

POLITECNICO DI MILANO

**School of Architecture, Urban planning, Construction engineering
Master of Science in Management of built environment engineering**



**The Somali National University 4 project:
a technical and managerial approach to the development process**

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1. Introduction

1.1. Somali National University 4 project

European university models, consolidated for centuries, are almost fixed and are modified only minimally through the years. On the African continent, however, the situation is very different. Decades of civil wars have certainly not positively contributed to building a solid educational system. Somalia is now facing a rebirth process that can get its entire economy back in motion and the Somali National University¹ has to play a key role in this development.

The African context offers the chance to operate in a different way from the architectural, environmental and cultural point of view with respect to the European one where everything is strictly defined and under control. The challenge of operating in a similar project is not to lose the focus and the bond between what it is needed and what it is expected as an outcome.

The initiative proposed by Politecnico di Milano, with its infrastructural specificity, integrates and brings continuity to the academic-didactic and political-institutional development of SNU. This process started with SNU1 project, the so called “Somali Web University” of the Interuniversity Research Centre for Sustainable Development². Then it continued with the SNU2 project of the University of Roma Tre called “Higher Education for the teachers of Somali National University operating in Somalia”, currently in the closing phase, and still in progress with the imminent start of the SNU3 project proposed by the same University of Roma Tre, “Italian Support for University Training in Somalia 2018-2020”, approved at the end of 2017. These projects are all integrated and coordinated by the Italian-Somali Scientific Committee³. The SNU4 project is the basis for the rebirth of the main university in Mogadishu, identifying as a major priority the survey of the actual state of the buildings, the construction of a perimeter wall to protect the area, the renovation of the surviving buildings and the drafting of a masterplan to organize the progressive construction of the new campus. The project aims at contributing to the institutional, economic and cultural rebirth of the country and participating in the strengthening of the role of university education in the process of overcoming tribal differentiation.

The approval of the cooperation initiative to be implemented in Somalia, lasting twenty-four months, called “Infrastructural and strategic strengthening of the Somali National University 2020-2022”, aims at providing quality, equitable and inclusive education and opportunities for learning for everybody. This refers to the program of guaranteeing equal access to all women and men by 2030 to technical, professional and tertiary education – including university – which is advantageous from an economic and qualitative point of view for the entire Somali community.

The operation also promotes peaceful and more inclusive societies for sustainable development with effective, accountable and transparent institutions at all levels.

The costs of carrying out the planned interventions on the SNU buildings will be financed by SNU with funds from the Italian Cooperation⁴ up to the amount of available funds.

The priority objectives underlying the project are:

- Urban and energy-environmental planning of the Gahayr Campus;
- Restoration of the existing building of the faculties and reconstruction of the rectorate;
- Institutional and technical strengthening of the SNU.

¹ Henceforth: SNU.

² CIRPS, established in April 1988.

³ CSIS, established at the birth of the program.

⁴ AICS, established in August 2014.

1.2. Stakeholders involved

A project is successful when it achieves its objectives and meets or exceeds the expectations of the stakeholders involved. This is the reason why it is important in the SNU 4 project identifying, analysing, engaging and managing the attitudes and expectations of all relevant stakeholders. All individuals, groups or organisations participating in, effecting, being affected by, or interested in the execution or the result of the project should be seen as stakeholders. This may include sponsors, clients and users, suppliers/subcontractors, alliances and partners.

Stakeholder engagement is an ongoing process, throughout the lifecycle of the project and it includes constantly revising, monitoring and acting upon their interests and influence on the project itself. It may also involve building strategic alliances that create organisational capacities and capabilities where both risks and rewards are shared⁵. All interested parties can influence the project either directly or indirectly, they can have an active or passive role and their involvement in the project may be permanent or part-time.

The first step in stakeholders analysis is to brainstorm who the stakeholders involved in the SNU 4 project are. As part of this, it must be taken into account all the people who are affected by the work, who have influence or power over it, or have an interest in its successful or unsuccessful conclusion. Then they can be divided into primary and secondary stakeholders. Primary stakeholders can influence the project more directly and immediately, while secondary stakeholders can influence the long term behaviours, being able to affect the social context of individual relationships. Although stakeholders may be both organizations and people, ultimately it must be identified the correct individual within a stakeholder organization to communicate with.

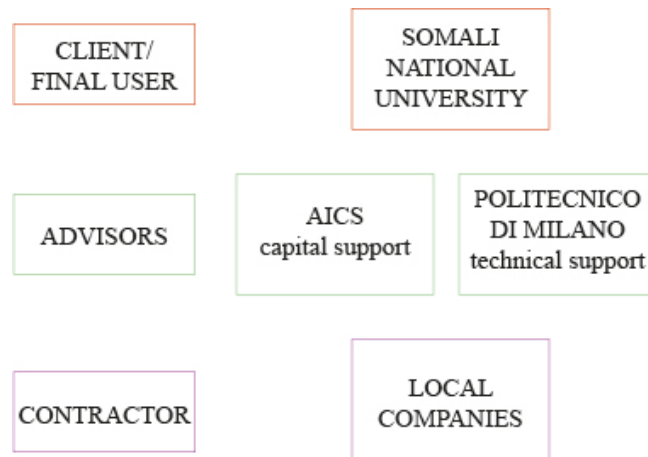
Stakeholders can be classified into four groups, depending on the power to influence the project and depending on the interest in the project, even if it must be considered that stakeholders' possibility to influence the project is the most during the project's initial phase. Key stakeholders are those with the most interest and power to influence the project. Institutional stakeholders must be considered and watched carefully because they have as much as power to influence the project, but they have less interest. Operational stakeholders have great interest in the project but less power to influence it, while marginal stakeholders have little interest in the project and little power to influence it.

The stakeholders involved in the SNU 4 project are:

- The client/final user of the project itself: the Somali National University, formally represented by the Rector;
- The advisors: on one hand AICS (Agenzia Italiana per la Cooperazione allo Sviluppo) for the capital support and on the other hand the group composed of professors and researchers of Politecnico di Milano for the technical support;
- The contractor, or winning bidder: local companies and businesses involved in the drafting of the executive project and its implementation.

The Somali National University is a primary and key stakeholder, because of its central role in the project as both client and final user. The advisors may be seen as secondary and institutional stakeholders because their role is detached but fundamental for carrying out the objectives established. The contractor will be the operational stakeholder, focused on the execution of the project.

⁵ IPMA (2015), Italian Individual Competence Baseline for Project, Programme and Portfolio Management (Version 4.0), Nijkerk, The Netherlands, pp. 145.



*Figure 1 - Stakeholders involved in the SNU 4 project.
Source: elaboration by the author.*

1.3. Flowchart and methodology

The entire project can be divided into three big phases: the preliminary phase, the planning phase and the executive phase. Each of them is composed of a series of activities connected to each other, with the aim of simplifying and preparing for the next phase.

All available information have been collected from a theoretical (history, context, culture, ...) and practical (survey, mapping, ...) point of view during the preliminary phase.

Since the early stages of planning and size drafting, the complexity of acquiring information was evident both during the data collection and the survey phase, due to different approaches and a radical change in the work method.

The assessment of information regarding the recent history of the country, the context in which the university was born and the actual situation of other universities in the territory was performed thanks to the document realized by Terra Nuova and AICS and published in November 2015 on trends in demand and supply of tertiary education around the whole country.

It was also necessary to assess the Somali youth with their needs and expectations to try to identify with the social context in which the campus will be built before going into the details of the actual project.

The analysis is a key aspect for the whole process and it was based on the most recent document (January 2020) made available by USAID (United States Agency for International Development). This scientific paper is particularly interesting because it doesn't reflect the views of USAID or the United States Government on the subject matter, but it is rather impartial and it allows to better understand the current situation of the Somali state from an internal point of view, since it is based on interviews with young people aged between 15 and 30 belonging to different regions and life scenarios.

The remaining part of information contained in this work (especially the data regarding the survey on the territory and drafting of the masterplan) is a re-elaborated version of material used by the group of professors and researchers of Politecnico di Milano led by Professor Niccolò Aste during the whole project.

The planning phase is being carried out in these months and it comprehends the design and the operational part: the drafting of a masterplan has already been completed by a group of Politecnico di Milano led by Professor Laura Montedoro and a first sizing was outlined for the purpose of this thesis, but it will be partially revised once the work will be in a more advanced stage.

The executive phase is divided into two main parts: the tender procedure and the implementation of the project.

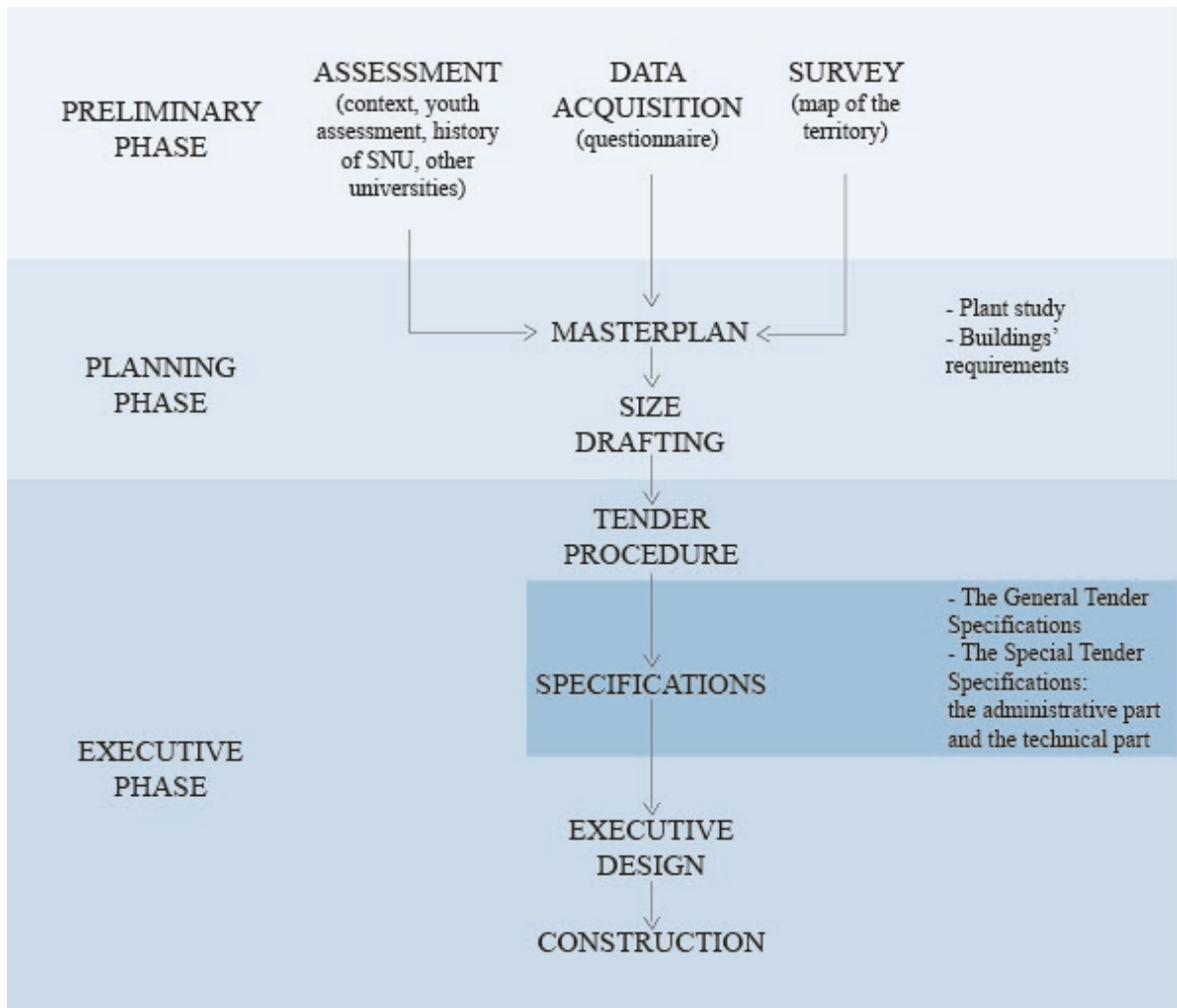
The first part will be the core of this thesis, in particular the analysis and the writing of the Specifications for a peculiar case like the one taken into account. The Specifications will be divided into the General Tender Specifications and the Special Tender Specifications, which is composed of the administrative and the technical part. The writing of the articles will be adapted from the European directives and regulations and on the analysis of similar Specifications for universities' buildings in the Italian and European context.

The technical part will be written not only following the current legislation, but also with hypothesis based on the information about the African context in order to adapt the articles to the specific SNU project and to give a more precise idea of which characteristics the buildings will have to satisfy from a qualitative point of view.

The objective of this work is to focus on the whole process from a technical and managerial point of view to analyse the realisation of a new campus from an internal perspective. This is the reason why the analysis of culture, history and education of youth in Somalia played an important role in the preliminary phase together with the operational part of drafting a questionnaire to investigate the real needs and expectations and of translating these results into a first size drafting for each building on the campus.

The challenging part was not only to take into consideration the most common regulations and needs that can characterize such a large campus as the SNU, but also to investigate the peculiarities related to the context and place. These attentions were addressed again when Specifications were draft to give a more personal cut to the work.

The second part is composed of the drafting of the executive project, the one made for the execution of the last phase, the construction of the project itself. This last activity will be carried out by the contractor who will be selected through the tender procedure and the drafting of the executive project will be based on the masterplan and on the Specifications under the supervision of professors and researchers of Politecnico di Milano.



*Figure 2 - Flowchart of the whole process.
Source: elaboration by the author.*

2. Preliminary phase

2.1. Assessment

2.1.1. Context

Somalia is classified as a least developed country by the United Nations and education was near the international bottom in terms of financial resources – average per pupil expenses are about US \$25 per annum – and persistence of the situation is affirmed by Somalia Education Cluster⁶, but an effective tertiary education system may be crucial for a country's economic development. For example, the rapid growth experienced by several East Asian countries in the last half-century followed increased investments in the education sector and the alignment of higher education provision with national economic priorities in those countries. The collapse of the Somali state in 1991 resulted in the disappearance of the formal education systems, leaving most children without an opportunity to receive the desired education. This also weakened the governance of the education sector especially crippling the monitoring of tertiary education.

Available literature indicates that the education system in Somalia was adversely affected when there was no functional government for almost twenty years after the deposition of Mohamed Siad Barre because there was no formal syllabus for unified training and instruction for both primary and secondary levels. This situation changed when the Somali Federal government came to power in August 2012 and established the Directorate of Education which quickly embarked on developing a curriculum for their education system and promote common national values. Nonetheless, private schools still managed to operate and established umbrella bodies representing the over 1,130 private schools across Somalia.

According to UNICEF, 52% of the educational activities in Somalia are based in the south central region, where there is no central government system. In this region, a network of educational organizations was established in 1999 to help implementing a common curriculum and examination system for their member schools but often at odds between the public and private sector. Although the education sector is not among the main priority areas of the government, the public education sector in Somalia has improved. In 2014, enrolment was estimated at 90,000 children in formal primary education after decades of stagnation. This is a first step toward addressing the extremely low national enrolment rate of around 42%, of whom only a third are girls. Secondary school participation is even lower for both boys and girls, with net attendance ratios of 12% and 8%, respectively. Barriers to education include limited or unavailable primary and secondary school facilities, prohibitive school fees in good schools at all levels, and conflicting household and livelihood demands. Girls, in particular, are less likely to attend school due to domestic responsibilities. Nearly 75% of females between 15 to 24 years are illiterate, one of the world's highest levels of gender disparity. Net Attendance Ratio (NAR) for both Primary and Secondary education indicates that there is disparity between regions, gender and areas of residence. North West (Somaliland area) has the highest primary and secondary education NAR for both boys and girls indicating potential for growth of the tertiary education in this region. However, the good achievements in education are marred by lower gender parity compared to other regions.

⁶ Somalia Education Cluster annual report (2011).



*Figure 3 - Mogadishu after a bombing attack.
Source: Pacific Standard Magazine.*

Since 1991, efforts and investments in rebuilding the sector have been mostly directed to primary and to a lesser extent to secondary education. There is a gap in the institutional framework for enforcement of compliance with quality assurance requirements important for improved delivery of tertiary education services in Somalia. In a normal context the government would mitigate that gap to a certain extent through subsidies. However, in the reality of a post conflict situation, this would be extremely difficult due to the obvious financial constraints. The paradox is that on one hand average fees for Arts, Management and Linguistics are the same or slightly higher than those for a similar diploma in Veterinary Science in spite of the completely different cost structure between science and art courses (taking into consideration associated costs such as chemicals, laboratory fees, etc.), while on the other hand modest fees are charged for degrees in Medical fields, but this could be realistic only in the case of substantial Government subsidies, which is not the case in Somalia. Therefore, other approaches to mitigate this situation have to be chosen, such as donor support and scholarships to widen the access.

Moreover, the legal framework and establishment of the quality standards for tertiary education are at an infancy stage and needs to be developed, harmonized and enforced everywhere in the Country (Somaliland, Puntland, Galmudug, Jubaland, etc.). Consequently, the private sector was left a wide margin to establish and operate universities and colleges as successful business outfits with minimal regulations. The ownership status of most of the tertiary institutions in Somalia is important for understanding the level of quality and control over the education system. There are three different types of tertiary institutions: public, private but operating on for-profit basis and private operating not-for-profit, which is the main status of most of the education institutions in Somalia, meaning that tertiary education has been left to private sector investors with government having no major control in their operations. This might eventually affect quality of education considering that most of the private investors will eventually want to make profit in order to sustain their operations. As such, government control and investment in tertiary education in Somalia needs to be readdressed. The institutional framework that the Government of Somalia is promoting to streamline tertiary education are the Ministry of Education (MoE) and Education Commissions and these include the National Education Commission, the Regional Education Commission and the District Education Commission.

In Somalia the main problems at the moment are therefore a tremendous increase of the demand for tertiary education and a tertiary education sector insufficiently regulated allowing the establishment of universities and colleges without meeting the minimum quality requirements mainly driven by commercial motives. In this regard the private sector has outpaced the creation of public institutions that set policies to guide and govern all activities in tertiary education. In Somaliland, for example, it was only in early 2014 that the National Commission of Higher Education (NCHE) was established, long after many universities had started not only operating but also graduating students. It is understandable that balancing public and private good interests under such circumstances is challenging. In stable contexts, a Commission would be the entry gate to assess the intent, relevance and capacity of any institution aspiring to operate and join the tertiary level league of institutions in a Country because the commission is created as a public institution with the mandate to set the guiding policies that govern all institutional activities whether public or private. In Somalia's situation the private sector institutions seems to have outpaced the regulator. The universities in three regions of Somalia did not adopt standard governance structure, even if this is contrary to the governance standards set by regulatory institutions such as the National Commission for Higher Education. Its minimum requirements under standard No. 1 demand that the governance and management structures of the higher institutions in Somalia should have clear and appropriate delineation between oversight responsibilities and day to day management such that oversight and management roles are distinct and apparent⁷. Colleges have different governance structures with common organs being the President, Board of Directors (BOD), Vice President, Academic Committee and Dean of Faculty, meaning that the governance and management structures for the higher education institutions are variable. This is indicative of lack of enforcement of a common governance structure across the Country, which can lead to difficulties in monitoring and evaluating the quality and provision of higher education because each would require different set of criteria and indicators.

Nowadays, 70% of Somali youth migrates to find better job opportunities, while the second most popular reason is to study and it is obviously linked to the first one: studying abroad is viewed as a path to achieve better or different job opportunities. Somalia has recently tried to redevelop the university system and a remarkable growth in both student number and enrolment for tertiary education in Somalia (Somaliland, Puntland and South Central Somalia) and Intergovernmental Authority on Development (IGAD) member States⁸ has been registered in the past years, while now is slowing down, probably due to attainment of full capacity. However, it is interesting to note the increasing of female students in the enrolment, a sign of change of attitude towards educating women in Somalia.

2.1.2. Youth assessment

The aim of this analysis is to describe youth life goals and factors that hinder them from achieving those goals, defining structure and characteristics of youth cohorts⁹ in Somalia, how to support youth and enable them to actualize their civic and economic potential, through specific strong opportunities perceived by Somali people for promoting private-sector engagement in issues impacting youth and for advancing self-reliance¹⁰.

⁷ National Commission of Higher Education of Somaliland (2014).

⁸ Djibouti, Ethiopia, Somalia, Eritrea, Sudan, South Sudan, Kenya and Uganda.

⁹ In statistics, a set of individuals who have experienced a given event in the same period.

¹⁰ Farah, O.; Jessee, C.; Rutherford, D.; Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia Youth Assessment, Washington, DC, pp. 1.

Assessment results also are intended to provide donors and development practitioners working in Somalia with information on opportunities and challenges for supporting youth’s journey from adolescence to adulthood and how to transition young people successfully into productive, healthy adults.

Youth cohorts are characterized as follows¹¹:

- Youth living in rural areas, Internally Displaced Persons¹² camps, nomads: just over half of youth fall within this group with 22% living in rural areas, 26% are nomads and 7% are IDPs. These youth suffer from low access to services, including education, health, water, and sanitation. Youth in IDP camps, especially girls, suffer more from insecurity than host communities.
- Youth from poverty-affected families: two out of three youth live in poverty with food insecurity.
- Poorly educated youth: more than half of Somali youth are illiterate; two out of three have no formal education. Out-of-school youth are dropouts or those who completed school, but unemployed.
- Youth from marginalized families and girls: these youth lack connections or family support, which is often related to being from one of the marginalized clans.
- Females: girls forced into early marriage and those experiencing gender-based violence, which affects one out of four women.
- Youth recruited into terrorist groups or crime groups: male youth are most in danger of being recruited into terrorist or crime groups.
- Youth attempting illegal migration: typically, these at-risk youth are seeking a better life or services.

Zone	Region	Site (approximate distance and time)	Status
	Banadir	Mogadishu, Capital City	Urban
Federal/ South Central	Hirshabelle State	Balcaad Town (30 Km from Mogadishu) 45 km/3-hour drive by road with security	Rural
	South West State	Baidoa city, Regional Capital City (400 km from Mogadishu) Accessible by flight (45 min)	Rural/urban
Somaliland	Moroodi Jeex	Hargeisa (Capital City)	Urban
	Galbeed	Gabiley (30 km) from Hargeisa 45-minute drive	Rural
Federal/ Puntland	Nugaal	Garowe (Capital City)	Urban/ rural
	Mudug	Burtinle (60 km from Garowe) by road with security	

Figure 4 - Zone and regional sampling.

Source: Farah, O.; Jessee, C.; Rutherford, D.; Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia Youth Assessment, Washington, DC.

Youth lack safe spaces in which to engage and grow: these are necessary for emotional growth and confidence building, as well as peer-to-peer communication, and opportunities to learn conflict-resolution and other communication skills.

¹¹ Farah, O.; Jessee, C.; Rutherford, D.; Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia Youth Assessment, Washington, DC, pp. 1-2.

¹² Henceforth: IDPs.

In terms of the enabling an environment for positive youth development, a few salient themes to take into consideration are¹³:

- Government attitudes, policies, and regulation: policies and strategies supporting youth are well written and recommend some best practices for youth development, but require coordination, oversight, and follow-through.
- Tribalism, nepotism and corruption interfere with youth development, except for those who are connected with strong clan networks.
- Private-sector engagement: some non-government people believe the private sector is booming and is ready to engage youth if they had the skills required to work in the private sector. They believe that government is neglecting to appropriately engage with the private sector and that public-private partnerships would enable funding for youth training, tools (such as those needed in an ICT (information and communication technology)-based workplace), and internships/future work.
- Gender: traditional views of household roles are strong in Somali households in which women are responsible for household chores and children, and men make financial decisions. Women suffer from harassment in the workplace, which is a result of culture-based discrimination.
- Elders control leadership positions: elders do not retire to make room for youth to lead.

There are several opportunities that could have high potential to make a difference in the lives of Somali youth, such as the increase of youth earnings through self-employment, the increase of youth access to educational opportunities, the increase of youth engagement in community and government activities, the addition of an open space for youth to be leaders in the public sphere to strengthen the rule of law, the increase of youth's access to finance and the implementation of positive youth development approaches within youth programs.

Much more in detail, these actions could be explained in the following way¹⁴:

- The increase of youth earnings through self-employment: there is a great unmet demand for programs that offer skills, assets, and supports for youth to obtain a stable source of income through self-employment in the informal sector. Targeting rural areas and the agriculture/livestock sector is important to reaching underserved youth, despite the trend in rural to urban migration. Successful youth livelihood interventions require integrated supports, using flexible, modular components that can be tailored to the needs of different youth segments. Develop a public-private partnership strategy to make private sector engagement easier for local stakeholders. Youth livelihood programs must align the aspirations of youth with the demand trends of the market.
- The increase of youth access to educational opportunities: integrate technology, manual labour skills, soft skills, and social-emotional learning throughout education. Improve the quality of education. Strengthen technical and vocational education training¹⁵ institutions by developing standards and providing progressive skills to meet entry-level, mid-level, and high-level positions so that youth can be competitive in the market and respected by would-be employers and clients.
- The increase of youth engagement in community and government activities: engage youth with one-stop centres and sports in safe spaces. Be intentional about reaching vulnerable youth segments. Conduct Somalia-wide, locally tailored public information campaigns to support youth development and civic engagement. Foster the development of youth-led projects and

¹³ Farah, O.; Jessee, C.; Rutherford, D.; Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia Youth Assessment, Washington, DC, pp. 2-3.

¹⁴ Farah, O.; Jessee, C.; Rutherford, D.; Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia Youth Assessment, Washington, DC, pp. 3-4.

¹⁵ Henceforth: TVET.

strengthen youth-focused institutions and line ministries to deliver youth-focused holistic programs and monitoring.

The final goal is to build a durable foundation for a more stable, democratic, and prosperous Somalia by strengthening systems and processes that enable inclusive governance, improving service delivery, and expanding inclusive economic growth. The Framework describes youth as much of the population (75% below the age of 30) and recognizes deeply entrenched attitudes and values with power asymmetries, making youth participation in economic and civic life challenging and necessitating programming to facilitate youth political empowerment and leadership. Due to the civil war, youth lack training and education, making education a strategic priority, with only 6% of youth (15-24 years old) enrolled in secondary school. Youth also suffer from a higher rate of unemployment than the overall population, which suggests the need for economic strengthening programming¹⁶.

The assessment sought to better understand the status and aspirations of Somali youth ages 15-30 in their journey from adolescence to adulthood, a transition that includes starting a productive working life, developing healthy lifestyles, and exercising citizenship¹⁷.

2.1.2.1. Somali youth demographics

Somalia has a youthful demographic that is like other countries in sub-Saharan Africa. With a total population of about 15 million¹⁸, 75% are under the age of 35 and about 29% are between 15 and 29 years-old¹⁹. More than half of the youth are illiterate, two out of three have no formal education²⁰, and literacy declines with age²¹.

Young women are more likely to be married. On average, youth marry in their 20s, men slightly later than women (25 years-old and 22 years-old, respectively). More women are married between the ages of 15-35 (55%) than men (40%). More rural youth are married

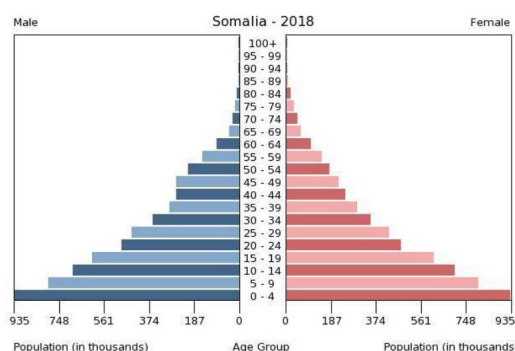


Figure 5 - Population Pyramid.
*Source: Farah, O.; Jessee, C.; Rutherford, D.;
Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia
Youth Assessment, Washington, DC.*

¹⁶ Farah, O.; Jessee, C.; Rutherford, D.; Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia Youth Assessment, Washington, DC, pp. 5.

¹⁷ Farah, O.; Jessee, C.; Rutherford, D.; Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia Youth Assessment, Washington, DC, pp. 6.

¹⁸ The World Bank (2018), World Development Indicators.

¹⁹ UNFPA based on PESS (2014), The Somali Youth in Figures.

²⁰ UN (2019), Somalia Youth Engagement & Empowerment.

²¹ UNFPA (2016), Educational Characteristics of the Somali People, vol. 3.

(60%) than urban youth (40%). Youth-headed households are most likely to be led by men (80%)²².

Most youth live in poverty and with high food insecurity. Two out of three youth ages 15-24 live in poverty²³. Larger households are more likely to be in poverty (7.23 members compared to non-poverty households with 5.57 members)²⁴, which is driven partially by food insecurity, as over half of Somalis are acutely food insecure²⁵. Poverty-ridden households also have a higher dependency ratio. Two out of three youth are unemployed despite having more education than the previous generation²⁶. According to the Somalia Social Protection Policy (2019), political participation is weak, and unemployment and livelihood opportunities are drivers for youth engagement in conflict.

Youth in Somalia live mostly in urban areas (45%) or are nomads (26%) or live in rural areas (22%), while some live in camps for internally displaced people (7%)²⁷. Youth are moving from rural areas where they work in agriculture (particularly livestock) to urban areas (or out of the country) due to famine, drought, and lack of livelihood opportunities²⁸. Yet rural youth lack skills necessary for employment in urban areas, where unemployment already is high and nepotism makes opportunities unavailable to the majority, which can lead to disaffection, unrest, and recruitment into criminal activities²⁹.

2.1.2.2. Youth and education

Access to and quality of education are a work in progress. Children ages 6-13 and 14-17 are most likely to be in school (59.2% and 55.2%, respectively), while youth ages 18-24 and 25-34 are less likely to be in school (36.6% and 16.8%, respectively)³⁰. Half of the children in primary school, however, are over the age of 13³¹, making Somalia a country with the one of the lowest rates of primary school enrolment. Two out of three youth enrolled in secondary school are over age³².

Access to education is lowest for those in rural areas, in the lowest wealth quintile, and in IDP camps. Poverty correlates with school enrolment. Gross enrolment rates in primary school suggest some progress with greatest improvements in Federal/Puntland, stagnation in Somaliland, and challenges in the areas governed by the Federal Government of Somalia. Rural and nomadic communities lack educational infrastructure, enough teachers, and learning materials and supplies, and are long distances to schools and have poorly aligned curricula to cultural and economic needs of communities³³. Gross enrolment rates for secondary level show more improvement in all areas, but especially

²² UNFPA based on PESS 2014, The Somali Youth in Figures.

²³ UN (2019), Somalia Youth Engagement & Empowerment.

²⁴ Somalia Social Protection Policy (2019).

²⁵ Somalia Situation Report (2019), Food and Agricultural Organization of the United Nations, retrieved from http://www.fao.org/fileadmin/user_upload/emergencies/docs/SituationReportSomaliaOct2019.pdf

²⁶ Somalia Situation Report (2019), Food and Agricultural Organization of the United Nations, retrieved from http://www.fao.org/fileadmin/user_upload/emergencies/docs/SituationReportSomaliaOct2019.pdf

²⁷ UNFPA based on PESS 2014, The Somali Youth in Figures.

²⁸ Ministry of Youth and Sports (2017), The National Youth Policy of the Federal Government of Somalia.

²⁹ SIDRA Institute (2019), Policy Brief 12: The Idle Youth Labour Force in Somalia: A blow to the country's GDP, retrieved from www.sidrainstitute.org

³⁰ UNFPA (2016), Looking Towards a Brighter Tomorrow: Educational Characteristics of the Somali People, vol. 3.

³¹ UNICEF, Somalia Education Strategy Note 2018–2020, retrieved from <http://files.unicef.org/transparency/documents/Somalia%204.%20Education.pdf>

³² UNFPA (2016), Educational Characteristics of the Somali People.

³³ UNICEF (2018-2020), Somalia Education Strategy Note.

Federal/Puntland and Somaliland. Youth in households receiving remittances have a higher school attendance by 17%, suggesting that education is a priority investment³⁴. Out-of-school children ages 6-18 have risen where most of them are in Central and South Somalia³⁵.

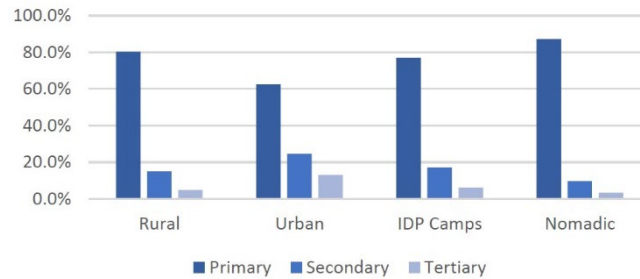


Figure 6 - School enrolment by location.

Source: Farah, O.; Jesse, C.; Rutherford, D.; Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia Youth Assessment, Washington, DC.

While urban enrolment rates show greater education access, the urban poor are among those most affected by inequities. Other affected groups include those living in rural areas, especially pastoralists, Internally Displaced Persons, and girls. Gender inequities remain high, although less so for those in IDP camps due to interventions³⁶.

In terms of quality of education, literacy rates are highest among the youngest group, those 15-19 years-old, suggesting that education quality may be improving³⁷. The proportion of qualified teachers is improving, although fewer than one in four are qualified³⁸. Quality of curricula and availability of materials are also improving. As with access and equity, the most affected young people live in rural areas.

Existing educational institutions and curricula fail to meet the needs of youth with skills needed in the job market and for livelihood opportunities. This issue includes TVET curriculum, which, if an approved curriculum is established, would mean graduates would have greater competency and productivity³⁹.

2.1.2.3. Employment and economic opportunities

One of the major contributors to poverty is the lack of opportunities for youth⁴⁰. Youth employment is a cornerstone of stability in Somalia⁴¹. Regardless of formal employment rates estimated at 27% youth employed (58% male, 42% female), of whom 70% are in agriculture, forestry, and fisheries⁴², many youth are engaged in work of some sort. One

³⁴ World Bank Group (2018), Federal Republic of Somalia Systematic Country Diagnostic. Report No. 123807-SO.

³⁵ UNICEF (2017), Annual Report 2016: Somalia Education Cluster.

³⁶ UNICEF, Somalia Education Strategy Note 2018–2020.

³⁷ UNICEF, Somalia Education Strategy Note 2018-2020.

³⁸ FGS, ESSP 2018–2020.

³⁹ FGS, ESSP 2018–2020.

⁴⁰ Somalia National Development Plan for 2020-2024 (2019).

⁴¹ Ministry of Youth and Sports (2017), The National Youth Policy of the Federal Government of Somalia; UN Youth Strategy for Somalia 2016-2020; UN Somalia Youth Engagement & Empowerment (2019).

⁴² PESS (2014).

survey⁴³ found that 72% of youth are actively job hunting and 27% feel discouraged. The report also finds that the private sector is reviving in urban centres and construction is the most visible economic activity.

Challenges to youth employment include:

- An ineffective system to enforce fairness processes;
- Strong clan preferences; nepotism; lack of advertised jobs – jobs are mostly acquired through connections and word-of-mouth within networks. This is exacerbated by small companies' reliance on clan relatives/friends/elders to identify candidates (these jobs are not advertised);
- 67% of youth interested in starting a business, with 91% of them reporting a financial barrier;
- Brain drain and migration due to lack of opportunities, peer pressure, and access to quality education;
- Lack of livelihood opportunities in rural areas due to migration to urban areas; lack of skills due to inadequate education, disrupted knowledge sharing from one generation to the next, and/or loss of lifestyle (rural, agricultural/pastoral).

Key sectors are agriculture/livestock, fisheries, forestry, and minerals. Somalia's economy heavily depends on these sectors (agriculture represents about 93% of total exports), particularly livestock, but drought and flash floods have deeply affected agriculture and those dependent on it for their livelihoods and food⁴⁴. More than half the population is acutely food insecure; half of whom are coping with severe food insecurity, which is particularly intense in rural areas. Somalia is ranked first for climate-change vulnerability among 167 countries⁴⁵. Other factors affecting vulnerable youth in agriculture are access to land, which is diminished by government policy pushing large-scale, mechanized agriculture⁴⁶, and the loss of traditional agriculture as youth do not have the previous generation from whom to learn⁴⁷.

Youth engagement in the crop sector, dominated by maize and sorghum, also is suffering though Somalia has a growing food imbalance, with supplies producing only about a quarter of the cereal needs. Crop production as a means to employ youth suffers from insecurity, low yields, limited access to inputs and finance, and poor infrastructure. Growth of the sector will require adapting to climate change⁴⁸. Development of fisheries could diversify the economy, but the potential for livelihood from fisheries is hampered by a lack of infrastructure and government policy⁴⁹.

Youth unemployment and lack of economic opportunities is a push factor toward unrest and violence. Insufficient, unequal, and inappropriate education and skills combined with poor governance and weak political participation from the legacy of past conflicts⁵⁰ are push factors toward violence. High inflation is a constraint for youth employment⁵¹. Other

⁴³ Altai Consulting for IOM (2016).

⁴⁴ World Bank Group (2018), Federal Republic of Somalia Systematic Country Diagnostic. Report No. 123807-SO.

⁴⁵ World Bank Group (2018), Federal Republic of Somalia Systematic Country Diagnostic. Report No. 123807-SO.

⁴⁶ World Bank Group (2018), Federal Republic of Somalia Systematic Country Diagnostic. Report No. 123807-SO.

⁴⁷ Somalia National Development Plan 2020–2024 (draft) (2019).

⁴⁸ World Bank Group (2018), Federal Republic of Somalia Systematic Country Diagnostic. Report No. 123807-SO.

⁴⁹ World Bank Group (2018), Federal Republic of Somalia Systematic Country Diagnostic. Report No. 123807-SO and Forcier Consulting and ARC (2016).

⁵⁰ Evaluation of the Joint Program on Youth Employment Somalia (YES).

⁵¹ National Youth Policy.

enabling environment factors affecting youth employment include low levels of investment, a lack of financial services and infrastructure, and low labour productivity⁵².

High unemployment and limited livelihood opportunity, exacerbated by low levels of training and skills among the youth, both emerge from and amplify the poverty and vulnerability arising from conflict and environmental causes⁵³. All of Somalia's strategies, plans, and frameworks prioritize economic opportunities for youth. The nature of the challenges and goals in the strategies recognizes the mismatch between youth skills and employers' needs and expectations. The destruction of the education system and the absence of a significant vocational and technical training system have resulted in a substantial skills deficit among the youth in Somalia⁵⁴.

The mismatch also is due to a theory-based education in universities and lack of access to and quality of TVET⁵⁵. Yet findings from labour market surveys found that employers value university graduates more than TVET graduates⁵⁶. The findings support the recognition that clannism, ageism, and sexism negatively affect youth employment, especially for women. Nepotism and unfair practices are supported elsewhere as well⁵⁷. One of the many challenges to designing an effective youth unemployment strategy is the lack of reliable labour-market data, although some new surveys help to mitigate data gaps.

2.1.2.4. Youth participation and civic engagement

There may be possible confusion between civic engagement and civic education among youth-led organizations, because majority of rural youth lack both awareness of civic activities and civic education and they are not aware of their rights and responsibilities as citizens.

Civic engagement is broad and can be integrated into any sector, such as community activities, awareness raising, advocacy, sports for change, and leadership programs like Young African Leaders Initiative, etc.

Civic education focuses on educating the public on their rights, responsibilities, good citizenship, political participation, voting, etc. It can be integrated into school curricula and education programming.

Youth can be agents in their own development and the development of their communities and countries. Given that most people in Somalia are under age 35, youth participation and their engagement in civic and political issues are critical to individual, community, and national development.

Building youth capacity for civic engagement is critical. USAID's Somali Youth Learners Initiative⁵⁸ implemented group-based leadership training to build youth capacity for civic engagement. SYLI found that students were inspired by older youth and that civic engagement can be stunted by substance abuse. An impact evaluation of SYLI found that

⁵² Chiwara, et al. (2018), Youth Employment Somalia Mid-term Evaluation Report.

⁵³ The National Development Plan draft 2020–2024 (2019).

⁵⁴ National Employment Policy (2019).

⁵⁵ JICA (2017), Youth Employment Baseline Study for Somalia.

⁵⁶ Findings of the Labour Market Surveys: Commissioned by CISP For Strengthening Education and Training in Somalia (SETS), PowerPoint slides (2019).

⁵⁷ SIDRA Institute (2019), Policy Brief 12: The Idle Youth Labour Force in Somalia: A blow to the country's GDP, retrieved from www.sidrainstitute.org

⁵⁸ Henceforth: SYLI.

SYLI's combined intervention of secondary education with civic engagement reduced youth's support for political violence more than education alone.

Youth agreed that young people had few opportunities for agency or to develop leadership roles even in places where they described opportunities to participate. In most cases, the system is controlled by elders, who may not have a positive view of youth or trust youth. Youth are unhappy and they easily give up, but they want to be equally engaged in decision-making in their communities and beyond.

The biggest barrier is control by elders and tribes. Challenges to civic engagement include tribalism, criticism, lack of support, lack of awareness, lack of connection between people and government, youth not being allowed to participate, and parents discouraging youth from participating.

Security can hinder public participation. Fear, especially by marginalized groups such as returnees and IDPs who are unlikely to be from clans with high status or power, can hinder youth participation in public events such as civic engagement⁵⁹.

2.1.2.5. Defining vulnerable youth

The demographics reveal many circumstances that influence young people in Somalia. There also are many different segments of youth with unique circumstances that may be defined by biological stages, geographic location, or cultural factors. The term "assets" is here defined as the necessary resources, skills, and competencies to achieve desired outcomes. In Somalia, some distinguishing features of youth cohorts that are most relevant in understanding youth assets, or conversely defining vulnerability, include the following: possessing networks or family support; school completion; working; living in an urban setting with greater access to resources versus in a rural environment, IDP camp or living a nomadic life; gender.

Vulnerable youth is been described as:

- Out-of-school youth: dropouts and those looking for work, including unemployed university graduates;
- Those from poor/IDP/minority/marginalized families;
- Girls, especially those forced into early marriage;
- Boys recruited as drug dealers or terrorist groups, al-Shabaab;
- Youth who migrate illegally.

Youth may experience a vicious cycle in which inadequate education/skills and high inflation negatively affect their chances of employment/business start-up, possibly exacerbating their use of khat as a means of temporary escape. Substance abuse also contributes to poor health, further decreasing the likelihood of steady employment. This cycle is further affected by food insecurity, personal insecurity, challenges to freedom of movement, gender and geographic divides, and elite capture of power structures creating barriers to youth civic engagement and empowerment, which may result in disenfranchised youth potentially leading to an uptick in civil conflict.

⁵⁹ Regional Durable Solutions Secretariat (2019), Solutions Analysis Update 2019: Case Study on Lessons Learnt and Practices to Support (Re)Integration Programming – Mogadishu, Baidoa, and Kismayo.

2.1.2.6. Youth goals, aspirations, priorities, bright spots

The assessment affirms that young people have a clear set of goals for their future. While all want to be educated and self-sufficient through economic independence and the ability to provide for their families, they also see a series of tremendous obstacles that impede their progress. Most youth have a common set of goals: complete their education, get work that will support financial independence, have a family, support their kin, and give back to the community. Most IDPs, however, want these things for their children because they do not believe they are likely for themselves.

	Federal/Puntland		Federal/South Central		Somaliland	
	Urban	Rural	Urban	Rural	Urban	Rural
Increased safety and security		1	1	1	3	3
Better education	1		3	3		2
Better health	2	2		2	1	
Better livelihoods/jobs/ business opportunities	3		2			1
Better spiritual life					2	
Better social/civic opportunities		3				

Figure 7 - Youth ranking of priorities by location.

Source: Farah, O.; Jessee, C.; Rutherford, D.; Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia Youth Assessment, Washington, DC.

Tribalism/nepotism, corruption and access to finance are barriers to youth meeting their goals and aspirations. Sufficient finances allow youth to attend school at any level in the absence of a free education system. Money and financial assets are required to support entrepreneurship or any type of business. Success, according to youth, depends mostly on having the skills, knowledge, and finances. Some other requirements for success are: support from friends and family, a legal system to support agreements and adjudicate disagreement, being healthy in order to work, and adequate infrastructure, (e.g., for transport, and security). Personal and clan networks can be a source of finances for youth.

Limited access to education, finances, economic opportunities, community and family support, health services and security, in addition to power structures (favouring older men and those with connections to majority clans⁶⁰), diminishes the likelihood of success.

Youth top priorities for their well-being are:

1. increased safety and security,
2. better education,
3. better health.

⁶⁰ The 4.5 system is based on the political formula used in sharing political positions and resources to ensure stability, inclusivity and representation by women. 4 represents four major tribal blocks (Hawiye, Darod, Isaaq, and Dir) in Somalia and point 5 represent the small tribes. This system appears to be marginalizing youth from the smaller tribes.

Life in Somalia is gendered. Most youth have socially constructed gender views about what kind of work women and men can do. Women are easily harassed in the workplace, especially women working in Non-Governmental Organizations and government.

Youth involvement in households is traditional: women do household chores and men do not, except for heavy lifting. Some parents make joint decisions.

Economic opportunities or a general better life are the primary drivers for both rural-to-urban migration and going abroad. The rural-to-urban migration is driven by access to basic amenities, infrastructure, education, and jobs. Migrating youth is perceived as having little education, increasing the number of idle youth in urban areas. In rural areas, especially in Federal/South Central, al-Shabaab is a threat to youth, especially those from poor households, minorities and marginalized youth, who are exploited and recruited into extremist groups and engage in clan-instigated violence.

Irrespective of age, youth underscore the importance of access to quality education as they see education as a necessary step to a better future. This plays out in their goals and aspirations. The youngest people have the desire to complete their education and pursue further studies/university or professional courses. They aspire to be engineers, doctors, teachers, lawyers, social workers, political elites, scholars, managers, agricultural experts, bankers, and government officials. Youth with some formal education (at minimum attending or completed high school) from rural and urban areas have similar goals/aspirations. Youth IDPs, who missed out on formal education, have totally different aspirations. Rather than having dreams for themselves for the future, IDPs aspire for their children to have access to what they themselves lack: education, health services, and adequate food.

Some youth strongly desire to have their own business as a means to financial independence. Older youth (25-30) want good jobs/businesses, family, and political representation.

2.1.2.7. Education

Youth place a high priority on educational achievements from secondary through tertiary, and education is perceived by most employers to be the best opportunity to support youth in earning a living. Most youth are happy with the quality of education, mainly because of greater access to education opportunities (especially for girls); a unified curriculum; government control of curriculum and exams; improved quality and healthy competition between private and public schools (public school closing the gap); and improved teacher trainings and teacher incentives. However, dissatisfaction with education quality increases with age largely because education has not proved to be a launching pad to employment. However, there is considerable dissatisfaction with the education system and its outcomes.

The education system has not given youth the skills, tools, and abilities to face life's challenges and secure a job. This contributes to migration as youth fail to get work even after completing university, which they feel is largely due to an emphasis on theory-based teaching and learning rather than practical and activity-based learning strategies.

Curriculum concerns touch on all levels of education from primary to university. Youth believe that university curriculum lacks focus on critical fields, such as productive

systems (agriculture, livestock, fisheries) with courses in engineering, land economics, geology, etc., and is most often saturated with general courses, such as business skills, community development, social work, human resources. Quality of education is questionable as common curriculum is not used and teachers are not well trained and teachers training colleges are few. There's no quality assurance in place for education systems as a whole, teachers lack incentives, monitoring systems for schools are not in place, education is not free and is in the hands of private sector. Youth that studied abroad stand a better chance in getting employment due to poor quality education system. The major problem is the absence of one unified curriculum. There are more than twenty different curricula in use and the majority lack any bearing to the socioeconomic realities of Somalia. Important skills and courses, such as ICT/technology-based skills, agriculture, livestock keeping, and fisheries, are not in the curriculum and this represent a huge loss in the system.

Issue	Key informants	Youth
Mismatch between education and skills training and job market demand	✓	✓
Curriculum does not address needs and is frequently foreign based; it's broad and general, not standard and tailored to prepare youth to face challenges.	✓	✓
Lack of regulatory framework/quality control by respective government compromises quality; ineffective policy	✓	✓
Lack of public education hampers access to education for most children and youth.	✓	
Private-sector schools are driven by profit, not quality.	✓	
Mushrooming of educational institutions		
Overcrowded classes		✓
Lack of materials		✓
Political interference in scholarships		✓

Figure 8 - Concerns with education.

Source: Farah, O.; Jessee, C.; Rutherford, D.; Walanwal, F. K.; Woolf, L. (2020), USAID/Somalia Youth Assessment, Washington, DC.

Youth want information technology integrated into education because skills in technology are essential, although IDPs have no access to technology. IT and computer studies are absent from curriculum, leaving graduates without IT skills in an IT world.

While most youth have little or no information about vocational training available in their areas, they have a poor perception of TVET as they largely want office/professional employment. Somaliland and Federal/Puntland youth have more information on TVET than those in Federal/South Central. Youth have a low perception of TVET, especially in Somaliland and Federal/Puntland in undertaking manual and skill-based jobs. Youth in Federal/South Central have a higher perception of skill-based work. The idea that emerges is that TVET is not adequately preparing youth for the market, since training is short-term, of low quality, and project-based, and therefore not sustainable. Youth cannot compete with more skilled and experienced foreign experts (e.g., from Kenya, Uganda, Ethiopia, Yemen, Asia). Youth despise TVET skills because the mindset is wrong about the TVET among the youth in Puntland. Vocational institutes have been set up, but youth don't enrol.

Youth lack awareness of available resources in the regions and lack the skills to tap into those resources. In addition, youth's low opinion of skill-based jobs can be seen as misplaced priorities in which urban youth are unwilling to take TVET courses and rural youth do not want to work in agriculture, but rather migrate to urban areas to get white-collar jobs. Despite this, youth-led organizations and line ministries want long-term, high-

quality TVET training institutions to meet the demand for a skilled workforce. Currently, TVET training is short-term and project-based, typically three- to six-month training that saturates the market with traditional skills (e.g., tie-dye, tailoring, and beautification for women trainees), while diversity in youth-sectoral opportunities, ideas, innovations is needed as the current market sector is flooded with same ideas/skill sets.

Education is seen as a key step on the road to self-reliance by youth, their families and government. In addition to moral and financial support from families and community support, youth want peers, mentors, teachers, and policies to be supportive. Federal Government of Somalia Education Sector Strategic Plan 2018– 2020 seeks to contribute to several Sustainable Development Goals, including education, gender, equity, and peace and security with an increased budgetary commitment for education sector in the National Development Plan from about \$36 million in 2018 to about \$60 million per year in 2019 and 2020.

The critical issues⁶¹ around education in Somalia have been recognised by the Government and they are working to strengthening education and skills training:

- Increase accessibility and student participation by making education more engaging and more readily available to all.
- Empower the non-formal education sector and expand it in all regions of Somalia.
- Expand opportunities for TVET – ESSP 2018–2020, including doubling the funding for TVET from 2018 to 2019 though TVET accounts for 9% of the education sector budget between 2018–2020.

Top factors influencing learning outcomes are teachers and, at the community-level, parental support and encouragement. Teacher training needs to be a priority, as does hiring women teachers, as the absence of female teachers hinders girls’ enrolment⁶². In areas where families or communities discourage some youth, information campaigns should improve school enrolment and attendance.

Employment is a major challenge for youth in which livelihood opportunities are limited. Barriers to gainful employment include:

- Not having the necessary skills, sometimes due to lack of education and/or resulting from the mismatch between education and work described above (Education). Youth are not interested in undertaking and studying agriculture and livestock. Instead the market is flooded by youth with skills in business management and other social studies that are not market driven. Youth lack career counselling opportunities that can link them to courses that are market oriented.
- The lack of job opportunities across zones exacerbated by inadequately educated youth and instability.
- Tribalism, nepotism, corruption. Opportunities are often not open to youth (or publicized) unless they have connections. Some youth think effective implementation of government employment policies would benefit job seekers. There is a lack of advertised jobs, whereby people get work largely through word-of-mouth within networks. Small companies rely on relatives, friends, and clan elders to identify candidates.
- Negative perception of manual labour may prevent some from accessing TVET to build skills.
- Insecurity and fear of al-Shabaab limits movement and access to agricultural land.

⁶¹ Somali National Youth Policy (2017).

⁶² Colburn, M., Mwero, D., Meme, J., Hassan, A. (2015), Somalia Youth Learners Initiative Baseline Report, IBTCI.

- Gender discrimination. Youth say women experience harassment and insecurity in the workplace, especially if they work in government or NGOs. Youth said this is due to a negative perception of women in those types of jobs. This discrimination was more commonly described by youth in Federal/South Central.

Many employers seek high-level skills. Depending on the sector – Energy, Telecommunication – employers are looking for employees with engineering skills, such as electrical, internet, and telecommunication. However, soft skills, such as hospitality, communication, front office operations, management skills, etc., are also critical skills. Desirable professional skills in the banking sector include accounting, marketing, auditing, finance, human resources, and management, Islamic banking background, ICT skills, but soft skills such as easy communication and presentation skills are also needed. All employers want people with excellent soft skills: interpersonal relations, presentation, customer care, and good communication skills.

2.1.3. History of SNU

Somali National University was founded in Mogadishu with the support of the Italian Cooperation in the mid-1970's, and was open until the beginning of civil war in 1991. The campus was realized with the help of the European Common Fund on a project made by two important Italian architects, Ludovico Quaroni and Salvatore Dierna. The area involved is 4 kilometres away from the city centre on the western suburbs, a favourable spot from a logistical and environmental point of view: it takes advantage from the monsoons because of the elevated position with a moderate slope towards south and it is reachable from the main road linking the city centre of Mogadishu to Afgoi. It was an important road on a national scale already at the time because it was the only paved one connecting all the cities of Somali's southern regions to Kenya with urban and suburban means of transport. The campus was divided into two parts between the Afgoi road: the institutional part with rectorate, classrooms, departments and laboratories of the faculties on a concentric band model on the south, while student residences, the canteen, sports area and other residences for teachers according to a linear comb pattern on the north.

Due to the civil war, it has been abandoned for the past twenty-seven years. The institutional part was used as land to build the sheds that housed the UNOSOM forces (later demolished), while some buildings (teachers' residences) were illegally occupied and integrated by other newly built illegal residences. The northern part was also illegally occupied and the saturation of the empty spaces was reached with abusive constructions of various functions.



*Figure 9 - Aerial view of the campus designed by Quaroni and Dierna.
Source: Quaroni archive.*

Prior to its closing in 1990, SNU had over 7,500 students enrolled in eleven different faculties. It is currently the only publicly funded higher education institution that provides free, quality education to Somali nationals. The Rector of SNU, professor Mohamed Ahmed Jimale, forecasts a facility hosting 50,000 students in twenty years and composed of the following different faculties:

1. Faculty of Agriculture and Environmental Science, founded in 1971, composed of six departments: Cultivation production, Agriculture economics, Plants' protection, Nutrition, Horticulture and Agricultural extension.
2. Faculty of Economics and Management Science, one of the largest Faculties at the Somali National University, composed of six departments: Economics, Public finance, Commerce, Agriculture economics, Applied statistics and Business economics.
3. Faculty of Education and Social Science, established in 1963, composed of the following departments: Political science, Psychology, Media science, Communication sciences, Social worker, Tourism science, International relations, Foreign Languages (such as Italian, English, French and Arabic), Modern culture, Geography, Anthropology, History.
4. Faculty of Engineering, founded in 1973-74, at the time there were two departments: Industrial and Civil and environmental engineering. It was active until 1990, when civil war erupted in the country. It has been re-established in 2016-17 and now its departments are: Civil & Environmental, Mechanical, Electronics, Electrical, Meccatronic, Chemical, Architecture and Urban Planning.
5. Faculty of Law, established in 1954, as a satellite of the universities of Rome and Padua. In December 1969 the Institute of Law was transformed into the Faculty of Law. After the outbreak of the civil war in 1991 all the institutions and infrastructures were completely destroyed. The Faculty of Law was re-established again in 2014, enrolling 60 students. Currently there are 45 students. The departments are three: Private law, Public law and Criminology.
6. Faculty of Veterinary and Animal Husbandry, established in 1973, composed of five departments: Veterinary medicine, Zootechnics, Food technology science, Food safety, Forestry science and rangelands, Biosecurity, Biotechnical science.

7. Faculty of Sciences, founded in 1987, it then reopened in 2019. The departments are: Geology, Marine science, Biotechnology, Chemical sciences, Pharmacy, Computer science, Physical sciences, Environmental sciences, Biological sciences, Mathematical and Statistical sciences, Meteorology and Atmospheric science.

2.1.4. Other universities in the territory

Only four institutions of Higher education were operating in Somalia by 2008. In the North West Zone (NWZ), Amoud University in Borama was founded in 1998 with 66 students in two faculties (Business & Administration and Education). The university had a population of 4,303 in the year 2014-2015 enrolling 14 faculties⁶³. Hargeisa University was founded two years later and had similar focus. In 2015 the students population was 5,000⁶⁴. These institutions conducted their classes in English, while the East African University in Bossaso established in 1999, North East Zone (NEZ), had a College of Sharia (Law) and Islamic Studies, taught in Arabic, and a College of Business Administration where English was the medium used⁶⁵. Finally, the Benadir University in Mogadishu started with a single faculty of Medicine in 2002 and it had grown to 8 faculties with 2,385 students in 2015. Currently, the number of universities and colleges has escalated and they are trying to exploit the huge gap in tertiary education that has been existing in terms of quality assurance and regulatory frameworks since 1991.

Concerning the courses or disciplines preferred by Somali students, it was ascertained that Business Management is the most preferred. Others in order of preference are Health and Medical Laboratory, English Language, Engineering, Accounting & Finance, Management Science, Medicine, ICT, Sharia and Law and Animal Science. The least preferred faculties – based on the lowest enrolment – include Pharmacy, Telecommunication Engineering, Public Administration, Diploma-Livestock Health, BSC Dryland Economics & Agro-Ecosystem Management, Diploma-Product Development & Entrepreneurship, Economics & Statistics and Agriculture. While the trend in enrolment for the most preferred disciplines is increasing, the trend for the least enrolled disciplines is either stagnated or decreasing for some cases⁶⁶.

In contrast, there was a strong preference by the community for Economics and Medicine, followed by Livestock Product and Entrepreneurship as well as Animal Health Science. The high request for Economics is actually consistent with the human resources demand of a country in a post-conflict period such a Somalia needing specialized socio-economic expertise for the necessary planning for reconstruction in both public and private sectors. Therefore, Dry-land Economics course addresses a felt need in the development of arid and semi-arid areas. It is interesting to note that Economics does not appear amongst the main academic disciplines in the ranking by all the universities in the Somali regions. This may arise due to lack of suitable and qualified lecturers in these disciplines or lack of ability to match institutional planning with community needs.

⁶³ Amoud University (2015).

⁶⁴ Hargeisa University (2015).

⁶⁵ East Africa University (2016).

⁶⁶ According to enrolment data from 2012 to 2015.



*Figure 10 - The new campus of University of Nairobi.
Source: University of Nairobi.*

In comparison with other IGAD member states, similar disciplines with the highest enrolment at Makerere University include Bachelor of Agricultural and Rural Innovations, Bachelor of Agribusiness Management, Bachelor of Science in Agricultural Land Use and Management; as for the University of Nairobi, the similar and most popular disciplines are Bachelor of Science in Agriculture, Bachelor of Science in Horticulture, Bachelor of Science in Range Management, Bachelor of Science in Agricultural Education and Extension, Bachelor of Science in Agribusiness Management, Bachelor of Science in Veterinary Medicine, Bachelor of Science in Wildlife Management and Conservation and Bachelor of Science in Biomedical Technology.

2.2. Data acquisition and survey

2.2.1. Questionnaire

A questionnaire was realized in order to better understand the Rector's needs, requests and expectations from the new project because it's important to draft the guidelines at this initial level of the project to set uniform basis.

The survey was divided into sections to facilitate the data collection, since the amount of data involved in a project of this size is usually huge, from the general data to the educational and researching activities, through the general services, incubator for start-ups and new companies, accommodations, external area, history and available budget for the whole project. The questionnaire was a preliminary but fundamental step to gain information about the current status of each faculty, the expected future needs of each one of them and existing infrastructures (comprehending: electric grid, drainage network, aqueduct, groundwater).

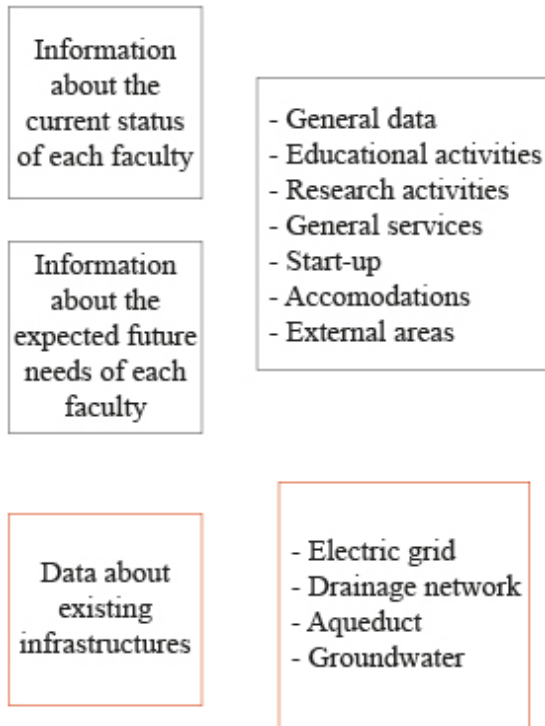


Figure 11 - Data collection scheme.
Source: elaboration by the author.

Area of interest	Period	Question
Students	Present	First-year students
		Second-year students
		Third-year students
		Fourth-year students
		Fifth-year students
	PhD students	
	Future	Expected first-year students
		Expected second-year students
		Expected third-year students
		Expected fourth-year students
Expected fifth-year students		
Expected PhD students		
Structured university personnel	Present	Teachers
		Full time researchers
		Fixed-terms lab assistants
	Future	Expected teachers
		Expected full time researchers
Unstructured university personnel	Present	Expected fixed-terms lab assistants
		Post-doctoral fellows
		Fixed-term researchers
	Future	Temporary teaching assistants
		Expected post-doctoral fellows
Administrative personnel	Present	Expected fixed-term researchers
	Future	Expected temporary teaching assistants
Support personnel	Present	Secretaries
		Expected secretaries
	Future	Maintainers
		Door-keepers
		Cleaners
		Security officers
		Expected maintainers
		Expected door-keepers
Expected cleaners		
Expected security officers		

Figure 12 - Data collection example.
Source: elaboration by the author.

The complete collection of such information is pivotal for all project activities, however, the answers received so far are not exhaustive, but they were sufficient to be able to carry out a first dimensioning of spaces and buildings on campus. In fact, it has been provided the number of students who will occupy each faculty, details on the administrative staff of each faculty and information on the type of courses and classrooms.

The general data sheet includes all information regarding actual and expected number of students per year, PhD students, structured university personnel such as teachers, full time researchers and fixed-terms lab assistants, unstructured university personnel such as post-doctoral fellows and temporary teaching assistants, administrative personnel such as secretaries, support personnel such as maintainers, door-keepers, cleaners and security officers, other kind of personnel such as librarians, canteen service operators, sports centre instructors, shop assistants and start-ups workers.

The educational activity includes faculties, classrooms, auditorium, spaces for students such as studying spaces or meeting spaces for groupworks and educational laboratories for the scientific faculties.

The researching activity is divided between departments with offices and open spaces where the theoretical part of the work is carried out and laboratories for the practical activities.

The so called general services gather together different areas such as rectorate, administration, libraries, exhibition centre, canteen, sports centre, spaces for commercial activities.

The incubator for start-ups and new companies will comprehend offices, meeting rooms, classrooms, laboratories, event rooms and conference rooms.

The accommodations will be divided between male and females and among student dorms, residences for teachers and researchers and a guest house for visiting professors and other occasional guests.

The external area is composed of parking lots and green areas where there will be space for recreational areas and studying areas such as botanical gardens and stables for the care of animals.

The acquisition of data about the history of the SNU, such as how it worked before the civil war, how many and which faculties were there or if there is any memory of it among the Somali population, seems to be difficult to gain or maybe they are not evaluated as relevant information by the Rector and his colleagues for the future development of a new campus.

It is still unclear what is going to be the final budget for the whole project, since it has been mentioned that the buildings will have different benefactors and, it may be assumed, different timing of realization.

2.2.2. Survey and map of the territory

The initial phase of the work is made of gaining information about the actual state of the buildings, in order to gradually define the intervention options and to develop the functional schemes that may be useful for the following works stages.

The detailed survey strategy has been structured with the initial production of orthophoto of the entire campus by means of autonomous UAV instruments (such as DJI Phantom 4 Pro) and following ad-hoc planned flight plans, then with the acquisition of panorama images and 3D point cloud data using a 3D Camera and finally the 3D tool will be used to survey buildings, both indoors and outdoors, to obtain a 3D digital twin of space.

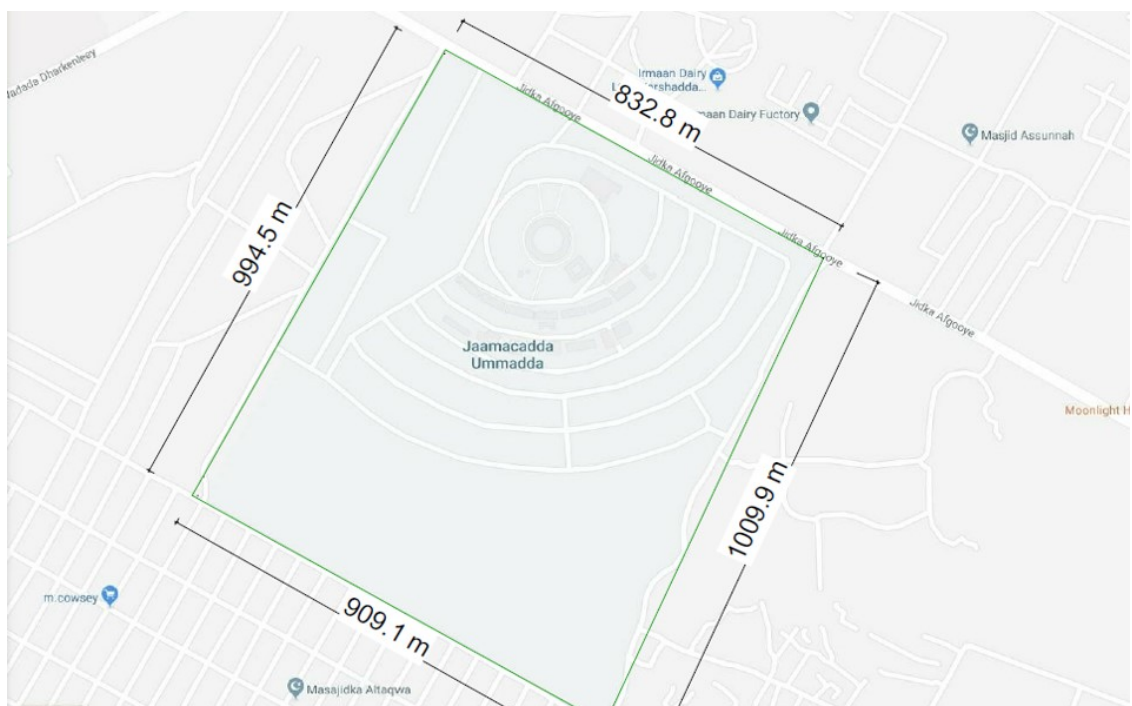


Figure 13 - SNU property area.
Source: Google Maps.

The SNU's property line is an irregular quadrilateral with the main gate on the shortest side of the area which is also the one facing the main road, while other two gates are positioned on the north-west side and on the south side of the campus.

The analysis of the actual state of the campus highlighted the unstable conditions of the original surviving buildings, such as the Rectorate and the first ring of buildings. The idea for these buildings is, once removed the people that illegally occupied them during the past decades, to restore and use them, not only as historical memory of the University, but also as a tangible sign of reborning at the basis of the new campus.

The rest of the area (such as the green, the internal roads and the original parking lots), as the images below shows, is been abandoned for years and the illegal buildings that are now present are going to be demolished as soon as the renovation of the first ring begins.



*Figure 14 - The Somali National University at current state.
Source: Politecnico di Milano.*

Somali National University is six kilometres (twenty-five minutes by car) away from Mogadishu's centre and five kilometres (thirty minutes by car) away from the seaside. It is very decentralised with respect to the other universities (such as the Indian Ocean University, the City University of Mogadishu, the Daaruu Salaam University, the SIMAD University, the Islamic University, the Atlas University of Somalia and the Capital University), but this may be seen as an advantage because of the opportunities given by the open space and the flexibility to expand in the next twenty years.

The choice of positioning itself outside the city resembles that of the ancient European universities with open-plan territories, blended in nearby civil settlements that favoured the free flow of knowledge. The antique institutions were and still are characterized by: the student accommodation within the campus territory as a priority component, the university perceived as an intimate and cloistered establishment and sports units holding supremacy in universities' fame and recognition⁶⁷. These three elements seem to be present in the Somali National University case, even if the context in which it is embedded is really different from the European environment in which the first universities were born.

3. Planning phase

3.1. Masterplan

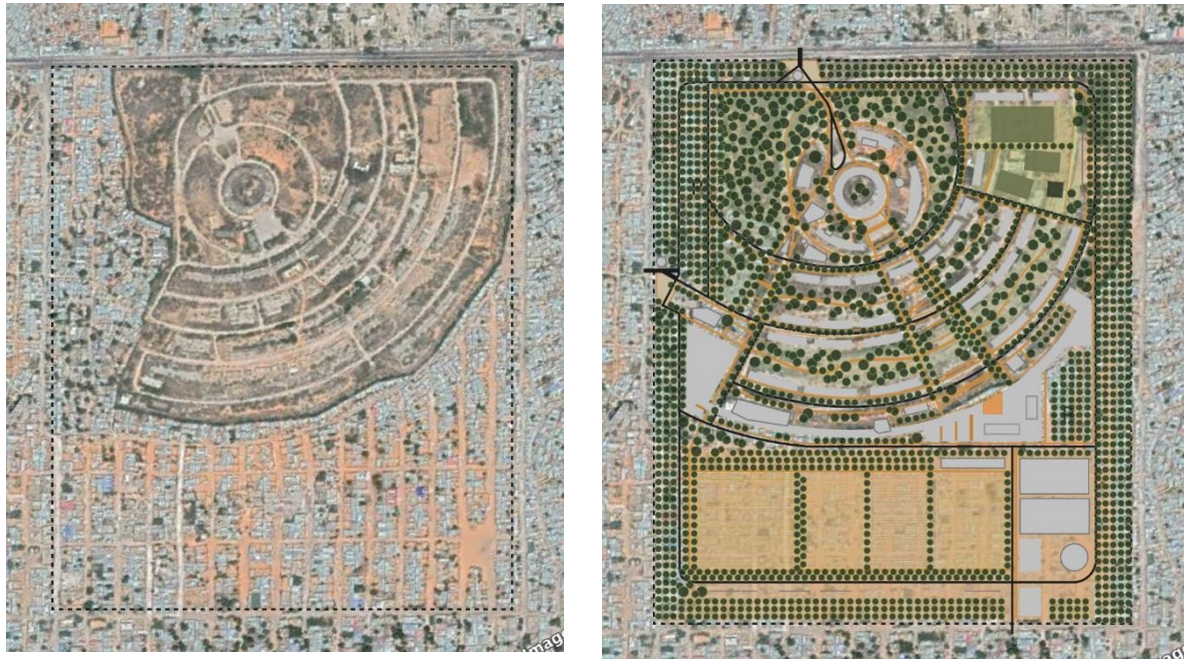
The project masterplan is being developed by a team composed of professors and researchers at the Politecnico di Milano, led by Professor Laura Montedoro.

The concept is based on the university seen as a garden of knowledge, composed of one tree per student. This highlights the idea that reborn, growing, learning and improving require time and care just like trees.

The main characteristic is the diagram and incremental strategy: the masterplan maintains and strengthens the original structure centred on the rectorate, inspiring a tension between public functions on the other side of the space for the faculties, also working as a filter towards the farming areas of the faculties with open air facilities. In this vision the main campus facilities such as the rectorate, the auditorium and the students hub take a unique position with respect to the other buildings.

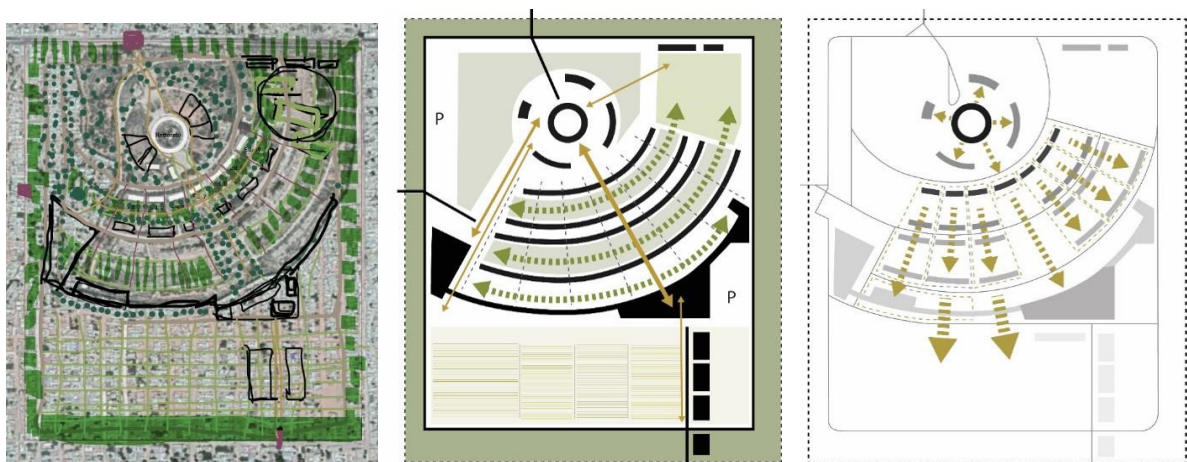
The masterplan is thought to be implemented by phases and per parts, without losing its functionality, with the increasing number of faculties and of students.

⁶⁷ Baker, W. J., & Smith, R. A. (1990). Sports and Freedom: The Rise of Big-Time College Athletics. *History of Education Quarterly*, 30(2), 279, retrieved from <https://doi.org/10.2307/368684>
Gumprecht, B. (2008). *The American College Town*. University of Massachusetts Press, retrieved from <https://doi.org/10.2307/3708587>



*Figure 15 - Concept scenario: before and after.
Source: Politecnico di Milano.*

The open spaces occupy an important role in the campus thanks to the relevance of open air faculties (such as Faculty of Agriculture and Environmental Science), the university garden, the sports centre, the auditorium boulevard and the campus terraces. The principle behind the open spaces is the university as a garden providing eco-systemic services in terms of climate-change resilience, microclimate improving (shadow and winds), biodiversity and nature-based solutions for drainage. The purpose is to offer quality open spaces for open-air educational activities, conviviality and leisure. The tree lines will shadow all the paths and roads across the campus, but also the buildings' facades. The garden is therefore meant as an experimental ground to reforest a semi-arid climate zone. There will be also high permeability of surfaces and nature-based solutions for drainage.



*Figure 16 - Concept scenario: preliminary sketch, relational diagram, incremental strategy.
Source: Politecnico di Milano.*

For what concerns the accessibility and inner mobility, the principles at the basis of the project are: incentivising slow-mobility (walking and cycling), ensuring safety and accessibility, finally setting a pleasant experience while moving across the campus. These principles will be achieved through three controlled accesses: the main gate with access to the rectorate, the auditorium gate and the service gate with access to farming areas. There is also one ring road to access and patrol the whole campus and to reach the main parking area. Inner roads are planned for service use only. It's then included in the plan a network of shadowed cycling and walking paths to move from one side to the other. Finally, bike sharing stations will be strategically located across the campus.



*Figure 17 - Aerial views of some Italian (first row) and African (second row) campuses.
Source: Google Maps.*

3.2. Size drafting

The second stage in the process of planning the new campus was the assignment of a preliminary size to each building in the masterplan. At this point of the work, the link provided by the masterplan's drawings and the questionnaire is essential to understand and supply an initial idea of the project for the realization of a new campus. In this part of the work, it is important not to forget anything and to overestimate spaces rather than underestimate them.

The calculation was estimated on the basis of Italian laws and European standards and regulations, used as a benchmark to obtain a mean value that could be representative of the right size of each space.

The approach adopted for the task was the one already used for the questionnaire: through an Excel file divided in seven sheets for the seven different faculties⁶⁸ plus one sheet for the other buildings in the campus, including distribution spaces such as corridors, ramps and stairs, service spaces such as archives, storage areas, locker rooms, rooms for cleaning, coffee shop, canteen, toilets and spaces for prayer, student dorms for males and student dorms for females, guest house and even the space for a mosque eventually. In this particular sheet, the calculation was pretty easy because it took into

⁶⁸ Science, Engineering, Law, Economics and Management, Social Science, Veterinary & Animal Science and Agriculture.

account just simple data as the total number of faculties, a mean value of number of students using common spaces simultaneously and minimum and maximum square metres per user to find a mean value between them.

	Type	Seats	Quantity	N° users	mq/user MIN	mq/user MAX	mq tot MIN	mq tot MAX	mq MEDIA	
1. Spaces for teaching and study	Classrooms	Big	200	4	1500	0,84	0,87	672	696	684
		Little	50	14		1,15	1,82	805	1274	1039,5
	Special rooms	Lab	20	10	200	4,5	5,5	900	1100	1000
	Study rooms	-	24	3	72	1,2	1,5	86,4	108	97,2
	Library	-	100	1	100	0,98	1,5	98	150	124
	Conference rooms	-	200	1	200	0,88	1,5	176	300	238
	Meeting rooms	-	80	5	400	1,2	1,5	480	600	540
Teachers' offices	-	8	15	120	10	12	1200	1440	1320	
2. Administrative spaces	Presidency	-	6	1	6	18	24,5	108	147	127,5
	Secretariat	-	5	1	5	10	16	50	80	65
	Administrative offices	General office	1	1	20	6,5	12	6,5	12	9,25
			2	2		12	15	48	60	54
			3	1		14	18	42	54	48
			4	3		21	24,5	252	294	273
	Meeting rooms	-	15	1	15	1,6	2	24	30	27
mq TOT							4947,9	6345	5646,45	

Figure 18 - Sizing for the faculty of Veterinary & Animal sciences.
Source: elaboration by the author.

Each faculties' sheet was divided in two categories, spaces for teaching and spaces for the administration, since it is too soon to know if there will be an entire building for the administration of the whole University or each faculty will have a specific space for its own administration in the main building.

Depending on the type of faculty, it was assumed that the need for spaces may vary: some faculties such as Law or Economics & Management don't need laboratories or open spaces for special lessons, but just regular classrooms for ordinary lectures, while others like Veterinary & Animal Science or Agriculture require open spaces like stables for the animals and botanical gardens for practical classes.

The estimation of space for the faculties depends on several factors, such as:

- Type of room: classic or equipped, big or small, laboratory;
- Presence of studying rooms, libraries, conference rooms, meeting rooms, offices for teachers
- Estimated number of users per faculty;
- Estimate number of seats per room (depending on the number of students and professors per faculty);
- Total number of each type of room to satisfy needs of estimated number of users per faculty.

The calculation was then carried out taking into account both the minimum and the maximum square metres per user for each space as stated by Italian laws and European regulations. Once a mean value was obtained, the total required square metres per each faculty's building was computed putting together the estimated numbers of users, seats and rooms.

It has also been taking into consideration the possibility of having communicating classrooms or bigger classrooms that can be divided in smaller rooms thanks to sliding walls, but at this stage of the work it is too soon to discuss such detailed and practical information.

4. Executive phase

4.1. Tender procedure

4.1.1. Introduction to the tender procedure (Initial development process)

A public proceeding consists of a series of acts leading to the adoption of an administrative provision to fulfil the public interest in compliance with the law. Coordinated measures are adopted during each phase towards the final purpose: every single step of the procedure, from the initial act to the final one, is established by law in order to satisfy the principle of transparency.

In every proceedings the contracting authority has to notify the community about the need to make a specific decision and the intention to proceed. It must declare which public interest justifies the action and the proceedings, providing evidence that no other solution is possible, and finally the contracting authority inform the interested community about the possibility to submit relevant documentation to be taken into account in order to close the procedure and adopt the final decision within a specific limit of time established by law.

Public administrations must act through administrative measures and procedures conforming to a series of European criteria and principles to ensure the correct conduct of the tender procedure. These criteria and principles of administrative action are:

- freedom of competition is the freedom to produce and trade what is produced in every market;
- economy of action, meaning that administrative action should be the least possible expensive and the administration's goal is to save public funds every time it uses the power granted by law;
- effectiveness, since the administrative action should be economic but at the same time it should invest what is necessary to reach the goals established by law and this is a balance between the investment of public money and the pursuit of given objectives;
- impartiality, because the administrative action must not be discriminatory and has to treat equally any person/company so that public power is exercised without substantial differences;
- publicity and transparency ensure that any administrative decision is published on the administration's website and on the office notice-board to inform the community about the decisions taken and about related reasons. Transparency gives to the private company involved the possibility to control and supervise the administrative action and ensures the selection of the best bid. Any lack of transparency will have consequences on the final provision that may be declared unlawful;
- proportionality of the selection in accordance with all the involved interests.

These principles must be applied to protect the public interest in choosing the best bid from an economic and technical point of view. The most advantageous offer is selected on the basis of the price using a cost-effectiveness approach such as life-cycle costing, and may include the best price-quality ratio, which shall be assessed on the basis of various criteria linked to the subject-matter of the contract. Such criteria may include: quality, technical merit, aesthetic and functional characteristics, accessibility for all users, social and environmental aspects, innovative characteristics, organization, qualification and experience of staff assigned to performing the contract, especially where the quality of the staff assigned can have a significant impact on the level of performance of the contract, after-sales service and technical assistance, delivery conditions such as delivery date, delivery process and delivery period or period of completion.

Any administrative measure must be justified (with the exception of legislative measures) to understand how and why the administration has taken its decisions, which elements were taken into account and also to challenge the taken measures if they are not able to satisfy the public interest.

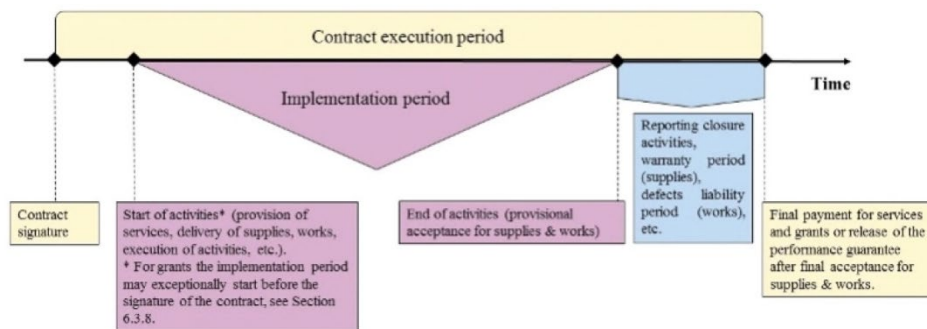


Figure 19 - Contract execution period.

Source: European Commission (2019), Procurement and Grants for European Union external actions – A practical guide.

The award of any public contract is preceded by an administrative procedure called “tender process” or “public tender process” in which the private contractor is selected. This system is similar in all European civil law countries⁶⁹, while it differs in common law countries⁷⁰. In civil law countries, negotiations and contracts between public administrations and private operators take place in accordance with public procurement law, implemented by each country on the basis of the European directives.

The award of public contracts on behalf of contracting authorities has to comply with the principles of the Treaty on the Functioning of the European Union (TFEU) and in particular with the already mentioned European principles of free movement of goods, freedom of establishment and freedom to provide services, equal treatment, non-discrimination, mutual recognition, proportionality and transparency.

The public notice is an administrative act adopted by the contracting authority in which the specific needs connected to the tender are expressed and described. It is an important step for any undertaking potentially interested in participating to the tender. The public call for tender is published in the Country’s and EU Official Journal so it can be widely known by the highest possible number of undertakings. The call for tender is then published on the contracting authority website and newspapers of national and/or regional interest. The public call cannot be sent by e-mail or by any other mean of communication addressed to a specific undertaking: this would breach the principle of impartiality and equal treatment. The only way to make it publicly known is to publish it in the widest possible way. The publication of the call for tender is an important step because potential suppliers can evaluate their interest in the contract and their capability to participate to the tender.

The public call for tender must specifically list all the needs of the administration and the reasons why it is looking for a specific work, supply or service. The call explains also which criteria will be considered in order to award the contract and what kind of importance in terms of ranking attention will be given on the various aspects. This means that the criteria can be differently

⁶⁹ Civil law systems have their origin in Roman law.

⁷⁰ Common law systems, even if they often have statutes, rely on precedent legal decisions that have already been made.

evaluated: each of them gives a certain score, that could be higher or lower depending on its importance for the final execution of the contract (such as safety, as well as the environmental impact, is generally more important and gives a higher score than design). The criteria cannot be changed during the tender because this would distort the regularity of competition. The bidders make their offer based on the criteria established by the call: therefore, if the administration modifies the criteria, the submitted offer becomes useless or irrelevant. The sum of the scores addition designates the tender winner.

Technical and functional requirements shall define the characteristics required from the works that are the subject-matter of the work. They shall not refer to a specific make or source or a particular process which characterises the products or services provided by a specific economic operator, or to trade marks, patents, types or a specific production with the effect of favouring or eliminating certain undertakings or certain products.

Examples of technical and functional requirements are quality levels, environmental and climate performance levels, design for all requirements and conformity assessment, performance, safety, dimensions.

Public tenders should contain:

1. a preliminary project;
2. a feasibility study with the functional, technical, operational, economic and financial nature of the work to be performed, analysis of possible alternatives, analysis of the status quo and architectural, geological, socio-economic and administrative factors, a description of the requirements of the work to be designed for prior assessment of environmental sustainability and landscape compatibility, features and links with the environment, with particular reference to verification of environmental, historical, archaeological, landscaping restraints, and identification of appropriate measures to safeguard the environment, landscape and cultural values.
3. a draft agreement;
4. an economic-financial plan, corroborated by a financial credit institution or by an audit company;
5. mention of the involvement of one or more financial institutions in the project;
6. a specification of the characteristics of the service and management thereof and the guarantees offered by the promoter to the contracting authority.

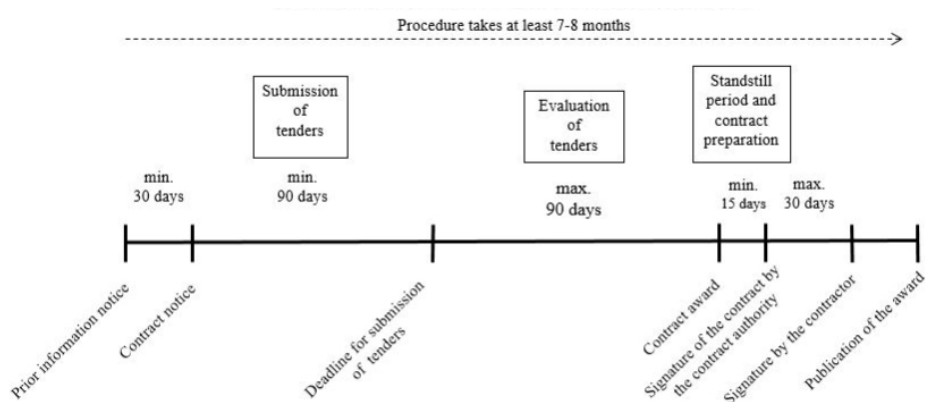


Figure 20 - Timeline for an international open tender procedure for a works contract.
Source: European Commission (2019), Procurement and Grants for European Union external actions – A practical guide.

This last one is the document that is going to be the focus of next paragraphs, explaining the points in which this project in a peculiar context like the African one is different from any other similar project.

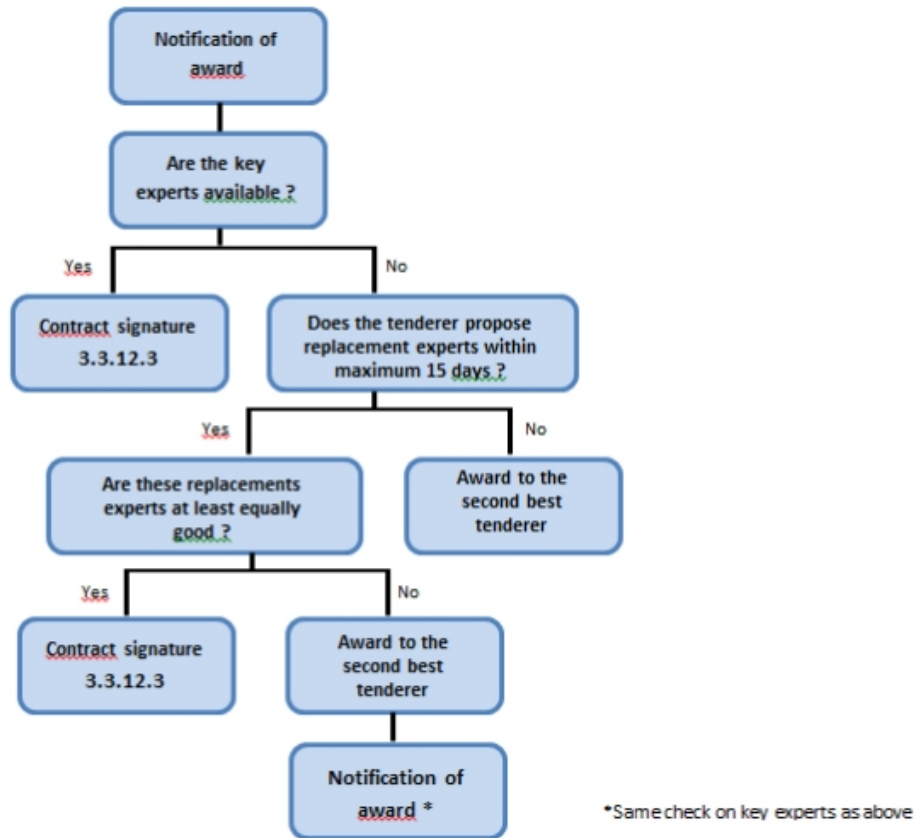


Figure 21 - Procedure to notify the award decision.

Source: European Commission (2019), *Procurement and Grants for European Union external actions – A practical guide*.

4.1.2. Type of Contracts

In administrative law there are several proceedings in order to adopt an administrative decision or measure. These proceedings are different from one another depending on the kind of measure the administration has to adopt. All these proceedings are established by different and specific laws and the administration has to follow the relevant guidelines and principles.

Public contracts are written contracts between one or more economic operators and one or more contracting authorities. Depending on the subject of the contract, there are three different categories of public procurements: the execution of works, the supply of products or the provision of services.

Public works contracts are public contracts having as their object the execution, or both the design and the execution, of a work or the realization, by whatever means, of a work corresponding to the requirements specified by the contracting authority exercising a decisive influence on the type or design of the work. They include the outcome of buildings or civil

engineering works (such as infrastructures) taken as a whole which is sufficient in itself to fulfil an economic or technical function.

Public supply contracts are public contracts regarding the purchase, lease, rental or hire-purchase, with or without an option to buy, of goods or products. A public supply contract may include, as an incidental matter, installation operations.

Public service contracts are public contracts having as their object the provision of services.

The first type of contract, the public works contract, is the one that perfectly fits the SNU 4 project, since it is about the construction and restoration of buildings.

4.1.3. Management modes

The so called “management modes”⁷¹ are the different arrangements for implementing the project and they vary depending on the degree of delegation of a number of budget implementation tasks (such as conclusion of contracts, their operational and financial management, audit, evaluation, etc.).

There are three different management modes: direct management, indirect management and shared management. The right choice of management mode is essential for the correct execution of the tender procedure.

The European Commission is the contracting authority when there is direct management: it takes decisions on behalf and for the account of the partner countries and is responsible for the entire cycle leading to contract signature.

Under indirect management the European Commission entrusts budget implementation to third countries (or bodies designated by them), international organisations and their specialized agencies, bodies set up under the Treaty on the Functioning of the European Union and the Euratom Treaty, development agencies of EU Member States or of third countries, public law bodies including Member States organisations. In this case, the contracts are concluded with the contracting authority designated in a financing agreement, such as the government or an entity of the partner country with legal personality. There are two possible modalities under indirect management with partner countries: indirect management with ex ante controls and indirect management with ex post controls.

In the case of indirect management with ex ante controls, the decisions on the procurement and award of contracts are taken by the partner country, acting as contracting authority, in line with the requirements set out in this practical guide and subject to the prior approval of the European Commission.

On the other hand, in the case of indirect management with ex post controls, the European Commission may decide to rely on the rules and procedures of the third country entities' and to limit its control to ex post controls.

If shared management is chosen, the European Commission delegates implementation tasks to the EU Member States. This mode is rarely used in the implementation of external actions, but there are a few cases such as joint operational programmes on cross-border cooperation implemented by a joint managing authority (for instance under the European Neighbourhood Instrument (ENI) or the Instrument for Pre-accession Assistance, IPA II).

⁷¹ European Commission (2019), Procurement and Grants for European Union external actions – A practical guide, pp. 16.

Both direct management and shared management can be excluded for this project, while indirect management perfectly adapts to the scope of the Somali National University case, since it allows the needed flexibility from a peculiar context like the African one. In the case of the SNU, the lack of defined deadlines and known (certain) funds at the moment means that the type of indirect management more suitable for these conditions is the one with ex ante controls to ensure the appropriate supervisory measures during the tender procedure.

4.2. Specifications

Specifications are a set of documents collecting all detailed description or assessment of requirements, dimensions and materials to be satisfied during the realization of a work contract. For this reason, it is often referred to as a type of technical standard, because they may refer to a standard which is often referenced by a contract or procurement document, or an otherwise agreed upon set of requirements. Standards for Specifications may be provided by government agencies, standards organizations, trade associations, corporations, and others.

Specifications are usually part of the contract documents that accompany and govern the construction of building and infrastructure projects. They describe the quality and performance of building materials, following the indications dictated by the standards in force, and they may comprehend actual work quantities, like a bill of materials, or a quantity breakdown of the work to be performed. While there is a tendency to believe that Specifications overrule drawings in the event of discrepancies between the text document and the drawings, the actual intent must be made explicit in the contract between the contracting authority and the awarded bidder.

Following the indications dictated by Procurement and Grants for European Union external actions - A Practical Guide Applicable as of 15 July 2019 and taking into account all the differences that the African context requires in a similar operation compared to the European context, the Specifications for the new buildings of the SNU university campus must be written considering that, as for the timing of the works, at the current state of the project, it is impossible to predict how many months or years the execution of the buildings will require.

Furthermore, the role of donors, those who will make the main contribution to the realization of the project, should not be underestimated in this operation. This, however, involves a necessary flexibility on a practical level: the buildings will not all be built simultaneously, but rather gradually with the available funds. This is the reason why it cannot yet be established a deadline for the completion of the project.

The research part, essential for this step of the project, involved the analysis of Specifications of other university buildings, mainly Italian and European, due to the difficulty and scarcity of finding relevant information on the subject matter in the African context. Despite this, the Specifications used as examples have been rigorously analysed in the light of the contexts in which they are located, very different from Mogadishu and all Somalia.

The Specifications for SNU's project will be divided in two main parts, the General Tender Specifications and the Special Tender Specifications.

The General Tender Specifications is the document governing the most important conditions and contractual relationships between the contracting authority and the contractor. As of today, it provides for the regulatory discipline of the relationships between contracting authorities and contractors of public works.

The Special Tender Specifications defines the requirements and quality of the works to be carried out, with particular attention to the characteristics of the materials used and the methods of execution of the works. Being more detailed than the General one, the Special Tender Specifications vary according to the object of the intervention and the works to be carried out.

The Special Tender Specifications can be divided into two sub-parts: the administrative part and the technical part.

The administrative part collects all information about the contractual conditions, administrative requirements, subcontracting, documents to be provided, financial and jurisdictional aspects to be covered.

Traditionally, most forms of technical part have lacked recognized standards, though this is changing. So far, ISO has published a series of standards related to technical product documentations.

Offers deviating from the requirements or not covering all requirements may be rejected on the basis of non-compliance with the tender Specifications and will not be evaluated.

4.2.1. The General Tender Specifications

Article 1: Regulatory sources

The contractor is required to strictly observe all applicable laws, regulations and rules in force including those that should be issued during the contract. For all that is not established or in any case is not in contrast with the rules of the present Specifications, reference is made to the current provisions of the Administrative law and regulations.

The execution of the contract is subject to compliance with the provisions of the contract and these Specifications as well as the rules contained:

1. In the regulations, uses and customs of the University, with regard to the services of accounting and cash.
2. In the laws, regulations, provisions and circulars of the government, prefectural, provincial, municipal and of any other legally recognized authority, which in any case have relevance to the contract in question, whether they are in force at the time of the offer, whether they are issued during the course of works.
3. In the standards and technical provisions relating to the quality and origin of the materials and the procedures for carrying out any maintenance work, checks and tests on the systems.

Below there is a list of the applicable legislation in no case to be understood exhaustive:

Public works:

- Directive 2014/24/EU of the European Parliament and of the Council on public procurement and repealing Directive 2004/18/EC on the coordination of procedures for the award of public works, supply and service contracts;
- Construction Products Regulation (CPR) EU 305/2011.

Workspace safety:

- Article 153 of the Treaty on the Functioning of the European Union on safety and health at work;
- Directive 89/391/EEC, the so called OSH “Framework Directive” on main principles to encourage improvements in the safety and health of workers at work;
- IEC 31010:2019 Risk management, risk assessment.

Environmental standards:

- Directive 85/337/EEC on Environmental Impact Assessment (EIA);
- Directive 76/769/CEE on restrictions on the marketing and use of certain dangerous substances and preparations.

The contractual relationships resulting from the award of the work in question are governed by:

1. The call published in the Official Journal of the European Union, in the Official Gazette of the Italian Republic, from this Tender Specifications and related annexes as well as from a specific contract that will be stipulated in public administrative from following the award;
2. Procurement and Grants for European Union external actions – A Practical Guide applicable as of 15 July 2019

Article 2: Object of the contract

These Specifications governs the Framework Agreement for the work of construction of the new National Somali University campus, qualitatively suitable for the current legislation, environmentally sustainable, also with technological innovation and energy saving systems, to be destined to be positioned in the areas indicated by the masterplan. The work of construction and installation includes all necessary duties such as, by way of non-exhaustive indication: transport to the areas that will be indicated by the client, the implementation, the necessary connections to the water distribution networks, sewerage, electricity, gas and telephone, the removal, transportation and unloading of waste material, as well as the transfer of the same to the landfill and any authorizations that may be made necessary. The works for the construction of the foundations are also included in the contract. The contractor is also responsible for drafting the construction project, based on the masterplan realized by Politecnico di Milano's team, on the project realized for the tender and the improvements offered by the competitor, including the necessary calculations relating to structures and systems.

During the tender process, the contractor – after having been to the place where they must carry out the work and be aware of local conditions, as well as all general and particular circumstances that may have influenced the determination of the choices proposed techniques, prices, contractual conditions and elements that can influence the execution of the work – totally accepts and makes the economic conditions his own and auction-based project techniques.

The works that are the subject of the contract can be summarized purely as an indication as follows:

- Restoration of the rectorate and first ring buildings, so called n° 4, 5, 6, 7, 8, 9, 10.
- Construction of second ring buildings.
- Construction of stables for the animals and botanical gardens for open air faculties.
- Construction of student dorms.
- Requalification of open spaces, roads, parking area.



*Figure 22 - Buildings to be restored.
Source: Politecnico di Milano.*

Article 3: Place of performance of the contract

The contract must be carried out in the state-owned areas granted to the Somali National University as reported in the masterplan design in Mogadishu, Somalia.

Article 4: Amount of the contract

In the SNU project the total amount of the work and installation subject of the contract, as well as the works provided complementary, depends on the amount of donations that will be collected so it cannot be provided yet.

Article 5: Requirements for participation in the award procedure

The evaluation of the so called “general requirements” or “requirements of morality” is conducted by means of a negative assessment to that the client excludes candidates on the ground of specific conditions which can be mandatory or facultative.

The client shall exclude an economic operator from participation in the award procedure where they have established that that economic operator has been the subject of a conviction by final judgment for one or more of the following reasons:

- participation in a criminal organisation;
- corruption;
- fraud;
- terrorist offences or offences linked to terrorist activities;
- money laundering or terrorist financing;
- child labour and other forms of trafficking in human beings.

The client may establish further causes of exclusions, where the contractor;

- committed violation of applicable obligations referred to environmental, social, labour law;
- is bankrupt or is the subject of insolvency or winding-up proceedings, where its assets are being administered by a liquidator or by the court, where it is in an arrangement with creditors, where its business activities are suspended or it is in any analogous situation arising from a similar procedure under national laws and regulations;
- is guilty of a grave professional misconduct, which renders its integrity questionable;
- is in a situation of conflict of interest;
- has entered into agreements with other economic operators aimed at distorting competition;
- has shown significant or persistent deficiencies in the performance of a substantive requirement under a prior contract;
- has been guilty of serious misrepresentation in supplying the information required for the verification of the absence of grounds for exclusion or the fulfilment of the selection criteria, has withheld such information or is unable to submit the required documents supporting such information;
- has undertaken to unduly influence the decision-making process of the contracting authority or contracting entity, to obtain confidential information that may confer upon it undue advantages in the procedure or to negligently provide misleading information that may have a material influence on decisions concerning exclusion, selection or award;
- has been found not to possess the reliability necessary to exclude risks to the security of the Member State (fields of defence and security).

Without prejudice to the possession of the general requirements, the contractor must possess the following necessary requirements in order to guarantee the economic and financial reliability of the contractor and to ensure the capacity to perform the contract:

1. Economic and financial capacity of the contractor:
 - 1.1 The contractor must have a certain minimum yearly turnover, including a certain minimum turnover in the area covered by the contract. In this case the minimum yearly turnover must not exceed two times the estimated annual contract value, except in duly justified cases linked to the nature of the purchase, which the contracting authority must explain in the procurement documents.
 - 1.2 The contractor provides information on their annual accounts showing ratios between assets and liability. In this case the contracting authority must explain the methods and criteria for such ratios in the procurement documents.
 - 1.3 The contractor provides an appropriate level of professional risk indemnity insurance.

2. Technical and professional capacity of the contractor:
 - 2.1 The educational and professional qualifications, skills, experience and expertise of the persons responsible for performance;
 - 2.2 A statement of the technical equipment, tools or plant available to the contractor for performing works contract;
 - 2.3 A description of the technical facilities and means available to the contractor for ensuring quality, and a description of available study and research facilities;
 - 2.4 A reference to the technicians or technical bodies available to the contractor, whether or not belonging directly to it, especially those responsible for quality control;
 - 2.5 In respect of supplies: samples, descriptions or authentic photographs or certificates drawn up by official quality control institutes or agencies of recognised competence attesting the conformity of the products clearly identified by references to technical Specifications or standards;
 - 2.6 A statement of the average annual manpower and the number of managerial staff of the contractor for the last 3 years;
 - 2.7 An indication of the work chain management and tracking systems that the contractor will be able to apply when performing the contract;
 - 2.8 An indication of the environmental management measures that the contractor will be able to apply when performing the contract.

Article 6: Contract award criteria

The client shall base the award of public works contract on the most economically advantageous tender.

The most economically advantageous tender from the point of view of the client shall be identified on the basis of the price or cost, using a cost-effectiveness approach, such as life-cycle costing, and may include the best price-quality ratio, which shall be assessed on the basis of criteria, including qualitative, environmental and/or social aspects, linked to the subject-matter of the public contract in question.

An option of contract award criteria may be to evaluate the quality of the tender on the following criteria, where the maximum total score is 100 points.

1. Understanding of works to be performed (10 points): this criterion will assess the contractor's understanding of the purposes of the works and of the nature of the activities to be undertaken under the framework contract. The contractor should also provide an assessment of the difficulties to achieve the expected results and the mitigation measures to address identified risks (a few specific examples to develop efficient and appropriate solutions should be provided).
2. Quality assurances system (10 points – minimum score 70%): this criterion will assess the quality assurance system put in place during the provision of the works (a few specific examples should be provided) and the operational process for coping with multiple assignments run in parallel.
3. Quality of the proposed project (40 point – minimum score 70%): this criterion will assess the quality of the proposed project, tools and approach put in place by the contractor to allow meeting the requirements. Finally this criterion will consider how the realisation of works will be organised to ensure high-quality delivery and adequate sustainability.

4. Project management and team (40 points – minimum score 70%): this criterion will assess how the roles and responsibilities of the proposed team are distributed for each task. It will also assess the balance of the proposed team members in the fields of expertise relevant for the required work. The contractor should provide details on the allocation of time and human resources and the rationale behind the choice of this allocation. The contractor should be demonstrative and explain how the organisation and structure of the proposed team will allow requirements to be met and expected results to be delivered.

The contractor must score minimum 70% for each criterion and minimum 75% in total. Tenders that do not reach the minimum quality levels will be rejected and will not be ranked.

Article 7: Contract signature

The client must sign and date all originals of the contract and initial all pages of the special conditions and most relevant annexes. The standard contract annexes including the general conditions, forms and other relevant documents must be reproduced unchanged in every contract. Then, the client must send the signed originals of the contract to the contractor, who must countersign them within thirty days of receipt.

The contractor keeps one original and returns the others to the client together with any financial guarantees required in the contract. If the contractor fails to do this within the specified deadline or indicates at any stage that it is not willing or able to sign the contract, the contractor cannot be awarded the contract.

The contract preparation process must be restarted with a new contract dossier prepared using the second-best tender (provided that that tender passed the technical threshold and is within the maximum budget available for the contract).

The contract takes effect on the date of the last signature. The contract cannot cover earlier works or costs or enter into force before that date, unless in duly substantiated exceptional cases⁷².

Article 8: Interpretation of the contract and the Special Tender Specifications

The interpretation of the contractual clauses, as well as the provisions of the special Specifications contract, must be carried out taking into account the purposes of the contract and following the European directives and regulations.

Article 9: Knowledge of the conditions of the contract

The work of construction and installation of the buildings covered by these Specifications is subject to all the provisions of the law, ministerial provisions and circulars concerning the present contract. The contractor, in formulating its offer, undertakes to bring to the items supplied all the variations necessary to make them compliant with any changes to the technical standards, directly or indirectly referred to in these Specifications, which should occur, throughout the duration of validity of the offer, as defined in the tender notice. The contractor

⁷² European Commission (2019), Procurement and Grants for European Union external actions – A practical guide, pp. 75-76.

unconditionally accepts all the clauses and conditions set out in these Specifications special tender and in the contract notice. By signing the contract and its attachments, the contractor also declares to know the state of the area, the conditions agreed in the offer and any other circumstance affecting the works contracted.

Article 10: Start and delivery of works

The execution of the works begins no later than forty-five days from the effective date of the contract, subject to convocation of the contractor. The client has the right to authorize, in some special cases, the early execution of the work after the definitive award has become effective. If on the fixed and communicated day, the contractor does not appear for the start of the execution of the contract, the client sets a new deadline for starting, not less than five days and not higher than fifteen; the deadlines for execution in any case run from the date of the first call. Once the aforementioned term has expired, the client has the right to terminate the contract.

Article 11: Provisional and definitive deposit

The provisional deposit is used to participate in a tender and to guarantee that the contractor has the necessary requisites to undertake the contract, while the definitive deposit guarantees the completion and the correct fulfilment of the contractual obligations assumed for the execution of the works provided by the contractor and gives compensation for damage resulting from any breach of the same obligations, without prejudice to in any case the compensation of the greater damage. It also guarantees the reimbursement of the extra sums paid to the contractor with respect to the results of the final settlement.

The offer for the award of the work must be accompanied by a provisional deposit equal to 2% the amount of the works based on the tender including safety charges, prepared according to the procedures established in the tender.

The final deposit is set at 10% of the contractual amount. In the event of an auction discount of more than 10%, the final deposit it increased by as many percentage points as there are those exceeding the aforementioned percentage downside. Where the decrease is greater than 20%, the increase is two percentage points for each redemption point greater than 20%.

The surety is provided by means of a bank or insurance policy, issued by an authorized institution, or issued by a registered financial intermediary, which exclusively or mainly carries out the release of guarantees.

Failure to provide this warranty determines the revocation of the assignment and the acquisition of the provisional deposit by the client, who awards the contract to the next competitor in the ranking.

The definitive deposit must be effective until the expiry of the guarantee period required or the supplementary one indicated by the contractor; however, their effectiveness is understood to be extended if, beyond this term, they are pending disputes between the client and the contractor. The deposit will remain binding until complete fulfilment of contractual obligations, but it can be progressively released according to the progress of the execution, up to a maximum limit of 80% of the initial guaranteed amount. The release is automatic with the sole condition of prior delivery to the guarantor institution, by the contractor, of the states of progress of the works or similar document, in original or certified copy, certifying the successful execution. The residual

amount, equal to 20% of the initial guaranteed amount, is released upon approval of the test certificate (or the regular certificate execution).

The client has the right to rely on the definitive deposit for any higher expenditure incurred for the completion of the work in case of termination of the contract and for the payment of the amount due by the contractor for the resulting breaches from non-compliance with the rules and requirements of collective agreements, laws and regulations on the protection, protection, insurance, assistance and physical safety of however workers present on site.

The definitive deposit must be promptly reinstated if, in the course of execution, has been partially or totally forfeited by the client; in case of non-compliance, reinstatement is carried out on the basis of the price accruals to be paid to the contractor, without prejudice to the right of the client to proceed with the termination of the contract of the guarantee determines the revocation of the credit line and the acquisition of the provisional deposit by the client which proceeds to award the contract to the following bidder in ranking.

Article 12: Obligations and responsibilities of the contractor

All the charges indicated below are charged to the contractor and are intended to be offset in the contract price:

1. all contractual expenses, such as registration fees, contractual fees and expenses, expenses for the guardian of the construction site, all present and future expenses up to the time of testing, all other expenses consequent and ancillary even if not expressly indicated;
2. expenses for the construction and maintenance, at the site of the site, of premises or huts on the surface and suitable furniture, necessary for the personnel involved in the execution phase of the works;
3. expenses for the clearing of the areas affected by the realization of the works covered by these Specifications from the artifacts that they can in any way interfere with the execution of the works themselves;
4. expenses for the immediate evacuation, from the areas of the structures built, of all the stored material at the end of the work and in the case of specific and justified requests by the party the contracting authority;
5. expenses for the safekeeping and good conservation of works completed up to final approval;
6. expenses for the realization of experiences, essays and samples, for the preparation and sending of samples of construction materials provided by the contractor to authorized testing institutes, as well as the payment of the relative expenses and taxes with the responsibility of the observance of both the provisions in force regulations for the testing of construction materials in general, both of those that will be able possibly be issued during the course of the work, as well as all the expenses that occur will make it necessary during the testing operations during construction, including the checks of establishment, or the final ones. Samples can be ordered to be stored on site, providing them with seals signed by the contractor, in ways deemed most suitable for guaranteeing its authenticity;
7. expenses for the provision of electricity necessary during the various working phases. It is the contractor' responsibility to supply electricity at its own expense, a generating means, when for any reason this should fail;
8. expenses for the connections and the supply of water necessary during the various working phases. It is a burden of the contractor to supply water at its own expense, through the use of suitable means of transport, when for any reason the functioning of the network of water distribution would stop;
9. charges for maintenance of works carried out in the periods between completion of the work and testing. Maintenance concerns the execution of all repair work for damage that may occur

- on the works performed and what is necessary to give them in perfect condition, excluding only the damage caused by causes of force majeure;
10. expenses for delivery to the client, within five days from the completion certificate of the works, of the certifications required by the current building and plant regulations, as well to the certification required by current legislation on energy saving, as well as all expenses necessary to obtain the certifications referred to in this point, for each unit built;
 11. expenses for the adoption in the execution of the provisions of these Specifications and the necessary precautions to ensure the safety of its staff and any third parties involved in the works covered by this contract and subsequent changes and additions, remaining solely responsible for relieving from any responsibility the contractor and the personnel responsible for the management and supervision of the performances. The contractor must also ensure compliance with current regulations on accident prevention;
 12. compliance with the regulatory and remuneration provisions resulting from employment contracts and agreements additional premises of the same, applicable to the category and in the locality where the work takes place and of all the current provisions on insurance and social security for its employees;
 13. timely communication to the client of any changes in the structures owners, in the structure of the contractor's company and in the technical and administrative bodies;
 14. the drafting of the Operational Safety Plan and the appointment of its own safety manager in the executive phase for each construction site. To ensure the best performance of the contract, the contractor must have the activities supervised and directed related by a technical manager. In the execution of the contract, the technical manager of the contractor is the contact person for the requests, the communications and provisions from the client. The technical manager must also take care of the discipline of the personnel and the perfect observance of all the obligations foreseen by the present Specifications and the contract. The contract must be carried out in a workmanlike manner by specialized personnel, avoiding any element of any nature owned or used by the client suffers damage. The contractor must employ suitable personnel to carry out the work in the most prepared way and in sufficient numbers to carry out the activities described in these Specifications. The client has the right to ask the contractor to remove the personnel who, during the performance, has had inappropriate behaviour. In any case, the contractor is responsible for all obligations regarding safety and health in the workplace that the law attributes to employers and, in particular, for the obligations to be observed in relation the risks inherent in the nature and characteristics of the activity to be performed.

Article 13: Verification of activities

The client reserves the right to inspect the works, the activities and equipment to verify compliance with the terms of these Specifications and the offer presented by the contractor itself in the tender, without this resulting in additional charges for the same. If part of the works or equipment are found not to comply with the technical Specifications, the client may refuse them and the contractor must, at its own expense, replace them or make any requested changes. The parts found to be non-compliant with the contractual requirements may, under unquestionable judgment of the client, be demolished and carried out again without any charge additional. The client reserves the right to inspect, control and possibly refuse the works and equipment after their arrival at their destination, regardless of whether they have been checked with positive outcome in any previous phase of the contract. Any refusal of all or part of the assignment contributes to the immediate termination of the contract and to the execution of the residual works by means of a trusted company, with execution to the detriment of defaulting company without it having anything more to claim. On the dates established by the client, an audit will be carried out in contradictory with the technical manager of the contractor and with the manager

of the execution of the contract, to ascertain the exact fulfilment of the contractual works. The results of the checks must be written on a report.

Article 14: Safety - general safety rules

The contractor is obliged to provide the client an indication of the collective agreements applied to employees and a declaration on the compliance with the insurance and social security obligations provided for by the laws and contracts in force. The contract must be carried out in full compliance with all current regulations on prevention of accidents and occupational hygiene and in any case in conditions of permanent safety and hygiene. The contractor prepares, in due time and in accordance with the provisions in force, the appropriate plans for noise reduction, in relation to the personnel and equipment used.

The equipment supplied must comply with all current regulations on workplace safety. The equipment must be accompanied by technical information and above all by warranty booklets and instructions for use and maintenance, showing the necessary information for carry out, without any risk, commissioning, use, transport and any installation and/or assembly (disassembly), adjustment, maintenance and repairs of the machine itself. The offer must specify any improvement hypotheses with respect to the typical forecasts and define the necessary measures to minimize possible risks during the processing phase.

Article 15: Variants

The client reserves the right to introduce those variants to the contract which at its sole discretion judgment deems appropriate, in compliance with the provisions and within the limits established by law.

The contractor is obliged to submit to the increases or decreases ordered by the client up to the amount of one fifth of the total contract price to them conditions provided for by the latter. The contractor is also obliged to carry out all those changes of a non-substantial nature deemed suitable by the client.

Works and activities of any kind performed by the contractor without the written authorization of the director of the execution previously approved by the client will not be recognized as variants of the contract. The interventions in increase or in decrease arranged by the director of execution to ensure improvement or better functionality of the works covered by the contract are not classified as variants, provided that they are contained within an amount not exceeding 5% and are covered by the sum allocated for the execution of the performance.

Article 16: Penalty

For any breach of the obligations deriving from the contract, however ascertained, the client has the right to apply penalties of pecuniary nature.

The finding of the non-fulfilment – communicated upon written and motivated complaint by registered letter with return receipt – and the assessment of its seriousness are the sole responsibility of the client and the contractor cannot raise any objection in this regard. The extent of the penalties is established by the client, at its sole discretion, for each breach of contract.

In particular, by way of indication and not exhaustive, the penalties will be applied in the following cases:

1. failure to comply with the prices indicated in the offer;
2. negative outcome of checks and inspections carried out on buildings;

3. failure to comply with the minimum environmental performance requirements;
4. failure to comply with the work standards as provided for in these Specifications.

The amount of the penalties imposed must be paid within ten consecutive and continuous calendar days from the date on which the client will communicate by fax the application of the penalties. Once this term has expired unsuccessfully, the client will, without the need for formal notice and with a simple administrative provision, forfeit a portion of the security deposit equal to the amount of the penalty itself. This is without prejudice to the client's right to compensation for any greater damage resulting from the contractor's default.

Article 17: Data processing

Data processing occurs when data is collected and translated into usable information. Usually performed by a data scientist or team of data scientists, it is important for data processing to be done correctly as not to negatively affect the data output.

After all of the data is processed, it is then stored for future use. While some information may be put to use immediately, much of it will serve a purpose later on. Plus, properly stored data is a necessity for compliance with data protection legislation like General Data Protection Regulation. When data is properly stored, it can be quickly and easily accessed by the client when needed.

Pursuant to European regulation 2016/679⁷³, the data provided by the contractor are processed by the Somali National University exclusively for the purposes related to the tender and for any subsequent stipulation and management of contracts.

Article 18: Contractual expenses, taxes, fees

Contractual costs are those services carried out by an individual or organization, other than the applicant, in the form of a procurement relationship. The costs a contractor, including an individual consultant, are included in the contractual line item of the budget. The contractor should list the proposed contract activities along with a brief description of the scope of work or services to be provided, proposed duration, and proposed procurement method (competitive or non-competitive), if known.

Examples of contractual costs are equipment rental or purchase for the works, construction costs, service or maintenance costs once the works are realized, communication and publication costs.

Taxes are involuntary fees levied on individuals or corporations and enforced by a government entity – whether local, regional or national – in order to finance government activities.

A fee is a fixed price charged for a specific work. Fees are applied in a variety of ways such as costs, charges, commissions, and penalties. Fees are most commonly found in heavily transactional services and are paid in lieu of a wage or salary. Fees are most often associated with transactional relationships, specifically to professionals who provide services. In some cases, a fee is charged when an individual hires a business to do a specific task, such as cleaning a house or filing taxes. This type of fee is often the most transparent and transactional, as it

⁷³ The General Data Protection Regulation (GDPR) entered into force on 24th May 2016 and applies since 25th May 2018.

represents payment for the sole reason a fee-charging business was hired. Examples of transactional fees include mortgage fees and fees for wiring money.

The executor is responsible for:

1. contractual expenses;
2. expenses, taxes, administration fees and fees relating to completion and registration of the contract.

The contract is subject to value added tax. The company also bears the costs of publishing the extract from the announcement in newspapers race.

4.2.2. The Special Tender Specifications

4.2.2.1. The administrative part

Article 19: Suspension and resumption of execution

If causes of force majeure, climatological conditions or other special circumstances prevent in temporary continuation of the work in a perfectly done manner, the director of execution may order the suspension of the execution of the contract by drafting a specific verbal. The minutes of suspension and resumption of performance must be countersigned by the contractor.

Suspension of the works may be due to different causes:

1. Suspension due to force majeure.
The contractor undertakes to promptly notify the client in writing of the occurrence of a force majeure event, not foreseeable at the time of stipulation of the contract, providing:
 - an indication of the causes that led to the event;
 - a description of the management activities that cannot be performed due to this event, as well as those that can be provided, even if partially;
 - an indication of the foreseeable duration of the event, the effects and remedies that the contractor intends to activate.Upon receipt of this information, the client and the contractor will jointly identify possible common actions to mitigate the effects caused by the force majeure and the possible division of additional costs.
Within ten days of receipt of this information, the client may ask for any clarification regarding the reasons given by the contractor in relation to the non-executable management activities and indicate any of its decisions in this regard.
If the client does not request clarification or does not raise exceptions on the information sent by the contractor within the above deadline, the contractor will be released from the obligation to carry out the activities.
2. Suspension for public interest or for technical-logistical reasons.
If the client requests the total or partial suspension of the management activities or the delayed activation of the same:
 - for reasons of public interest such as the serious and imminent danger of damage to the health, physical integrity, safety of employees, auxiliaries and collaborators of the contractor;

- for proven technical-logistical reasons, the contractor will be entitled to an extension of the duration of the work for a period of time equal to the duration of the suspension, without prejudice to the provisions.

Article 20: Insurance coverage

The insurance coverage is the amount of risk or liability that is covered for an entity by way of insurance services. It is issued by an insurer in the event of unforeseen occurrences and it helps to recover financially from unexpected events, for example natural disasters – earthquakes or floods – or accidental fires. It is often determined by multiple factors, especially in construction works that require to cover several aspects such as people working, rented or purchased equipment, construction materials, property area, etcetera.

The contractor is required to present a policy, stipulated with a primary company of insurance, for civil liability insurance coverage for all damages they may be caused to third parties, including the client. The contractor will have to take care of the insurances of the whole staff employed at its own expense, the client remaining exempt from any responsibility in this regard.

The contractor must present suitable insurance coverage to protect the following risks:

1. Damage coverage during the execution of the works. Policy for the protection of direct damage to insured things (works in progress and pre-existing works) with a ceiling adjusted to the amount of the contract.
2. Liability coverage for damage to property/people occurring during the execution of the work, at the place of execution of the same.

The guarantee must also include:

- damage deriving from fire or explosion to things owned by the client or third parties;
- damage from electrocution, short circuits or damage in any case resulting from malfunctions of electrical nature.

The contractor also undertakes to produce a certified copy of the original policy for the civil liability of employees relating to its business.

Article 21: Transfer of the contract

The transfer of the contract occurs when the parties to a contract agree on the transfer from one party, the transferor, to another, the transferee, of the transferor's rights and obligations arising out of the contract with the person or company remaining a party to that contract.

The transfer of a contract requires the consent of the other party. That consent may be given in advance or at the moment the transfer is effected by transferor and transferee. If the other party has given its consent in advance, the transfer of the contract becomes effective when a notice of the transfer is given to the other party or when the other party acknowledges it.

The other party may discharge the transferor or may retain the transferor as an obligor in case the transferee does not perform properly. Otherwise the transferor and the transferee are jointly and severally liable⁷⁴.

⁷⁴ Trans-Lex – law research, retrieved from <https://www.trans-lex.org/917500/ /transfer-of-contract/>

Given the size and extended duration of this project over a two-year period as a minimum, the transfer of the contract in any form is prohibited under penalty of nullity; any contrary act is void by law.

Article 22: Termination of the contract

The contract may be stopped by the client only for serious, mandatory and justified reasons of public interest with simultaneous written communication to the contractor of the revocation itself, together with the reasons. In this case, the contractor will be obliged to draw up a specific delivery report in consultation with the client within the following thirty days.

The effectiveness of the revocation of the contract will be subject to the condition of payment of all the sums provided for.

The client reserves the unquestionable right to terminate the contract, with an administrative provision, for particularly serious non-compliance and/or repeated violation of the provisions of the tender Specifications, of laws or regulations. The assessment of the seriousness of the non-fulfilment is the sole responsibility of the client. In the event of a serious breach by the contractor of its contractual obligations, or in cases where the execution of the contract delays with respect to the forecasts of the time schedule relating to the work, the client must assign, by registered letter with return receipt, a term of not less than fifteen days from the date of receipt of the communication to fulfil. In case of termination of the contract, communication of the decision taken by the client is made to the contractor by registered letter with return receipt.

In the event of termination, the client will be able to proceed with the forfeiture of the security deposit, without prejudice to the action for compensation for the greater damage suffered and any other action that the client deems appropriate to undertake to protect its interests. The defaulting party will also be responsible for all costs that the client may incur to carry out a new tender.

The client also reserves the right to withdraw from the contract in all cases provided for by current legislation.

The client may proceed with the termination of the contract if:

1. the contractor, who has been warned three times in writing for serious breach, persists in the contested contractual breach;
2. the application of the penalties provided for reaches an amount greater than 10% of the value of the works;
3. there is a serious non-compliance with the provisions of law and/or regulations, whether of a local, national or community nature, which specifically regulate the execution of the work covered by these Specifications;
4. the contractor's unique contribution regularity document is negative twice in a row;
5. the contractor fails to reinstate the security deposit within the term of fifteen calendar days, subsequent and continuous from the client's request;
6. there is an interruption, at one or both of the locations covered by the contract, of the work for more than three consecutive days, except for reasons of force majeure, specifying that the lack of staff cannot be considered as a cause of force majeure;
7. failure to deliver the requested documentation within thirty days from the start of the management of the works, in any case without prejudice to the manager's responsibility from the beginning of the hiring of the works referred to in these Specifications;

8. the lack of any of the requested authorizations, without prejudice in any case to the right to compensation for damage;
9. delays of more than fifteen consecutive and continuous calendar days, for reasons attributable to the bidder, in the beginning of the execution of the works referred to in these Specifications with respect to the effective date;
10. it's been ascertained the presence among the employees of the work even of a single person who is not duly employed according to the current regulations in force;
11. the head of the work is missing.

Article 23: Subcontracting

Subcontracting is the practice of outsourcing part of the obligations and tasks under a contract to another party known as “subcontractor”.

It is especially used in the construction area where complex projects are typically carried out through hiring subcontractors by the project's general contractor, who keeps having overall responsibility for the project completion and execution within its stipulated parameters and deadlines. This can create a subcontractor risk for compliance.

Subcontracting is permitted, subject to the authorization of the contracting authority, to the following conditions:

1. that the contractor has indicated in the offer the portion (not more than 30% of the entire work) of the contract that he intends to sub-contract;
2. that the contractor deposits a copy of the subcontracting agreement at the client at least twenty days before the effective start date of the execution of the portion of the work subcontracted;
3. that the contractor presents a declaration as to the existence or otherwise of any forms of control or connection with the company to which the subcontracting; in the case of a temporary association, company or consortium, similar declaration must be made by each of the companies participating in the association, company or consortium;
- 3.1 that the contractor, together with the filing of the subcontract agreement, transmits to the client the documentation certifying that the subcontractor is in possession of the requirements prescribed by current legislation for participation in public tenders, with reference to the nature and amount of the works to be subcontracted;
- 3.2 that the contractor, together with the filing of the subcontract agreement, transmits to the client one or more statements by the subcontractor, certifying the possession of the general requirements and the absence of the reasons for exclusion;
4. that there is no prohibition against the subcontractor.

Subcontracting must be authorized in advance by the client following a written request; the authorization is issued within thirty days of receipt of the request; this term can be extended only once, for no more than thirty days, if there are justified reasons; spent the term, the authorization is considered granted if the legal conditions are verified for the award of subcontracting.

The subcontracting of a portion of the work involves the following obligations:

1. the contractor must practice, for the work fee subcontracted, the prices resulting from the award reduced by no more than 20%.
2. the subcontractors must fully comply with the remuneration and legislation established by the national and territorial collective agreements in force for the sector and for the area in which the work is carried out and are jointly and severally liable with the contractor

for compliance with the aforementioned rules towards their employees for the works rendered in the context of subcontracting;

3. the subcontractors, through the executor, must transmit to the client, before the start of the work, the documentation of the notification to the entities social security, insurance and accident prevention;
4. the contractor must transmit to the contracting authority, within twenty days from the date of each payment made to him, copy of the receipted invoices relating to payments paid to the subcontractor, with an indication of the guarantee deductions made. So far as the contractor does not send the receipted invoices of the subcontractor within the aforementioned deadline, the client suspends the subsequent payment in favour of the contractor.

These provisions also apply to temporary business associations. The portion of the work subcontracted cannot be subject to further subcontracting.

The construction work is composed of several parts, which can be more generic or more specific, depending on the building and on the agreement established by the contract. The specialized parts of the work are the ones more frequently subjected to subcontracting, such as the plant installation that may easily require the intervention of another company to carry out the job in the most efficient way because of its complexity.

Article 24: Responsibility for subcontracting and payment of subcontractors

No subcontract can create contractual relations between any subcontractor and the client. The client must not be held responsible for any failure by the contractor to honour its contract with the subcontractor. In case of disagreement regarding the implementation of that contract, the subcontractor must address itself to the contractor and/or to the respective jurisdiction competent to hear such litigations.

In any case, the contractor remains responsible towards the client of the work subject to subcontracting, relieving the latter of any claims by subcontractors or claims for compensation damages made by third parties as a result of the performance of the works. Unauthorized subcontracting involves reporting to the Judicial Authority. The client will not make direct payment of subcontractors and therefore the contractor is obliged to transmit to the client copy of the receipted invoices relating to the payments made by it to the same subcontractors, with an indication of any guarantee withholdings made.

Article 25: Dispute resolution

The amicable settlement of disputes is an essential precondition before starting a legal action before the courts or an arbitration procedure (this latter foreseen only for procurement contracts). Therefore, a party to the contract is able to initiate a court proceeding only if this party has attempted to resolve the dispute amicably without being able to reach an agreement. Therefore, if the client is the initiator of the legal action before the courts, it must provide a proof that it has made firstly an attempt to resolve the dispute amicably. This means that the client should have a preliminary contact with the

contractors aiming at resolving the disputes amicably, following which it turned out that the parties could not reach a settlement⁷⁵.

If, following disputes by the contractor, recorded in the accounting documents, the disputed economic amount is not less than 10% of the amount originally stipulated, the amicable agreement will apply. In any case, pending the resolution of disputes, the contractor cannot slow down or suspend the execution of the contract, nor refuse to carry out the orders given by the client.

Arbitration is excluded for the settlement of disputes.

An example of dispute that may arise during the execution of the project is the installation of frames with an energy performance not as efficient as the one established by the contract but at a lower price than the one stipulated in the contract or the existence of architectural barriers that may be an obstacle for the accessibility to the campus by people with disabilities.

Article 26: Jurisdiction

For any dispute that may arise regarding the application, interpretation, execution or termination of the work contract, the competent court will be that of Mogadishu, applying European directives and regulations at the basis of these Specifications.

Article 27: Administrative authorizations

Administrative authorizations are a type of discretionary administrative act with which an authority removes the limits that, for reasons of public interest, are placed in a general and abstract way by the law to the exercise of a pre-existing subjective legal situation. Unlike the concession, the authorization does not grant new rights but allows the exercise of an existing right.

The performance of certain private activities is subject to the issuance of an authorization or a positive act of assessment, with which the administration verifies the compatibility of these activities with a specific public interest (such as the protection of the landscape and the planning of the territory, citizens' safety, public safety, etc.). The authorization therefore follows the request of the private individual to be able to exercise a right falling within their legal situation (for example, the construction or renovation of a property, the driving of a car or motor vehicle, the possession of a weapon, etc.)⁷⁶.

The contractor must be in possession of all the legal authorizations and certifications required for the exercise of contractual activities.

The contractor must prove that all administrative authorizations have been fulfilled at any time, at the simple request of the client.

The contractor is responsible for all the obligations inherent in running the work. The inability to comply with the aforementioned obligations is a cause for termination of the contract without any charge for the client.

⁷⁵ European Commission (2019), Procurement and Grants for European Union external actions – A practical guide, pp. 8.

⁷⁶ Treccani, retrieved from <http://www.treccani.it/enciclopedia/autorizzazione-diritto-amministrativo/#:~:text=L'autorizzazione%20%C3%A8%20una%20tipologia,una%20preesistente%20situazione%20giuridica%20soggettiva.>

All authorizations and certifications must always be in force for the entire duration of the works; in the event that some of them expire, they must be renewed by the contractor. It will be the responsibility of the contractor to comply with all relevant regulations that may be issued during the course of the contract concerning the activities referred to in these Specifications, without any cost or other charge for the client.

The lack or failure to promptly renew any of the administrative authorizations and certifications will be assessed as a serious breach at the sole discretion of the client. If the aforementioned deficiency is not remedied within fifteen days, or if certain proof of the initiation of the procedure for obtaining the necessary documents is not provided, the client will be legitimized, depending on the severity, to the imposition of penalties, or to the termination of the contract.

4.2.2.2. The technical part

Article 28: Technical features

The technical requirements and performance characteristics of the buildings to be supplied are laid down in the design (including technical drawings, material-specifications, ...) previously made by the contractor and which to the very detail determines how the works must look like. In such cases, in a yes/no format, a clear assessment can be made of whether or not the offer meets the technical Specifications set out in the tender dossier⁷⁷. All material and equipment to be supplied must be new, produced with high quality materials and must respond in every detail – for what concerns the dimensional and construction characteristics, as well as with regard to the materials, the processing and finishing – to the standards in force. Requirements must be demonstrated by provision of certificates of compliance with the aforementioned standards. The works in reinforced concrete must comply with current regulations on the matter⁷⁸.

The contractor must comply with the following technical requirements in drafting the project for SNU buildings in order to achieve the completion of a sustainable campus:

TECHNICAL REQUIREMENT	EXPLANATION	INNOVATIVE APPROACH
Planning	It's the initial master-planning phase.	Identification and analysis of the climatic conditions of the site, which provide natural resources such as sun and wind potential, water availability, soil characteristics. Identification of important natural constraints. Identification of environmental and other threats and risk areas. Identification of main access points and infrastructure. Identification of legal restrictions (protected natural areas, heritage sites).
Climate responsive design	Climate is the main driver of energy	Manipulate the geometry of the buildings, i.e. the three-dimensional volume formed

⁷⁷ European Commission (2019), Procurement and Grants for European Union external actions – A practical guide, pp. 151.

⁷⁸ Norme Tecniche per le Costruzioni (2008).

	<p>consumption for heating or cooling, and the urban form plays a significant role in determining the amount of energy needed. Geometry, size and materials (including vegetation) have a big impact on outdoor and indoor comfort and liveability, and consequently on indoor energy consumption.</p>	<p>by buildings to minimise radiation trapping and enhance shadowing. Manipulate the street layout and building shape to favour wind access. Control the thermal properties of urban surfaces, i.e. colour and mass. Maximise evapotranspiration loss with vegetation and water bodies.</p>
Urban canyons	<p>The primary design strategy is to manipulate urban geometry (height and width of buildings, street orientation and street width) to enhance self-shading of buildings and shading of public spaces, to increase urban albedo and to exploit the cooling potential of wind. This strategy should be combined with the shading potential of trees.</p>	<p>Appropriate design of urban canyons (i.e. their depth and orientation) is the most crucial step, as they dictate the width of the streets and the height of the buildings. Consider that orientation of the street network and the aspect ratio of the urban canyons are crucial factors for shadowing and ventilation, as they have a significant effect on outdoor comfort and the liveability of the streets, and the thermal and visual comfort achievable indoors. Use deep N-S, NE-SW oriented canyons for comfortable pedestrian pathways, as the sidewalks will be in shade almost all day if the street is tree lined.</p>
Green areas	<p>Green areas and spots have fundamental properties such as improving outdoor comfort, safeguarding biodiversity, providing people with accessibility to nature.</p>	<p>Differentiate between green area typologies in order to include microclimates and the ecological and social qualities of urban nature.</p>
Water bodies	<p>They have the potential to cool the urban environment due to their thermal and optical properties, although they should be used with great care, as they can be counterproductive.</p>	<p>To maximise their effect water bodies should be located at the northern/southern corner.</p>

Energy supply	It is the delivery of fuels or transformed fuels to the point of consumption.	The key issue is the decentralisation of energy production combined with the use of renewable energy sources. This approach, besides being a prerequisite for coping with the challenge of climate change, brings additional benefits, such as energy security, improvement of urban air quality (no pollution due to combustion), reduction or elimination of soil contamination due to leakages or spills in fossil fuel transport, reduction or elimination of water use for electricity production with thermal plants, creation of local employment and economic activities.
Cogeneration	Combined heat and power (CHP).	For electricity production and district cooling to supply energy in a more efficient way at the campus scale.
Solar and wind energy	Renewable energy sources are distributed and usually available with a low power density.	They need to be integrated into structures designed and constructed for fulfilling other requirements, otherwise they would occupy too much space.
Embodied energy of materials	It is the main source of greenhouse gas emissions and it should not be overlooked.	Use local materials with low embodied energy, such as stone, stabilised bricks, timber and bamboo. Minimize the use of materials that require very high temperature processing for production. Consider the reuse of waste materials from other constructions.
Water and wastewater cycles	Efficient, circular use of the water resources is an essential prerequisite not only for sustainability but also for basic liveability.	Through the provision of infrastructures for decentralised urban water management, decentralised water resource management and water services can work more effectively and sustainably than a system of centralised management. Sustainable water management embraces: conservation of water sources; use of multiple water sources including rainwater harvesting, storm water management and wastewater reuse; and treatment of water as needed, exploiting the energy and nutrient potential of wastewater, rather than treating all water to a potable standard.

Article 29: Contents of the improvement proposal to be presented during the offer

The objective is to identify a quality and technically valid work through the acceptance of improvement proposals from part of the contractor, in compliance with the best relationship between the benefits and the overall costs of construction, maintenance and management. The work proposal must be inspired by principles of minimization of the use of non-renewable materials, of maximum ease and cost-effectiveness of maintenance,

durability of materials and of components, replacement of elements, compatibility of materials and easy control of performance of the intervention over time.

The technical solutions identified must allow the achievement of the following objectives:

1. adequate functional standards;
2. adequate safety standards;
3. limited energy consumption;
4. quality and liveability of indoor environments (lighting, acoustics, air exchange, protection from radiation, architectural barriers, etc.).

Article 30: Execution in damage

The execution in damage is required by the client if it chooses to entrust the provision of the services covered by the contract to third parties, attributing the additional costs to the contractor. This can happen if the contractor fails to fulfil the obligations deriving from the contractual relationship. The execution in damage constitutes a form of protection of the client as an alternative to the ordinary instruments of contractual resolution, and takes place after a warning.

The total period of execution of a works contract includes the period of implementation of the works and the defects liability period between provisional and final acceptance. During this time, the period of implementation can be extended by an administrative order or by contract addendum, even after the implementation period specified in the contract has expired. The contractor is committed to completing the works, and the client is committed to paying for the certified works. These commitments and the contract remain valid even if the contractor fails to complete the works within the period specified in the contract, the consequence being that liquidated damages for delay can be deducted from the amounts due⁷⁹.

In the event of omissions or non-compliance ascertained according to the methods and times provided in these Specifications, it is the faculty of the client to have the work carried out by another company to the detriment of the company executrix.

In a work contract, the client has the power to issue an administrative order to change any part of the works if necessary for the proper completion and/or functioning of the works. These changes may include additions, omissions, substitutions, changes in quality, quantity, form, character, kind, position, dimension, level or line and changes in the specified sequence, method or timing of execution of the works and they must be accepted by the contractor.

In the SNU project, it may be required the execution in damage if the contractor fails to carry out the works within the timeframe agreed upon at the time of the signing of the contract, or the buildings don't fulfil the technical characteristics required or any contractual conditions is breached, such as in the case of subcontracting, if the work is entrusted to a company affiliated with the mafia.

⁷⁹ European Commission (2019), Procurement and Grants for European Union external actions – A practical guide, pp. 165-166.

Article 31: Warranty, after sales assistance and training

A warranty is a type of guarantee that a manufacturer or similar party makes regarding the condition of its product. It also refers to the terms and situations in which repairs or exchanges will be made in the event that the product does not function as originally described or intended. After sales support, sometimes called after sales service, is any service provided after a customer has purchased a product. After sales support may be provided by a retailer, manufacturer, or a third party customer service or training provider. Typically, examples of after sales service include support regarding warranty service, training, or repair and upgrades.

The contractor guarantees that the works are of the best existing quality on the market, possess the characteristics established by the laws and regulations in force on the subject of buildings and correspond to the technical Specifications indicated in these Specifications tender and to the technical characteristics presented by the contractor during the tender. The materials and supplies must come from those locations that the contractor deems its own convenience, provided that, at the discretion of the client, the suitability and the compliance with the prescribed requirements. Provisions not accepted by the client, as they are unquestionably not recognized suitable, must be immediately removed from the construction site at the contractor's care and expense, and replaced with others meeting the required characteristics. However, the contractor remains fully responsible in relation to the materials provided, the acceptance of which, in any case, does not affect the rights that the client reserves to assert in the final testing.

For what concerns after sales assistance, there can be two types of work contracts: the ones not including ancillary services and the ones including them.

In the first case, price is the sole award criterion for awarding work contracts not including ancillary services (such as after-sales services and training). All non-compliant tenders having already been eliminated, the contract is awarded to the bidder submitting the least expensive, compliant tender. Where specified in the technical Specifications, the financial evaluation may take into account not only the acquisition costs but, to the extent relevant, costs borne over the life cycle of the buildings (such as maintenance costs and operating costs). If so, the procurement dossier must indicate in advance the data to be provided by the bidders and the method that will be used to determine the life-cycle costs on the basis of those data.

In the second case, where a work contract includes ancillary services (such as after sales services and/or training), the technical evaluation should take into account the quality of such services on a yes/no basis. All noncompliant tenders having been eliminated, the contract is awarded to the bidder offering the lowest price for both equipment and ancillary services together.

In this tender procedure, the work must be guaranteed for at least twenty-four months from the date of installation, with any additional term indicated by the competitor in the technical offer. For the same period (twenty-four months) any ordinary and extraordinary maintenance will be charged to the supplier company. The company undertakes in this period to carry out at its own expense the interventions of transport, assembly and placement, repair, restoration, replacement of the parts that in any case present imperfections for the quality of materials and/or operation even if not detected at the time of testing and taking charge indicated by the contracting authority. The successful bidder must provide for the necessary repairs and/or replacements as soon as possible and, in any case, no later than ten consecutive calendar days from the request for intervention.

5. Discussion and conclusion

5.1. Tropical climate

The design of a new campus can be an opportunity for coping with global warming and the quality of life, and, bearing in mind that architectural design principles that apply to cities in tropical climates differ significantly from the principles that apply to cities in temperate climates, it is a burden shared by both developed and developing countries⁸⁰.

In a tropical climate⁸¹, the primary aim of energy-efficient architectural design is to minimise heat gains and to maximise heat losses. This implies controlling the short and longwave radiation in urban canyons, as the goal should be to find an urban geometry that is self-shading, using an intelligent combination of building heights and geometry, if necessary complemented with horizontal shading elements such as canopies, awnings and urban vegetation, and favouring air movements, by manipulating the geometry and relative positions of the buildings according to the prevailing winds.

A hot humid climate⁸² is characterised by abundant rainfall, near constant temperatures, seasonal variations in wind speed and direction, and high humidity. A hot arid climate, on the other hand, is characterised by scarce rainfall, a high day-night temperature difference, generally weak but persistent winds, and low humidity, especially in the hottest hours. Tropical climates range between these two extremes. While in temperate climates the increased summer discomfort derived from urbanisation is somehow compensated by the reduction of winter discomfort (thus energy consumption), in tropical climates, urbanisation leads to increased discomfort (and energy consumption) all year round⁸³.

As the sun is high in the sky in the tropics⁸⁴, much of the short-wave radiation on building facades is generally reflected onto the surface of the street, and this adds to the already large amount of direct radiation it receives and absorbs. For this reason, the control of solar gain is the first aim of urban design in a tropical climate.

In all tropical climates⁸⁵ it is important to design streets and buildings in such a way as to provide maximum shade in pedestrian sidewalks and in general in public spaces in order to improve their thermal quality, as in tropical climates a large part of people's time is usually spent outdoors, for both productive and leisure activities. Since the sun is high in the tropics, pedestrian streets should avoid an east-west orientation, while a north-south orientation, which provides shade in the morning and in the afternoon on at least one side of the street, will be beneficial. Such shading strategies should be mindful of the need to promote ventilation at building scale. Thus, tools for easily controlling shade patterns are crucial at the design stage.

⁸⁰ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 3.

⁸¹ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 19.

⁸² Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 25.

⁸³ With the exception of the relatively few urban developments located above 2000 m above sea level.

⁸⁴ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 26.

⁸⁵ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 30.

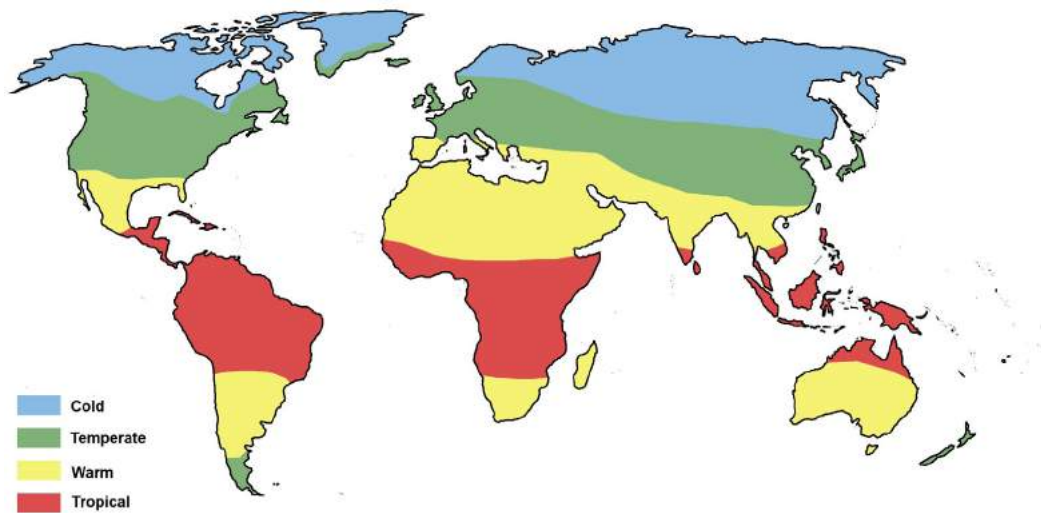


Figure 23 - Macroclimates. Source: Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi

5.2. Elements to consider

When a new building in a developed country is being designed, it is taken for granted that it will be connected to the existing city’s electric grid, water network, sewage system, gas network, solid waste collection and disposal system, and transport system. The existence of such facilities makes it easier to build and inhabit the new building progressively and leaves the responsibility of providing the services to the utilities.

In cities in developing countries, on the other hand, these facilities are often not efficient or reliably available, or are not available at all, thus a new building should be planned and designed with these issues in mind and distributed energy generation, local water supply and local stormwater, wastewater and solid waste treatment systems should be included in the design. The integration of the energy issue into architectural design affects the entire metabolism of the building, such as energy consumption, water and waste cycles.

A sustainable building⁸⁶ is a building whose design integrates into a holistic vision the following aims⁸⁷:

1. Climate responsiveness and context. Aim for a building based on the climatic conditions, with appropriate responses to location and site context. Find out what the unique site constraints, climatic conditions and opportunities are.
2. Renewable energy for zero GHG emissions. Aim for a building as a self-sufficient on-site energy producer, using decentralized energy systems. Find out how energy can be generated and supplied emission-free and how to minimise energy demand in buildings and in transport
3. Zero-waste. Aim for a zero-waste building as a circular, closed-loop eco-system. Find out how to turn waste into a resource, aspiring to nature’s zero-waste management system.

⁸⁶ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 15.

⁸⁷ Lehmann, S. (2010), Green Urbanism: Formulating a Series of Holistic Principles, S.A.P.I.E.N.S, 3.2, Vol. 3 / n. 2, retrieved from <http://sapiens.revues.org/1057#tocfrom2n1>

4. Water cycle. Aim for a building with closed urban water management and high-water quality. Find out how to promote rainwater collection, wastewater recycling and storm water harvesting techniques, which are also for flood management, and how to avoid the consumption of potable water for uses not requiring its purity. Try to obtain energy from wastewater.
5. Local and sustainable materials with less embodied energy. Aim for a building construction using regional, local materials with less embodied energy. Find out what kind of materials are locally available and which appear in regional, vernacular architecture.

Through the technical requirements anticipated in the Specifications, it may be possible to control the impact of the new buildings even in a complex scenario like the one analysed. It is now necessary to deepen the discussion to better understand the direction in which the contractor will have to follow in order to build a new sustainable campus.

5.2.1. Site layout: Planning

This initial master-planning phase is made up of several steps:

- Identification and analysis of the climatic conditions of the site, which provide natural resources such as sun and wind potential, water availability (rainwater, underground water, water bodies, running water), soil characteristics;
- Identification of important natural constraints (topography, rivers, parks, forests, wetlands, agriculture);
- Identification of environmental and other threats and risk areas;
- Identification of main access points and infrastructure (roads from city to highway);
- Identification of legal restrictions (protected natural areas, heritage sites).

Then, the functional brief with the diverse land uses, the overall density and its distribution over the site and the urban form (which includes street network layout and building typologies design) have to be defined.

The metabolism⁸⁸ of today's cities is generally linear: the inputs crossing their borders are distributed inside them and used to keep all the functions working. Then, after their use, they are disposed of as waste (inorganic, organic and emissions) outside the borders. In this model, the development and the growth of cities is accompanied by a corresponding increase in the inputs and, consequently, in waste. It should be noted, however, that not all the products of the metabolism are waste: in a city some productive processes take place, and some goods and/or food cross the borders towards the outside environment, to become input for other settlements.

This linear production path of inputs and outputs is not sustainable as cities continue to grow. The linear "Take, make, dispose" lifestyle of our cities increasingly depletes finite natural reserves producing wastes in quantities that the environment is not capable of absorbing without damage.

A sustainable city should reduce to a minimum dependence on the input flows by maximising dependence on local, small scale, reliable production of energy and food, and by maximising reuse/recycling of water and goods. At the building scale, this implies:

- decentralised energy production mainly from renewable energy sources coupled with energy efficient buildings and appliances;
- urban and peri-urban gardens for food production;
- optimised water cycle coupled with energy production from wastewater

⁸⁸ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 7.

- reduction of the flow of goods through their maintenance, repair and reuse, according to the concept of a circular economy, with the consequent reduction of waste;
- all this in a polycentric urban structure, which allows a more efficient management of material and people flows around local centralities (based, for example, on transit oriented developments and local energy production and distribution systems).

When it comes to “what”⁸⁹ a sustainable building should be, there is a wide choice of literature, and guidelines and recommendations are available. There is much less literature on “how” the architect should put into practice the general guidelines and recommendations proposed, because there are fewer tools, indicators or figures allowing him/her to achieve the desired aims. The main reason for this is that the literature usually refers to planning, not to design that would allow the designer to translate into practice the indications given by the theoretical part. Some literature, however, is available and it addresses individual, specific, aspects of sustainability, such as density, street design, green areas, energy, water and waste systems etc., but generally fails to integrate all these aspects into a holistic vision that evaluates the practical interconnections between them. What appears to be the best choice if the subsystem is considered in isolation may not be (and usually is not) the best when the subsystem is treated as a part of the whole system, as it affects other subsystems and is affected by them.

Infrastructures such as electricity grids and power generators, water piping, sewerage, solid waste management are usually left to somebody else, who will add them on, hiding them as much as possible. This is similar to what, for far too long, has been going on with buildings: the architectural design first, and then the building services engineer comes in to make the building liveable, with water, sewerage, gas and electricity networks – with no or very little interaction with the architect. In recent years we have learnt that this approach is not consistent with sustainable building design, as architectural choices are affected by the technological services, and vice versa. Architect and building services engineer must work together, sharing their expertise in energy efficiency; this is especially necessary when designing zero energy buildings.

If the aim is sustainability, it must be implemented the maximisation of energy self-sufficiency with renewable resources, efficient use of energy and water, decentralised energy, water and waste systems, minimisation of motorised mobility, and so on.

5.2.2. Climate responsive design

Climate is the main driver of energy consumption for heating or cooling, and the urban form plays a significant role in determining the amount of energy needed. Geometry, size and materials (including vegetation) have a big impact on outdoor and indoor comfort and liveability, and consequently on indoor energy consumption. The design scheme of a building impacts both on people’s behaviour (mobility habits) and on the performance of buildings (shading, ventilation, vegetation and infrared radiation are the drivers of the energy loads in indoor spaces).

Strategies for controlling outdoor comfort (i.e. mitigating the UHI) in a tropical climate are:

- Manipulate the geometry of the building, i.e. the three-dimensional volume formed by buildings to minimise radiation trapping and enhance shadowing;
- Manipulate the street layout and building shape to favour wind access;

⁸⁹ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 10.

- Control the thermal properties of urban surfaces, i.e. colour and mass;
- Maximise evapotranspiration loss with vegetation and water bodies.

Air temperature⁹⁰ depends significantly on that of the surface below it, and urbanized land has a greater capacity to absorb solar radiation because of the morphological configuration and characteristics⁹¹ of the materials it is made of. Thus, these surfaces are hotter than nonurbanized ones, and the temperature is higher.

Buildings in cities are mostly constructed of concrete and other man-made materials. They have higher thermal capacity than the natural environment, and therefore store more heat during daytime. The heat stored will increase night-time urban temperatures, especially if tall buildings block the urban area's sky view and so limit release of the heat back to the atmosphere. In addition, there is little or no cooling effect due to vegetation, and there is heat due to the mechanical cooling of buildings and to vehicular traffic. For these reasons, temperatures in urban areas are higher by several degrees than in rural surroundings, particularly at night. This phenomenon, called the urban heat island, increases with urban size and towards the centre of the city. The reduction of the heat island effect⁹², by increasing the albedo (type of surface) and by applying sunscreens (such as vegetation) in the most critical areas, reduces energy requirements for air conditioning (which results in decreasing GHG emissions from electricity generation), reduces smog levels, and reduces the health risks due to heat and poor air quality.

The strategies⁹³ to mitigate the urban heat island in a tropical climate are:

- Manipulate the geometry of the buildings to minimise trapping of solar radiation;
- Manipulate the street layout and the building heights to favour wind access (ventilation);
- Control the thermal properties of urban surfaces, such as colour and mass;
- Minimise anthropogenic heat, minimising motorised traffic and mechanical cooling;
- Maximise evapotranspiration loss with vegetation and water bodies.

Because of the multiple reflections⁹⁴ on canyon walls, part of the incident solar radiation reaches the bottom, contributing to the heating of the canyon's floor; moreover, the walls also heat up because of the radiant energy absorbed, with the ultimate consequence of both heating the air and increasing the mean radiant temperature – thus affecting the outdoor comfort and the heat transmitted to the building's interior.

The narrower and deeper the canyon, that is the higher the value of the aspect ratio (building height/street width), the more reflections take place and the more radiant energy is trapped. The amount of reflected energy reaching the bottom of the canyon also depends on the albedo of the wall's surface: the higher the absorption coefficient (meaning the lower the albedo), the more the radiant energy is absorbed by the upper part of wall and the lower the amount reaching the bottom of the canyon. Thus, low albedo walls should be beneficial to the thermal comfort of the street; the drawback is that the energy absorbed is partly transmitted to the internal part of the

⁹⁰ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 22.

⁹¹ Urban areas typically have surface materials, such as roofing and paving, which have a lower albedo than those in rural settings. As a result, built up communities generally reflect less and absorb more of the sun's energy.

⁹² Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 24.

⁹³ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 25.

⁹⁴ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 26.

building, creating indoor discomfort, and is partly released as long-wave radiation towards the canyon, affecting outdoor comfort.

The design of urban canyons plays an important role in creating the urban climate. The orientation affects comfort because east-west oriented streets are exposed to sun all day, almost irrespective of the canyon's aspect ratio, while the north-south oriented streets are exposed only in the central hours of the day.

Special cases⁹⁵ are the urban canyons whose walls are the facades of highly glazed buildings. When sun rays hit a rough surface, as a plastered wall, they are subject to diffuse reflection and, as first approximation, follow the theoretical so called cosine law, that is the reflected energy in a particular direction is proportional to the cosine of the angle between that direction and the surface normal.

Glass, however, when hit by solar radiation with a high angle of incidence as in the tropics, reflects almost entirely the solar radiation (specular reflection), which reaches the bottom of the canyon, with the effect that the amount of radiant energy reaching the canyon floor is almost doubled (direct + reflected), and this has obvious dramatic consequences on both thermal comfort and the heat load that buildings derive. This phenomenon, at tropical latitudes, takes place for any canyon orientation and building height/street width (H/W) ratio, thus buildings with high Window to Wall Ratio (WWR) should be avoided, as well as any kind of highly reflective surfaces, such as aluminium clad facades.

By making use of the obstruction profiles⁹⁶ and sun charts, some general rules can be derived for the latitudes within which the East African Community lies (that is from about 11 S to 5 N).

- A North-South orientation is the best, as a point at centre canyon, ground level, is subject to direct sunshine for the minimum number of hours in all months, thus better outdoor and indoor comfort is achieved, provided that the windows and walls of the upper storeys are appropriately shaded with movable devices or egg-crate protections.
- With the East-West orientation the floor of the canyon is fully exposed to solar radiation for most of the time, irrespective of the aspect ratio: only in the coolest and in the hottest month of the year will the floor of the canyon be fully shadowed for $H/W \geq 2$. East-west canyons hold relatively little potential for enhancing outdoor thermal comfort through geometry alone; indoor comfort, however, can be controlled if shading devices or overhangs protect the canyon walls.
- The number of hours of solar exposure decreases as the aspect ratio increases: the deeper the canyon, the lower the direct and diffuse solar radiation at ground level. This finding calls for densely built areas.
- Moving away from the north-south orientation, towards the east-west, the amount of solar radiation reaching the bottom of the canyon increases, but not so much up to 45° offset from south.
- It is advisable, for north-south canyons, not to have an aspect ratio lower than 2.

In conclusion, the optimum street grid for outdoor comfort should be structured in the form of deep, narrow north-south canyons and, if required, larger east-west ones. An offset not exceeding 45° from the exact cardinal orientations is acceptable. Canyon walls and windows, especially those of the upper floors, should be appropriately protected with shading devices.

⁹⁵ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 27.

⁹⁶ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 33.

Shade⁹⁷, in tropical climates, makes for liveable outdoor spaces. Sidewalks are the most common and thus critical open spaces in the streets, not only as transit areas, but also for their different potential uses, such as small aggregations, recreation or shopping spaces. In order to expand the potential uses of sidewalks, shading them is a crucial prerequisite.

Due to the sun paths of the tropical latitudes, it is impossible to have all the points of the ground level of an urban canyon shaded for the whole day or all year round, and around noon only horizontal sun protections can provide shade. There are many examples of movable horizontal protections across the street, as in Sevilla, Spain or in Fez, Morocco. Mobile horizontal protections are particularly effective if they are removed at sunset and activated again in the early morning, because in this way night cooling is not precluded.

Another possibility for having part of the street completely or almost completely shaded at any time of the day and of the year is given by arcades, which are the only way to shade walkways in wide streets.



Figure 24 - Horizontal mobile street sun protections in Sevilla, Spain (left) and in Fez, Morocco (right). Source: Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi.

5.2.3. Urban canyons

The primary design strategy is to manipulate urban geometry (height and width of buildings, street orientation and street width) to enhance self-shading of buildings and shading of public spaces, to increase urban albedo and to exploit the cooling potential of wind. This strategy should be combined with – and enhanced by – the shading potential of trees in the streets. Appropriate design of urban canyons (i.e. their depth and orientation) is the most crucial step, as they dictate the width of the streets and the height of the buildings.

Consider that orientation of the street network and the aspect ratio of the urban canyons are crucial factors for shadowing and ventilation, as they have a significant effect on outdoor comfort and the liveability of the streets, and the thermal and visual comfort achievable indoors. Use deep N-S, NE-SW oriented canyons for comfortable pedestrian pathways, shops, coffee houses, small artisan workshops, as the sidewalks will be in shade almost all day if the street is tree lined. In such canyons, sidewalks should be wide enough to allow for outdoor activities (leisure or productive). The upper floors should contain residences, as the height above street level favours ventilation.

⁹⁷ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 33.

Use east-west oriented streets mainly for vehicular traffic and leave north-south oriented streets mainly for pedestrians. Consider the possibility of making use of horizontal overhangs appropriately dimensioned and spaced along the height of the walls: they protect canyon walls very effectively from direct exposure to the sun, reduce solar radiation reflected by the walls towards the canyon floor and the heat flux through the walls towards the indoor space.

Consider that, due to the sun paths characterising the tropical latitudes, it is impossible to have all the points of the ground level of an urban canyon shaded all day or all year, and that around noon only horizontal sun protections can provide shade. Attention must be paid to the mass and surface colours of materials: both influence comfort in both urban canyons and open spaces. Avoid dark surfaces, especially horizontal ones. Albedo values of opaque surfaces should be higher than 0.4. Control the mass of walls (heavyweight in a hot dry climate, lightweight in a hot humid climate, medium weight in a highland climate). Be cautious about using glazed or reflective materials for canyon walls: the comfort (thermal and visual) conditions in the street are significantly worsened, unless appropriately designed devices shadow the façade. In order to control the excessive reflection due to glass surfaces, Window to Wall Ratio (WWR) should not exceed the value 0.3, unless the window is fully shadowed all day.

The using of vegetation on streets, as planned in the masterplan, should significantly improve outdoor comfort and reduce energy consumption indoors. A green area is not only beneficial for the buildings directly around it, but also induces – because of its lower air temperature and thus lower pressure in comparison with the built-up areas – mild air movements that, with appropriate street and building design, can significantly improve outdoor and indoor thermal comfort.

Check that the design choices deriving from climatic drivers do not conflict with the choices promoting the reduction of motorised mobility. In the tropics, a large part of the anthropogenic heat production is due to motorised mobility. The reduction of motorised mobility would be indirectly beneficial in further reducing the heat island because of the reduction of pollutants in the atmosphere, which cause an increase in the long-wave radiation from the sky and a decrease in the radiative heat losses towards the sky. there is, of course, also an impact on health.

Encourage easy channelling of the prevailing winds. Wind has a multiple positive effect in tropical climates: it improves outdoor thermal comfort, removes the sensible and latent heat and reduces air pollution. Encourage wind penetration by creating breezeways. Breezeways can be in the form of roads, open spaces and/or low-rise building corridors through which air reaches the inner parts of urbanised areas. If streets are aligned to the prevailing wind direction, wing walls in the buildings' façades should be considered to enhance indoor ventilation.

Avoid uniformity in building height, canyon width and canyon length; uniformity reduces eddies, thus ventilation. Variation in Building height across the building with the height decreasing towards the direction of the prevailing wind should be adopted to promote air movement. a Staggered arrangement of the blocks allows the blocks behind to receive the wind penetrating through the gaps between the blocks in the front row.

Provide comfortable street landscapes. Consider the canyon's aspect ratio to provide shadowed pathways and cycle lanes to make walking and cycling more pleasant. Provide internal connectivity⁹⁸ of the street network inside the new campus to promote walkability.

⁹⁸ Connectivity is the degree to which the movement networks interconnect. It refers to the directness or ease of moving between origins (e.g., households) and destinations along the movement network.

5.2.4. Green areas

Green areas and spots represent another kind of urban material for climate control with fundamental properties such as

1. improving outdoor comfort,
2. safeguarding bio-diversity,
3. providing people with accessibility to nature.

Differentiate between green area typologies in order to include microclimates and the ecological and social qualities of urban nature. make sure the campus provides, among others:

- urban parks;
- tree lined streets;
- pocket parks with diffused small green interventions (planters, green shelters, roofs and walls);
- urban food gardens.

Define the extent of green areas and spots and their spatial distribution taking into account their cooling effect, which can be checked by means of simulations. As a basic reference value, 15-20% of the campus land should be allocated for green open areas. Consider that trees and vegetation in general are also a very effective carbon sink. All the streets should be treelined, but care must be taken to ensure that they do not endanger ventilation.

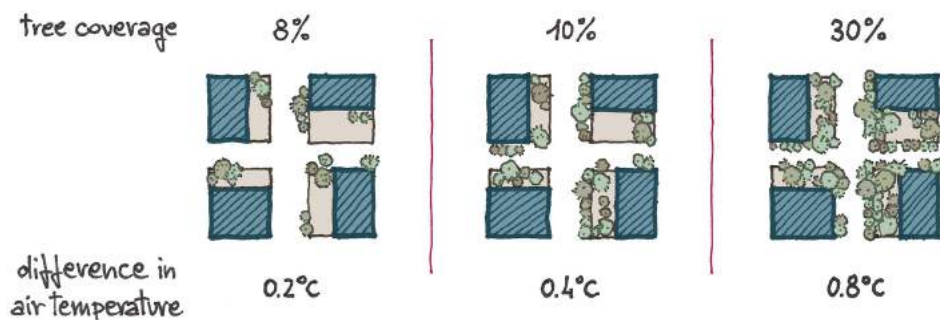


Figure 25 - Simulations carried out for Hong Kong (School of Architecture). Adapted from: School of Architecture (a), Chinese University of Hong Kong, Urban Climatic Map and Standards for Wind Environment - Feasibility Study – Executive summary. Source: Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi.

The albedo⁹⁹ of vegetation is often lower than that of solid surfaces such as bare soil or concrete, both because of the dark leaf pigment and because sunlight penetrates the upper surface of the canopy and is then absorbed within the plant following multiple reflections between individual leaves; even grass reflects only 20 to 22% of incident sunlight, while bushes or trees may reflect as little as 12 to 15%, about the same as asphalt pavement¹⁰⁰. One would expect that this low albedo would cause the surface, and thus the air, to overheat. Instead, urban greening, i.e. extensive road side tree planting, green patches, urban parks and urban gardens, are very

⁹⁹ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 40.

¹⁰⁰ Errell, E.; Pearlmutter, D. (2011), T Williamson – Urban Microclimate, Earthscan.

efficient and effective means of improving outdoor and indoor thermal comfort and of reducing energy consumption for cooling buildings. This benefit derives primarily from the heat exchange properties of leaves: intercepted and absorbed solar energy is released by convection, longwave radiation, and evaporation. Because of evaporation the leaf temperature does not rise, and thus air around it does not heat up. Moreover leaves, intercepting solar radiation, provide shade, preventing the temperature of the ground underneath from increasing. In this way the low albedo is entirely offset by the thermal properties of greenery.

Vegetation affects the energy exchanges between buildings and the environment in three ways:

- because of evapotranspiration, plants release less sensible heat to the adjacent air, so that buildings are exposed to cooler ambient temperatures;
- cooler surfaces emit less infrared radiation, thus reducing the radiant load on building surfaces (e.g. a lawn vs. a bare parking lot);
- when vegetation provides shading, the solar heat load on building surfaces is significantly reduced.

Green areas¹⁰¹, to the extent that they can be properly irrigated, are a great benefit especially in a hot dry region, not only because air temperature is reduced and surfaces are shaded, but also because the evaporation from the leaves elevates the air humidity, which is usually very low, improving thermal comfort. Unfortunately, it must be borne in mind that, whereas in hot humid climates greening is generally a relatively easy option because of the availability of water (rain, running water and water bodies), there is a very different situation in hot arid climates, where water is a very scarce resource, and the capability for greening is limited unless local water cycles are activated.

Providing water for trees, parks, small green areas and/or urban agriculture is thus challenging because of the large amount required and the its cost: the quality of potable water is far higher than that needed for watering plants. This is also the reason why the maintenance of urban greening is often poor, and large amounts of green areas are usually available mainly in the richest and best organised cities.

The issue of urban vegetation, then, intersects with the issue of the urban water cycle: decentralised water management, based on the exploitation of rainwater and on the recycling of wastewater is closely connected with the availability and cost of water for irrigation, and is a prerequisite for a sustainable integration of green areas into the new settlements.

The microclimatic beneficial effect of trees¹⁰² is due to¹⁰³:

- solar heat gains on a building's envelope and on urban surfaces, including human bodies, are lowered because of the shading they provide;
- a building's long-wave exchanges are reduced because of the lower temperature of shaded surfaces;
- the dry-bulb temperatures are lowered because of the evapotranspiration process.

Heat dissipation via transpiration depends on the water balance of the tree. A single large tree can transpire 450 litres of water per day, consuming 1000 MJ of heat energy to drive the

¹⁰¹ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 41.

¹⁰² Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 43.

¹⁰³ Ng, E.; Chen, L.; Wang, Y.; Chao, Y. (2012), A study on the cooling effects of greening in a high-density city: An experience from Hong Kong, *Building and Environment* 47(1), pp. 256–271.

evaporation process¹⁰⁴. In the presence of unrestricted water, transpiration will cause substantial cooling. However, if water supply to the root system is restricted, it causes the closure of stomata, reducing the transpiration rate, thus the cooling capacity. This explains why the effectiveness of trees as cooling agents in hot arid climates is usually lower than in hot humid ones, unless the appropriate quantity of water is provided. The use of trees as microclimate modulators in hot arid climates entails a very careful design of the water cycle.

Trees can be particularly effective in improving the microclimate of streets, contributing to better outdoor and indoor comfort and to lower cooling energy consumption; there are some rules to follow for best exploiting their effectiveness¹⁰⁵:

- Tree crowns should not occupy large canyon volumes, so as not to suppress the ventilating canyon vortex system and the corner eddies. In particular, sufficient free space between crowns and adjacent walls should be ensured.
- The tree height should not exceed roof level, as this would result in a substantial reduction in entrained above-roof air required to ventilate the street canyon.
- Broad tree spacing creates less of an obstruction, and allows rooftop flow to generate vortices in the street.
- Trees have a smaller effect in shallow canyons ($H/W < 0.5$) than in deeper ones.

As the amount of radiant energy intercepted is crucial, the effectiveness of a tree canopy as a shading element is firstly a function of the density of its leaves, stems and branches¹⁰⁶.

Shading provided by trees is far more effective than shading provided by a solid shading component. The reason is that a canopy made of whatever material absorbs solar radiation in the upper surface, heats up, and both upper and lower surfaces emit long-wave radiation, the amount of which depends on the superficial properties (spectral absorption and emissivity) and on the insulation characteristics of the component. In any case, the lower surface will be hotter than air, thus emitting more longwave radiation than a leaf crown, whose temperature is usually very close to that of ambient air. Consequently, the energy received by a person or a building shadowed by a thick tree crown is lower than that received when shadowed by a surface of any material.

Another quality of trees is their ability to sequester and store carbon in their trunks, leaves, and roots, acting as carbon sinks, so contributing to a reduction in GHG emissions.

Trees provide multiple benefits, however, they have drawbacks. The most important are:

- they may act as obstacles to air movement, so decreasing the convective heat transfer for cooling urban structures;
- they restrict long-wave radiative heat losses of the ground, i.e. nocturnal cooling.

¹⁰⁴ Doherty, M.; Nakanishi, H.; Bai, X.; Meyers, J. (2009), Relationships between form, morphology, density and energy in urban environments, GEA Background Paper, retrieved from https://www.academia.edu/4916721/Relationships_between_form_morphology_density_and_energy_in_urban_environments_GEA_Background_Paper_prepared_by

¹⁰⁵ Errell, E.; Pearlmutter, D. (2011), T Williamson – Urban Microclimate, Earthscan.

¹⁰⁶ Errell, E.; Pearlmutter, D. (2011), T Williamson – Urban Microclimate, Earthscan.

5.2.5. Water cycle

Urban demand¹⁰⁷ for water, especially in developing and emerging economies, will grow significantly in the coming decades. At the same time, observational records and climate projections provide abundant evidence that freshwater resources are vulnerable and will be greatly affected by climate change¹⁰⁸. Already, groundwater supplies are diminishing, with an estimated 20% of the world's aquifers being over-exploited¹⁰⁹. Globally, the rate of groundwater abstraction is increasing by 1% to 2% per year¹¹⁰.

The problem of water is particularly critical in many parts of African countries, which face severe challenges in securing sustainable and sufficient access to quality water to meet the increasing demands of a growing population and socio-economic development, while preserving the essential ecosystems on which water resources depend. Access to drinking water and sanitation services had been improving over time, but, as the demand for fresh water for domestic use has also been rapidly increasing, access has started to decline recently as a consequence of rapid urbanisation and environmental degradation and the percentage of people who enjoy piped water on their premises has decreased from 42% to 34%¹¹¹.

Water and energy are related. Water is used in the production of energy and energy is used in water supply, to pump, treat and distribute water. With a growing population, the demand for water has been rising simultaneously, requiring more and more energy. Water and energy are specially interrelated in tropical climates since vegetation improves outdoor and indoor comfort, reducing the need for mechanical cooling, and vegetation requires water. Urban water cycle and energy systems are not only interdependent, but also show similarities in both their historical development and their desirable future.

In the present urban metabolism high quality energy (fossil fuels, electricity) enters the city, is used, and low quality, degraded (thermal) energy is disposed of in the surrounding environment; similarly, high quality water (pure, clean, potable) enters the system, is used, and low quality (impure, more or less dirty, non-potable) is conveyed to a nearby large water body (sea, lake, river). It is the same process: a negentropy flow enters the city, the campus, the individual buildings, and is degraded into an entropy flow and disposed of into the environment. The water system mimics the energy system: centralised production, distribution, use, waste (wastewater here, CO₂ there).

¹⁰⁷ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 76.

¹⁰⁸ IPCC (2008), Climate Change and Water, retrieved from <http://ipcc.ch/pdf/technical-papers/climate-change-water-en.pdf>

¹⁰⁹ UNESCO (2015), Water for a Sustainable World, retrieved from <http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/2015-water-for-a-sustainable-world/>

¹¹⁰ UN (2014), United Nations World Water Assessment Programme, WWDR 2014, Water and energy, retrieved from <http://unesdoc.unesco.org/images/0022/002257/225741e.pdf>

¹¹¹ UNESCO (2015), Water for a Sustainable World, retrieved from <http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/2015-water-for-a-sustainable-world/>

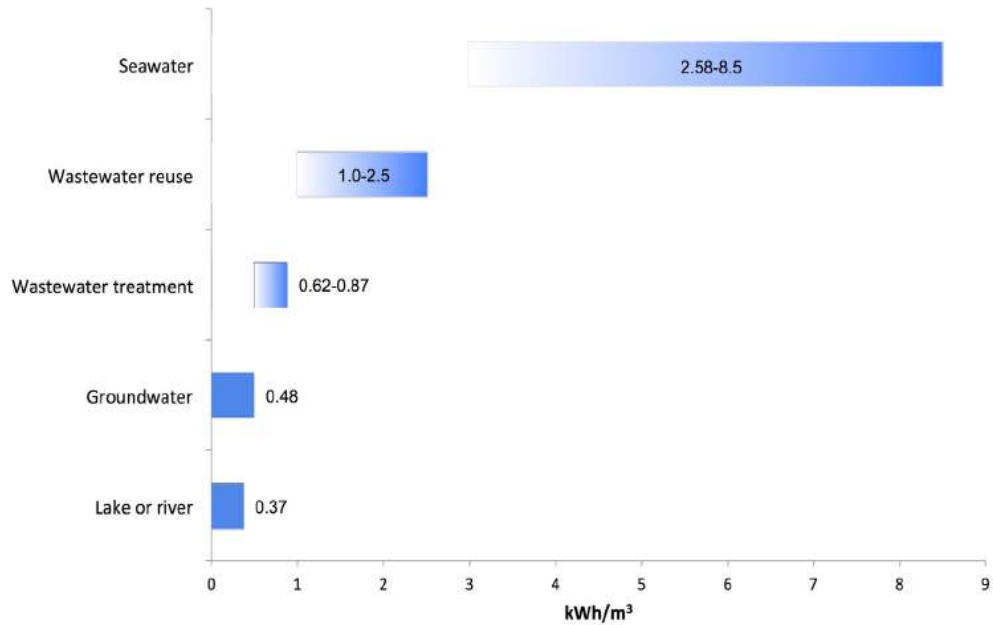


Figure 26 - Amount of energy required to provide 1 m³ water safe for human consumption from various water sources.

Note: the diagram does not incorporate critical elements such as the distance the water is transported or the level of efficiency, which vary greatly from site to site.

Source: UN (2014). United Nations World Water Assessment Programme, WWDR 2014, Water and energy.

The linear approach is not only unsustainable, but also makes cities vulnerable. When a city depends on a remote water resource, and there is a long period without rainfall in the upstream dam sites, its ability to function effectively is seriously compromised.

Global warming is going to make reduced or excessive rainfall more and more likely, with consequences not only on water availability but also on flooding, which cities will be more prone to because of their drainage systems.

Water must be seen instead as part of a circular economy, where it retains full value after each use and eventually returns to the system: a system in which water circulates in closed loops, allowing repeated use.

Most communities are struggling to handle low-quality sludge and streams of organic waste. At the same time, new sources for nutrients are being explored, as mineral fertilizer availability depends on finite resources, and, in most cases, they are environmentally harmful in the long term. If we aggregated local organic waste flows, we would help communities deal with their problem while also creating local markets for fertilizer components.

Since wastewater is the largest untapped waste category – as big as all solid-waste categories taken together – it is the natural starting point for the circular revolution¹¹².

¹¹² McKinsey (2015), Rethinking the water cycle, McKinsey & Company, retrieved from <http://www.mckinsey.com/business-functions/sustainabilityand-resource-productivity/our-insights/rethinking-the-water-cycle>

Like energy, water consumption in cities can be reduced if appropriate choices are made in the early stages of settlement design, through:

1. High density, mixed land use settlements, which significantly reduce water and energy consumption compared to low density land use settlements, as the latter require large amounts of water for irrigation of outdoor landscaping (and energy for transporting water and sewage over long distances);
2. The provision of infrastructure for decentralised urban water management, such as conservation of water sources, use of multiple water sources – including rainwater harvesting, storm water management and wastewater reuse – treatment of water according to end-use, rather than treatment of all water to a potable standard, and exploitation of the energy and nutrient potential of wastewater.

The new goals for the design and operation of wastewater treatment plants should:

- achieve public health and environmental goals,
- maximize energy and water recovery from wastewater,
- preserve or recover nutrients for reuse.

5.2.6. Water bodies

Water bodies¹¹³ have several potential advantages for cooling the urban environment due to their thermal and optical properties:

- The evaporation process of water requires a high amount of energy, which is extracted from the air, thus lowering its temperature;
- The high specific heat of water delays and buffers the maximum temperature;
- The low reflectivity of water at great incidence angle causes a low solar reflection to other surfaces in the surroundings, in this way preventing them from warming up.

Combining these effects, the temperature of a water body can be around 2-6 °C lower than the surrounding urban environment¹¹⁴. Thus, in urban areas, water bodies could have a positive effect upon the microclimate of the surroundings; in addition, if situated among parks and residential areas, they may play a crucial role in the urban ecosystem.

It has been found that¹¹⁵:

- The microclimatic effects of urban water bodies are affected by their geometry, shape, and depth, in a complex way.
- What counts is the total area of the water body, thus if it is divided into several small water bodies, the benefits and positive effects will still remain the same or are even improved.
- Water bodies strategically placed to take advantage of air movement patterns at a local scale and more trees planted around water bodies highly enhance the potential for cooling the environment.

The positioning of urban water bodies is important in relation to their effectiveness for cooling effect; to maximise the effect water bodies should be located in every building at the northern/southern corner¹¹⁶.

¹¹³ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 46.

¹¹⁴ Manteghi, G. et al. (2015), Water Bodies an Urban Microclimate: A Review, Modern Applied Science, vol. 9, No. 6.

¹¹⁵ Manteghi, G. et al. (2015), Water Bodies an Urban Microclimate: A Review, Modern Applied Science, vol. 9, No. 6.

¹¹⁶ Emmanuel, M. R. (2005), An Urban Approach to Climate-Sensitive Design, Spon Press.

The positive effect of urban water bodies on urban comfort is not universally recognised. Studies have shown that:

- An urban water body has a negative effect on the immediate surroundings as opposed to a vegetated area of similar magnitude¹¹⁷;
- Water bodies increase rather than decrease the maximum temperature. The high heat capacity of water suppresses the diurnal and annual cycle over water, and water temperatures remain relatively high after evening and seasonal transitions¹¹⁸;
- Evaporation from open water bodies may lower the temperature, but on the other hand also increases the humidity, which dampens the positive effect on thermal comfort. In addition, when the water is warmer than the air temperature (during autumn or night), the water body has an adverse effect on thermal comfort¹¹⁹.

Finally, the potential function of urban water bodies as breeding grounds for mosquitoes should be considered. Thus, the use of water bodies for improving outdoor comfort in tropical climate is rather controversial, and the contractor should analyse the pros and cons very carefully, in consultation with urban climatology experts.

Rain¹²⁰ is the primary source of water; rivers, lakes and ground water are all secondary sources. In present times, we depend entirely on such secondary sources: it is generally forgotten that rain is the ultimate source that feeds all these secondary sources and that rainwater can be harvested. Rainwater is a free source of nearly pure water; rainwater harvesting is the process of intercepting stormwater runoff from a surface (e.g. roof, parking area, land surface), and putting it to beneficial use¹²¹. The benefits are several¹²²:

- Capturing and using stormwater runoff reduces site discharge and erosion, and the potential transport of stormwater pollutants;
- Collecting and storing water within an accessible distance of its place of use greatly enhances the accessibility and convenience of water supplies;
- Raising the water levels in wells and bore holes that are drying up;
- Solving water problems in areas that have inadequate water resources;
- Reducing soil erosion as the surface runoff is reduced;
- Decreasing the blocking of storm water drains and flooding of roads;
- Saving the energy used for raising ground water.

Rainwater can be harvested from:

- Rooftops;
- Paved and unpaved areas, i.e. storm water drains, roads and pavements and other open areas;
- Storm water drains; if properly designed and maintained they offer a simple, cost effective means of rainwater harvesting.

¹¹⁷ Perera, N. G. R.; Liyanapathirana, A. (2014), Influence of urban water bodies on microclimate and thermal comfort: Case study of Beira Lake, Colombo, FARU Journal 2014, Vol. 06, Issue 01, retrieved from https://www.academia.edu/19851187/Influence_of_urban_water_bodies_on_microclimate_and_thermal_comfort_Case_study_of_Beira_Lake_Colombo

¹¹⁸ Steeneveld, G. J. et al. (2014), Refreshing the role of open water surfaces on mitigating the maximum urban heat island effect, Landscape and Urban Planning 121, pp. 92–96.

¹¹⁹ Theeuwes, N. E. et al. (2013), Modeling the influence of open water surfaces on the summertime temperature and thermal comfort in the city, Journal of Geophysical Research: Atmospheres, vol. 118, 8881–8896, doi:10.1002/jgrd.50704.

¹²⁰ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 78.

¹²¹ Phillips, A. A. (2005) (ed.), City of Tucson Water Harvesting Guidance Manual, City of Tucson, retrieved from <https://www.tucsonaz.gov/files/transportation/2006WaterHarvesting.pdf>

¹²² UN-Habitat (2005). Blue Drop Series on Rainwater Harvesting and Utilisation – Book 2, retrieved from http://unhabitat.org.np/?post_type=publications&p=1485

Typically, a rainwater harvesting system consists of three basic elements: the collection system, the conveyance system, and the storage system; it can be both individual and community/utility operated and managed. The large cumulative area of roofs¹²³ in the campus means that a very significant amount of rainwater can be harvested. Rainwater harvesting is an important water source at the building level, and in many cases, could provide anywhere from half to over 200% of the water needs of a building, or a city¹²⁴. The wide range depends on the local rainfall and on the total roof area available; this implies that there is a limit to the maximum building height, deriving from the balance between water demand and water collection¹²⁵.

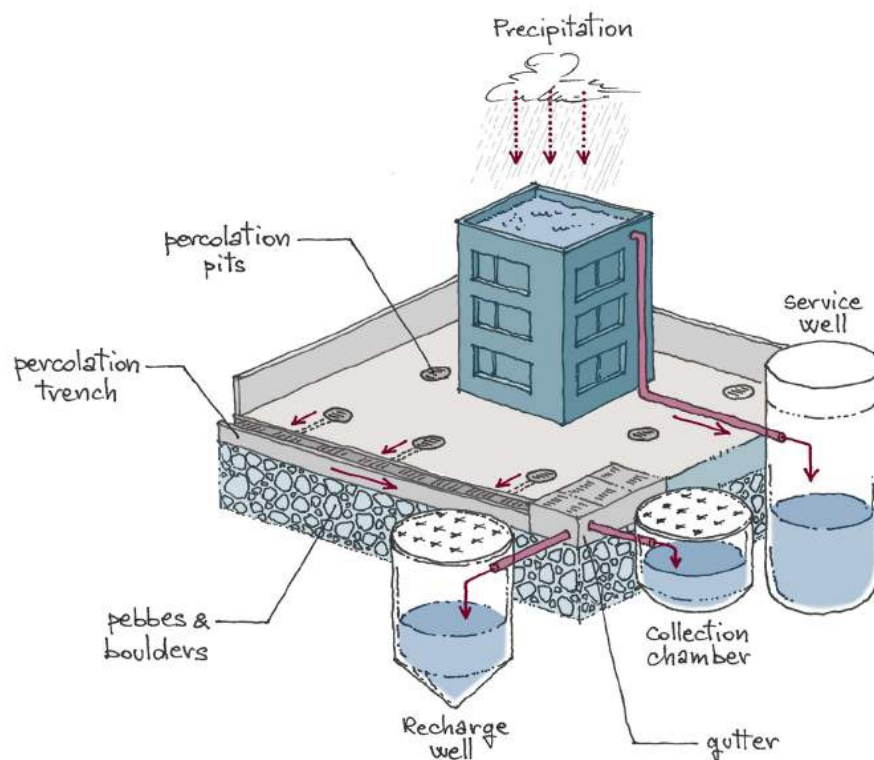


Figure 27 - Rooftop rainwater harvesting system.

Source: Butera, F. M. (2018), *Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook*, Sue Ball, UNON, Publishing Services Section, Nairobi.

¹²³ Butera, F. M. (2018), *Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook*, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 79.

¹²⁴ Elmer, V. and Fraker, H. (2011), *Water, Neighbourhoods and Urban Design: Micro-Utilities and the Fifth Infrastructure*, Working Paper 2011-4, Institute of Urban and Regional Development, University of California, Berkeley.

¹²⁵ High-rise residential buildings provide a small roof area/water demand ratio, so that the amount harvested is insufficient to meet the demand. The same happens with solar energy, whose annual availability per square metre depends on local climate: if all the electricity needs of the building have to be fulfilled by a PV system in the roof, there is a height limit.

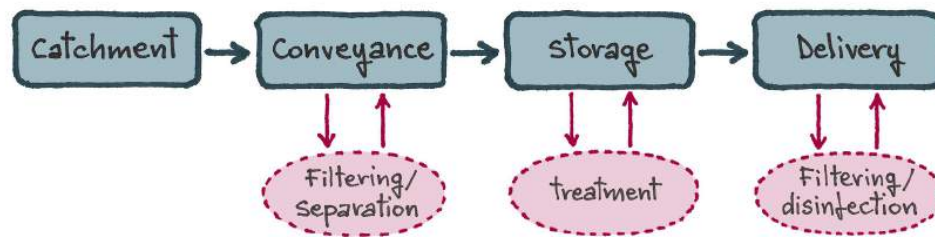


Figure 28 - Rainwater harvesting: process diagram for drinking water.

Source: Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi.

Collected and stored rainwater can supplement other water sources when they become scarce or are of low quality, like brackish groundwater or polluted surface water in the rainy season. It also provides a good alternative and replacement in times of drought or when the water table falls and wells go dry. It is generally believed that rainwater can provide clean, safe and reliable water that can be consumed without pre-treatment. This may be true in areas that are relatively unpolluted. Rainwater collected in many locations, however, contains impurities. Once rain comes into contact with a roof or collection surface, it can wash many types of bacteria and other contaminants into the cistern or storage tank. If rainwater is for potable use, it needs to be treated. There are many well established techniques and devices for making rainwater potable, both at individual building and campus scale. At campus scale a rooftop rainwater collection system with a single large common storage tank should be considered by the contractor, as it should be part of the campus infrastructure, as well as a filtering/disinfection system for making rainwater potable. The advantages could be in the lower cost of storage and maintenance and in the possibility of obtaining safer water quality, as skilled operators can manage the water treatment system. Of course, the space necessary and the location of the large volume storage tank has to be integrated into the campus design.

Three options can be followed:

1. Rainwater collected is stored for direct use; excess water, if any, is diverted from the storage tank and is lost;
2. Rainwater collected is stored for direct use; excess water, if any, is diverted to a recharge system to improve the quality of ground water and raise the water levels in wells and bore wells;
3. Rainwater collected is all used for underground water recharge.

Options 2) and 3) are especially important if the water system of the campus is decentralised, and relies heavily on groundwater rather than on a municipal potable water network. The aquifer, in this way, becomes large additional storage. The decision whether to store or recharge (or both) water depends on the local rainfall patterns and on the characteristics of the underground water system.

The possibility of supplying new developments only with potable water obtained by the appropriate treatment of collected and stored rainfall and of underground water should be always considered, and the cost, reliability and resilience of such a decentralised system should be carefully compared with that of a conventional connection to the main potable water network.

It should be also considered that the advantage of collecting and using rainwater during the rainy season is not only to save water from conventional sources, but also to save the energy expended on transportation and distribution of water at the doorstep.

In any case, even if the comparison leads to the designer choosing connection to the main urban water network, rainwater should be considered for non-potable uses, so reducing the flow of potable water that needs to be provided to the settlement, with the consequent economic benefits deriving from smaller piping, and the fact that, for non-potable uses, treatment requirements can be less stringent or not required at all.

Most of the methods above described¹²⁶ are applicable to a single building, a group of buildings or the entire campus, where – as a possible design choice – the runoff from individual houses is dealt with at the building-level itself, while remaining runoff from the storm water drain (which drains water from roads and open areas) is harvested at campus level.

The current, linear, urban water supply catchments are typically far from the urban area they serve, but with this approach the city itself can be seen as a catchment for its water requirements. Rooftops, paved areas and unpaved areas and the entire city itself is, therefore, to be managed as an area of water provision.

Runoff¹²⁷ is that component of rainwater which flows over a surface and out of the catchment area: it is generated when the intensity of the rainfall reaching the ground exceeds the infiltration rate of a soil, and after surface puddles, ditches and other depressions have been filled¹²⁸. Runoff in rural areas or in parks is a very limited part of the rainfall, as the infiltration rate is high; the opposite occurs in urbanised contexts, due to the large extent of impervious surfaces.

Usually, stormwater conveyance systems are designed to convey the rainwater that falls in the catchment areas to the nearest storm water drain or to the sewerage system. In order to reuse this water later on and to avoid overloading the sewerage system, collected rainwater should instead be directed to a recharge structure, to restore aquifer extraction potential.

Rainwater harvested from catchment surfaces along the ground¹²⁹, if stored in cisterns instead of being used for recharging the aquifer, should be directly used only for non-potable uses, because of the risk of bacteriological and chemical contamination. Cisterns holding water harvested from adjacent public sites could be incorporated into streetscape design, as could earth-formed stormwater basins and catchment techniques.

Intercepted stormwater can be collected, slowed down, and retained or routed through the site's landscape using micro basins, swales and other water harvesting structures. Capturing and using stormwater runoff also reduces site discharge and erosion.

There are many ways to intercept and control rainwater runoff, according to the City of Tucson Water Harvesting Guidance Manual¹³⁰:

¹²⁶ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 81.

¹²⁷ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 81.

¹²⁸ Hatibu, N. and Mahoo, H. F. (2000), Rainwater Harvesting for Natural Resources Management, Relma, retrieved from http://www.samsamwater.com/library/TH22_Rainwater_Harvesting.pdf

¹²⁹ They can be paved areas like streets, pavements, terraces or courtyards, or an unpaved area like a lawn or open ground.

¹³⁰ Phillips, A. A. (2005) (ed.), City of Tucson Water Harvesting Guidance Manual, City of Tucson, retrieved from <https://www.tucsonaz.gov/files/transportation/2006WaterHarvesting.pdf>

1. Create multiple small watersheds¹³¹ by dividing the site into small watersheds based on existing topography, or reshaping as necessary, to maximize stormwater harvesting; as more stormwater infiltrates into the soil, less stormwater has to be managed as surface runoff.
2. Prepare for overflow. Water harvesting structures need to allow excess stormwater to overflow safely to other locations where it will be used beneficially. Overflow devices (tank overflow pipes, spillways, etc.) should be sized to safely handle large rainfall events. Several types of watersheds can be used: micro basins, swales, French drains, in many variations.
3. Mulch to reduce evaporation. Mulching soil by adding a thick layer of organic or inorganic material reduces evaporation of water from, and retains moisture in, the soil to support plants. All water harvesting swales and basins should be mulched to substantially reduce water loss through evaporation, especially in hot arid and semi-arid climates.
4. Put harvested water to beneficial use. Harvested stormwater is much lower in salts and higher in nitrogen than groundwater, which benefits plants. Stormwater stored in well-mulched soil supports plants during and after the rainy season; stormwater stored in tanks is typically available beyond the rainy season.

Water bodies have the potential to cool the urban environment due to their thermal and optical properties, although they should be used with great care, as they can be counterproductive. Constructed wetlands can be included among the water bodies in addition to the stormwater catchment basins. To maximise their effect water bodies should be located in the campus at the northern/southern corner. Consider the mosquito breeding problem in still water bodies.

5.2.7. Energy supply

Up to now, energy supply to make the city work has never been considered an issue concerning urban planning. This is no longer the case since there is the need to rely mainly or exclusively on renewable energy sources. This paradigm shift, together with the crucial role of energy efficiency, makes the issue of energy supply an important part of the contractor's work.

The key issue is the decentralisation of energy production combined with the use of renewable energy sources. This approach, besides being a prerequisite for coping with the challenge of climate change, brings additional benefits, such as energy security, improvement of urban air quality (no pollution due to combustion), reduction or elimination of soil contamination due to leakages or spills in fossil fuel transport, reduction or elimination of water use for electricity production with thermal plants, creation of local employment and economic activities.

Choosing the most efficient energy conversion technologies¹³² that are needed for the urban system to work, means optimising energy streams from the exergetic point of view¹³³. Urban energy consumption is conventionally subdivided into three sectors: buildings (residential and commercial), transport, and industry. In cities in developed countries the building sector usually ranks first, while in cities in developing countries, it is generally the transport sector that ranks first.

¹³¹ The term watershed is commonly used to describe an area within which all stormwater drains towards a common collection point.

¹³² Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 68.

¹³³ Vandevyvere, H. and Stremke S. (2012), Urban Planning for a Renewable Energy Future: Methodological Challenges and Opportunities from a Design Perspective, Sustainability 2012, 4, pp. 1309-1328.

The main reason for this difference derives from the fact that cities in developed countries are – with a few exceptions – located in temperate-cold climates, and heating is the main cause of energy consumption. Space heating is a matter of survival, not just comfort, in cold environments. The issue of cooling in hot environments is less critical, as it is a matter of comfort, rarely of survival.

5.2.8. Cogeneration

Traditionally, heat is obtained by the combustion of fuel, either biomass or fossil, but this way of producing heat is not always the most efficient, in terms of exergy, as in the case, for example, of providing hot water or space heating. According to the Second Law of Thermodynamics, burning fuel in a boiler to obtain an ambient air temperature of 20 °C or water at 40°C for showering is the most inefficient way of attaining the desired result (because we use high grade, i.e. high exergy, heat when we need it at low grade, i.e. low exergy). On the other hand, the production of electricity with a thermal power plant necessarily implies the production of some low temperature heat. Since we need low-grade heat for heating, why not use the low temperature heat produced by the power plant, which is otherwise wasted? In this way the overall efficiency of the system is significantly improved¹³⁴. This technological approach is named cogeneration, or Combined Heat & Power (CHP).

Cogeneration is defined as the sequential generation of two forms of useful energy from a single primary energy source. Typically, the two forms of energy are mechanical (transformed generally into electricity) and thermal energy. With cogeneration, heat – as a by-product of electricity generation in a small-scale power plant – is captured and used for other purposes instead of being disposed of in the environment. In temperate-cold climates CHP waste heat is distributed to the residential and commercial buildings of an area (district heating). CHP is widely used in many cities in developed countries, where heating is needed for at least eight months of the year, and hot water all year round. This is not only thermodynamically sound, but also cost-effective.

In tropical climates space heating is not required, and if, at high altitudes, some heat may be welcome, the short heating period means that CHP is not economically viable for this function. But CHP can also play a role in cooling, by means of absorption chillers that use the waste heat for producing chilled water, which can be distributed to the residential and commercial buildings of an area (district cooling¹³⁵). A district CHP system can provide both electricity, cooling and Domestic Hot Water (DHW).

An appropriately sized land area must be provided to accommodate the CHP district cooling, taking into account the need for cooling towers, in addition to the CHP units and the absorption chillers.

¹³⁴ Moreover, water consumption – in a world in which water shortage is already an emergency – is greatly reduced. Approximately three quarters of the water consumption in Germany and about 50% in USA is used in the cooling systems of fossil and nuclear power stations for extracting the low-grade heat, wasting it in the atmosphere, in the rivers or in the sea causing the so called thermal pollution. Source: Butera, F. (2008), Towards the renewable built environment, in: P. Droege (ed.), Urban Energy Transition, Elsevier.

¹³⁵ In a district cooling system, chilled water is produced at a central plant and distributed through an underground network of pipes to the buildings or consumers connected to the system. The chilled water is used primarily for air-conditioning systems. After passing through these systems, the temperature of the water has increased and the water is returned to the central plant where the water is cooled and re-circulated through the closed loop system.

The use of waste heat for district cooling entails the use of an additional component besides the network for CHP district heating. This additional component is the absorption chiller, which is expensive and is characterised by a low conversion efficiency; the economics of this solution, thus, need to be very carefully analysed and compared to a district cooling system where chilled water is provided by electricity driven compression chillers¹³⁶.

Alternatively, waste heat can be used for purifying treated wastewater via vacuum distillation, for producing potable water. In this case also some dedicated space has to be provided for the distillation plant.

The Second Law of Thermodynamics also states that the most efficient way to produce (or subtract) heat for heating or cooling with high quality sources such as fuel or electricity is by means of an appropriate use of the heat pump. The heat pump is a device that “pumps” a heat flow from a lower to a higher temperature, in the same way as a water pump raises a water flow from a lower to a higher height.

When it is used for heating, it pumps heat from the outdoor to the indoor environment, heating it; when used for cooling (refrigerators, air conditioners), it pumps heat from the indoor to the outdoor environment; as heat is subtracted from the indoor environment, its temperature decreases or remains constant in spite of the heat flow coming from the outdoor environment. This is the way an air conditioning system works: it cools down indoor air and blows hot air into the outdoor environment, increasing the anthropogenic heat produced by motorised traffic and cooking.

There is a way to make this process more efficient: instead of blowing the heat produced outdoors and wasting it, it is possible to use it for hot water production, with some clever technology. In this way the energy consumed for DHW production is saved. This approach can be used at building and entire campus scale, the latter if district cooling has been implemented.

DHW can be produced by dedicated heat pump units that subtract heat from the environment and pump it at a higher temperature for water heating. Thermodynamically, this approach is far sounder than the usual one which is based on direct combustion of fuel or, even worse, on electric resistance. Heat pump DHW production systems are available at different scales, and their use at building or campus scale should be evaluated.

A combination of cogeneration and heat pump for cooling can be considered for district cooling, where chilled water is produced by both an electric (heat pump) and an absorption chiller. The electricity produced by the CHP plant is used for supplying the electric compression chiller, while the waste heat supplies the absorption chiller. The amount of electricity and heat produced is such that their sum is capable of producing the amount of chilled water necessary to satisfy the immediate cooling demand.

A careful economic analysis of the cost-effectiveness of such a technological option should be carried out, as it is very sensitive to the structure of the cooling demand, and a dedicated area for the plant must be provided.

¹³⁶ The advantage of such a district cooling system is that it is possible to use less energy and emit less CO₂ compared to traditional individual systems operated by electrically driven chillers. By aggregating the need for cooling, it is possible to employ more efficient cooling technologies. The disadvantage is the investment cost and the losses in the piping network.

District cooling, either provided with a CHP system or with compression chillers, or both, can be entirely fuelled by renewable energy: biomass as fuel for the CHP system and sun and/or wind for providing the electricity for the compression chillers, as shown in the next section.

Space cooling implies the production of heat that is released into the outdoor environment. If space cooling is obtained with building scale air conditioning systems, the heat produced is diffusely released in the campus, contributing to the anthropogenic heat flow that enters the energy balance, affecting the local climate. With district cooling, heat is produced and released only at the location of the chilled water production, i.e. where the chiller is located, while in the rest of the campus no production of heat due to air conditioning occurs (in fact, heat is subtracted from the outdoor environment).

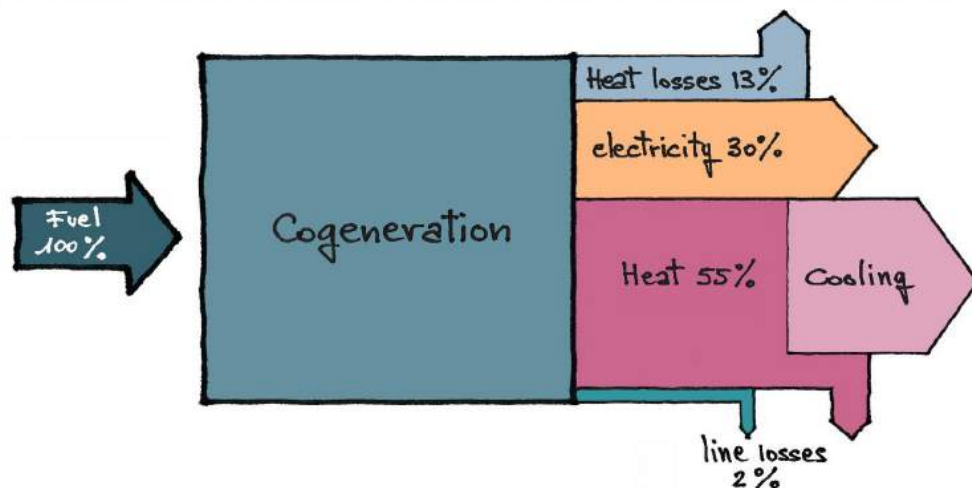


Figure 29 - Cogeneration heat used for chilled water production.

Source: Butera, F. M. (2018), *Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook*, Sue Ball, UNON, Publishing Services Section, Nairobi.

In conclusion¹³⁷, for the built environment, low temperature (and thus low exergy) heat sources are of particular importance, for heating, cooling and hot water production. The main aim in designing the energy system should be to avoid using high exergy sources for low exergy uses, and to choose the energy conversion technology accordingly. Therefore, three major constituents of exergy optimization emerge:

1. use of direct sourcing of low exergy heat sources (ambient heat, waste heat, etc.);
2. use of high exergy sources only for high exergy uses (electricity, mechanical work);
3. heat exchange and storage. It should be noted that electricity and heat (or cold) are characterized by different transportation and storage possibilities. In basic terms and considering the present situation, this may be summed up as electricity being easy to transport and difficult to store, while the opposite applies to heat and cold.

This illustrates the importance of spatial planning: all the energy related infrastructures must have their place, i.e. a space to accommodate them. Spatial arrangements and distances between energy generation, transfer and storage systems thus become an important issue: many of the most appropriate technologies may require dedicated spaces or infrastructures, especially if the most efficient ones – as often happens – are shown to be the ones centralised at campus or

¹³⁷ Butera, F. M. (2018), *Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook*, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 73.

building scale – such as district cooling or distributed generation units. The designer must be able to make provision for responding to such requirements.

5.2.9. Solar and wind energy

In a new building located in a developing country, the new approach of distributed generation of energy, maximising the use of renewable sources and supported by smart grid technologies, is going to be a viable alternative to the centralised approach characteristic of the energy supply system of existing cities, because it may well suit rapidly expanding cities. The fast decreasing cost of both photovoltaic panels and batteries is making the production of renewable-based decentralised energy cheaper than the fossil-fuel-based centralised production found in developing countries as it avoids the need for new transmission lines and the construction of power stations. In the coming decades the balance between energy demand and renewable energy supply at campus scale will be a prerequisite for sustainable (environmentally, economically and socially) urban development both in developing and developed countries.

The potential¹³⁸ for renewable energy sources at campus scale depends on the climate and on the campus design. The potential for solar and wind energy depends on climate, i.e. on the availability of solar radiation and wind, but also on the number of suitable surfaces that can be covered with solar panels and on the texture of the settlement, as this affects wind velocity. Biomass potential depends on the campus design, as it includes wood and leaves from the pruning of trees and bushes in the parks, green spots, tree-lined streets, etc. It also depends on the type of wastewater treatment system and on the existence and size of plots dedicated to urban agriculture.

The use of renewable energy technologies is very challenging for the contractor, as it imposes significant constraints on urban design. Photovoltaic systems, for example, affect the albedo and size of roofs, the latter if the aim is to have zero energy buildings. Photovoltaic systems could be used for supplying electricity to fleets of electric cars, and the ideal would be to park these cars in dedicated outdoor parking plots equipped with photovoltaic canopies; in this case the challenge is to optimise the size and the position of the parking lots in relation to the number of cars and of the photovoltaic area needed to charge them.

¹³⁸ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 73.

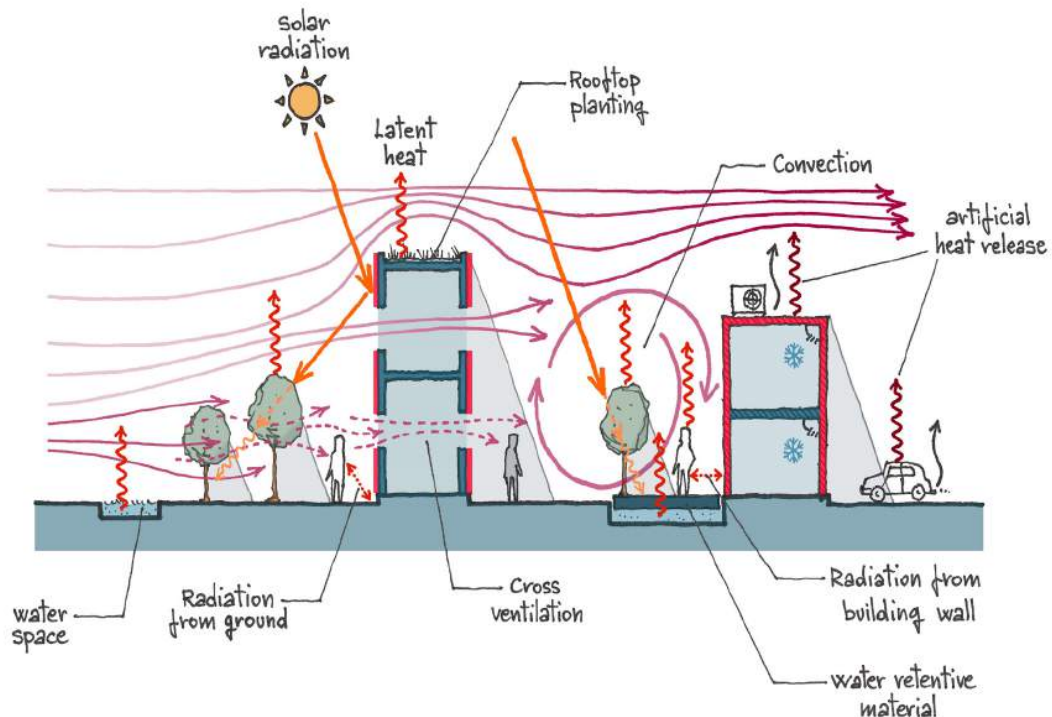


Figure 30 - The urban thermal environment needs a balanced understanding of air temperature, solar and surface radiation and wind.

Source: Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi.

Biogas production from liquid organic waste requires appropriate design of the sewerage and provision for the necessary space to accommodate the anaerobic digestion plant or, alternatively, individual digesters for each building. Syngas production requires space to be allocated not only for the gasifier, but also for wood storage and pre-processing.

Electricity production¹³⁹ from solar and wind energy is not programmable, as photovoltaic systems cannot produce at night and both photovoltaic and wind systems produce more or less electricity according to the meteorological conditions; thus, it is very unlikely that demand and power supply match. The easiest solution is to be connected to the main grid, which provides power when the renewable production is insufficient and absorbs power when production exceeds demand.

If a connection to the main grid is not available or the power supply is unreliable, there are two options, which are often used in combination. The first option is the storage of electricity by means of batteries, or other storage technology. The second is to have backup provided by a generator supplied with programmable energy sources, such as fossil fuels and biomass. A control system is necessary for the management of both the storage option and the generator, to regulate their output so that instantaneous power demand is met by the corresponding instantaneous power production.

¹³⁹ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 73.

Mini-grids, or micro-grids derive from this approach, and they are defined as local energy systems of distributed energy resources, distributed consumers and, optionally, storage¹⁴⁰.

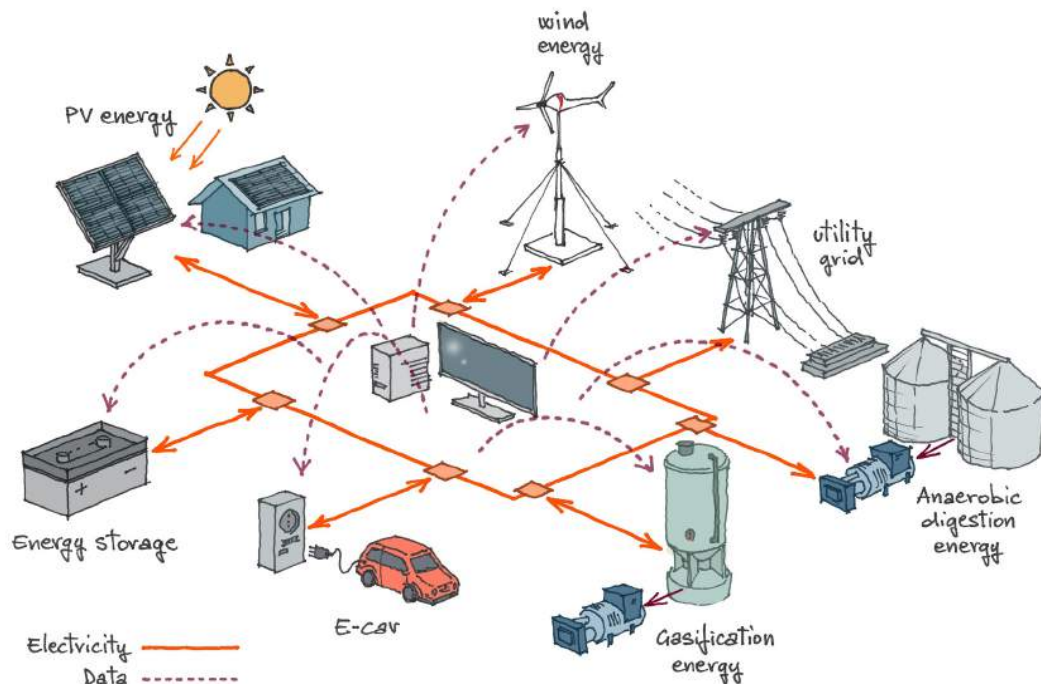


Figure 31 - Concept of a mini-grid.

Source: Butera, F. M. (2018), *Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook*, Sue Ball, UNON, Publishing Services Section, Nairobi.

Distributed generation located close to demand delivers electricity with minimal losses. This power may therefore have a higher value than power coming from large, central conventional generators through the traditional utility transmission and distribution infrastructure, especially when – as is common in Africa – transmission losses are very high: besides the economic loss CO₂ emissions not balanced by any benefit should be taken into consideration.

A microgrid maximizes the benefits of distributed generators and solves the above-mentioned disadvantage (energy transport losses will be less than 1% under normal circumstances¹⁴¹), distributed generation can also be utilised during utility power system outages. A microgrid designed for a sustainable campus includes programmable and non-programmable renewable generation, energy storage facilities and/or optional fossil fuelled generation and load control. This new system will be scalable, which means that growing loads may require the installation of additional generators without any negative effect on the stable and reliable operation of the existing microgrid. Typical distributed energy resources for microgrids are wind and solar-powered generators, and biomass powered systems.

A crucial component of mini-grids based on nonprogrammable generation is the storage system. A number of energy storage technologies have been developed or are under development for electric power applications, including:

¹⁴⁰ Siemens (2011), Microgrids, retrieved from www.siemens.com/download?DLA17_8

¹⁴¹ Siemens (2011), Microgrids, retrieved from www.siemens.com/download?DLA17_8

- Pumped hydropower
- Compressed air energy storage (CAES)
- Batteries
- Flywheels
- Superconducting magnetic energy storage (SMES)
- Supercapacitors

Each of these technologies is characterised by maturity level and by power range and discharge time.

Among the above-mentioned storage technologies, the most suitable for integration into a campus mini-grid are, presently, batteries, even though they are rather expensive. A combination of batteries and programmable electricity generators (fossil or biomass fuelled) is the most economical option. The cost of batteries is steadily decreasing and their use is expanding to the automotive sector.

The increased resilience of the local energy system derives from the variety of the renewable energy sources and technologies used, which increases the system's redundancy. For this reason, reliance on a single renewable energy source is not a wise option, and a campus's energy system should be based on as many sources and technologies as possible, and the provision of some excess installed power is recommended.

A possibility offered by mini-grids is that they could be owned by the campus community, which operates and manages the system and provides all services for the benefit of its members. Mini-grids, or microgrids, are popping up all over the world, from systems that can connect or disconnect from larger 'main' grid systems, to tiny, informally wired connections between very few users.

In new urban developments, especially in developing countries, where most part of the infrastructure for electricity production, transmission and distribution has yet to be built, the mini-grids (or smart grids, as mini-grids are often named because of a "smart" control system managing them) are an almost obligatory technical option. Indeed, it would be very odd to develop new settlements with the kind of obsolete centralised system that developed countries are correcting or abandoning as it is not consistent with an energy system based on renewable energy sources.

Renewable energy sources are distributed and usually available with a low power density. This means that in the urban context they need to be integrated into structures designed and constructed for fulfilling other requirements, otherwise they would occupy too much space. This has an impact on the design of these structures.

Consider that solar photovoltaic panels are already a reality in many places in Africa. The success of this technology is related to the fact that they do not need largescale infrastructure and can be used locally and off grid. This may result in a significant impact on campus design. At the latitudes of tropical countries, the optimum tilt angle of a photovoltaic panel is 0 degrees (horizontal), up to 15 degrees with no significant reduction in productivity. Hence, vertical arrangements of panels on balconies or facades are not applicable. Photovoltaic systems play a crucial role in zero energy buildings, and not only in energy terms, as relying on them places constraints on the maximum building height. The reason for this is that there is a relationship between the building's energy demand, the size of the photovoltaic system required to supply it, and the roof area available to install it (see Figure 3.21 for a first evaluation in East African Community climates).

Take into account the possibility of establishing a smart-grid system at the campus scale. Smart-grids or micro-grids are a great option if a reliable centralized energy network is lacking or unreliable. Urban planning can lead the transition to new ways of energy production and distribution. Combining the different renewable energy systems, it is possible to provide a complementary, integrated and stable energy system. Storage is the main challenge and is still under rapid development. Smart grid solutions require technical expertise and control systems, and give opportunities to provide new jobs.

Studies on wind behaviour¹⁴² in an urban context show that effective ventilation of urban streets may be promoted by applying the following general guidelines¹⁴³:

- Avoid uniformity in building height, canyon width and canyon length; uniformity reduces eddies, thus ventilation¹⁴⁴;
- Keep the length of street canyons as short as is practical, to promote flushing at street intersections by corner eddies.

It is important, in hot humid climates, to let more wind penetrate through the campus texture. Breezeways can be in the form of roads, open spaces and low-rise building corridors through which air reaches the inner parts of urbanised areas.

Proper orientation and layout of the buildings and adequate gaps between buildings are needed. A staggered arrangement of the blocks allows the blocks behind to receive the wind penetrating through the gaps between the blocks in the front row.

- With high ground coverage¹⁴⁵ it is important to consider measures such as building set back, so that the campus average ground coverage can be lowered. Greening at ground level in these areas further improves the urban climate for pedestrian activities. A ground coverage < 70% is recommended;
- When a campus is by a waterfront, properly orientated air paths connecting to the waterfront or open spaces are effective in bringing air ventilation into it;
- Open spaces in urban areas allow wind to flow into them and benefit pedestrians with air movement. In general, the dimensions of the open space should be no less than twice the average height of the surrounding buildings. This would create a height to width ratio < 0.5;
- Where possible, open spaces may be linked and aligned in such a way as to form breezeways or ventilation corridors. Structures along breezeways/ventilation corridors should be low-rise.

5.2.10. Taking into account the embodied energy of materials

In a sustainable campus that aims to rely as much as possible on renewable energy sources for its operation, the embodied energy of construction materials becomes the main source of GHG emissions attributable to the campus itself, and it should not be overlooked.

Use local materials with low embodied energy, such as stone, stabilised bricks, timber and bamboo. Minimize the use of materials that require very high temperature processing for

¹⁴² Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 35.

¹⁴³ Erell, E.; Pearlmutter, D. (2011), T Williamson – Urban Microclimate, Earthscan.

¹⁴⁴ On the other hand, uniformity is beneficial regarding the settlement’s albedo, which is higher than in the case of lack of uniformity.

¹⁴⁵ Ground coverage = total built area/total area.

production (steel, glass, cement, aluminium and fire-bricks). Consider the reuse of waste materials from other constructions.

Minimise the use of construction materials, considering the compactness of buildings through the surface to volume ratio (S/V) indicator and trying to minimise it, for two reasons: i) the larger the S/V the larger the area exposed to sun and the larger the area subject to heat transfer; ii) the larger the S/V the greater the amount of material that has to be used for walls, with the same volume, i.e. with the same number of people accommodated, and the more material used, the greater the embodied energy and GHG emissions.

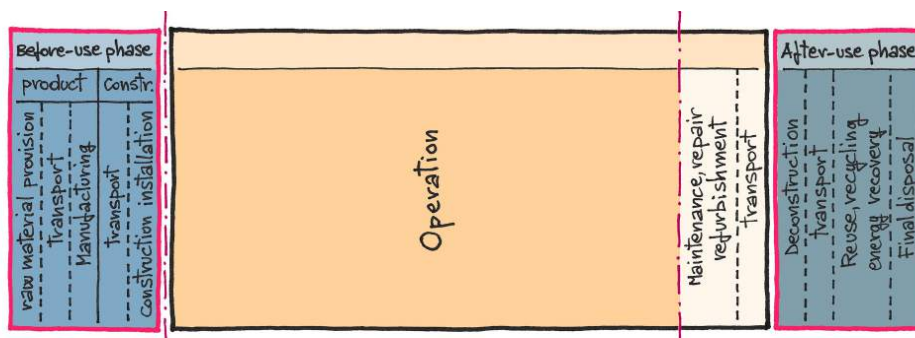


Figure 32 - GHG Emissions of buildings across their life-cycle.

Adapted from: UNEP, Common Carbon Metric - for measuring Energy Use & reporting Greenhouse Gas Emissions from building operations).

Source: Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi.

Minimise and recycle construction waste. Plan the recycling or salvaging of at least 50% of construction waste.

Traditional roofing materials¹⁴⁶ have low solar reflectance (or albedo) of 5 to 15%, i.e. they absorb 85 to 95% of the energy reaching them, and become hot. Even white coloured roofs cannot have a solar reflectance exceeding 50%, as they reflect only the visible part of the solar spectrum, which accounts for less than 50% of the energy incident on it, and the rest (UV and IR) is almost entirely absorbed.

But it is not only because of low albedo that traditional roofing heats up, there is another property of the material’s surface that determines the temperature reached: its thermal emittance, i.e. the capability of radiating more or less energy at a given temperature, that is, how readily a surface gives up heat. Hence, when exposed to sunlight, a surface with high emittance will reach thermal equilibrium at a lower temperature than a surface with low emittance, because the high-emittance surface gives off its heat more readily.

The combination of solar reflectance and thermal emittance have significant effects on surface temperature.

¹⁴⁶ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 46.

“Cool roofing” refers to the use of highly reflective and emissive materials. They are capable of reflecting not only in the visible spectrum, but also in the near infrared, and their emissivity is high at all the wavelengths of the solar spectrum.

A large proportion of the ground surface of a city is covered with pavements¹⁴⁷, which are usually made of asphalt or concrete; because of the low albedo of such materials (0.5-0.35, respectively), on clear days, during the hours in which the sun is high in the sky, their surface can reach peak temperatures of up to 60-70 °C, as they absorb 95 to 65% of the solar radiation reaching them.

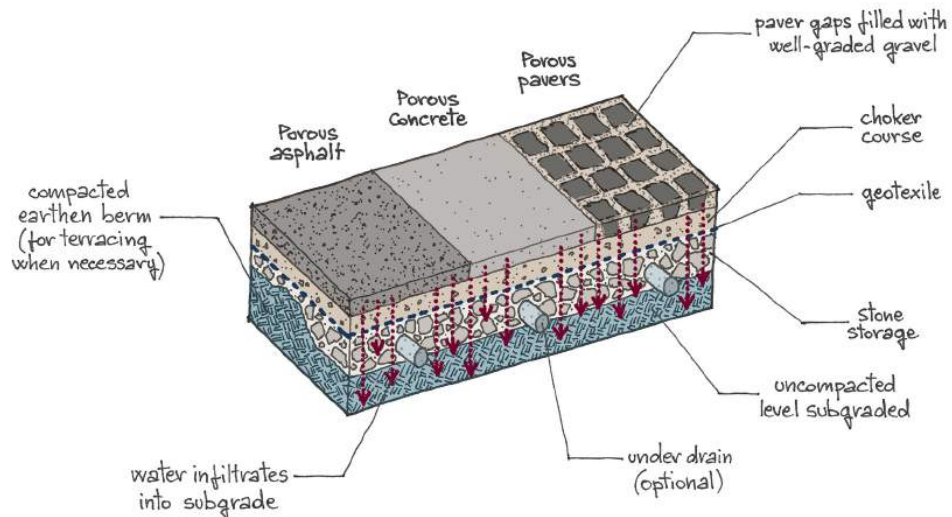


Figure 33 - Types of porous pavements.

Source: Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi.

¹⁴⁷ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 45.

In many cities pavements may represent the largest percentage of a community's land cover, compared with roof and vegetated surfaces (in US cities paved areas account for nearly 30 to 45% of land cover¹⁴⁸), thus the first, most effective way to reduce their heating effect is to reduce the need to pave. There are various options to reduce the amount of paved surface areas, such as reducing parking space requirements, connecting parking and mass transit services and allowing for narrower streets. The second approach is the most obvious: try to increase the pavements albedo. The albedo of asphalt pavements can be raised by mixing the binder with light coloured aggregates; concrete albedo can be raised up to 70% by using white instead of grey cement. It must be remembered, however, that albedo values change with time: asphalt albedo increases while concrete albedo decreases. The third approach to mitigating the heat island effect deriving from paved surfaces originates from reproducing in the urban context the mechanism taking place in rural conditions, with the use of permeable, or porous, paving. Although originally designed for storm water control, permeable pavements are an effective choice for control of urban energy balance. Permeable pavement technologies include porous asphalt applications, pervious concrete applications, permeable pavers, and grid pavements and are designed to allow air, water, and water vapour into the voids of their surface. When wet, the water passes through the voids into the soil or supporting materials below. Moisture evaporates slowly as the surface heats, thus drawing heat out of the pavement, and keeping it cooler by evaporative cooling. Some permeable pavement systems contain grass or low-lying vegetation.

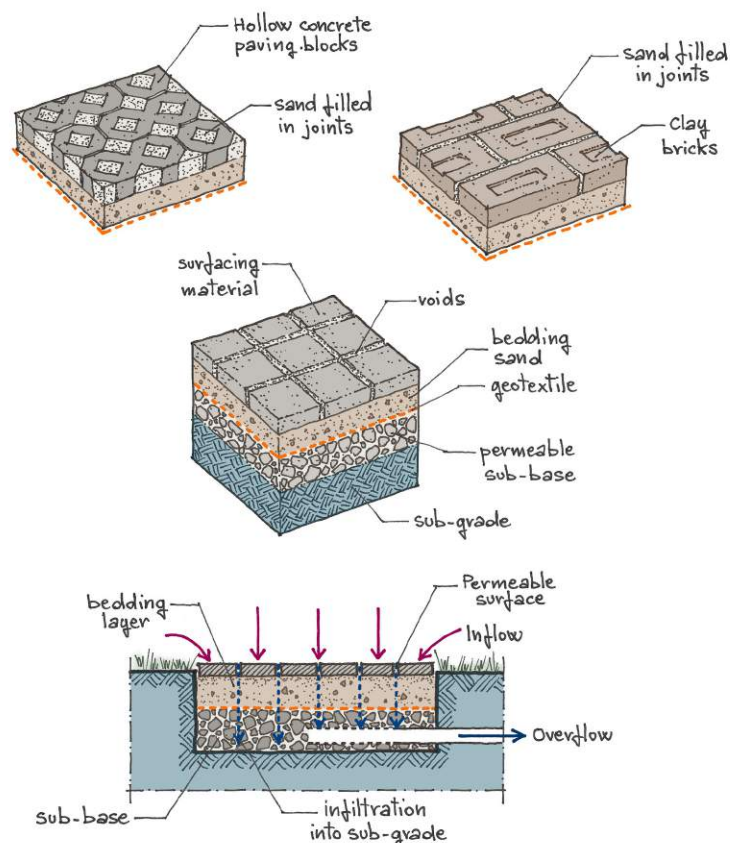


Figure 34 - Porous paving systems.

Source: Butera, F. M. (2018), *Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook*, Sue Ball, UNON, Publishing Services Section, Nairobi.

¹⁴⁸ EPA (2008), Reducing Urban Heat Islands: Compendium of Strategies – Urban Heat Island basics, retrieved from <http://www2.epa.gov/heat-islands/heat-island-compendium>

5.2.11. Designing decentralised water and wastewater cycles

In the same way as for energy, water consumption in cities can be reduced if appropriate choices are made during the early stages of settlement design. Through the provision of infrastructures for decentralised urban water management, decentralised water resource management and water services can work more effectively and sustainably than a system of centralised management.

Sustainable water management embraces: conservation of water sources; use of multiple water sources including rainwater harvesting, storm water management and wastewater reuse; and treatment of water as needed, exploiting the energy and nutrient potential of wastewater, rather than treating all water to a potable standard.

Minimize dependence on the municipal network for the water needs of the campus. Collect rainwater from rooftops and store it for non-potable uses such as flushing toilets, onsite irrigation or for local farming; use bio-swales and surface systems instead of storm drains whenever possible.

Consider the opportunity for self-sufficiency of the community offered by rainwater harvesting and local, campus scale treatment to make it potable, besides using it raw for use in toilets, washing machines, irrigation, and car and street washing.

Evaluate the threat to health that may come from the possible contamination of the water table caused by incompletely treated wastewater. Involve experts in hydro-geology and water-borne diseases. Treated wastewater enhances the effectiveness of green areas for the mitigation of the local climate, and paves the way for the development of urban agriculture, as it provides water and nutrients; this potential, however, must be exploited carefully, as it may have negative effects on health because of the potential for uncontrolled bacterial contamination and mosquito breeding. Balance the extent of green areas (both for leisure and agriculture) with the availability of water and nutrients, on the basis of the degree of self-sufficiency in water of the campus, and size plots accordingly. Evaluate the level of treatment needed to make wastewater safe for use as a fertiliser or for fertigation. Involve an agronomist and a botanist from the beginning of the design process.

The location and design of a public open space which incorporates urban water management measures should promote the detention of runoff through the use of swales, depressions, contour banks, rock channels, pebble paths, reed beds or other suitable measures without compromising the principal function of the public open space.

Streets should all include runoff mitigation systems such as swales or other pervious surfaces capable of absorbing and storing storm water. therefore, guarantee enough extra space for accommodating sustainable urban drainage systems.

Try to have the largest pervious areas possible, as they reduce runoff, and thus the danger of flooding; furthermore, replenishing the water tables via percolation makes a water shortage caused by an interruption of the centralised water supply less critical.

Calculate the percentage of permeable soils. At least 50% permeability should be assured in residential areas. For instance, open parking lots should be permeable where possible, and the width of roads should be limited to the minimum standards for cars to circulate.

Try to achieve such stormwater control as to be able to cope with at least 95% of precipitation events without their resulting in flooding.

Evaluate the potential of the water table to provide a proportion of the water demand for the campus, aiming for the community to be self-sufficient in water, by combining sustainable underground water extraction with rainwater harvesting. Involve a hydro-geologist from the earliest phases of the design process. Evaluate the consequent energy demand for pumping.

Treat all waste on site with biological systems. Reclaim as much water as possible for non-potable uses and harvest biomass for use as fertilizer on local farms. Collect sewage sludge, kitchen waste and yard waste and convert it into gas to be used in combination with energy from other onsite renewable resources.

If proposing a bio-digestion or a composting plant, plan its size, location and distance to the urban context carefully.

Wastewater is a resource in terms of energy, soil nutrients, irrigation and water table replenishment via percolation; this resource is best exploited at local level. Consider decentralised wastewater treatment as a sustainable option that increases community resilience and creates opportunities for employment. Consider the consequent space needed and the location.

Wastewater¹⁴⁹ is usually subdivided into black water, grey water and storm water. Black water is the wastewater from the toilet and the kitchen sink; grey-water consists of the wastewater from washing/bathing and the washing of clothes.

Grey water is of far higher quality than black water because of its low level of contamination and higher potential for reuse. When grey water is reused, either on-site or nearby, it has the potential to reduce the demand for new water supply, reduce the energy and carbon footprint of water services, and meet a wide range of social and economic needs. In particular, the reuse of grey water can help reduce demand for more costly high-quality potable water.

Wastewater treatment plants are based on a biological process. The treatment can be carried out either in the presence of oxygen (aerobic system) or in its absence (anaerobic system). At the end of the process we have a flow of clean water and a flow of sludge plus, in the case of the anaerobic system, a flow of biogas.

In a conventional large-scale aerobic system, wastewater is pre-treated (screening and settling), passes to the activated sludge chamber, is then post-settled in a secondary clarifier, and finally disinfected if required; treated wastewater is either conveyed to a water body, or used for agriculture, industrial or domestic (non-potable) reuse; the sludge can be treated in different ways, according to its final use. The process is highly mechanised and thus mainly adapted for centralised systems where energy, mechanical spare parts and skilled labour are available. In some plants the sludge, before further treatment, is sent to an anaerobic digester where biogas is produced.

The benefits of anaerobic digestion of sewage sludge are widely recognised and the technology is well established in many countries. Today, a high proportion of biogas produced in biogas plants is from those on municipal wastewater treatment sites.

¹⁴⁹ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 88.

DEWATS¹⁵⁰ (Decentralised Wastewater Treatment System) is a modular system approach to ensure efficient performance in wastewater treatment. It is a different, decentralised approach, suitable at campus scale, that allows the on-site closure of the water cycle. In addition, it is an approach that does not necessarily have highly skilled manpower and maintenance requirements (but has high quality standards in planning and construction) and its energy demand is far less than conventional treatment systems. It provides treatment for wastewater flows from 1 m³ to 1000 m³ per day and unit¹⁵¹.

DEWATS is not just a technical hardware package, but an approach, as besides technical and engineering aspects it also takes into consideration the specific local economic and social situation, and it can be seen as complementary to other centralised and decentralised wastewater treatment options.

Typical DEWATS applications suitable for wastewater treatment at campus scale are based on three basic technical treatment modules, which are combined according to demand:

- primary treatment in septic tanks, Imhoff tanks, or biodigesters;
- secondary anaerobic treatment in baffled reactors (baffled septic tanks) and fixed-bed filters;
- tertiary aerobic treatment in sub-surface flow filters constructed wetlands (horizontal gravel filters).

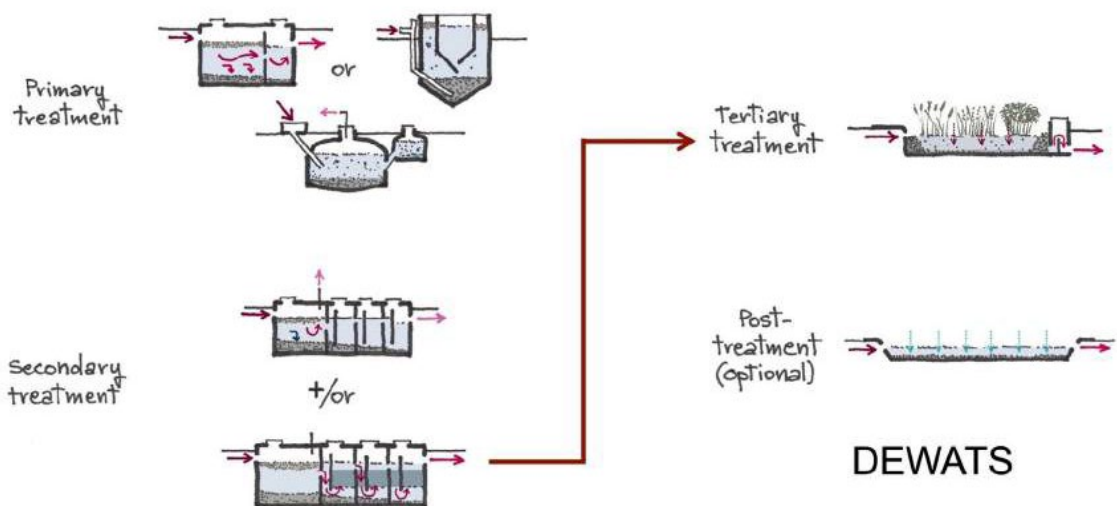


Figure 35 - Decentralised wastewater treatment system: DEWATS.

Source: Butera, F. M. (2018), *Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook*, Sue Ball, UNON, Publishing Services Section, Nairobi.

A post-treatment in aerobic polishing ponds may be considered according to the final conditions of effluents and their intended use.

Depending on the total volume and the nature of the wastewater and its temperature, the values may indicate permanent area requirements for setting up a treatment plant¹⁵²:

¹⁵⁰ Butera, F. M. (2018), *Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook*, Sue Ball, UNON, Publishing Services Section, Nairobi, pp.89.

¹⁵¹ WEDC (2010), *Decentralised Wastewater Treatment Systems and sanitation in developing countries (DEWATS): a practical guide*, Water, Engineering and Development Centre (WEDC), Loughborough University, Leicestershire, UK.

¹⁵² WEDC (2010), *Decentralised Wastewater Treatment Systems and sanitation in developing countries (DEWATS): a practical guide*, Water, Engineering and Development Centre (WEDC), Loughborough University, Leicestershire, UK.

- For decentralised wastewater treatment in a new campus two basic options can be considered:
1. primary, secondary and tertiary filtration and disinfection treatments take place in decentralised plants, to which untreated wastewater is conveyed, via a sewer line. The advantage of such a system is the relatively low cost (only the sewerage system). The disadvantage is that piping must be large enough to prevent clogging, to which the system is prone anyway;
 2. primary treatment takes place in on-site, septic tanks, fully mixed digesters or Imhoff tanks, servicing an individual building or group of buildings; wastewater is then discharged into a sewer leading to a common plant for the secondary and tertiary filtration and disinfection treatment. The advantage of such a system is that diameter of piping can be smaller without clogging problems, as the wastewater does not carry solids, being already settled in the tank. The disadvantage is the higher cost.

The selection of appropriate technical configuration of a DEWATS depends on the:

- volume of wastewater;
- quality of wastewater;
- local temperature;
- underground conditions;
- land availability;
- costs;
- legal effluent requirements;
- cultural acceptance and social conditions;
- final handling of the effluent (discharge or reuse).

The contractor should make allowance for the land area requirements and the position of components in the campus, working closely with wastewater treatment experts, who can also advise on different, conventional or technologically advanced systems for decentralised wastewater treatment. They are available, but are more expensive than DEWATS, require more skilled manpower for running them, and consume energy. Among these, some advanced and sustainable systems have been developed, such as the Advanced Ecologically Engineered System (AEES), also known as the Living Machine.

Centralized wastewater¹⁵³ processing plants in developing countries are often vulnerable because of inadequate upgrading and maintenance as well as frequent power cuts, resulting in the release of pathogenic wastewater. A sustainable and resilient campus should be able to rely only on rainwater for providing, at different quality levels, all the water necessary to fulfil the community's needs. In many cases this ideal aim – for technical and/or economic reasons – cannot be reached. However, the contractor should at least do his best to minimise the reliance of the campus on the centralised water supply.

Energy, water and waste flows are interconnected. In the conventional, centralised, linear, urban metabolism the connections are one-way: the higher the standard for providing water, the higher the water input, and the higher the energy consumption for water purification and for pumping; the higher the standard of sanitation, the higher the energy consumption for wastewater treatment; the better the solid waste collection and disposal system, the higher the energy consumption for transport.

In the circular metabolism, however, energy is linked to water and waste in many other ways:

- the use of rainwater and treated wastewater for replenishing water tables stops them from getting lower and less pumping power is required;

¹⁵³ Butera, F. M. (2018), Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner's Guidebook, Sue Ball, UNON, Publishing Services Section, Nairobi, pp. 97.

- the use of treated wastewater for vegetated areas means that they can flourish because of fertigation, which is also beneficial for both outdoor and indoor comfort, reducing the need for air conditioning;
- the availability of natural fertilisers and water means that urban agriculture can be promoted and the use of locally produced food also reduces the energy consumed for supplying it from distant locations;
- organic waste and wastewater can produce biogas, which, among other uses, can be used in a cogeneration system whose waste heat can make potable water from treated wastewater via vacuum distillation;
- organic waste from urban agriculture and green maintenance residuals can provide energy, via digesters and/or gasifiers;
- the reduction of the need for private transport deriving from mixed use reduces energy consumption and - because of the reduced traffic - the necessary street width, with a consequent reduction in the impervious areas, in favour of pervious surfaces which allow stormwater to percolate and replenish the water tables.

Thus, in a sustainable campus, conventional linear processes are substituted by circular ones, reducing the entropy production in each flow; moreover, an appropriate interconnection between flows can lead to a further reduction of the entropy production in the metabolic process of the campus, making it more sustainable and reducing both direct and indirect emissions.

The combination of demand management and an efficient supply of energy and water, based on decentralised systems and a closed cycle approach is the only way to drive cities towards their aim of sustainable development. A sustainable campus needs to begin to approach zero emissions if it is to cope with future challenges.

The interactions between structure (layout, form, land use, materials, greenery), energy, water and waste can be used for minimising the flow of resources (or negentropy) needed for the operation of a campus and – at the same time – can make the campus more resilient, thus more capable of coping with the challenges of climate change.

The increased resilience of the campus derives mainly from the diversity of both the energy supply (sun, biomass and wind, if available, fossil) and of the water supply (rainwater, wastewater, well water plus water from the city's distribution system). Further resilience is created by the reduced flood danger, which is the result of a more controlled runoff, because of the large percolating areas, such as the green spaces.

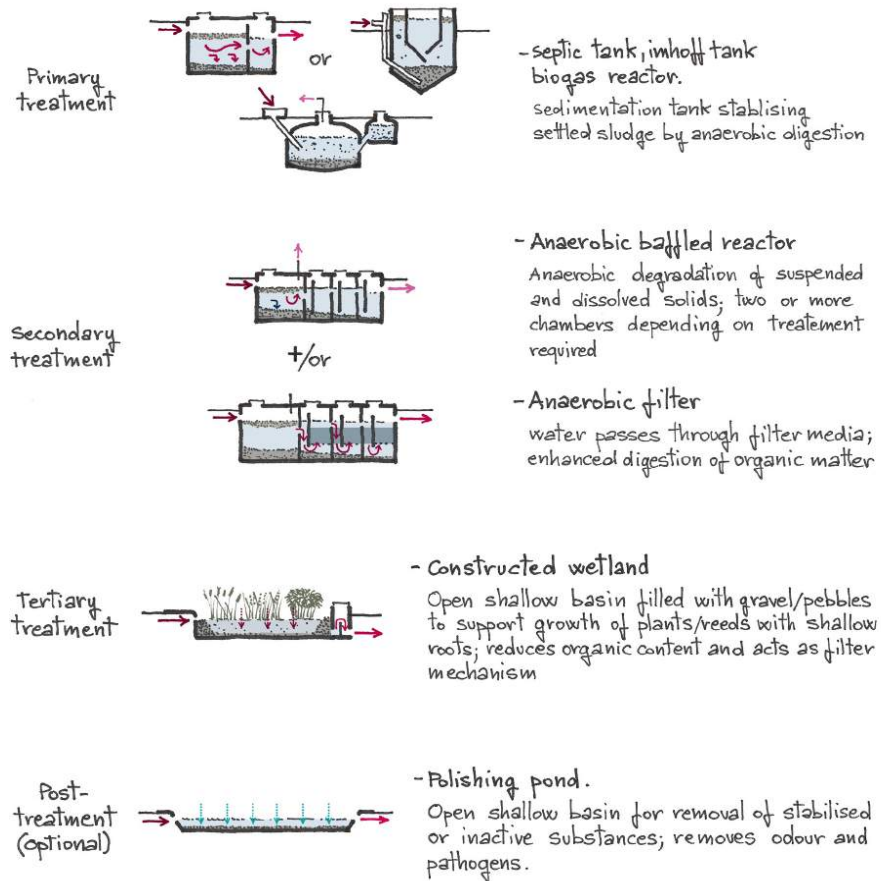


Figure 36 - DEWATS configuration scheme suitable for small-scale decentralised wastewater treatment.
 Adapted from: WEDC (2010). *Decentralised Wastewater Treatment Systems and sanitation in developing countries (DEWATS): a practical guide*, Water, Engineering and Development Centre (WEDC), Loughborough University, Leicestershire, UK.
 Source: Butera, F. M. (2018), *Energy and resource efficient urban neighbourhood design principles for tropical countries – A Practitioner’s Guidebook*, Sue Ball, UNON, Publishing Services Section, Nairobi.

5.3. Conclusion

The African context offers the chance to explore a new educational paradigm, in complete different environmental, cultural and social conditions with respect to what we face every day in Europe. This can be an opportunity, but also a challenge. Incessant complexities arise every day in the management of SNU 4 project in Mogadishu. On one hand, it depends from the economic aspects that are extremely fragile and must be carefully managed and on the other hand from the social aspects since Somali people are still extremely affected by the past twenty years of struggle. At the same time the idea of rebirth gives the impetus to improve the quality of life and consequently the field of education among the young generation.

The technical ideas addressed in this chapter want to compare the pragmatism of the Specifications with considerations of a theoretical and methodological nature. The buildings will very unlikely be zero energy buildings, but some ideas regarding sustainability issues could improve the contractor's proposals compared to a building built in the same context thirty or forty years ago. For example, the water cycle can be an important part of the executive project to consider. Optimizing the management of water sources cannot be totally excluded, despite the criticalities due to the technologies to be used that could arise. The approach to be given to the entire project goes towards a sustainable design and construction of buildings, as far as possible in an African context so different for all the reasons explained in the previous chapters from the European one. Complications, however, must not preclude sustainability from the whole process.

The complexity of interventions of this type lies in the ability to integrate processes that are entrusted to individual parts (for example the masterplan made by the group headed by Professor Montedoro, the specifications that will be developed by another group of the Politecnico di Milano, the principles technicians who will be contributions from specialists, ...) and make the whole project unitary. An excellent and integrated management of the process from start to finish becomes crucial just as it is important to have specialists dealing with the green areas, plants, and all other peculiar aspects of the project.

Project management is the application of methods, tools, techniques and competencies to a project. It includes the integration of the various phases of the project life cycle. Basically, project management allows to manage people, capital and time through an organised approach along all project phases. During the whole work at the development of the new campus, the integrated management of the of the various specialist contributions can give excellent results in the end, even if it is never simple to obtain in a project of this size.

The management of the whole process may become a critical issue when it is difficult to connect all the different parts. This is the reason why a fundamental task of the work was dealing with technical and specialist aspects of the project and settling guidelines and rules to set up and control the construction according to the objectives and requirements defined during the preliminary phase. From this point of view, the list of Specifications is a great tool to handle risk mitigation and allocation of resources throughout the course of the project. All projects are risky ventures, since they are unique and temporary undertakings based on assumptions about the future, affected by uncertainty and subject to the influence of multiple stakeholders. The management of the project allows the control of risks connected with it, since a general view may help to prevent and to cope with accidents. A risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on at least one project objective. Risk analysis, whose goal is to increase the probability and impact of positive events and decrease the probability and impact of events adverse to the project objectives, thus becomes of primary importance for the whole management process.

In the next few months, further developments of the project could be:

- A feasibility study on sustainable campus plants, according to the African resources and renewables;
- An integrated building management system for the campus during construction and after completion in order to ensure good maintenance and care;
- Regarding the Specifications, a more detailed description of available capital and funds for the project and the adjustment of economic resources to buildings' technical requirements, thus the relation between the technological choices and available funds.

In the long period, some interesting aspects to analyse deeply could be:

- The delicate role of the project manager during the construction process, because of the multiple stakeholders with different interests involved in the SNU 4 project;
- The evaluation and documentation of phases carried out and formally closed to better understand objectives achieved and stakeholders' expectations met. This part could also be important to evaluate the whole experience and to improve future projects in a similar context.

6. List of attachments

Checklist_20200403

CV_Facoltà_UNIS

Data collection - Gahayr

Dimensionamento spazi_29072020

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7.2. Legislation

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Anagrafica / General data												
		Ambito	Area of interest	Tempo	Period	Domanda	Question	Numero	Number	Note	Notes	
Numero di utenti/utizzatori del campus	Didattica / Educational activity + Ricerca / Researching activity	Studenti	Students	Presente	Present	Studenti iscritti al primo anno	First-year students					
						Studenti iscritti al secondo anno	Second-year students					
						Studenti iscritti al terzo anno	Third-year students					
						Studenti iscritti al quarto anno	Fourth-year students					
						Studenti iscritti al quinto anno	Fifth-year students					
						Studenti di dottorato	PhD students					
				Futuro	Future	Studenti iscritti al primo anno previsti	Expected first-year students					
						Studenti iscritti al secondo anno previsti	Expected second-year students					
						Studenti iscritti al terzo anno previsti	Expected third-year students					
						Studenti iscritti al quarto anno previsti	Expected fourth-year students					
						Studenti iscritti al quinto anno previsti	Expected fifth-year students					
						Studenti di dottorato previsti	Expected PhD students					
		Personale strutturato di ateneo	Structured university personnel	Presente	Present	Docenti	Teachers					
						Ricercatori a tempo indeterminato	Full time researchers					
						Assistenti di laboratorio a tempo determinato	Fixed-terms lab assistants					
				Futuro	Future	Docenti previsti	Expected teachers					
						Ricercatori a tempo indeterminato previsti	Expected full time researchers					
						Assistenti di laboratorio a tempo determinato previsti	Expected fixed-terms lab assistants					
	Personale non strutturato di ateneo	Unstructured university personnel	Presente	Present	Ricercatori post-dottorato	Post-doctoral fellows						
					Ricercatori a tempo determinato	Fixed-term researchers						
					Assistenti alla didattica temporanei	Temporary teaching assistants						
			Futuro	Future	Ricercatori post-dottorato previsti	Expected post-doctoral fellows						
					Ricercatori a tempo determinato previsti	Expected fixed-term researchers						
					Assistenti alla didattica temporanei previsti	Expected temporary teaching assistants						
	Servizi generali / General services	Personale amministrativo	Administrative personnel	Presente	Present	Segretari	Secretaries					
				Futuro	Future	Segretari previsti	Expected secretaries					
		Personale operativo di supporto	Support personnel	Presente	Present	Manutentori	Maintainers					
						Portinai	Door-keepers					
						Addetti alle pulizie	Cleaners					
						Addetti alla sicurezza	Security officers					
				Futuro	Future	Manutentori previsti	Expected maintainers					
						Portinai previsti	Expected door-keepers					
						Addetti alle pulizie previsti	Expected cleaners					
						Addetti alla sicurezza previsti	Expected security officers					
		Rettore, vice-rettore e personale di supporto	Rector, vice-rector and support personnel	Presente	Present	Rettore	Rector					
						Prorettore	Vice-rector					
Personale di supporto						Support personnel						
Futuro				Future	Prorettore/i previsto/i	Expected vice-rector						
					Personale di supporto previsto	Expected support personnel						
					Personale per ufficio previsto	Expected personnel per department						
Biblioteche, spazi espositivi, servizi di ristorazione, spazi per lo sport, spazi per attività commerciali		Libraries, exhibition centre, canteen, sports centre, spaces for commercial activities	Presente	Present	Bibliotecari	Librarians						
					Operatori servizio mensa	Canteen service operators						
	Istruttori centro sportivo				Sports centre instructors							
	Commessi				Shop assistants							
	Futuro		Future	Bibliotecari previsti	Expected librarians							
				Operatori servizio mensa previsti	Expected canteen service operators							
				Istruttori centro sportivo previsti	Expected sports centre instructors							
				Commessi previsti	Expected shop assistants							

Incubatori d'impresa e start-up / Incubator for start-ups and new companies	Uffici, laboratori	Offices, laboratories	Presente	<i>Present</i>	Start-up	<i>Start-ups</i>				
					Lavoratori per start-up	<i>Workers per start-up</i>				
					Start-up previste	<i>Expected start-ups</i>				
			Futuro	<i>Future</i>	Lavoratori per start-up previsti	<i>Expected workers per start-up</i>				

Didattica / Educational activity												
Ambito	Area of interest	Tempo	Period	Domanda	Question	Chiarimento	Explanation	Risposta	Answer	Note	Notes	
1	Presidenza delle facoltà	Faculties' presidency	Presente	Present	Dov'è ospitata al momento?	Where is it located now?						
					Che cosa comprende?	Which kind of spaces are there now?	Descrizione degli spazi principali che fanno parte della presidenza. Ad esempio: sale riunioni, uffici, ...	Description of what are the main spaces that are part of the presidency. For example: meeting rooms, offices, ...				
					Quanto è grande?	How big is it?	mq	square metres				
			Futuro	Future	Verrà ingrandita?	Will it be increased?						
2	Aule didattiche	Classrooms	Presente	Present	Quante aule esistono al momento?	How many classrooms are there now?						
					Quanto sono grandi?	How big are they?	mq	square metres				
			Futuro	Future	Serviranno più aule?	Will you need more classrooms?						
					Quanto dovranno essere grandi?	How big will they be?	mq	square metres				
3	Aula magna	Auditorium	Presente	Present	Esiste attualmente?	Does the auditorium already exist?						
					Che tipo di eventi ospita?	Which type of events do you host nowadays?	Ad esempio: conferenze, proclamazioni di laurea, lezioni magistrali, seminari, ...	For example: conferences, graduations, keynote lectures, seminars, ...				
					Quanto è grande?	How big is it?	mq	square metres				
			Futuro	Future	Quanti posti occorrono?	How many seats will you need?	Numero di posti	Number of seats				
					In quale parte del campus va collocata?	Where will it be located in the campus?						
4	Spazi per gli studenti	Spaces for students	Presente	Present	Esistono già spazi per gli studenti?	Do spaces for students exist now?						
					Come sono distribuiti nel campus?	How are they distributed over the campus?						
			Futuro	Future	Quante aule studio serviranno?	How many studying spaces will you need?						
					Quanti posti per aula studio?	How many seats per studying space?						
					Quante aule studio silenziose?	How many quiet studying spaces will you need?						
					Quante aule studio per progetti di gruppo?	How many studying spaces for groupworks will you need?						
					Quanti spazi in cui si possa parlare a bassa voce?	How many studying spaces where you can talk will you need?						
5	Laboratori didattici	Educational laboratories	Presente	Present	Esistono già laboratori didattici?	Are there laboratories now?						
					Quante postazioni per laboratorio?	How many seats per laboratory?						
			Futuro	Future	Quali facoltà useranno i laboratori?	Which faculties will use the laboratories?						
					Quanti laboratori per facoltà?	How many laboratories per faculty?						
				Quante postazioni per laboratorio?	How many seats per laboratory?							

Ricerca / Researching activity											
Ambito	Area of interest	Tempo	Period	Domanda	Question	Chiarimento	Explanation	Risposta	Answer	Note	Notes
1	Dipartimenti / Istituti	Presente	Present	Quanti dipartimenti esistono al momento?	How many departments are there now?						
				In quali spazi del campus si svolgono le attività di ricerca?	Where are the departments located in the campus?						
				Quanti uffici chiusi?	How many closed offices?						
				Quanti spazi di lavoro aperti?	How many open spaces?						
			Futuro	Future	Verranno aggiunti altri dipartimenti?	Will other departments be added?	Numero di dipartimenti previsti	Number of forecasted departments			
2	Laboratori	Presente	Present	Esistono già laboratori di ricerca?	Are there researching laboratories already?						
				Quante sono grandi?	How big are they?	mq	square metres				
		Futuro	Future	Verranno ingranditi?	Will they be increased?						

Servizi generali / General services													
Ambito	Area of interest	Tempo	Period	Domanda	Question	Chiarimento	Explanation	Risposta	Answer	Note	Notes		
1	Rettorato	Rectorate	Presente	Present	Quanto è grande l'edificio del rettorato?	How big is the rectorate?	mq	square metres					
					Che cosa comprende?	Which kind of spaces are there now?		Descrizione degli spazi principali che fanno parte dell'edificio. Ad esempio: sale riunioni, sale di rappresentanza, uffici, ...	Description of what are the main spaces that are part of the rectorate. For example: meeting rooms, representative rooms, offices, ...				
			Futuro	Future	Che cosa comprenderà?	Which kind of spaces will be there?		Descrizione degli spazi principali che saranno parte dell'edificio. Ad esempio: sale riunioni, sale di rappresentanza, uffici, ...	Description of what are the main spaces that should be part of the rectorate. For example: meeting rooms, representative rooms, offices, ...				
					Quanto sarà grande?	How big will it be?	mq	square metres					
2	Amministrazione	Administration	Presente	Present	L'amministrazione è divisa in dipartimenti?	Is the administration composed of departments?		Descrizione dei vari dipartimenti	Description of departments				
					In quali spazi si svolgono le attività amministrative?	Where is the administration located in the campus?							
			Futuro	Future	Verranno aumentati?	Will they be increased?							
3	Biblioteche	Libraries	Presente	Present	Esistono biblioteche?	Are there any libraries?							
					Quante?	How many libraries are there in the campus?		Una unica per tutte le facoltà, una per facoltà, ...	One per all the faculties, one per faculty, ...				
					Quanto sono grandi?	How big are they?	mq	square metres					
					Includono postazioni per gli studenti?	Do they include spaces for students?							
			Futuro	Future	Quante biblioteche ci saranno nel nuovo campus?	How many libraries will there be in the new campus?							
					Che cosa comprenderanno?	What will they involve?		Descrizione degli spazi principali che saranno parte dell'edificio. Ad esempio: spazi studio, spazi per la ricerca, ...	Description of what are the main spaces that should be part of the libraries. For example: studying spaces, researching spaces, ...				
Quanto saranno grandi?	How big will they be?	mq	square metres										
4	Spazi espositivi	Exhibition centre	Presente	Present	Vengono utilizzati degli spazi espositivi attualmente?	Are there any exhibition centres now?							
					In quale parte del campus?	Where are they located in the campus area?							
					Che tipo di esposizioni vengono realizzate?	Which kind of exhibitions are hosted nowadays?							
					Quanto è grande?	How big is it?	mq	square metres					
			Futuro	Future	Basterà uno spazio espositivo o ne servirà più d'uno?	Will you need one exhibition centre or more than one?							
					Quanto sarà grande?	How big will it be?	mq	square metres					
5	Servizi di ristorazione	Canteen	Presente	Present	Quanti punti di ristorazione esistono attualmente?	How many canteens are there now?							
					Quanto sono grandi?	How big are they?	mq	square metres					
			Futuro	Future	Quanti punti di ristorazione serviranno in futuro?	How many canteens will there be?							
					Come verranno distribuiti nel campus?	How will they be located in the campus?							
Quanto saranno grandi?	How big will they be?	mq	square metres										
6	Spazi per lo sport	Sports centre	Presente	Present	Esiste già un centro sportivo nel campus?	Is there a sports centre already?							
					Quanti mq occupa totalmente?	How many square metres overall?							
					Quali sport sono maggiormente praticati?	Which are the most practiced sports?							

			Futuro	<i>Future</i>	Quanto sarà grande?	<i>How big will it be?</i>	mq	<i>square metres</i>				
7	Spazi per attività commerciali	<i>Spaces for commercial activities</i>	Presente	<i>Present</i>	Che tipo di attività commerciali esistono dentro o intorno al campus?	<i>Which kind of commercial activities are there now inside or around the campus?</i>						
					Quanto sono grandi in tutto?	<i>How big are they overall?</i>	mq	<i>square metres</i>				
			Futuro	<i>Future</i>	Verranno aumentati gli spazi dedicati?	<i>Will the spaces be increased?</i>						

Incubatori d'impresa e start-up / Incubator for start-ups and new companies

	Ambito	Area of interest	Tempo	Period	Domanda	Question	Chiarimento	Explanation	Risposta	Answer	Note	Notes
1	Uffici	Offices	Presente	Present	Quanti uffici ci sono al momento?	<i>How many offices are there now?</i>	Numero di uffici	<i>Number of offices</i>				
					Quanti uffici chiusi?	<i>How many closed offices are there?</i>	Numero di uffici chiusi	<i>Number of closed offices</i>				
					Quante postazioni di lavoro aperte?	<i>How many open spaces are there?</i>	Numero di postazioni aperte	<i>Number of open spaces</i>				
					Dove si trovano al momento gli spazi utilizzati?	<i>Where are the offices now?</i>						
					Che tipo di uffici comprendono?	<i>Which kind of offices are there?</i>	Di ricerca, di sviluppo manifatturiero, ...	<i>Researching activities, manufacturing growth, ...</i>				
			Futuro	Future	Verranno incrementati gli uffici?	<i>Will they be increased?</i>						
			Quanto saranno grandi?	<i>How big will they be?</i>	mq	<i>square metres</i>						
2	Sale riunioni	Meeting rooms	Presente	Present	Quante sale riunioni ci sono?	<i>How many meeting rooms are there now?</i>						
					Quanto sono grandi?	<i>How big are they?</i>	mq	<i>square metres</i>				
			Futuro	Future	Verranno aggiunte altre sale riunioni?	<i>Will you need more meeting rooms?</i>						
					Serviranno sale riunioni più grandi?	<i>Will you need bigger meeting rooms?</i>						
					Quanto saranno grandi?	<i>How big will they be?</i>	mq	<i>square metres</i>				
3	Spazi per corsi	Classrooms	Presente	Present	Ci sono aule attualmente?	<i>Are there any classrooms now?</i>						
					Quante aule ci sono?	<i>How many classrooms are there?</i>						
					Quanto sono grandi?	<i>How big are they?</i>	mq	<i>square metres</i>				
			Futuro	Future	Serviranno più aule?	<i>Will you need more classrooms?</i>						
					Serviranno aule più grandi?	<i>Will you need bigger classrooms?</i>	mq	<i>square metres</i>				
4	Laboratori	Laboratories	Presente	Present	Quanti laboratori ci sono al momento?	<i>How many laboratories are there now?</i>						
					Che tipo di attività supportano?	<i>Which type of activities are carried out?</i>	Ad esempio: stampa 3D, prodotti sperimentali, ...	<i>For example: 3D printer, research products, ...</i>				
					Che cosa producono?	<i>Which products are developed?</i>						
			Futuro	Future	Verranno ingranditi i laboratori?	<i>Will they be increased?</i>						
5	Spazi per eventi	Event room	Presente	Present	C'è uno spazio per eventi attualmente?	<i>Is there an event room nowadays?</i>						
					Quanto è grande?	<i>How big is it?</i>	mq	<i>square metres</i>				
					Dove si trova?	<i>Where is it located?</i>	Posizione nel campus	<i>Location in the campus</i>				
			Futuro	Future	Vi servirà in futuro?	<i>Will you need it?</i>						
Quanto sarà grande?	<i>How big will it be?</i>	mq	<i>square metres</i>									
6	Spazi per conferenze	Conference room	Presente	Present	Esiste già?	<i>Is there a conference room?</i>						
					Quanti posti contiene?	<i>How many seats are there?</i>	Numero di posti	<i>Number of seats</i>				
			Futuro	Future	Verrà ingrandito?	<i>Will you need a bigger conference room?</i>						
					Quanti posti occorreranno?	<i>How many seats will you need?</i>	Numero di posti	<i>Number of seats</i>				

Residence / Accomodations											
Ambito	Area of interest	Tempo	Period	Domanda	Question	Chiarimento	Explanation	Risposta	Answer	Note	Notes
1	Residenze per studenti		Presente	Presente	Esistono al momento?	<i>Are there any dorms nowadays?</i>					
					Quanti posti ospitano?	<i>How many beds are available now?</i>					
					Quanto distano dall'università?	<i>How far are they from the campus?</i>					
					Si trovano all'interno o all'esterno del campus?	<i>Are they inside or outside the campus?</i>					
				Futuro	Future	Quanti posti serviranno?	<i>How many beds will you need?</i>				
						Che servizi prevederanno?	<i>Which services will you need?</i>	Descrizione dei servizi, ad esempio: mensa, aule studio, palestra, auditorium, ...	<i>Description of services, for example: canteen, studying rooms, gym, auditorium, ...</i>		
2	Residenze per docenti e ricercatori		Presente	Presente	Esistono al momento?	<i>Are there any residences nowadays?</i>					
					Quanti posti ospitano?	<i>How many beds are available now?</i>					
					Quanto distano dall'università?	<i>How far are they from the campus?</i>					
					Si trovano all'interno o all'esterno del campus?	<i>Are they inside or outside the campus?</i>					
				Futuro	Future	Quanti posti serviranno?	<i>How many beds will you need?</i>				
						Saranno strutture separate dalle residenze per studenti?	<i>Will they be separate buildings from the student dorms?</i>				
Che servizi prevederanno?	<i>Which services will you need?</i>	Descrizione dei servizi, ad esempio: mensa, aule studio, palestra, auditorium, ...	<i>Description of services, for example: canteen, studying rooms, gym, auditorium, ...</i>								
3	Foresteria		Presente	Presente	Esistono al momento?	<i>Are there any residences nowadays?</i>					
					Quanti posti ospitano?	<i>How many beds are available now?</i>					
					Quanto distano dall'università?	<i>How far are they from the campus?</i>					
					Si trovano all'interno o all'esterno del campus?	<i>Are they inside or outside the campus?</i>					
				Futuro	Future	Quanti posti serviranno?	<i>How many beds will you need?</i>				
						Sarà inclusa nella residenza per studenti?	<i>Will it be in the student dorms or will it be a separate building?</i>				

Area esterna / External area											
Ambito	Area of interest	Tempo	Period	Domanda	Question	Chiarimento	Explanation	Risposta	Answer	Note	Notes
1	Spazi verdi	Green areas	Presente	Present	Come vengono utilizzati?	How are they used?	Descrizione dell'uso, ad esempio come spazi ricreativi, spazi studio, ...	Description of how they are used, for example as recreational spaces, studying spaces, ...			
					Quanto sono grandi?	How big are they?					
			Futuro	Future	Verranno incrementati?	Will they be increased?					
2	Parcheggi	Parking areas	Presente	Present	Come viene raggiunto il campus?	How do people reach the campus?	esempio: in macchina, in bici, in autobus, ...	example: by car, by bike, by bus, ...			
					Qual è il mezzo più utilizzato?	Which is the most common means of transport?					
					Attualmente ci sono parcheggi?	Are there any parking areas?					
					Quanti?	How many parking areas are there now?					
			Futuro	Future	C'è necessità di avere posti auto?	Do you need parking lots?					
				Quanti?	How many will you need?						

Storia / History											
Ambito	Area of interest	Tempo	Period	Domanda	Question	Chiarimento	Explanation	Risposta	Answer	Note	Notes
Storia	History	Passato	Past	Come funzionava il campus?	<i>How did the campus work?</i>						
				Quante facoltà c'erano?	<i>How many faculties were there?</i>	Numero delle facoltà	<i>Number of faculties</i>				
				Quali facoltà c'erano?	<i>Which faculties were there?</i>	Ad esempio: ambito scientifico, umanistico, ...	<i>For example: scientific area, humanistic area, ...</i>				
				Quanti studenti c'erano?	<i>How many students were there?</i>	Numero totale medio	<i>Total average number</i>				
				C'è memoria di cos'era l'università prima della guerra?	<i>Do you remember how the campus was before the war?</i>						

Budget

Ambito	Area of interest	Tempo	Period	Domanda	Question	Chiarimento	Explanation	Risposta	Answer	Note	Notes
Budget	Budget	Futuro	Future	Budget a disposizione?	<i>How much money will it be available?</i>	Importo per l'intero progetto	<i>Amount for the whole project</i>				
				Ci sono fondi per funzioni particolari?	<i>Will there be any special funds?</i>	Importo per spazi speciali, ad esempio: l'auditorium, gli spazi di ricerca, ...	<i>Amount for special spaces, for example: the auditorium, researching spaces, ...</i>				
				Ci sono incentivi per gli spazi esterni?	<i>Will there be any incentives for green areas?</i>	Importo riservato agli spazi esterni	<i>Amount for external spaces</i>				

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

JAAMACADDA UMMADDA SOOMAALIYEED



الجامعة الوطنية الصومالية

SOMALI NATIONAL UNIVERSITY

CURRICULUM & COURSE DESCRIPTIONS

**FACULTY OF AGRICULTURE
AND
ENVIRONMENTAL SCIENCE**



2018 - 2019



BRIEF PROFILE

The Faculty of Agriculture was established in 1971 with the purpose to generate agricultural experts who are able to provide relevant consultancy services for farmers such as: soil and water conservation practices, pest and disease management, crop husbandry methods and minimizing the use of chemicals and encouraging the application of integrated pest management (IPM) in farming production systems. The faculty has prepared almost 600 graduates with various backgrounds of agricultural science and agricultural engineering; it had 65 academic staff and 50 non-academic staff.

VISION STATEMENT

The faculty strives for excellence in teaching, research, customer care, extension and community outreach.

VALUES

The values of the faculty include:

The Faculty of Agricultural Science strives to deliver its mandate with integrity (individually and collectively), commitment, accountability, and respect, continuous improvement of services and products, accessibility to society, gender equity and rational use of resources.

MISSION

The mission of the faculty is to realize its vision by: engaging the faculty in Educating and training agricultural scientists through a quality teaching process in order for them to meet national needs, producing relevant and focused research for the benefit of the country and its people and ensuring the implementation of expertise through transfer technology and extension services in the country for poverty alleviation.

The current Government of Somalia is doing its utmost in order to make the nation among the middle income countries of the World. Education in general and higher education in particular is the key in the development of any nation. As Agriculture and Livestock is the main stay for more than 85% of the population in the country and crop production takes the lion's share, it would be difficult to bring fast economic growth without increasing crop production and productivity. Therefore, the agricultural sector in general and higher academic institutions in particular have a decisive role to play in the efforts to build modern and prosperous in the years to come.

Even though more than 85 % of the total landmass of the country is classified as a dry land, the attention and coverage with respect to trained professionals in the area of Dry land crop production was very limited. In addition, as most of the curricula in this area and the different courses in the different departments were not more of competency based and market oriented,

it has become imperative to address these issues through curriculum revision and nationwide modularization.

GENERAL OBJECTIVE

The ultimate aim of the program is to improve crop production and productivity and ensure sustainable use of natural resources in the country, thereby contributing to improvement of the livelihood of the nation. Such a program seeks to produce competent professionals who are equipped with both academic and practical knowledge and skills in managing all phases of the crop production and management; and conducting various research and extension activities which can contribute to the development of the country and ensuring food security and self-sufficiency.

SPECIFIC OBJECTIVES

- 1) Provide students with basic and applied knowledge and skill of field crops, horticultural crops, industrial crop production and protection.
- 2) Provide students with basic knowledge of natural resources: soil, water, Rangeland and forestry and their management for appropriate crop production.
- 3) enable students to understand and comprehend problems in dry land crop production and seek solutions through exposure to research, extension and management
- 4) Enable the students to gain the skill, knowledge and attitude of conserving and managing crop genetic resources
- 5) Integrating teaching-research activities with extension activities so as to extend the new improved technologies to the farmer.
- 6) To provide professional services to the community and policy makers at large



DEPARTMENT OF AGRICULTURAL SCIENCE
COURSE PATTERN

ACADEMIC YEAR ONE							
First Semester				Second Semester			
C. Code	Course Name	Crd Hrs	Total Hrs	C. Code	Course Name	Crd Hrs	Total Hrs
HUAG112	Intro to Agriculture	4	80	ISOS 121	General microbiology	4	80
UEN111	Intro to Environmental sciences	4	80	GNE C122	Math II	4	80
PLAM113	Plant Morphology & anatomy	6	120	GNLZ 123	General zoology	4	80
IOCH114	In-organic Chemistry	4	80	GNZO 125	General Climatology	4	80
PRCL115	Math I	4	80	GNPH 126	General Ecology	4	80
GEMO116	Geomorphology	4	80	GNMI 126	General physics	4	80
ISST117	Islamic Studies I	2	40	MTHM 127	Introduction to soil science	6	120
INGT118	English I	4	40	ORCH 128	Organic chemistry	4	80
COAP119	Computer and its application	4	80	ISST 129	English II	4	80
ARBC1110	Arabic I	2	40	ARBC 1210	Islamic Studies II	2	40
				ENGL 1211	Arabic II	2	40
TOTAL		36	760	TOTAL		42	840
ACADEMIC YEAR TWO							
Third Semester				Fourth Semester			
C. Code	Course Name	Crd Hrs	Total Hrs	C. Code	Course Name	Crd. Hrs	Total Hrs
PRCP211	Principles of crop production	6	120	PRGN241	Principle of genetics	6	120
PRHO212	Principles of Horticulture	6	120	PANP242	Principles of animal production	4	80
PREN213	Principles of entomology	4	80	PLPT243	Plant Pathology	4	80
PLPY214	Plant Physiology	4	80	WARM214	Water Resource Management	4	80
FAMN215	Farm machinery	6	120	TOPL245	Topography and land survey	4	80
TAXN216	Taxonomy	4	80	FRVP247	Fruit and Vegetable Production	6	120
SOCH217	Soil chemistry			GNST246	General Statistics	4	80
ENGL218	English III	6	120	PBCH248	Plant Biochemistry	4	80
				ENGL249	English IV	4	80
TOTAL		40	800	TOTAL		40	800
ACADEMIC YEAR THREE							
Fifth Semester				Sixth Semester			
C. Code	Course Name	Crd. Hrs	Total Hrs	C. Code	Course Name	Crd. Hrs	Total Hrs
AGRM351	Rangeland management and agro forestry	4	80	SOFF361	Soil fertility and fertilizers	6	120
PLBR 352	Plant breeding	4	80	DDMN362	Desertification & Drought Management	4	80
WESC 353	Weed science	4	80	INPM363	Integrated Pest management	4	80
AGIS 354	Agricultural irrigation system	6	120	RMED364	Research methodology	4	80
PRAP215	Principles of animal production	4	80	ANNU365	Animal nutrition	6	120
SSCT 356	Seed Science & Technology	4	80	FSHY 367	Food science and Hygiene	6	120
RSSN 357	Agri-Extension and rural sociology	4	80				
PAGE 358	Principles of Agro Economics	4	80				
TOTAL		38	680	TOTAL		28	560
ACADEMIC YEAR FOUR							
Seventh Semester				Eighth Semester			
C. No.	Course Name	Crd. Hrs	Total Hrs	C. No.	Course Name	Crd. Hrs	Total Hrs
ECEN 471	Economic Entomology	4	80	AGPP 481	Agricultural Policy & Planning	4	80
POHT 472	Post harvesting technology	4	80	AGPR 482	Agricultural projects management	4	80
NARC 473	Natural Resource Conservation	4	80	BEHP 483	Bee keeping & honey Production	4	80
FAMN 4 74	Farm management	4	80	AGBS484	Agro- business & small projects	4	80
AEMA 475	Agricultural Extension & Rural Sociology	6	120	BLBR485	Plan breeding	4	80
POPR476	Poultry production	4	80	GRPR	Graduation project	4	240
EADC477	Agricultural biotechnology	6	120				
PFPR362	Pasture and forage production	4	80				
TOTAL		36	720	TOTAL		24	640

DEPARTMENT OF ENVIRONMENTAL SCIENCE
COURSE PATTERN

ACADEMIC YEAR ONE							
First Semester				Second Semester			
C. Code	Course Name	Credit Hrs	Total Hrs	C. Code	Course Name	Crdr Hrs	Total Hrs
IENS 111	Intro. to Environmental science	4	80	ISOS 121	Introduction to soil Science	4	80
INAG 112	Intro. to Agriculture	4	80	GNE C122	General Ecology	4	80
INCO 113	Intro. to Computer	4	80	GNCL 123	General Climatology	4	80
MTHM 114	Math I	4	80	GNZO 125	General Zoology	4	80
IOCH 115	In - organic chemistry	4	80	GNPH 126	General physics	4	80
PLMA 116	Plant Morphology & Anatomy	4	80	GNMI 126	General Microbiology	4	80
GEMO 117	Geomorphology	4	80	MTHM 127	Math II	4	80
ISST118	Islamic Studies	2	40	ORCH 128	Organic Chemistry	4	80
ENGL119	English-I	4	80	ISST 129	Islamic studies2	2	40
ARBC110	Arabic I	2	40	ARBC 1210	Arabic II	2	40
				ENGL 1211	English-II	4	80
TOTAL		36	720	TOTAL		38	800
ACADEMIC YEAR TWO							
Third Semester				Fourth Semester			
C. Code	Course Name	Crdr Hrs	Total Hrs	C. Code	Course Name	Crdr Hrs	Total Hrs
ENCH 211	Environmental Chemistry	4	80	IREE221	Intro. to Renewable Energy and Environment	4	80
FRMN212	Forestry & Rangeland Management	4	80	ENPO222	Environmental Pollution	4	80
PENL 213	Principles Of Environmental law	4	80	EPSD 223	Environmental Planning & SD	4	80
PSMN 214	Principles of solid waste Management	4	80	POEN224	Population and Environment	4	80
MAEC 215	Man and Ecosystem	6	120	POST225	Principal of Statistics	4	80
GEGE216	Air and Water Quality	6	120	CCGW226	Climate Change and global warming	4	80
ENGL 217	English-III	4	80	DMNR227	Drought management & Risk Mitigation	4	80
ENMI218	Environmental Microbiology	4	80	ENGL228	English 4	4	80
TOTAL		36	720	TOTAL		32	640
ACADEMIC YEAR THREE							
Fifth Semester				Sixth Semester			
C. Code	Course Name	Crdr Hrs	Total Hrs	C. Code	Course Name	Crdr Hrs	Total Hrs
PMNO351	Project Management and Operations	4	80	ATES362	Analytical Techniques in Environmental Science	4	80
ENTO352	Environmental toxicology	6	120	EMNS 363	Environmental Management Systems	6	120
EAED353	Water Resource Management	4	80	BWLC364	Biodiversity & Wild life Conservation	6	120
PREC354	Principals of Environmental economics	4	80	ENMO365	Environmental Monitoring	4	80
GIRS355	GIS and Remote Sensing	6	120	DRMA366	Disaster Risk Management	4	80
EIAS356	Environmental impact assessment	6	120	PCTE367	Pollution Control Technologies	4	80
DMRM357	Environmental Information Systems	4	80	NRMN368	Natural Resource Management	4	80
TOTAL		32	660	TOTAL		36	720
ACADEMIC YEAR FOUR							
Seventh Semester				Eighth Semester			
C. No.	Course Name	Crdr Hrs	Total Hrs	C. No.	Course Name	Crdr Hrs	Total Hrs
FPOP472	Forest protection Operation	4	80	ENGO481	Environmental Governance	4	80
REME473	Research Methodology	6	120	PHAE482	Public Health and Environment	6	120
OSHE474	Occupational Safety, Health and Environment	6	120	CNRM483	Conflicts in Natural Resource Management	6	120
RDET475	Rural development and Ecotourism	4	80	FIYP484S	Final Year Project/Internship	6	120
EEME476	Environmental extension system	4	80				
ENET	Environmental Ethics	4	80				
TOTAL		28	560	TOTAL		22	440

COURSE DESCRIPTIONS

CORE SUBJECTS AND FACULTY REQUIREMENTS



BOTANY

The course intends to expose students to meanings and significance of plant morphology, anatomy and taxonomy as a science; functions of different organs of wood and herbaceous plants and translocational and physiological role of different plant tissues. Plant specimen collection methods and procedures to prepare a herbarium so as to classify plants to different taxonomical groups will be discussed. Contents of the course include: Morphological features of angiosperms; pollination, fertilization, seed and fruit development, Tissue: structure and functions, internal structure of dicot and monocot stem, root and leaf, Plant systematics and its utility, binomial nomenclature, general classification; concept of water potential with respect to plant cell, absorption and translocation of water/sap and Basic concepts of plant growth and development, respiration and photosynthesis.



ZOOLOGY

The course covers provides an introduction to the classification, relationships, structure, and function of major animal phyla. Emphasis is on levels of organization, reproduction and development, comparative systems, and a survey of selected phyla. Topics covered in this course unit include: Definition of zoology, Branches of Zoology, Systematic zoology, The sub kingdoms protozoa, Sub kingdom: Parazoa, Sub kingdom: Metazoa, Classification of Metazoa, Triploblastic (Acoelomata), Tribloblastic (Coelomata), Phylum: Arthropoda, Phylum: chordate and Sub:, Phylum: Vertebrata.



PLANT PHYSIOLOGY

The overall aim of this course is develop students' understanding about plants environment relationship for better crop management. Specifically it teaches students the different functions involved in producing organic compounds by the crops of the drier regions, which is used for growth and development, and how plants utilize energy; obtain and distribute water and minerals; respond to their environment; react to stress; and reproduce. It enables students to interrelate crop production and management practices with basic physical mechanisms. In order to equip students with basic knowledge about the subject matter soil-plant-atmosphere continuum, nutrient requirements of plants, plant metabolism, plants growth and development and role of plant enzymes are major topics covered in this course.



PLANT ECOLOGY

Ecology is the study of interrelationships between organisms and their biotic and abiotic environments. As a basic science, ecology informs us about the processes governing the patterns we observe in nature. From an applied perspective, it is critical that we understand ecology as it provides insights and solutions to many of the environmental issues we are confronted with in our daily lives. In this course we will focus specifically on the ecology and topics to be covered include: Introduction to Ecology, Scope of Ecology, Disciplines of ecology, Importance of Ecology, Terrestrial and Aquatic Ecosystems, Physical Environment, Global warming, Influence of natural sources, Atmosphere, Hydrosphere, Biosphere, Biome, Wetlands, Marin Biome, Coping with Environmental Variation: Temperature and Water, Response to Environmental Variation, Variation in Temperature and Evolution and Ecology.

○

GENERAL MICROBIOLOGY

This course intends to give an understanding of microbes important to agriculture. The course enables students to familiarize with general characteristics of micro-organisms, their ecology, and economic importance. It also introduces students with microorganisms and covers the type and significance of agriculturally important microorganisms, classifications, morphological characteristics and identification, reproduction and survival. Soil microbes and their activities on soil fertility, plant growth, and the decomposition of organic residues, and environmental pollutants. Topic to be covered include: Introduction to Microbiology, Historical Aspects of Microbiology, The Relevance and Scope of Microbiology, Microscopy and Specimen Preparation, General Characteristics of Microorganisms, Microbial Growth, and Reproduction, Physical Methods of Controlling Microbial Growth, Chemical Methods of Controlling Microbial Growth, Systematic Classification of Microorganisms, Microbial Genetics and Biogeochemical Cycling of Elements, plants and microbial interaction and Role of microbes in Environment.

○

ORGANIC CHEMISTRY

The course deals with the concepts of chemistry, particularly organic compounds and common organic substances. The course primarily covers elements and compounds that are more important for the formation of organic compounds/materials, their composition and properties. Nomenclature, preparation, and geometrical structures will also be discussed in the course. The content of the course include: Introduction to Organic Chemistry in general and its importance in various disciplines/applications, Atomic Structure, configuration and bonding properties of elements frequently present in organic compound, types of orbital and their effects, Hydrocarbons, Petroleum resource and its Separation Technique Classes of Organic Compounds: General Alcohols Preparation and Reactions, Polymers General, Natural Polymers

○

MATH II

This course is designed to introduce students to the basic ideas and methods of mathematical analysis and their application to mathematical modeling. This course provides students with experience in the methods and applications of calculus to a wide range of theoretical and practical situations. The course is taught in English. The course unit contains among others the following: Factoring, Slope of a line, Functions and their graphs, Systems of linear equations, Roots, Radicals, and Complex numbers, Quadratic functions, Exponential and logarithmic functions.

○

FARM MACHINERY

The course contains six chapters and some more subtopics to be included. It starts with the sources of powers that can be used whether in a mechanized or traditional production systems. Besides, it also gives a high light about engines used in horticultural farms. The rest chapters focus on tillage and different machineries including: Seeding machines, equipment's for cultivation, weed control, fertilizing, and mechanical harvesters. Moreover, there are also machineries which are very important for spraying activities. The main objectives of the this course unit are to give student a thorough understanding about what horticultural machineries deal with and its influence in production of the crops, and to Familiarize the diverse machineries used in horticulture and finely able to assign appropriate machineries for concerned horticultural practice.

○

TOPOGRAPHY & LAND SURVEY

This course provides the undergraduate student with a background in a descriptive way to understand the objective of surveying, basic principles of surveying, construction and working of different scales, working of telescopes, spirit levels, leveling, theodolite surveying and the types of errors encountered in survey work. student can come to know how to collect and record data of points on the surface of the earth, compute areas and volumes, prepare plans and maps, lay out works using survey data and check the accuracy of laid out works.

○

PLANT BIOCHEMISTRY

This course deals with cell organization; plant cell structure; enzymes; nucleic acids, protein synthesis; and biochemistry of carbohydrates, lipids and amino acids. The main objects include: To understand the basic structure and function of plant cell and the biochemistry of carbohydrates, lipids and amino acids. The contents include: Introduction to plant biochemistry, the chemistry of carbohydrates, Amino acids, lipids, nucleic acid and nucleoprotein, Minerals and plant nutrition, Enzymes and their biological importance for plants, Phytohormones, plant natural products and medicinal plants.

○

PRINCIPLES OF CROP PRODUCTION

The objectives of the course include Calculation of fertilizer requirement, fertilizer mixtures and unit values Methods of fertilizer application this course deals with the definition of Agriculture, Agronomy - scope and its role in crop production. Development of Agriculture and crop production in the country, Classification of field crops and definition of different terms used in field crops. Environmental factors that affect crop production, Different cultural Practices in crop production, cropping systems. Land Preparations, Importance of soil tilt, tillage - its objectives and classification of tillage.

○

INORGANIC CHEMISTRY

The course is intended to introduce fundamental principles in inorganic chemistry, including basic concepts of symmetry and group theory, and their application in the description of bonding, reactivity, and spectroscopy of inorganic compounds. Reaction mechanisms and physical methods for the study of inorganic, organometallic, and bioinorganic compounds will be discussed. Selected topics in main group chemistry will be included as well. Discussion of contemporary literature will be used as a means to expose students to recent developments in the field, ranging from the application of metals in catalysis to the study of metals in biological systems.

○

GENERAL PHYSICS

General Physics is intended to provide you with a fundamental understanding of the laws of physics with applications to our everyday life. This course also serves to develop cognitive and analytical skills, which can be applied in all majors. Contents of the course include: motion, force, force & motion, turning effects of forces, energy sources and changes, energy transfer, power, pressure, properties of matter, ionization and radioactivity, waves, electricity and magnetism and electricity supply.

○

MATH I

This course presents the topics necessary for entry into calculus courses. The student is introduced to various fundamental concepts and equipped with the necessary skills, understanding and insights required to succeed in calculus. The course prerequisite is Principles of Math 1 or its equivalent, and it is assumed that students have algebra .Course content includes the following: introduction to graphs and functions; polynomial and rational functions; trigonometric functions; exponential and logarithmic functions.

○

COMPUTER

The course covers some general theoretical aspects of computer and mainly devoted to introduce students with computer hardware, software, information storage and retrieve and displaying stored information using computer application. Specific areas of concern include MS-word, MS-Excel and MS-Power point.

○

PRINCIPLES OF GENETICS

This course aims to equip students with basic principles and concepts about hereditary science: its nature and manipulation to apply the principles and concepts of the science into problem solving practice in organism improvement program. Genetics broadly classified into classical, molecular and quantitative and introduces the basic concepts of pre- and post Mendelian genetics, cell mechanics, structural and functional description of genetic materials (chromosome: DNA and RNA), gene expression and interaction, occurrence and use of genetic linkage and crossing over and finally the effect and significance of genetic material alteration in agriculture.

○

AGRO CLIMATOLOGY

This course introduces the basic concepts of weather and its elements and their measurement, significance of atmosphere for agriculture, climate taxonomy including classification of n climate and model application. Specific areas covered include solar radiation, temperature, air pressure and wind, atmospheric humidity and precipitation, evapotranspiration, agro-meteorological station uses and basic requirements; Global weather patterns; Classification of climate (description of Koppen system; Thornthwaite's system); Agriculture and water use; Extreme weather patterns; Micro-climate; weather forecasts and statistics: uses of weather forecasting, national and international networks of stations, technological advances, forecasting in ; Agricultural and climatological modeling: overview, analysis and development of models, uses and applications of models, modeling and developed and developing countries.

○

GENERAL STATISTICS

The general objective of the course is to introduce students to basic ways of data collection, summarizing, analyzing and interpreting it primarily statistics deals with frequency distribution, graphical representation, measures of central tendency and dispersion, elementary probability, common probability distributions (binomial, poisson, and normal), sampling and tests of hypotheses on the mean and chi-square test.

○

GENERAL ENTOMOLOGY

This course provides an excellent background of entomology, Position of insect in Animal Kingdom, important characters of phylum Arthropoda and its classification up to class, elementary facts about insect anatomy and morphology, Insects and other arthropods: Phylum arthropods and Phylum annelids; General organization of an insect body, Insect structure and function: Elementary knowledge of physiology of insects, structure and function of digestive, excretory, circulatory, respiratory, nervous and reproductive system. Development and metamorphosis, classifications and identification of insects: the classification system, rules in nomenclature, major features used in classification; Agricultural important orders of insects. Insect collection, preservation and handling. General control methods of insect pests.

○

IRRIGATION

Irrigation and Drainage is the course that introduces the students to the significant of Irrigation and Drainage in relation to design and construction of irrigation and drainage practices and management. Also, it involves water relation in soils, determination of soil moisture and water movement in the soil. Objectives of the course include: to understand and design different irrigation methods, Estimate crop water requirement and irrigation requirement, to manage the available water resources. Contents include: General introduction, Soil-water- plant relationship, irrigation methods, Measurement of irrigation water, Estimating crop water requirement, Scheduling irrigation, Soil salinity and irrigation and Drainage.

○

PLANT PATHOLOGY

This course deals with significant of plant pathogens; Mechanism by which pathogens attack their hosts; Classification of plant diseases; Causes of plant diseases (abiotic and biotic factors); Methods of reproduction, distribution and dissemination. Koch's postulates and plant disease symptoms; Relationship between parasite and host; Defense mechanisms of plants against pathogens; Epidemiology of plant diseases; General control methods of plant diseases; Genetics of plant diseases. The course also accounts for practical aspects of plant pathology such as temporary slide preparation of representative genera of disease causing fungi for morphological studies simple staining of bacteria from milk and curd, Preparation of PDA and Practical record.

○

WATER RESOURCE MANAGEMENT

The main objectives are teaching students how to assess surface and ground water resources. Developing suitable plans for water resource development and management. To learn the principles of integrated water resources management. Assessment of surface and groundwater resources, water resources planning, water resources management, water demand management, integrated water resources management, water resource systems (Linear and Dynamic programming techniques). Units to be covered are: Assessment of Ground water and Surface Water Resources, Water Resources Planning, Water Resources Management, Water Demand Management, Integrated Water Resources Management, Water Resource Systems.

○

SOIL CHEMISTRY

In this course we will explore chemical properties of soils. In particular, we will focus on the nature of the smallest of soil particle, the clay and humus colloids. We will also study sources of acidity and alkalinity in soils and characteristics and behavior of acid soils and soils of dry regions. The chemistry of essential macro- and micronutrient elements in the soil, and the soils ability to provide plants with nutrient elements will be another area of study in this course. Soil chemistry is foundation for many core subjects in agriculture: range management, land degradation and rehabilitation, forestry, environment, ecology, irrigation, soil fertility and fertilizers, soil microbiology, soil and water conservation, crop production, etc. Course lectures will deliberate also on other interrelated subjects such as water and soil conservation, erosion control, land degradation and rehabilitation, soil physics, etc.

○

SEED SCIENCE TECHNOLOGY

The aim of the course is to introduce students to the biological and technical requirements of seed production, including seed technology, certification and distribution. Concept of seed technology and seed system, General principles of seed production, Seed production technology of agricultural crops, Seed processing and storage, Seed testing and quality control, Seed certification and legislation and Seed quality enhancement. Business skill for small-scale seed producers.

○

PRINCIPLES OF ANIMAL PRODUCTION

This course is intended to help students to understand how feeding, breeding, management and interaction with the environment influence animal production. Objectives include: describe and explain the process of ruminant and non-ruminant digestion in farm animals. Explain the factors that affect feed intake and efficiency of feed utilization in farm animals. Explain the metabolism of feed nutrients in farm animals. Feed different types and age groups of farm animals efficiently. Manage hatching eggs for the production of day old chicks. Contents of the course unit are: an overview of animal production: concepts, roles, constraints and strategies, effects of the tropical environment on animal production, concept of adaptation and acclimatization, systems of livestock production, characteristics of ruminant animals, breeds of ruminant animals, management of ruminant breeding stock, feeding principles in ruminant animals, disease and health care of ruminant animals and general principles of poultry

○

DISEASE & PESTICIDES

The main objectives of the course include: Understand the development into pest status; explain the economics of pest attack and describe the major pest control methods; describe the principal methods of controlling plant diseases and weeds; Prepare solutions and dilutions, and calculate pesticide and herbicide for SNU lations. Contents are: Definition and types of pesticides, Pesticides and the environment Tools of IPM viz., physical, mechanical, cultural, biological, genetic control, chemical and legal control, Pesticide for SNU lations and pesticide toxicity, fumigation and fumigants, modern approaches of insect control like use of botanicals, anti-feedant, repellent, pheromone, hormone etc and their integration with conventional methods. Introduction to plant protection equipment, calibration of pesticide spraying equipment. Factors affecting insect pest outbreak, ecological basis of pest management.

○

WEED SCIENCE

Students will acquire a sufficient theoretical and practical knowledge and skills in planning and management economically important weeds in crop production system. At the end of the course students are also able systematically collect major and noxious weeds identify and classify them and kept as source of data bases for further necessary actions in research and extension. The economic importance of parasitic and non-parasitic weeds (crop weed interaction - competition), characteristics, their biology - reproduction and means of dissemination will be covered thoroughly during course period. Weed management aspects including integrated control of weeds: cultural, biological, and herbic use will be dealt in detail manner. The course includes practical in field and laboratory conditions.

○

AGRICULTURAL ECONOMICS

An introduction to the principles of economics including principles of supply and demand; consumer behavior; elasticity; production functions; production costs, supply and revenue; profit maximization; market structures; agricultural and macroeconomic policies. These principles are applied to agriculture and the role of agriculture in the Somalia and world economies. The main objectives behind the course include: Understand the structure of the agricultural sector of the Somali economy, Apply economic principles to understand the conduct and performance of the agricultural industry and understand the role and impact of government policy on the food and agricultural sector. Unites covered: Introduction to the economics of agriculture, The economics of production, The costs of production, Profit maximization , Optimal input selections, Optimal output selection, Consumer choices, Supply and demand , Markets, competitive firm and Market power and Macroeconomic and trade.

○

PRINCIPLES OF HORTICULTURE

Introduction to horticulture as a science, art and business. Exploration of the major general areas of horticulture and all essential principles and practices of horticulture pertaining to indoor and outdoor production. Emphasis is on the underlying science including current technology and how it is applied to practical horticulture. The general objectives include: to acquire a sound foundation in all aspects of horticultural science, applications of the principles of horticulture to growing plants both outdoors and indoors. Course content are: Introduction to Horticulture, Basics of Plant Nutrition, Propagating Horticultural plants, Growing plants indoors, Principles of landscape, Nursery megamenus, Pruning of Plants, Growing plants outdoors: Vegetables and fruits.

○

FIELD CROPS

The basic principles of plant growth, including human and environmental influences and the theoretical and practical application of agronomic principles to crop production. The units Include the historical and economic importance of crop plants for food, feed, and fiber; origin, classification, and geographic distribution of field crops; environmental factors and agronomic problems; crop plant breeding, growth, development, and physiology; cropping systems and practices; seedbed preparation, tillage, and crop establishment; pests and controls; and harvesting, storing, and marketing practices. The course also has practical seasons: identification of crop-seeds, plants associated weeds. Judging of maturity and estimation of yields. Study of crop production techniques at different farms. Calculation of seed and fertilizer requirement of crops and Practical study of all field crops.

○

AGRO-FORESTRY & RANGELAND

This introductory course explores application of ecological principles and social values to the management of rangeland resources. Emphasizes history, classification, and evaluation of rangelands; plant ecology; animal nutrition and ecology; grazing management; multiple use of rangeland resources; conflict management; collaborative and adaptive management; range improvement; contemporary rangeland issues. In the first units will have a touch on agro-forestry and its importance.

○

INTEGRATED PEST MANAGEMENT (IPM)

This course is designed to provide students in agriculture an opportunity to learn integrated pest management through study of materials and application in NTCC gardens, greenhouse, and farm. Major agricultural disease and pest agents will be studied, focusing on the biology of the pests to include life cycle, structure, and typical hosts. Management and control utilizing least toxic methods will be emphasized.

○

RESEARCH METHODOLOGY

This course aims to provide students with an understanding of the principles and skills needed in order to design and conduct scientific research. It will encourage students to critically evaluate the methods, strategies and data that used by Agriculture scientist. Contents are: Introduction and Overview, Problem statement, research questions, research object and Hypothesis, Literature review, Methodology/methods/materials, Data collection and Analysis, Introduction of Experimental Design and Preparation of thesis writing and sharing your results (Presentation, publication papers etc.).

○

ANIMAL NUTRITION

Animal Nutrition deals with classification and function of nutrients, deficiency symptoms, digestive processes, characterization of feedstuffs, and formulation of diets for domestic animals. This course introduces third year students to animal nutrition, including digestive physiology and metabolism of livestock and other species; nutrient properties and requirements for different aspects of animal production and performance; principles of feed evaluation and ration formulation. This includes nutritional roles of carbohydrates, proteins, lipids, minerals, vitamins, and water. Digestion, absorption, and use of nutrients and their metabolites.

○

FRUITS & VEGETABLES

The goal of this course is to introduce the students to the sciences of olericulture (vegetables) and pomology (fruit) with the overall objective of introducing to the student to the theories, principles and practices utilized in production. It is the objective of this course to increase the capacity of the student for intelligent decision-making and problem solving based upon scientific knowledge and resources of fruits and vegetables. This course contains the following topics: fruit production, Fruit crops in Somalia: Mango, Banana, Citrus, Guava, Date palm, Papay and Grape. vegetable production, Growth and development of vegetable, Agro-climatic requirements of vegetable production, Crop Soil and water management, Harvesting and handling of vegetables, Major vegetable crops in Somalia. There are also field practical.

○

SOIL FERTILITY & FERTILIZERS

Soil fertility is important in considering the role that the soil plays with regard to the availability of nutrients to plants. Availability of nutrients under different scenarios will be discussed as well as managing the availability of those nutrients in considering acidifying and liming soils, alkalizing, nutrient sources and fertilizers. Appropriate sampling techniques will be reviewed along with providing an understanding of soil and plant analysis and how to best interpret the results. Nutrient management programs are an important consideration for managers and will also be reviewed with respect to environmental concerns, effectiveness and availability of under different management techniques.

○

ECONOMIC ENTOMOLOGY

Insects are the most common animals on our planet with an estimated 1.5 million species of insects identified. This course will examine the basics of insect's structure and function, learn the major groups of insects and the basic principles of insect ecology. We will also learn how and why insects become pests, learn the principles of insect pest management, and explore the impact of pest insects on various agricultural production systems and public health. Objectives of the course include: to understand why and when insects need to be controlled. Learn methods for detecting insect activity, getting familiar with various strategies for insect management. Familiar with the major types of insecticides and how they function, Becoming aware of non-chemical alternatives for insect pest management. The contents of the course include: Pests, Definition of insect pests, Categories of Crop pests, Causes of pests outbreak, Cereal Insect pests and their control, Pests of pulse crops, Oil crop pests, Sugarcane pests, Horticulture crop pests, Pests of Cotton and Fiber crops, Stored pests, Control methods of insect pests and Insect Ecology And Behavior.

○

POST-HARVESTING TECHNOLOGY

The main objectives of this course include: Describe the processes/factors that result in quality deterioration and loss of harvested produce, Explain technologies/procedures applied to improve quality and reduce losses of harvested produce, Discuss quality attributes and standards required to maintain safety of harvested produce. Post-harvest physiology and biochemistry of perishable foods. Factors causing post-harvest losses. Post-harvest technologies for management of perishable and non-perishable produce. Maturity standards and components. Harvesting methods, Transportation and packaging, and their effects on post-harvest behavior of perishable foods. Gender dynamics in post-harvest handling, processing and quality maintenance in rural households. Appropriate storage technologies, climatic factors in relation to maturity, ripening and senescence, post-harvest handling of crops and operational/structures for storage and preservation.

○

NATURAL RESOURCE CONSERVATION

This course will provide a basic introduction to the field of natural resources management. Natural resources include both renewable resources such as soil, forests, water, and wildlife, and nonrenewable resources such as oil, metals and minerals. Current issues dealing with the conservation and management of wildlife will provide most of the examples for illustrating concepts that are generally applicable to the entire field. This course takes an integrated view of the field in that sound natural resource management requires an understanding of the interactions between natural and social processes. Units covered include: Introduction to natural resource management, Ecological Concepts, Human Population, Soil Conservation/Sustainable Ag, Water Management and Conservation, Rangeland Management, Forest Management/National Parks, Wildlife Management/Biological Conservation and Aquatic Environments.

○

FARM MANAGEMENT

This course involves the study of concepts and tools used to support financial operations and decisions of farm activities, including production, budgeting, and finance and risk management. These tools are applied to agriculture in the Somalia and world economies. Contents include: Introduction to farm management, Farm management and decision making process, Basic principles of farm management (production, cost, profit), Farm risk management, Farm resource management, Farm planning and control, Farm budgeting, Farm capital and financing, Farm record keeping, farm financial analysis and farm investment analysis.

○

AGRICULTURAL BIOTECHNOLOGY

This reason behind this course are to understand the basic principles of biotechnology, Understand the promises and risks of plant biotechnology in crop improvement, Acquire the fundamental technical skills of in vitro mass SNU triplication of horticultural crops. course addresses the following topics: Gene cloning, vehicle for gene cloning, methods of gene transfer to plants, application of biotechnology in agriculture and bio-safety, plant tissue culture lab organization, aseptic techniques, micro-propagation, plant tissue culture media types, media preparation and micro-propagation of different horticultural crops. Units to be covered include: Plant Agriculture: The Impact of Biotechnology, Mendelian Genetics and Plant Reproduction, Plant Breeding, Tissue Culture: The Manipulation of Plant Development, Molecular Genetics of Gene Expression, Recombinant DNA, Vector Design, and Construction, Genes and Traits of Interest for Transgenic Plants, Marker Genes and Promoters, Transgenic Plant Production, Transgenic Plant Analysis, Regulations and Biosafety, The Future of Plant Biotechnology. The course also will have practical periods which will tackle, Media components and preparations, Sterilization techniques and inoculation of various explants, Micro propagation of important crops Anther, Embryo and Endosperm culture and Demonstration of Isolation of DNA and gel – electrophoresis techniques.

AGRI-EXTENSION & RURAL SOCIOLOGY

The main objectives of this course include: linking sociological concepts and knowledge with extension education as applied in the dissemination of modernity to bring change and development in the rural areas and the rural people. The course has two parts: sociology and extension parts. The sociology part introduces to the meaning and subject matter of rural sociology, rural organization and structures, the concepts of rural livelihood, rural poverty and food security systems. In each part, the schematic analysis of the issue of gender and development will be addressed. The extension part of the course, deals with major approaches and methods of agricultural extension programs which are important for the betterment of rural life. Throughout the course, students will be able to conceptualize concepts and methods as applied into the development endeavor of the rural sector of our country. Contents include: Defining' agricultural extension, Functions of extension, Philosophy and principles of extension, The Nature of extension work, History of Agricultural extension, Approaches of agricultural extension, Extension Program Planning, Monitoring and Evaluation, Gender issues in agricultural extension services delivery in Somalia, Rural Sociology and development, Social Change and Rural Development, organizations in rural development, Functioning and maintenance of social systems, Socialization, social control and job performance in communities, Rural Sociology and Demography, Education and social change, The environment in which farmers make their decisions and Contemporary issues in Rural Sociology and Rural Development.

POULTRY PRODUCTION

This course will provide a basic principles of anatomy, physiology, nutrition, genetics, reproduction, housing, health, management, nutrient management, processing, economics and biosecurity as they relate to the poultry industry. Lecture periods will consist primarily of instructor presentations and some guest lecturers. Units to be covered include: introduction to poultry production, anatomy and structure of the chicken, physiology and reproduction in poultry. environment and housing, poultry equipment, poultry nutrition, poultry and egg marketing, broilers production, incubation and hatchery of egg, turkey production, diseases and parasites of poultry, poultry biosecurity and vaccination. The course will also include some practical seasons such as formulation of poultry diets, visits of some poultry farms, housing and equipment of poultry.

PASTURE & FORAGE PRODUCTION

The main intentions of this course unit include: Identify management practices upon the concepts of reserve carbohydrates, leaf area, etc, Give details on the forage development strategies being practiced in, Explain agronomic practices for establishment and production of cultivated forage crops, Identify the forage species under the specific edaphic (soil) and climatic conditions, To practice and implement the different forage conservation practices. This course covers the role of forage crops in agriculture, the effect of growth and development on forage quality. Each of the forage legumes and grasses are presented as to their role and management in today's agriculture and grassland ecology. The various environmental aspects related to forage establishment & management, development, seed production, measuring productivity of a pasture. Conservation management is also discussed as to how to produce and preserve quality forages. Units to be covered include Introduction to pasture and forage, Types of grazed pasture, Effects Of Environmental Factors On Forage Plants, Forages Legumes And Their Roles In Tropical Farming System, Agronomic Management For Seed Production, Pest and Diseases Control, Post-Harvest and Regenerative Practices, Cultivates or sown pastures, Forage Utilization, N Fertilization, Defoliation of pastures species, Forage Conservation, Storing And Feeding Conserved Feeds.

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AGRICULTURAL POLICY & PLANNING

This course is designed to provide students with a wide-ranging thorough understanding of the theories, policies, and practices aimed at increasing agricultural production, improve food security and rural development. It will critically analyses the issues, objectives, conceptual foundations, and instruments of various agricultural development policies and approaches. Units to be covered include: Introduction to Agricultural development, Agriculture development policies, Poverty, Hunger, and Malnutrition, The Role of Agriculture and Development Theories, Economic transformation and growth, Agricultural Systems and Resource Use Theories and Strategies for Agricultural Development, Research, Extension, and Education Land, Labor and credit, Pricing Policies and Marketing Systems, Trade Policies, Negotiations, and Agreements, Macroeconomic Policies and Agricultural Development, Capital Flows, Foreign Assistance, and Food Aid.

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AGRICULTURAL PROJECTS MANAGEMENT

The main aims of the course include to help students, understanding & conceptualizing nature of projects, their roles, and their impacts on organizations or institutions, describing the major phases of project cycle management, analyzing projects in different ways, understanding & conceptualizing the principles and practices of logical framework as a tool in project planning and management. Contents covered include: Overview of Project Management, The scope of Agricultural project management, Tools and Techniques of Agricultural Project Analysis and Investment, Solving the critical Path problem, Construction of Networks, Gantt Charts, Activity on A arrow (AOA), Activity on Node (AON), Project resource scheduling, Risk and Sensitivity Analysis of Agricultural Project and Agricultural Project Sustainability Analysis. The course seasons will include an internship for students in some big agricultural projects company.

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BEE KEEPING & HONEY PRODUCTION

The course introduces the basics of the honeybee world by exploring the natural history of apiculture, honeybee biogeography and evolution, biology, social structure, natural enemies, hive products and pollination dynamics. It illustrates the ecological aspects of one of nature's most fascinating creatures under the looming environmental degradation and focuses on hands-on beekeeping activities. Units contained include: Introduction, Economic importance of Honey bee, Honey bee Taxonomy and Races, Bee biology, Morphology and Anatomy of Adult Honeybees, Traditional bee management in the tropics, Modern beekeeping(Apiary construction), Colony Inspection and Maintenance Equipment, Bee behavior, Bee pests and diseases of Honey bee Honeybees diseases, Honeybees brood, Honeybee adults and Adults diseases. The course also includes practical seasons in the field.

○

AGRO-BUSINESS & SMALL PROJECTS

Milestone course for students in Agribusiness. Application of concepts, tools, and principles including management, finance, marketing, economic theory, and quantitative methods to applied agricultural decisions on selected agricultural and agribusiness projects that enhance team-building as well as written, and oral communication skills. Contents to be covered include: The concept of Agriculture, The concept of Business. The concept of Agribusiness, The concept of Agro-business and Steps involved in establishing Agro-business Enterprises, Forms of Agro-business Enterprises, Sources of Finance for Agro-business Enterprises, The concept of Management, Planning in Agro-business Organizations, Staffing as Management Function in Agro-business, Management function of Controlling in Agro-business, Financial Analysis in Agro-business Enterprises, Budgets and Budget Control for Agro-business Enterprises, Marketing of Agro-business Product, Small scale bee keeping project management and Small scale poultry farm project management.

○

PLANT BREEDING

Introduction to general principles, practices, and techniques used to breed plants, select traits, and develop crop cultivars: including biomass feedstock crops. The main objectives are among others, To develop general familiarity with the overall science of plant breeding, To understand how directed selection for crop improvement is affected by plant mating systems, available genetic variation, environmental influences, selection strategies, and the social context, To gain an understanding of the processes involved in natural evolution and directed selection and manipulation by humans, To become familiar with prominent techniques for directed plant improvement. Contents to be covered include: Plant Breeding-history, objectives and scope, Mode of reproduction in crop plants in relation to breeding techniques, Plant variation kind and causes, Genetic consequences of self and cross pollinated crops, Plant Introduction and exploration, Breeding self-pollinated crops, population's improvement, Mass selection, recurrent, selection. Breeding cross pollinated crops mass selection, pedigree, bulk and back cross methods, Male sterility and its importance, Breeding of asexually propagated crops, Clonal selection and apomixes, Polyploidy and mutation breeding.



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

JAAMACADDA UMMADDA SOOMAALIYEED



الجامعة الوطنية الصومالية

SOMALI NATIONAL UNIVERSITY

CURRICULUM & COURSE DESCRIPTIONS

**FACULTY OF ECONOMICS
AND
MANAGEMENT SCIENCE**



2018 - 2019



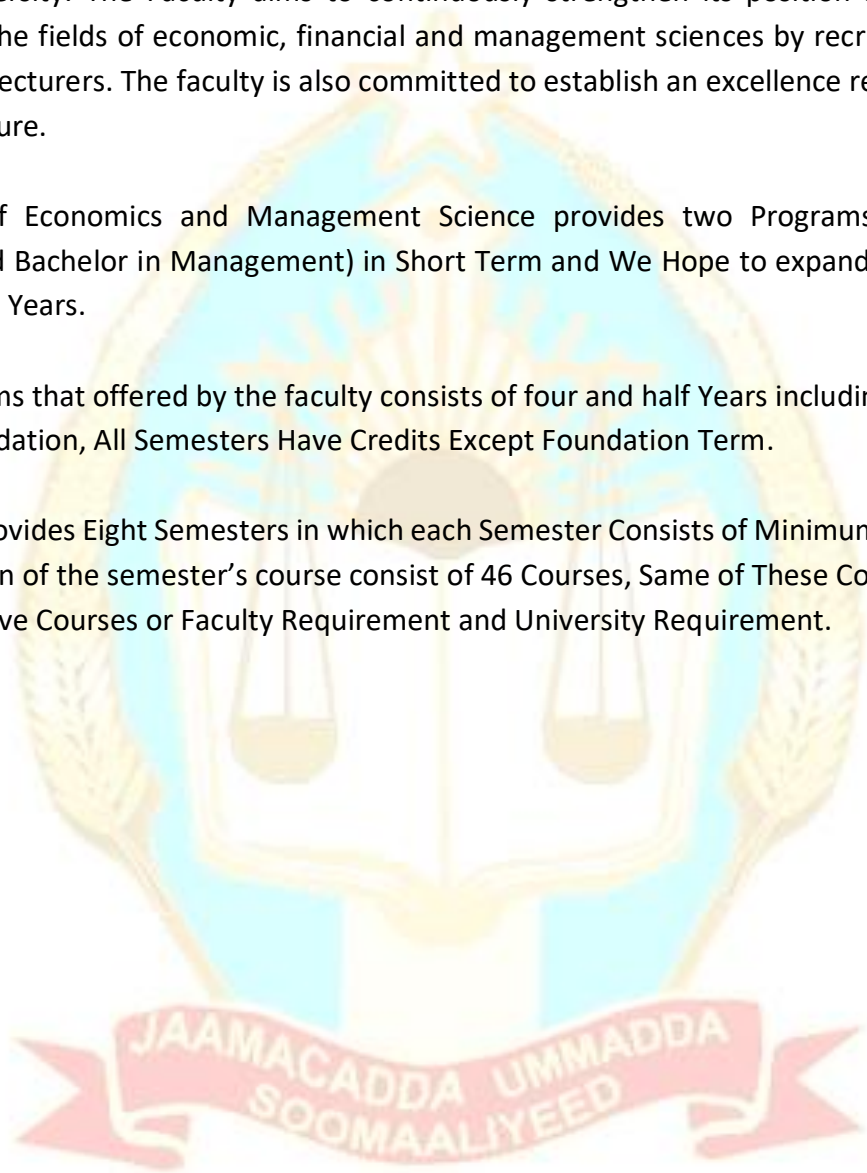
BRIEF PROFILE

The Faculty of Economic and Management Sciences is one of the largest Faculties at the Somali National University. The Faculty aims to continuously strengthen its position as the leading institution in the fields of economic, financial and management sciences by recruiting the best and brightest lecturers. The faculty is also committed to establish an excellence research Centre in the near future.

The faculty of Economics and Management Science provides two Programs (Bachelor in Economics and Bachelor in Management) in Short Term and We Hope to expand our Programs for the coming Years.

All the programs that offered by the faculty consists of four and half Years including 6 months of intensive foundation, All Semesters Have Credits Except Foundation Term.

The Faculty Provides Eight Semesters in which each Semester Consists of Minimum 5 Course and The Summation of the semester's course consist of 46 Courses, Same of These Courses are Core Courses, Elective Courses or Faculty Requirement and University Requirement.





DEPARTMENT OF ECONOMIC COURSE PATTERN

Core Courses: 18

Elective Courses: 10

Faculty & University Requirements: 28

2014 – 2015							
First semester				Second Semester			
C. No.	Course Name	Credit Hrs	Grade	C. No.	Course Name	Credit Hrs	Grade
	Principle Economics	8			Microeconomics	8	
	General Mathematics	8			Advanced Mathematics	8	
	General Accounting	6			Economic Statistics I	6	
	Sociology	6			Applied Accounting	6	
	Islamic Study	4			Private Law	4	
	English I	4			English II	4	
TOTAL				TOTAL			
Grade				Grade			
2015 – 2016							
Third Semester				Fourth Semester			
C. No.	Course Name	Credit Hrs	Grade	C. No.	Course Name	Credit Hrs	Grade
	Macroeconomics	8			Econometrics I	8	
	Enterprise Economics	6			Public Finance	8	
	Economic Statistics II	6			Principle of Marketing	6	
	Public Law	6			Commercial Law	6	
	Money And Baking	8			English IV	4	
	English III	4					
TOTAL				TOTAL			
Grade				Grade			
2016 – 2017							
Fifth Semester				Sixth Semester			
C. No.	Course Name	Credit Hrs	Grade	C. No.	Course Name	Credit Hrs	Grade
	International Economics	8			Economic Policy	8	
	Agricultural Economics	8			Economic Development	8	
	Business English Communication	4			International law of Economics	6	
	Accounting Information System	6			Research Methodology	6	
	Civic Education	4			English Academic	4	
					Somali Studies	4	
TOTAL				TOTAL			
Grade				Grade			
2017 – 2018							
Seven Semester				Eight Semester			
C. No.	Course Name	Credit Hrs	Grade	C. No.	Course Name	Credit Hrs	Grade
	Environmental Economics	8			Maritime Economic	8	
	Somali Economy	8			Industrial Economics	8	
	History of Economic Thought	8			Arabic II	4	
	Economic Development LCDs	8			Financial Mathematics	6	
	Arabic I	4			Econometrics II	8	
	Economic Planning	8			Labor Law	6	
					Fiqul Mucaamalaat	4	
					Thesis		
TOTAL				TOTAL			

COURSE DESCRIPTIONS

CORE SUBJECTS AND FACULTY REQUIREMENTS

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GENERAL MATHEMATICS

This course is designed to develop topics which are fundamental to the study of General Mathematics. Emphasis is placed on algebra reference, linear functions and nonlinear functions and their applications, the mathematics of finance, matrices and their operations, graphs of linear and quadratic functions, linear programming and the concept of probability. Upon completion, students should be able to select and use appropriate models and techniques for finding solutions to algebra-related problems with and without technology. The other topics to cover are Functions, the linear programming, graphs and applications of linear equation and non-function.

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GENERAL ACCOUNTING

This course includes the following topics: Measuring and recording business transactions, Adjusting entries, completion of accounting cycle, accounting for Merchandise operations, Inventories, Internal control and cash, receivables, Plant Assets and Current liabilities.

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PRINCIPLE OF ECONOMICS

This course provides an introduction to a broad range of economic concepts, theories and analytical techniques. It considers both microeconomics - the analysis of choices made by individual decision-making units (households and firms) - and macroeconomics - the analysis of the economy as a whole. The use of a market, supply and demand, model will be the fundamental model in which trade-offs and choices will be considered through comparison of costs and benefits of actions. Production and market structure will be analysed at the firm level. Macroeconomic issues regarding the interaction of goods and services markets, labour and money at an aggregate level will be modelled. The role of government policy to address microeconomic market failures and macroeconomic objectives will be examined.

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PRINCIPLE OF SOCIOLOGY

This introductory course provides students with the skills to analyze society from a sociological perspective. It examines a number of pressing social problems within contemporary Somali society and offers a comprehensive introduction to the discipline of sociology and its foundational theories. It aims to provide students with the skills to understand examine and explain broad social trends and their impact on the individual. Key sociological concepts covered include class/socioeconomic status, gender, youth, ethnicity, family, work, consumption and location.

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ENGLISH I

This is an Elementary English course for non-native speakers of English and it emphasizes elementary competency in Standard English with a focus on speaking, basic grammar, listening & reading skills necessary for success in introductory English as a foreign language. Learners should be able to learn basic Vocabulary, expressions, grammar, and contextualized social language that is essential for communicative skills in small groups as well as individual presentations. It will also emphasize role plays in various

situations and students will practice writing at a paragraph level and reading and listening from various sources.

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ISLAMIC STUDIES

These courses come from multiple departments and programs which contribute to the programs in Islamic Studies. Courses provide students with a rich, multidisciplinary perspective on issues involving the societies, cultures, history, and politics of the Islamic world. The students are expected to know five pillars of Islamic and 6 Spillars of iman(faith). They must know also basic of fiqh such as what makes one pray, fast and haj and invalid.

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PRINCIPLE OF MICROECONOMICS

The course provides an introduction to a core area of economics known as microeconomics. It considers the operation of a market economy and the problem of how best to allocate society's scarce resources. The course considers the way in which various decision making units in the economy (individuals and firms) make their consumption and production decisions and how these decisions are coordinated. It considers the laws of supply and demand, and introduces the theory of the firm, and its components, production and cost theories and models of market structure.

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ADVANCED MATHEMATICS

This course is designed to develop topics which are fundamental to the study of Advanced Matematics. Emphasis is placed on algebra reference, linear functions and nonlinear functions and their applications in higher than General Mathematics, the derivatives, calculating the derivatives , graphs and the derivative, and applications of the derivatives and Partial differentiation. Upon sucessful completion of this course, students should be able to select and use appropriate models and techniques for finding solutions to algebra and other mathematical related problems through practical applications. (With and without technology). The other topics covered are Functions, the derivatives, graphs and the derivative and applications of derivatives

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ECONOMIC STATISTICS I

This courses provides students in Economics, accounting. finance, international business, sales, management and other field of business and marketing with concise introduction inferential statistics Hypothesis and hypothesis procedures to teach students how to predict the accurate data. Methods to use Time series Analysis and Forecasting. Understand the role of quality control in production and service operations Definition of new terms unique to study of statistics Define Price index and how to calculate the price index.

○

APPLIED ACCOUNTING

Introduce the student to the accounting cycle. Basic concepts covered include double-entry bookkeeping and an examination of Statement of Comperhensive income(SOCI), income expense and Statemnt of Financial Position. (balance sheet statements). Cash receipt, cash disbursements, accounts receivable and accounts payable are emphasized. Intended to be the first accounting course for students who have not taken high school accounting and/or have no accounting experience.

PRIVATE LAW

This course examines the role of law in regulating four types of legal relationships: relationships established by agreement (contract law); relationships based upon widely recognized legal duties owed to others (tort law); relationships based upon respective interests in property (property law); and relationships based upon fiduciary obligations (the law of trusts). Throughout the course consideration will be given to the role of government in regulating private law relationships.

ENGLISH II

This is an integrated elementary-level course that builds on the foundation program as part of the package program which aims to bridge the gap between secondary school and university education. The course is intended for non-native speakers of English and consists of a number of elementary competencies in Standard English: literacy, communication, critical and creative thinking skills as well as academic English necessary for success in academic and daily life. An important focus will be to develop students' receptive skills (reading & listening) and productive skills (writing and speaking) as well as to build on their basic knowledge of grammar and vocabulary. This involves intense practice in listening, speaking and writing. Contextual social language will be used to enhance essential communication skills, while using academic language best suited to particular texts and purposes for reading and developing greater control in writing. Classroom learning is reinforced with a variety of Multimedia programs and special websites for students' supplementary materials and self-assessment.

PRINCIPLE OF MACROECONOMICS

This course will teach the students the basic tools of macroeconomic theory and how to apply it to the real world. It examines macroeconomic issues of National Income, business cycle, unemployment, Inflation, and economic growth.

ENTERPRISE ECONOMICS

Simply speaking enterprise economics is what entrepreneurs do and this course is precisely about that! The course deals in detail with the 4 basic fields: entrepreneurship, organization, management and marketing research. The course is composed of 28 lectures, 2 quizzes, 10 papers and two written evaluation exams (Midterm and final exam). Special consideration will be given to highlight the applied or practical side of management rather than theories alone. For this purpose examples from Somalia and international context of business and management are intended to be presented as real life situations. Another aspect which adds depth to this course is the extensive use of cases and managerial situations so that the students acquire the skills and knowledge to encounter these issues when faced in their work life. This is a core course and the main objective is to arouse participants' interest in the field of management and organization on one hand, and the applicability of theoretical knowledge on the other hand in its related areas. Two hundred years ago, before the industrial revolution, the concept of professional management and managers did not exist. Today millions of people around the world are managers. These managers coordinate and control organizational resources, lead their people into the future, and help their organizations respond to everything from technological changes to social expectations. Management touches everyone's daily lives in a variety of ways: managers run the largest and smallest businesses, hospitals and schools, charities and art organizations, governments and military organizations.

ECONOMIC STATISTICS II

Introduction to Probability and Statistics, students examine advanced statistical techniques and methods and their applications in business and economics. Topics include review of hypothesis tests; inferences about population variances; comparing multiple proportions for three or more populations and tests of independence; analysis of variance and experimental design; simple and multiple regressions; and time series analysis and forecasting. Students are required to apply statistical techniques using Excel and XLSTAT.

MONEY AND BANKING

Money, Banking, and Financial System is in the heart of financial economy. The Financial system consists of Money, Financial Instruments, Financial Markets, Financial Institutions, Government Regulatory Agencies, and Central Banks. Without understanding it properly, it will be hard to become an economist. This course is also about learning money including history of payment and evolution of Money and how commercial and central Banks work. Furthermore, this course provides to students the five core principles of Money and Banking based on Time, Risk, Information, Markets and Stability. The course give comparison analysis between Independent and dependent Central Banks. It also focuses on how money is created and who can do that. Monetary policy is to be taught and how central banks involve such this policy. An overview of Global Financial Crisis and Role of Governments as well as the role of Financial Markets on global prospective.

PUBLIC LAW

Unlike private law, which concerns the legal relations between individuals, public law encompasses relations among persons (individuals and corporate bodies), groups, levels of government, and the various actors and institutions comprising the state. These relations form the basis of administrative, constitutional, and the vast multiplicity of statutory law. Public law defines the structures, powers, and duties that inform these relations. The fundamental purposes of public law are to ensure legal accountability for public law-making and decision-making as well as to guarantee the legitimacy of the respective procedures. This course will focus primarily on statutes, including the enactment of legislation, approaches to statutory interpretation, and the role and objectives of statutes in furthering legal and political accountability. This course will also survey the various branches of government: legislative; executive, and judiciary, the relationship between each branch of government, the nature of their powers and authority, and the sources of law governing their functioning and powers.

ENGLISH III

This is an Elementary English course for non-native speakers of English and it emphasizes elementary competency in Standard English with a focus on speaking, basic grammar, listening & reading skills necessary for success in introductory English as a foreign language. Learners should be able to learn basic Vocabulary, expressions, grammar, and contextualized social language that is essential for communicative skills in small groups as well as individual presentations. It will also emphasize role plays in various situations and students will practice writing at a paragraph level and reading and listening from various sources.

ECONOMETRICS I

This Course introduces the regression methods for analyzing data in economics. This course emphasizes both the theoretical and the practical aspects of statistical analysis, focusing on techniques for estimating econometric models of various kinds and for conducting tests of hypotheses of interest to economists. The goal is to help you develop a solid theoretical background in introductory level econometrics, the ability to implement the techniques and to critique empirical studies in economics.

PUBLIC FINANCE

Students Examine the Rationale for Government Intervention in a Market economy, the assesment of public policy and the impact of government expenditures and taxation on the economy and the citizenry. Topics will include government activities in public finance, theory of public goods and optimal taxation, Public expenditure, public revenue, fiscal deficits and public debt, principles of taxation, incidence and effects of taxation, principle of maximum social advantages, financial administration, public enterprise, externalities and black money.

COMMERCIAL LAW

This course introduces students to the laws governing commercial transactions, primarily in the area of personal property. The course deals at length with the Sale of Goods Act 1923 (NSW) and with product liability.

PRINCIPLE OF MARKETING

A study that builds on the evolution of modern management toward a marketing-oriented view of business; stressing the underlying principle of the “marketing concept”; and integrating concepts in relation to consumer needs, marketing information, product development, pricing, distribution, selling, advertising, and promotions.

ENGLISH IV

This course is intended to help students improve their English skills in preparation for general courses. There is a particular focus on developing reading and writing skills, speaking, pronunciation, listening, spelling, and grammar. We will also work on mathematics by focusing on vocabulary. We will be meeting two hours a week in the computer lab to work on reading comprehension, vocabulary and speed, and mathematics.

INTERNATIONAL ECONOMICS

The objective of this course is to introduce students to both classical and modern theories of international trade in goods and services, as well as empirical research on trade. This course will provide students with a fundamental understanding of international economics in the 21st century. Students will be a fundamental understanding of international economics in the 21st century and a solid understanding of trade and globalization of international financial institutions. The main goal of the second part of the course is to introduce students to introductory level of theories of international finance flows, determination of interest and exchange rates in interconnected economies, macroeconomic policies available to the government, and the nature of financial crises.

AGRICULTURAL ECONOMICS

A study of economic principles, with emphasis on their application to the solution of farm, agribusiness, and agricultural industry problems

BUSINESS COMMUNICATION

The aim of this course is to develop students' communication skills in the English language that will enable them to function effectively in a business environment. The course offers a practical approach to corporate communication that includes training in the principles and key elements of business writing and the effective delivery of oral presentations. The course content focuses on selected written and oral forms of communication related to topics and issues critical to students of Business Studies.

COMPUTER INFORMATION SYSTEM

General nature of computer hardware, software and systems: Hands-on applications include introduction to word processing, spreadsheet, database management, and presentation software, and a brief introduction to web browsing and e-mail.

CIVIC EDUCATION

Civic education includes the study of the purpose of government, the nature of law, the way private behavior affects the public order, the political system, and the international context of politics. In most countries, formal instruction in civics and government is provided to students to help them understand the workings of their own and other political systems as well as the role and relationship of their country's politics and government to world affairs.

ECONOMIC POLICY

The aim of this course is to appraise students of bases of economic policy. The course is concerned about creation and application of economic policy by central organs of state (central bank, government etc.) or by regional authorities. The course enlarges economic knowledge acquired in courses of microeconomics and macroeconomics. Students should understand the meaning of economic policy measures and deduce their impact on economic subjects and entire economy.

ECONOMIC DEVELOPMENT

This is an intermediate undergraduate course in development economics. The course covers the following topics: the meaning and measurement of economic development, growth theories, poverty and income distribution, the role of geography and institutions, fertility and population growth, the role of credit markets and microfinance, health and nutrition, education, female empowerment.

INTERNATIONAL ECONOMIC LAW

In this course common principles of International Economic Law will be examined by analyzing leading decisions by international courts. Therefore a substantial part of the course will be dedicated to class room discussion of cases and reading materials. Multinational companies like Google or Apple self-evidently act on a global stage. But even small businesses participate in international trade today. The integration of national economies and the elimination of barriers of trade no longer allow a solely national view on this development. With the growing importance of international commerce, the need for an „International Economic Law“ arises. Numerous regulations and agreements concern international trade and investment, but the legal framework of international economy remains indefinite.

RESEARCH METHODOLOGY

The aim of this course is to introduce early career researchers to some of the methods and techniques of research and their methodological frameworks in their diverse and pluralistic nature, and to demonstrate their purpose, relevance and effectiveness. Further, it aims to provide a full coverage of the area of research, attempting to integrate all popular methodologies and methods, in both theory and practice. This course aims to introduce a researcher to a wide area of study ranging from traditional research models of positivism and neo positivism to more recent developments such as grounded theory and ethnographic approaches. Statistical techniques employed by researchers and the use of computers in research will also be discussed. Finally, it aims to present research as a dynamic process leading from the beginning to the end, and from questions to answers, showing clearly how researchers progress from one stage to the next, how decisions are made, how questions are chosen, and how conclusions/ inferences are drawn.

ACADEMIC WRITING

This course aims to help you write clear, grammatically accurate and well-organised academic English. A major focus of the course will be on the language used to express the main communicative functions used at all levels of academic discourse (eg defining, comparing, describing cause and effect). In addition, some sessions will cover certain common features of academic texts (style, conventions, and phraseological patterns). Examples of different types of text and the language used in them will be examined and discussed, and you will have a chance to practise a series of writing tasks, both individually, and, where possible, collaboratively, in groups.

SOMALI STUDIES

Somali is a language spoken by all Somali native. It has been in use since 1972 only after less than three years of the revolution. Somali language is important not only written communication but also literature purpose songs and poets. Without deep understand of Somali language, it may become difficult for the native to know more about their heritage and culture. Therefore, Somali University, particularly the Faculty of Economics and Management Science is committed to teaching Somali language. This course is comprised of songs, poet, literature and Somalia history and citizenship. Upon completion of this course, the students are expected to know the history of Somalia, Learn songs and poet and understand Somali history.

HISTORY OF ECONOMIC THOUGHTS

This course traces the history of Western economic thought from ancient to modern times, with an emphasis on developments since Adam Smith published the Wealth of Nations in 1776. We attempt to understand the interactions of scholars in building a discipline called "economics," the influence of technological change and the social, business, and political environments on economics, as well as the influence of economists on society. In addition, we examine the progress of the principles of economics from their formative stages to modern times

ECONOMICS OF DEVELOPING COUNTRIES

How do countries develop? How can we measure wealth, poverty and inequality? What barriers to development do low-income countries face? What can be done about global poverty? In this class we will explore answers to these questions. In the first half of the class, we will study the history of development in the West and theories of economic growth. We will explore different approaches to economics, and cover the work of Adam Smith and John Maynard Keynes. In the second part of the class, we will discuss barriers to growth in low-income countries, investigating institutional, geographic and political factors. In spite of these barriers, we will analyze new evidence of the recent ascent of the developing world and

consider how countries have overcome challenges to development. Finally, we will investigate the contemporary role of randomized-control trials (RCTs) in helping policymakers find solutions to poverty.

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PRINCIPLES AND TECHNIQUES OF ECONOMIC PLANNING

The course material covers three main elements of economic and strategic planning: Conducting Strategic Analysis; Developing Strategic Direction and Implementing Strategic options. It covers topics such as: What is Strategy? What is Economic Planning? The Planning Process, Forecasting, Strategy Formulation, Planning and Budgeting, Balanced Scorecard, Strategy Execution. The course is delivered through a combination of practical coursework and classroom lectures

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SOMALI ECONOMY

The course aims to provide a framework for consistent reasoning about domestic production, livestock, farming, fishing, and poverty of the country and so on.

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ENVIRONMENTAL ECONOMICS

The course is designed as a broad survey course covering the most critical topics in environmental economics today. Economics, the science of how scarce resources are allocated, is at the core of many of our most challenging environmental issues, and therefore vitally important. In a world of increasing scarcity and competing demands, economic analysis can guide public policy to efficient utilization of resources. Market failures are the cause of many of our most serious environmental problems, but can be remedied with economic tools. Getting prices to reflect true costs, providing productive incentive structures, and explicitly valuing environmental amenities are the primary goals. Topics covered include the economics of population growth, poverty & income distribution, market failures, economic valuation, economic incentive instruments, food and water resources, international agricultural markets, fisheries, and wildlife conservation.

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ARABIC I

The goal of this course is to begin developing reading, speaking, listening, writing, and cultural skills in Arabic. The course stresses communication using both formal and informal Arabic. Preparation for class is an essential component of the course, allowing us to devote in-class time to communicating in the language rather than talking about the language. Students will be evaluated on attendance and class participation, daily homework assignments, quizzes, skits, presentation, and a final examination

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MARITIME ECONOMIC

The objective of this unit is to provide a basic understanding of the organization and operation of the maritime industry from an economics perspective. The main focus is on the economic behavior of ship-owners, shippers, and other stakeholders in the markets for liquid bulk, dry bulk and container shipping, shipbuilding and second-hand ships.

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ECONOMETRICS II

In this course, students will develop a sound understanding of modern econometric theory. Sound working knowledge of matrix algebra and statistical theory will be assumed; students without the prerequisite skill set should take the initiative to seek additional help via reference to relevant texts. Sound working knowledge of the classical econometric methods covered in ECON3049 will be assumed. Students are also expected to be computer literate and to be familiar with the Econometric package E-Views.

LABOR LAW

The course focuses on legislation related to employment conditions, such as, hiring, working hours, vacation and termination of employment. The general theme in all phases of the course are regulations concerning equality.

FINANCIAL MATHEMATICS

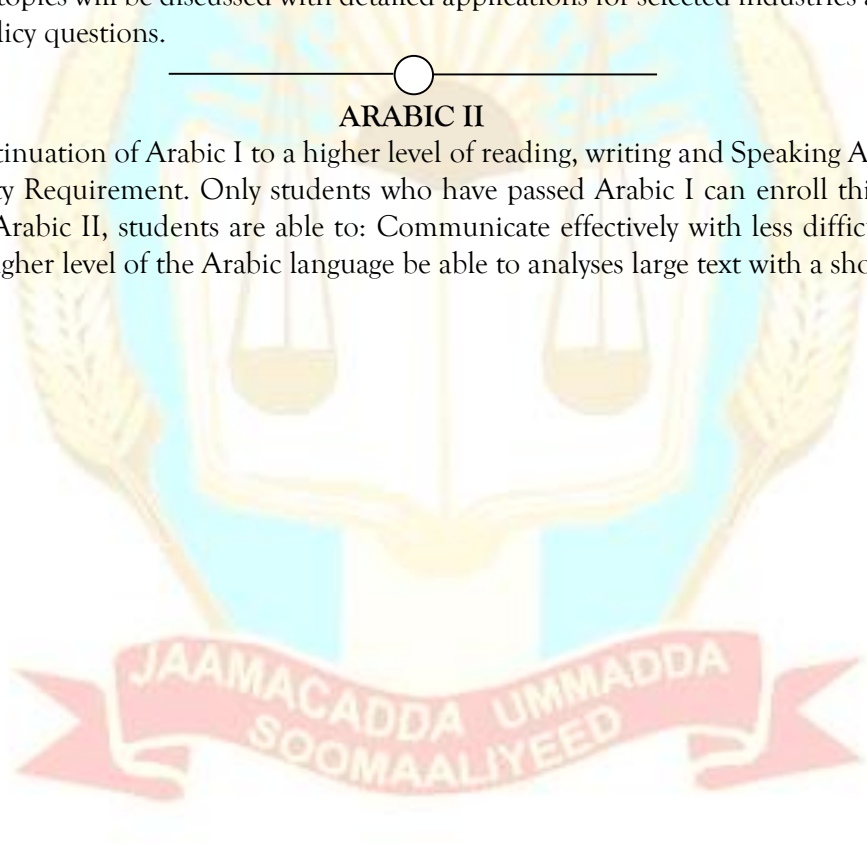
This course provides an introduction to the basic mathematical concepts and techniques used in finance and business, highlighting the inter-relationships of the mathematics and developing problem solving skills with a particular emphasis on financial and business applications.

INDUSTRIAL ECONOMICS

The aim of the course is to provide students with a working knowledge of theoretical and empirical methods for industry studies. Topics may include: monopoly, price discrimination, pre-requisites in game theory, oligopoly theory, product differentiation, demand estimation, production function estimation, conduct in concentrated industries (cartel stability, limit pricing, etc.), empirical techniques for oligopoly models, identification of conduct, markets with asymmetric information, matching models, entry in strategic settings, advertising, auction markets, empirics of auction markets, winner's curse, and insurance. The topics will be discussed with detailed applications for selected industries and considering competition policy questions.

ARABIC II

Arabic II is continuation of Arabic I to a higher level of reading, writing and Speaking Arabic Language. It is a University Requirement. Only students who have passed Arabic I can enroll this course. Upon completion of Arabic II, students are able to: Communicate effectively with less difficult Speak, write and read in a higher level of the Arabic language be able to analyses large text with a short period



ELECTIVE COURSES

GLOBAL ISSUES IN STRATEGIC FINANCIAL PLANNING

This course will be taught in the 3rd year of economic streamline of SNU the faculty of economics and management science as an optional. The availability of the course is subject for sufficient number of the students to enroll it.

GOVERNMENT AND BUSINESS

The relationship between Somali government and private businesses is essential both for the economic and social development and delivery of public policies and for the successful operation of businesses in Somalia. This course observes the nature of the relationship and the interactions between government and business in Federal Republic of Somalia. Topics to be considered include: Role of politics, markets and regulation, Globalization, Global business policy, business, the environment and sustainable development, Social responsibility and corporate governance, power of business, promotion of business competitiveness, e-business and e-government, rise of regulatory state, and the regulation of business activity.

BRAND MANAGEMENT

Brands are facing challenging times - and this course's aim is to equip students with an understanding of the models and frameworks necessary for them to understand, develop and grow brands in a variety of organizational contexts. The course is structured to bring together new product development and innovation, and subsequent brand development, the course allows the student to develop creative thinking skills and related business insight. A combination of teaching and learning techniques will be utilized including contemporary case studies, videos and role play. The theory will be explained and applied by tutors who have relevant experience managing products and brands for well-known companies.

POLITICAL ECONOMY

Traditional economic theories of the public sector view the government as an exogenous, benevolent economic agent. This view, though politically naive, is not without merit. For some public issues a consensus may be reached, and then the naive approach may suffice to explain government behavior. But more often, redistributive effects are central; then government actions can be understood only as a consequence of the political forces that enable it to maintain power. Political Economy regards income redistribution, taxation, the production of public goods, and other actions of the public sector as determined by a political process simultaneously with the economic process of exchange and production. In this course, we will investigate the connection between public policies and the political forces that shape them. We will attempt to explain why the government behaves as it does and how its behavior influences and is in turn influenced by the behavior of private citizens. We will also investigate the effects of political institutions on political and economic outcomes and assess the relative performance of different political systems.

LABOR ECONOMICS

This course will build upon Microeconomics and Macroeconomics introduced in Years 1 and 2 in order to develop an understanding of some of the principal issues in modern labor economics, while providing opportunities to practice and develop a range of key skills. This course will analyze topics of behavior and outcomes in labor markets and other related markets. We will discuss the way in which labor markets are organized and what implications this has for individual outcomes. We begin by considering the behavior of firms (labor demand) and workers (supply) and examine how labor market equilibrium is

obtained. After that, we turn to a variety of topics such as the returns to education, labor mobility, and inequality. The main analytical tools will be theoretical but we will also be using real-world examples and applied techniques in order to evaluate the theoretical models and relate them to topical issues in public policy. You will need to be prepared to use microeconomics, algebra, and basic econometrics.

○

MATHEMATICAL ECONOMICS

The aim of the course is to provide an introduction to dynamic methods commonly used in economics. Students learn various methods used to solve difference and ordinary differential equations. Particular emphasis is placed on learning about how to use these methods in order to analyze economic issues and problems.

○

MONETARY ECONOMICS

The course provides an introduction to monetary theory, to the effects of monetary variables on the macroeconomic system, the role of the central bank and the conduct of monetary policy. Subjects covered include: The nature and function of money; Asset prices and the term structure of interest rates; Classical monetary theory, neutrality and inflation; Interest-rate feedback rules; The interaction between monetary and fiscal policy; Theories of the demand for money; The market for reserves; Financial markets and financial intermediaries; The transmission mechanism of monetary policy and theories of the Phillips curve; The optimal rate of inflation and optimal stabilization policy; The positive theory of inflation and the case for central bank independence; Policymaking in an uncertain environment; The role of banks in the transmission mechanism and the case for bank regulation; Financial crises.

○

MANAGERIAL ECONOMICS

To illustrate the application of economic theory and methodology as an alternative in managerial decisions. The purpose of this course is to provide students with a basic foundation of economic concepts and tools that have direct managerial applications. The course will sharpen analytical skills of students through integrating knowledge of economic theory with decision making techniques. The course will help students become more adept at designing and developing business strategy at firm level. Students should gain a rigorous understanding of competitive markets as well alternative market structures.

○

PUBLIC ECONOMICS

This course investigates the role of the public sector in the economic arena. We will attempt to explain why government intervention is needed, how it influences the behavior of the private sector and what the welfare effects of such influences are. We will also survey political economy, which regards actions of the public sector as determined by political processes. Topics covered may include welfare economics, market failures, and political economy.

○

CORPORATE FINANCE

The course develops theoretical framework for understanding and analyzing major financial problems of modern company in market environment. The course covers basic models of valuation of corporate capital, including pricing models for primary financial assets, real assets valuation and investment projects analysis, capital structure and various types of corporate capital employed, derivative assets and contingent claims on assets. It provides necessary knowledge in evaluating different management decisions and its influence on corporate performance and value. The course requires the knowledge in micro and macroeconomics, accounting and banking. The course is based on lectures, seminars, case studies and self-study. “Corporate finance” is a two-semester course designed to prepare students for UOL examination.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

JAAMACADDA UMMADDA SOOMAALIYEED



الجامعة الوطنية الصومالية

SOMALI NATIONAL UNIVERSITY

CURRICULUM & COURSE DESCRIPTIONS

**FACULTY OF EDUCATION
AND
SOCIAL SCIENCE**

JAAMACADDA UMMADDA
SOOMAALIYEED

2018 - 2019

BRIEF PROFILE

Brief History of Faculty of Education & Social Sciences

The Faculty of Education and Social Sciences was known as Lafoole College of Education and had its beginning with the founding of the National Teacher Education Centre in 1963. From an initial enrolment of 60 students, the College has expanded to enrolments exceeding 1000 students. The original campus buildings have been augmented by several new structures including additional classrooms, expanded library capacities, and new laboratories.

In the new decade of the 1960's, the College operated a four-year program of study. During the 1970's this program was consolidated into a two-year program to accommodate the increasing demands for trained teachers. In 1983, the program was revised and expanded again into a comprehensive four-year program of study. At that time, a format of two 16-week semesters was instituted. Also, a new addition to the new curriculum was an interim session between the fourth and fifth semesters designed to provide students with opportunities to develop classroom teaching skills through guided practice in public school classrooms.

The last Course Catalogue for Lafoole college of Education before the civil war was developed during a workshop held in 1989 under the auspices of the United States Information Agency and the University of Massachusetts' Centre for International Education. Lafoole College of Education (Faculty of Education and Social Sciences now) was dedicated to the belief that individualized, facilitative, and socially useful higher education requires a combination of professional and theoretical training balanced with responsible participation in society.

It is the philosophy of the college of education that a college graduate in general and a teacher in particular needs to be broadly educated, as well as be a master of his chosen discipline. Furthermore, a graduate must be trained in depth in his field so as to be able to teach at the secondary level and to compete successfully when undertaking graduate studies. As well, it is equally essential that he clearly see how his discipline relates to the rest of society and that he is able to communicate successfully with those not trained in his discipline. Consistent with its aims and philosophy, Lafoole College of Education strived to:

1. Make available to all undergraduates the intellectual training and knowledge that will add meaning, scope, richness and interest to their lives.
2. Provide for undergraduates an education that will equip them to make important cultural, social and economic contributions.
3. Provide for undergraduates the quality and scope that will qualify them to enter graduate and professional schools.

After the Faculty was reopened in 2013, it started offering four programs of study or specializations which are major in Biology & Chemistry, major in Chemistry & Biology, major in English & History and major in Mathematics & Physics. In the last year, it added two years' diploma which is major in primary education and at the beginning of 2019 Bachelor in Social Work (BSW) was started. Therefore, the Faculty offers now the above six academic programs at the undergraduate level that are designed to develop the intellectual, academic and professional capacity of our students. Our pre-service programs in teacher education combine disciplinary knowledge, pedagogical content knowledge with practical field experiences in areas such as science and mathematics education, language education and social science education.

Strategic Vision

The Faculty of Education and Social Sciences seeks to usher in a new era of social responsibility and be a first class higher education institution through research and innovation and produce a well-educated, qualified and equitable society.

Mission Statement

Our mission is to advance teacher status and profession by producing graduates who embody integrity, leadership and social responsibility as core values; graduates who are dedicated to what education enables them to be and not just what it prepares them to do. Our graduates will become the next generation of schoolteachers, adult educators, counselors, educational leaders and administrators. We are committed to producing competent, caring and innovative professionals who can make a positive difference in the education sector and society at large.

Core Values

The Faculty shall be guided by the following core values:

1. Freedom of thought and expression
2. Innovativeness and creativity
3. Good corporate governance
4. Team spirit and teamwork
5. Social responsibility

Guiding Principles

- Professionalism
- Inclusiveness
- Integrity
- Equity

Mode of Study

The Faculty of Education and Social Sciences currently operates on a full time basis. This means that classes are attended during the day. No evening or weekend classes are being offered currently.

Departments and Specializations

Faculty of Education and Social Science has three departments

- Secondary Department
- Primary Department
- Social Work Department





SECONDARY EDUCATION DEPARTMENT
Program: Major in Biology minor in Chemistry
COURSE PATTERN

ACADEMIC YEAR ONE							
First Semester				Second Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd Hrs	
CHEM1101	General Chemistry	4		PHYS1202	Electricity and magnetism	4	
PHYS1101	General Mechanics	4		MATH1202	Calculus I	4	
MATH1101	Pre-Calculus	4		BIO1203	Zoology II	4	
BIO1101	Zoology I	4		BIO1204	Botany II	4	
BIO1102	Botany I	4		CHEM1202	Inorganic Chemistry	4	
IS1101	Islamic Studies I	2		ENG1202	English II	4	
EDU1101	Principles of Education	4		EDU1203	Psychology of Education	4	
EDU1102	Introduction to Education	4		EDU1204	Sociology of Education	4	
ENG1101	English I	4		ARA1201	Arabic I	2	
COM1101	Computer Applications	2					
TOTAL		36		TOTAL		34	
ACADEMIC YEAR TWO							
Third Semester				Fourth Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd. Hrs	
BIO2305	Human anatomy Physiology I	4		BIO2408	Plant Anatomy	4	
BIO2306	Cell Biology	4		BIO2409	Genetics	4	
BIO2307	Tropical crops	4		MATH2403	Probability and statistics	4	
CHEM2303	Organic Chemistry I	4		CHEM2404	Organic Chemistry II	4	
ENG2303	English III	4		CHEM2405	Qualitative Chemical Analysis	4	
EDU2305	Child Development	4		BIO2410	Human Anatomy & Physiology II	4	
EDU2306	Civic Education	4		EDU2407	Measurement and Evaluation	4	
ARA2302	Arabic II	2		EDU2408	Curriculum Studies	4	
				IS2402	Islamic Studies II	2	
				ENG2404	English IV	4	
TOTAL		30		TOTAL		38	
ACADEMIC YEAR THREE							
Fifth Semester				Sixth Semester			
C. Code	Course Name	Crd. Hrs		C. Code	Course Name	Crd. Hrs	
BIO3511	General Ecology	4		BIO3614	Vertebrate Embryology	4	
BIO3512	Plant Pathology	4		BIO3615	Environmental Science	4	
CHEM3506	Biochemistry	4		CHEM3607	Quantitative chemical analysis	4	
BIO3513	Plant Physiology	4		CHEM3608	Physical Chemistry	4	
ENG3505	English V	4		EDU3611	Teaching Methodology	4	
EDU3509	Educational Technology	4		EDU3612	Educational Plan. & Management	4	
EDU3510	Research Methodology in Education	4		ENG3606	English VI	4	
SOM3501	Somali studies I	2		SOM3602	Somali Studies II	2	
TOTAL		30		TOTAL		30	

ACADEMIC YEAR FOUR

Seventh Semester				Eighth Semester			
C. No.	Course Name	Crd Hrs		C. No.	Course Name	Crd. Hrs	
SP4701	Senior Project	4		GT4801	Graduating Thesis	4	
BIO4716	Vertebrate Comparative Anatomy	4		EDU4815	Advanced Teaching Practice	4	
BIO4717	Community Health	4					
BIO4718	Microbiology	4					
EDU4713	Subject Didactics (Teaching Biology)	4					
EDU4714	Basic Teaching Practice	4					
TOTAL		24		TOTAL		8	





SECONDARY EDUCATION DEPARTMENT
Program: Major in Chemistry with a minor in Biology
COURSE PATTERN

ACADEMIC YEAR ONE							
First Semester				Second Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd Hrs	
CHEM1101	General Chemistry	4		PHYS1202	Physics II	4	
PHYS1101	Physics I	4		MATH1202	Calculus I	4	
MATH1101	Pre-Calculus	4		BIO1203	Zoology II	4	
BIO1101	Zoology I	4		BIO1204	Botany II	4	
BIO1102	Botany I	4		CHEM1202	Inorganic Chemistry I	4	
IS1101	Islamic Studies I	2		CHEM1203	Organic Chemistry I	4	
EDU1101	Principles of Education	4		ENG1202	English II	2	
EDU1102	Introduction to Education	4		EDU1203	Psychology of Education	4	
ENG1101	English I	4		EDU1204	Sociology of Education	4	
COM1101	Computer Applications	2		ARA1201	Arabic I	2	
TOTAL		36		TOTAL		36	
ACADEMIC YEAR TWO							
Third Semester				Fourth Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd. Hrs	
BIO2305	Human anatomy Physiology I	4		BIO2407	Plant Anatomy & Physiology	4	
BIO2306	Cell Biology	4		CHEM2407	Biochemistry I	4	
CHEM2304	Inorganic Chemistry II	4		MATH2403	Probability and statistics	4	
CHEM2305	Organic Chemistry II	4		CHEM2408	Qualitative Chemical Analysis	4	
CHEM2306	Principle of Analytical Chemistry	4		CHEM2409	Physical Chemistry I	4	
PHYS1203	Introduction to Atomic Physics	4		PHYS1204	Nuclear Physics	4	
ENG2303	English III	4		BIO2408	Human Anatomy Physiology II	4	
EDU2305	Child Development	4		EDU2407	Measurement and Evaluation	4	
EDU2306	Civic Education	4		EDU2408	Curriculum Studies	4	
ARA2302	Arabic II	2		IS2402	Islamic Studies II	2	
				ENG2404	English IV	4	
TOTAL		38		TOTAL		42	
ACADEMIC YEAR THREE							
Fifth Semester				Sixth Semester			
C. Code	Course Name	Crd. Hrs		C. Code	Course Name	Crd. Hrs	
CHEM3510	Biochemistry II	4		CHEM3513	Instrumental analysis	4	
BIO3509	Ecology	4		CHEM3514	Natural Product of Chemistry	4	
CHEM3511	Physical Chemistry II	4		CHEM3515	Environmental Chemistry	4	
CHEM3512	Quantitative Chemical Analysis	4		EDU3611	Teaching Methodology	4	
ENG3505	English V	4		EDU3612	Educational Plan. and Management	4	
SOM3501	Somali studies I	2		ENG3606	English VI	4	
EDU3509	Educational Technology	4		SOM3602	Somali Studies II	2	
EDU3510	Research Methodology in Education	4					
TOTAL		14		TOTAL		26	

ACADEMIC YEAR FOUR

Seventh Semester				Eighth Semester			
C. No.	Course Name	Crd. Hrs		C. No.	Course Name	Crd. Hrs	
SP4701	Senior Project	4		GT4801	Graduating Thesis	4	
CHEM3516	Introduction to Industrial Chemistry	4		EDU4815	Advanced Teaching Practice	4	
CHEM3517	Organ metallic Chemistry	4					
EDU4713	Subject Didactics (Teaching Chemistry)	4					
EDU4714	Basic Teaching Practice	4					
TOTAL			20	TOTAL			8





SECONDARY EDUCATION DEPARTMENT
Program: Major in mathematics with a minor in Physics
COURSE PATTERN

ACADEMIC YEAR ONE							
First Semester				Second Semester			
C. Code	Course Name	Credit Hrs		C. Code	Course Name	Crd Hrs	
MATH1101	Pre-calculus	4		BIO1202	General Biology II	4	
PHYS1101	General Mechanics	4		MATH1202	Analytic Geometry And Algebra	4	
CHEM1101	General Chemistry	4		MATH1203	Calculus I	4	
BIO1101	General Biology I	4		PHYS1202	Electricity and magnetism	4	
IS1101	Islamic Studies I	2		CHEM1202	Chemistry II		
EDU1101	Principles of Education	4		ENG1202	English II	4	
EDU1102	Introduction to Education	4		EDU1203	Psychology of Education	4	
ENG1101	English I	4		EDU1204	Sociology of Education	4	
COM1101	Computer Applications	2		ARA1201	Arabic I	2	
TOTAL		32		TOTAL		14	
ACADEMIC YEAR TWO							
Third Semester				Fourth Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd. Hrs	
MATH2304	Calculus II	4		MATH2407	Calculus III	4	
MATH2305	Set Theory And logic	4		MATH2408	Probability and statistics	4	
MATH2306	Geometry I	4		MATH2409	Linear Algebra	4	
PHYS2303	Thermodynamics	4		PHYS2405	Classical Mechanics	4	
PHYS2304	Geometric Optics	4		EDU2407	Measurement and Evaluation	4	
ENG2303	English III	4		EDU2408	Curriculum Studies	4	
EDU2305	Child Development	4		IS2402	Islamic Studies II	2	
EDU2306	Civic Education	4		ENG2404	English IV	4	
ARA2302	Arabic II	2					
TOTAL		34		TOTAL		30	
ACADEMIC YEAR THREE							
Fifth Semester				Sixth Semester			
C. Code	Course Name	Crd. Hrs		C. Code	Course Name	Crd Hrs	
MATH3510	Complex Variables	4		MATH3613	Number theory	4	
MATH3511	Calculus IV	4		MATH3614	Vector Analysis	4	
MATH3512	Differential Equation I	4		MATH3615	Differential Equation II	4	
PHYS3506	Quantum Mechanics	4		PHYS3607	Vibration Motion	4	
ENG3505	English V	4		EDU3611	Teaching Methodology	4	
SOM3501	Somali studies I	2		EDU3612	Educational Planning and Management	4	
EDU3509	Educational Technology	4		ENG3606	English VI	4	
EDU3510	Research Methodology in Education	4		SOM3602	Somali Studies II	2	
TOTAL		30		TOTAL		30	

ACADEMIC YEAR FOUR

Seventh Semester				Eighth Semester			
C. No.	Course Name	Crd. Hrs		C. No.	Course Name	Crd . Hrs	
MATH4716	Geometry II	4		GT4801	Graduating Thesis	4	
MATH4717	Real Analysis	4		EDU4815	Advanced Teaching Practice	4	
MATH4718	Abstract Algebra	4					
PHYS4708	Modern Physics	4					
PHYS4709	Intro. Astronomy	4					
EDU4713	Subject Didactics (Teaching Math)	4					
EDU4714	Basic Teaching Practice	4					
SP4701	Senior Project	4					
TOTAL		32		TOTAL		8	





SECONDARY EDUCATION DEPARTMENT
Program: Major in English with a minor in History
COURSE PATTERN

ACADEMIC YEAR ONE							
First Semester				Second Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd Hrs	
ENG1101	English I	4		ENG1202	English II	4	
ENG1101	Foundation Reading	4		ENG1203	Composition II	4	
ENG1102	Composition I	4		ENG1204	Listening and Speaking	4	
HIST1101	Ancient History	4		HIST1202	World History since 1800	4	
GEO1101	Principles of Geography	4		HIST1203	African History I	4	
IS1101	Islamic Studies I	2		GEO1202	Somali Geography	4	
EDU1101	Principle of Education	4		EDU1203	Psychology of Education	4	
EDU1102	Introduction to Education	4		EDU1204	Sociology of Education	4	
COM1101	Computer Applications	2		ARA1201	Arabic I	2	
TOTAL		32		TOTAL		34	
ACADEMIC YEAR TWO							
Third Semester				Fourth Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd. Hrs	
ENG2303	English III	4		ENG2404	English IV	4	
ENG2305	Introduction to Linguistics	4		ENG2408	Grammar II	4	
ENG2306	Grammar I	4		ENG2409	Modern Drama	4	
ENG2307	Classical Literature (Greek)	4		ENG2410	Phonetics and Phonology	4	
HIST2304	African History II	4		HIST2405	Muslim World History	4	
EDU2305	Child Development	4		HIST2406	Somali History I	4	
EDU2306	Civic Education	4		EDU2407	Measurement and Evaluation	2	
ARA2302	Arabic II	2		EDU2408	Curriculum Studies	4	
				IS2402	Islamic Studies II	2	
TOTAL		30		TOTAL		32	
ACADEMIC YEAR THREE							
Fifth Semester				Sixth Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd. Hrs	
ENG3505	English V	4		ENG3606	English VI	4	
ENG3511	English Literature 1	4		ENG3614	Introduction to Novel	4	
ENG3512	Short Story	4		ENG3615	Modern Poetry	4	
ENG3513	Shakespeare	4		ENG3616	English Literature 2	4	
HIST3507	Somali History II	4		EDU3611	Teaching Methodology	4	
EDU3509	Educational Technology	4		EDU3612	Educational Plann. & Management	4	
EDU3510	Research Methodology in Education	4		SOM3602	Somali Studies II	2	
SOM3501	Somali studies I	2					
TOTAL		30		TOTAL		26	

ACADEMIC YEAR FOUR

Seventh Semester				Eighth Semester			
C. No.	Course Name	Crd Hrs		C. No.	Course Name	Crd Hrs	
ENG4717	African Literature	4		GT4802	Graduating Thesis	4	
ENG4718	Somali Literature	4		EDU4815	Advanced Teaching Practice	4	
ENG4719	Literary Criticism	4					
EDU4713	Subject didactics (Teaching English as a second language)	4					
EDU4714	Basic Teaching Practice	4					
SP4701	Senior Project	4					
TOTAL		24		TOTAL		8	





SOCIAL WORK DEPARTMENT
Program: Bachelor of Social Work
COURSE PATTERN

ACADEMIC YEAR ONE							
First Semester				Second Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd Hrs	
SWK1101	Introduction to Social Work	4		SWK1203	Islamic Social Work Practice	4	
SWK1102	Psychology I	4		SWK1204	Psychology II	4	
MATH1101	General Math	4		SWK1205	Sociology I	4	
SCII101	General Science	4		ARA1201	Arabic II	2	
IS1101	Islamic Studies I	2		ENG1202	English II	2	
COM1101	Computer	2		IS1202	Islamic Studies II	2	
ENG1101	English I	2					
SWK1101	Introduction to Social Work	4					
SWK1102	Psychology I	4					
MATH1101	General Math	4					
TOTAL		34		TOTAL		18	
ACADEMIC YEAR TWO							
Third Semester				Fourth Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd. Hrs	
SWK2306	Human Behavior Across the Lifespan	4		SWK2410	SWK Engagement & Assessment	4	
SWK2307	SWK Frameworks: Human Rights	4		SWK2411	Gender Based Violence	4	
SWK2308	SWK Theories	4		SWK2412	SWK Casework	4	
SWK2309	Sociology II	4		SWK2413	Child Protection	4	
MATH2301	Math I	4		BIO2401	Biology I & Lab	4	
ENG2303	English III	2		ENG2404	English IV	2	
ARA2302	Arabic II	2					
TOTAL		24		TOTAL		22	
ACADEMIC YEAR THREE							
Fifth Semester				Sixth Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd Hrs	
SWK3514	Social Work Communication	4		SWK3620	SWK Practice with Communities	4	
SWK3515	SWK Frameworks: Social Inclusion of Minority Populations	4		SWK3621	SWK Practice with/in Groups	4	
SWK3516	SWK Practice with Individuals & Families	4		SWK3622	SWK in Somalia	4	
SWK3517	Crisis Intervention	4		SWK3623	Field practicum I	4	
SWK3518	SWK Mental Health & Psycho-social Support	4		MATH3602	Probability and Statistics	4	
SWK3519	SWK Research Methods	4		ENG3606	English VI	2	
ENG3505	English V	2		SOM3602	Somali Studies II	2	
SOM3501	Somali studies I	2					
TOTAL		28		TOTAL		24	

ACADEMIC YEAR FOUR

Seventh Semester				Eighth Semester			
C. No.	Course Name	Crd Hrs		C. No.	Course Name	Crd. Hrs	
SWK4724	SWK Sustainable Social Development	4		SWK4829	SWK in Emergencies (Humanitarian Aid)	4	
SWK4725	SWK Prevention Practice	4		SWK4830	Organizational Leadership and Management in SWK	4	
SWK4726	Economics for SWKers	4		SWK4831	SWK Social Policy Analysis & Advocacy	4	
SWK4727	Youth Empowerment & Engagement	4		SWK4832	Field Internship III	4	
SWK4728	Field Internship II	4		GT4802	Graduating Thesis II	4	
GT4701	Graduating Thesis I	4					
TOTAL		24		TOTAL		20	





PRIMARY EDUCATION DEPARTMENT
Program: Diploma in Primary Education
(Two years diploma)
COURSE PATTERN

ACADEMIC YEAR ONE							
First Semester				Second Semester			
C. Code	Course Name	Credit Hrs		C. Code	Course Name	Crd Hrs	
SCI1101	Science module I	4		SCI1202	Science module II	4	
SOC1101	Social module I	4		SOC1202	Social module II	4	
MATH1101	Mathematics Module I	4		MATH1202	Mathematics Module II	4	
ARA1101	Arabic Module I	4		ARA1202	Arabic Module II	4	
IS1101	Islamic Study Module I	4		ISST1202	Islamic Study Module II	4	
PE1101	Physical Education Module I	4		PE1202	Physical Education Module II	4	
SOM1101	Somalia Studies Module I	4		SOM1202	Somalia Studies Module II	4	
ENG1101	English Module I	4		ENG1202	English Module II	4	
EDPE1101	Foundation of Education I	4		EDPE1202	Foundation of Education II	4	
AC1101	Arts and Crafts I	4		AC1202	Arts and Crafts II	4	
TOTAL		40		TOTAL		40	
ACADEMIC YEAR TWO							
Third Semester				Fourth Semester			
C. Code	Course Name	Crd Hrs		C. Code	Course Name	Crd. Hrs	
SCI2303	Science module III	4		SCI2404	Science module IV	4	
SOC2303	Social module III	4		SOC2404	Social module IV	4	
MATH2303	Mathematics Module III	4		MATH2404	Mathematics Module IV	4	
ARA2303	Arabic Module III	4		ARA2404	Arabic Module IV	4	
IS2303	Islamic Study Module III	4		IS2404	Islamic Study Module IV	4	
PE2303	Physical Education Module III	4		PE2404	Physical Education Module IV	4	
SOM2303	Somalia Studies Module III	4		SOM2404	Somalia Studies Module IV	4	
ENG2303	English Module III	4		ENG2404	English Module IV	4	
EDPE2303	Educational Psychology	4		EDPE2404	Managing Primary Schools	4	
AC2303	Arts and Crafts III	4		AC2404	Arts and Crafts IV	4	
TOTAL		40		TOTAL		40	



COURSE DESCRIPTIONS

MAJOR IN BIOLOGY MINOR IN CHEMISTRY

BOTANY I

This is a study of the morphological and evolutionary principles of plant life as revealed by the various major subdivisions of the thallophyte. The course discusses general systematics, morphology, life history, and evolutionary trend of the thallophyte.

ZOOLOGY I

Zoology I offers an in depth introduction to complex relationships between animal phyla, their functions and criteria that form the basis for their classification. The course also examines reproduction habits and characteristics of animal phyla. Learners will analyze various phyla systems and their organization and produce results of these comparative analyses.

GENERAL MECHANICS

General Mechanics begins with a broad introduction of the natural order in the universe and the physical laws governing it. It will then proceed to the fundamentals of movements and why, essentially, things move. Learners will gain useful insights in motion in straight line, circular motion, dynamics, kinematics, momentum and collision.

PRE-CALCULUS

This course is designed to cover topics in Algebra ranging from polynomial, rational, and exponential functions to conic sections. Trigonometry concepts such as Law of Sine and Cosines will be introduced. As well as, Systems of Equations and Partial Fractions, Analytic Geometry and Functions, Algebraic Functions and Their Graphs, Exponential and Logarithmic Functions, Trigonometric Identities and Trigonometric Inverses and Sequences and Series.

ZOOLOGY II

Zoology II represents a survey course designed to explore the diversity of animals that possess backbones or their cartilage precursors. Zoology II will focus on the morphological, ecological, behavioral and physiological diversity within an evolutionary perspective. Major topics will include paleontology, phylogenetic hypotheses of relationships, comparative anatomy, functional morphology, natural history, and biogeography of fossil and living vertebrates. The vertebrates which will be studied include fishes, amphibians, reptiles, birds, and mammals.

BOTANY II

This is a continuation of Botany I. The course deals with the basic taxonomy, morphology, life history and evolution of embryophytes. Its emphasizes the study of flower morphology, floral diagram and formulae, leaf morphology and phyllotaxy and root system of flowering plants.

○

INORGANIC CHEMISTRY

Inorganic Chemistry provides comprehensive theory of the field of inorganic chemistry. It covers the many topics in inorganic chemistry such as; introduction to inorganic chemistry, the atomic theory of matter, mechanical model of the atom, the nature of chemical bonding, molecular geometry and bonding theories, periodic properties of the elements, acids and bases are introduced in some detail. The chemistry of the main group elements (I, II and VII) are explored on the basis of the theoretical background emphasizing their occurrence, extraction, uses, physiochemical properties, compounds that they form.

○

ELECTRICITY AND MAGNETISM

This introductory course presents electrical and magnetic phenomena as they appear in nature. Learners will analyze the concepts of electric potential, currents, conductors and induction. The focus is to foster problem solving skills as well as creating knowledge based on various theories and laws.

○

CALCULUS I

Calculus I as a basic mathematics course begins with the study of functions and problem solving. Learners will gradually and steadily be able to understand and solve algebraic, trigonometric logarithmic and exponential functions. Interpretation of derivatives is a major component of the course and all students are expected to perform them effectively.

○

HUMAN ANATOMY AND PHYSIOLOGY I

Anatomy and Physiology I is the first of a two course sequence. It is a study of the structure and function of the human body including cells, tissues and organs of the following systems: the blood, cardiovascular, lymphatic, nervous, endocrine, respiratory system and special senses. Emphasis is on interrelationships among systems and regulation of physiological functions involved in maintaining homeostasis.

○

CELL BIOLOGY

Cell Biology will help the students to comprehend how our cells do what they need to do, from the molecular level through whole cells to tissues and organs. This course will also provide learners with a basic and comprehensive understanding of cell structure and function. We will discuss the molecular composition of cellular components and organelles, and how these molecules and their interactions ultimately dictate cell structure and function

○

PLANT ANATOMY

This course includes a detailed study of the structures of developing and mature seed plants. Topics discussed include the internal organization of the plant body (types of cells and tissues), the embryo and development of the adult plant from the embryo, the primary and secondary state of growth, adventitious roots and other structural types of roots and stems, histology, development and variations of the leaf, the flower, the fruit, and the seed

○

ORGANIC CHEMISTRY I

This course is intended to provide a systematic account of organic compounds by explaining on the basis of their different classes and properties. Students are encouraged to study the physical and chemical properties, methods of preparation and chemical reactions. Some reference is made to their usefulness and application in organic halogen compounds, alcohols and others.

○

HUMAN ANATOMY AND PHYSIOLOGY II

Anatomy and Physiology II is the second of a two course sequence. It is the completion of previously remaining topics which include: endocrine system, respiratory system, digestive system, urinary system, skin, resistance and immunity, skeleton system, joints, muscular system and reproductive system.

○

GENETICS

Genetic course will help you to classify the mechanism of heredity and evolution in an overview of the principles of plant and animal genetics including Mendelian and modern concepts of heredity. Developments in molecular genetics will be addressed through the chemistry and physiology of the gene and the nature of gene action in prokaryotic and eukaryotic cells and introduction to the mechanisms of meiosis, recombination, gene mutation and mapping will also be presented.

○

PLANT PHYSIOLOGY

Plant Physiology introduces learners to plant structure and function. Plant systems and abilities in capturing and utilizing light, water and nutrients are discussed at length. In addition, environmental factors that affect plant growth and development are analyzed. Examination of plants in laboratory settings is a major undertaking of this course. Students are expected to perform a certain number of experiments

○

ORGANIC CHEMISTRY II

This course is continuation of organic chemistry I, in this course the reaction mechanism of functional groups will be emphasized specially the chemistry of carbonyl compounds. Further studies are made in stereochemistry, organohalides, Benzene and aromaticity, chemistry of benzene, carboxylic acid and nitriles, amines and heterocyclic compound as well as introduction to biomolecules includes Carbohydrates, Amino acids and proteins, lipids will be discussed.

○

QUALITATIVE CHEMICAL ANALYSIS

This is a laboratory course designed to provide students with actual experience in qualitative chemical analysis. Preliminary to the laboratory work, students will be provided the theoretical background of solutions, the nature of solutions, chemical equilibrium, ionic reaction, removal of ions by distillation, formation of weakly ionized substances, precipitation, the relation between solubility and solubility products.

○

STATISTICS AND PROBABILITY

This course is an introduction to statistics, which includes frequency distributions, their representation through graphs and numbers, ideas about probability, and applications of descriptive and inferential statistics. This course covers such topics primarily in the context of social and scientific research. The idea is to show you basic statistical principles and their application to problems of general interest.

○

TROPICAL CROPS

This introductory course is intended to familiarize the student with tropical crops in general and those of economic importance in particular, with special reference to locally cultivated crops. The course surveys the biology, history, ecology, pathology and cultivation methods of individual crops such as maize, sorghum, sugar cane, banana, beans, sesame, cassava, melons, and others. The course requires both classroom and field work.

○

BIOCHEMISTRY

Biochemistry is designed to present the significance of the major classes of biochemical compounds primarily the basic principles to understand the structure, chemical composition of life; these include the aqueous chemistry, buffers, amino acids, protein structure and functions, enzymes, carbohydrates; lipids; nucleic acid, vitamins and hormones. It also puts emphasis on the metabolic path ways of the major classes of biomolecules (such as carbohydrates lipids and amino acids).

○

PHYSICAL CHEMISTRY

This course depends strongly on then understanding of other foundation course for learning chemical principles. In a broader sense, physical chemistry can be defined as the application of physics to chemistry. So this course provides a study of properties of gases in connection with kinetic molecular theory, atomic and molecular structures. As well, energies under the principles of wave mechanics are discussed. The three Laws of thermodynamics and its applications in chemistry. In addition, some aspects of Thermochemistry, and Physical transformations of pure substances will be done.

○

VERTEBRATE EMBRYOLOGY

Vertebrate Embryology traces the development of the embryo from zygote all through to the various amphibian, avian and mammalian organ systems. These systems include the cardiovascular, nervous, respiratory, digestive and sense organs. The focus of the course is to gain insights and understanding into the physical changes that occur from a single fertilized egg to a complex multicellular organism.

○

PLANT PATHOLOGY

This course provides a comprehensive treatment of the common diseases of plants giving consideration to relations of the environment to disease development, host-parasite interactions, and methods of disease control.

○

ENVIRONMENTAL SCIENCE

This course emphasizes environmental science and the interrelationships between humans and the environment. Topics include: environmental challenges, sustainability, risk analysis and environmental hazards, ecosystems and evolution, human population change, air and air pollution, global atmospheric changes, land and water resources and pollution, the ocean and fisheries, mineral and soil resources, agriculture and food, biodiversity and conservation, and non-renewable and renewable energy.

○

GENERAL ECOLOGY

General Ecology is an introduction to basic concepts or principles of ecology, and the use of these principles to predict possible consequences and uncertainties associated with human-caused changes in the environment. The course will examine both biotic (living) and abiotic (non-living) elements of the environment that influence the distribution and abundance of organisms. The course covers topics in the areas of individual, population, community, and ecosystem ecology, as well as humanity's effect on natural systems.

○

QUANTITATIVE CHEMICAL ANALYSIS

This course provides an adequate theoretical foundation and general concept of chemical analysis. Types of concentration; molarity, molality, normality will be discussed. Statistical analysis for data evaluation, sampling in chemical analysis will be done. The course also covers gravimetric and volumetric analysis. Emphasis will be on laboratory activity where selected experiments include: determination of chloride (argentometry); acid base titration, etc.

○

COMPARATIVE VERTEBRATE ANATOMY

Comparative Vertebrate Anatomy examines the evolutionary history of vertebrate morphology with a primary focus on structure-function relationships. Lectures will trace the evolutionary origin of vertebrates through the vast diversity of animals living today. Emphasis will be placed on the analysis of similarities and differences across groups using systems based approach to assess the significance of adaptations. Laboratory exercises will provide a hands-on opportunity to examine the major vertebrate organ systems through dissections and group activities. The course consists of four lecture hours in each week with the periods of laboratory activities.

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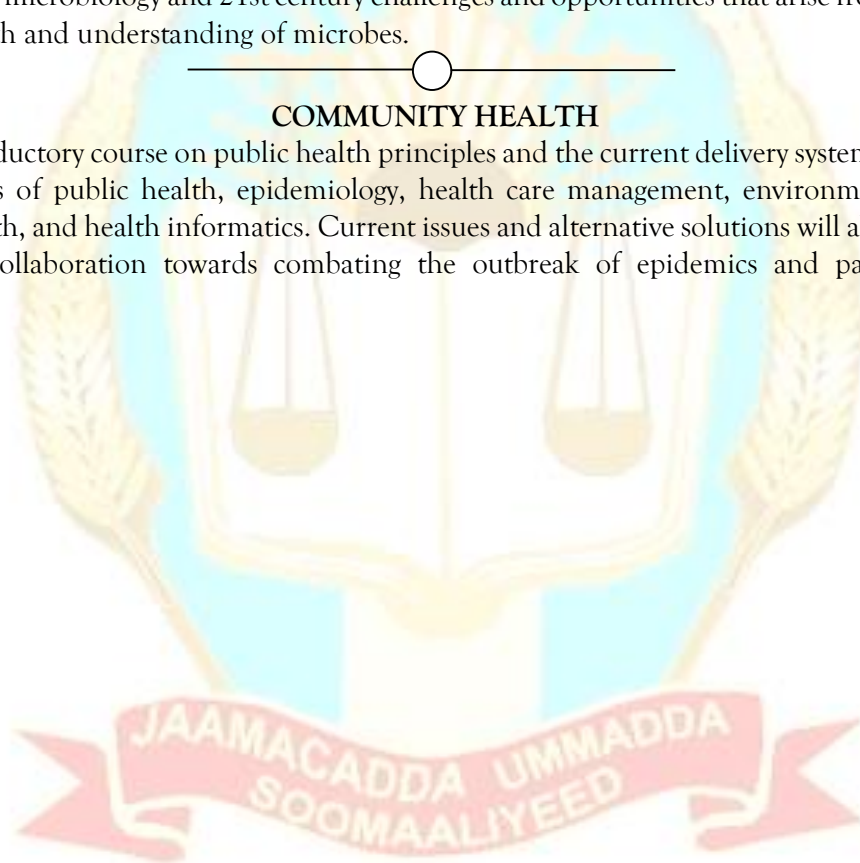
MICROBIOLOGY

Microbiology emphasizes classification of microorganisms, microbial metabolism, growth and control of microbial growth, microbial genetics, observing microorganisms through a microscope biotechnology and DNA technology principles of disease and epidemiology microbial mechanisms of pathogenicity, antimicrobial drugs, microorganisms and human disease environmental microbiology applied and industrial microbiology. Upon completion, students should be able to demonstrate knowledge of microorganisms and the disease process as well as aseptic and sterile techniques. Students will analyze the influence of microbiology and 21st century challenges and opportunities that arise from our changing relationship with and understanding of microbes.

○

COMMUNITY HEALTH

This is an introductory course on public health principles and the current delivery systems. It introduces the major areas of public health, epidemiology, health care management, environmental and social behavioral health, and health informatics. Current issues and alternative solutions will also be examined. International collaboration towards combating the outbreak of epidemics and pandemic will be investigated.



MAJOR IN CHEMISTRY MINOR IN BIOLOGY

GENERAL CHEMISTRY

This course surveys the basic principles of chemistry. It includes a general exposure to atomic weights, gram atoms, mole concept and Avogadro's number, equivalent weights, formula weight, calculations from equations and acid concepts. The second part of the course deals in depth with atomic structure and the chronological development of modern atomic theory. Selected groups of the Periodic Table (groups I, VI, VII) will then be studied utilizing the concepts developed earlier; demonstration experiments will be conducted as needed. Emphasis will be placed on a general survey of the application of chemistry for the development of society.

GENERAL MECHANICS

General Mechanics begins with a broad introduction of the natural order in the universe and the physical laws governing it. It will then proceed to the fundamentals of movements and why, essentially, things move. Learners will gain useful insights in motion in straight line, circular motion, dynamics, kinematics, momentum and collision.

INORGANIC CHEMISTRY I

This course provides comprehensive theory of the field of inorganic chemistry. It covers the many topics in inorganic chemistry such as; introduction to inorganic chemistry, the atomic theory of matter, mechanical model of the atom, the nature of chemical bonding, molecular geometry and bonding theories, periodic properties of the elements, acids and bases are introduced in some detail. The chemistry of the main group elements (I, II and VII) are explored on the basis of the theoretical background emphasizing their occurrence, extraction, uses, physiochemical properties, compounds that they form.

INORGANIC CHEMISTRY II

This course is a continuation of Inorganic Chemistry I. The course consists of the chemistry of noble gases describing their electronic configurations and also deals with the chemistry of group IA to VIIA and other representative elements. The similarities and differences in their chemical properties were highlighted, the chemistry of the transition and inner transition elements, isolation and extraction of metal. The course also introduces the chemistry of coordination compounds and their radioactivity is also been introduced.

ORGANIC CHEMISTRY I

This course is intended to provide a systematic account of organic compounds by explaining on the basis of their different classes and properties. Students are encouraged to study the physical and chemical properties, methods of preparation and chemical reactions. Some reference is made to their usefulness and application in organic halogen compounds, alcohols and others.

ELECTRICITY AND MAGNETISM

This introductory course presents electrical and magnetic phenomena as they appear in nature. Learners will analyze the concepts of electric potential, currents, conductors and induction. The focus is to foster problem solving skills as well as creating knowledge based on various theories and laws.

○

CALCULUS I

Calculus I as a basic mathematics course begins with the study of functions and problem solving. Learners will gradually and steadily be able to understand and solve algebraic, trigonometric logarithmic and exponential functions. Interpretation of derivatives is a major component of the course and all students are expected to perform them effectively.

○

PRINCIPLES OF ANALYTICAL CHEMISTRY

This course is an introduction to analytical chemistry. It focuses on the basic fundamental tools of analytical chemistry explaining the chemical apparatus (measurements of masses volumes) and sampling processes, calculations used in analysis, errors in chemical analysis, statistical data treatment and evaluation, and sampling Standardization and Calibration. It also introduces aqueous chemical equilibrium.

○

INTRODUCTION TO ATOMIC PHYSICS

This introductory course will mainly focus on the structure and behavior of atoms and atomic particles. Students will be exposed to theoretical and practical models in separating atoms and ions. Learners will also gain insights into electrons and their configurations. Atomic energy and its uses will also be examined in the course.

○

BIOCHEMISTRY I

This course is designed to provide an overview of the main aspects of biochemistry by relating molecular interactions to their effects on the organism as a whole, especially as related to human biology. The organization of macromolecules such as carbohydrates, proteins is addressed through a discussion of their hierarchical structure and a study of their assembly into complexes responsible for specific biological processes.

○

PLANT ANATOMY AND PHYSIOLOGY

This course includes a detailed study of the structures of developing and mature seed plants. Topics discussed include the internal organization of the plant body (types of cells and tissues), the embryo and development of the adult plant from the embryo, the primary and secondary state of growth, adventitious roots and other structural types of roots and stems, histology, development and variations of the leaf, the flower, the fruit, and the seed also study the water relations in plants, plant nutrition, plant growth and development, and the endogenous plant growth hormone.

○

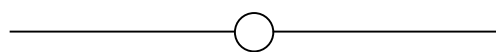
PHYSICAL CHEMISTRY I

This course depends strongly on the understanding of other foundation course for learning chemical principles. In a broader sense, physical chemistry can be defined as the application of physics to chemistry. So this course provides a study of properties of gases in connection with kinetic molecular theory, atomic and molecular structures. As well, energies under the principles of wave mechanics are discussed. The three Laws of thermodynamics and its applications in chemistry. In addition, some aspects of Thermochemistry, and Physical transformations of pure substances will be done.

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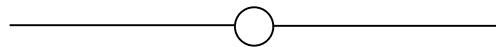
NUCLEAR PHYSICS

This course will mainly focus on the understanding of the nature of atoms which will be developed by examining the basic quantum mechanical model for the electronic structure of atoms.



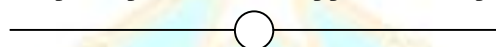
QUALITATIVE CHEMICAL ANALYSIS

This is a laboratory course designed to provide students with actual experience in qualitative chemical analysis. Preliminary to the laboratory work, students will be provided the theoretical background of solutions, the nature of solutions, chemical equilibrium, ionic reaction, removal of ions by distillation, formation of weakly ionized substances, precipitation, the relation between solubility and solubility products.



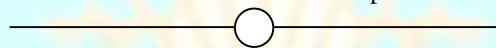
STATISTICS AND PROBABILITY

This course is an introduction to statistics, which includes frequency distributions, their representation through graphs and numbers, ideas about probability, and applications of descriptive and inferential statistics. This course covers such topics primarily in the context of social and scientific research. The idea is to show you basic statistical principles and their application to problems of general interest.



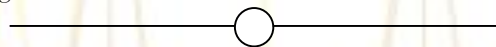
PHYSICAL CHEMISTRY II

This course is a continuation of Physical Chemistry I. It includes elaboration of chemical equilibrium and introduction of rates of mechanism of chemical reactions. Thermodynamics mixing (electrolyte and non-electrolyte solutions) and colligative properties of solutions are discussed in depth. Electrochemistry and quantum mechanics will be considered in terms of their postulate and principles.



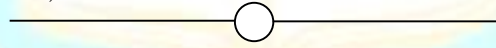
BIOCHEMISTRY II

This course is designed to provide an explanation of the metabolic pathways that are involved in synthesizing and degrading carbohydrates, lipids, and amino acids. Followed by topics addressing protein function includes enzyme kinetics, the basic and clinical aspects of metabolic processes and their interconnection into tightly regulated networks.



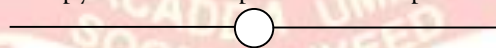
QUANTITATIVE CHEMICAL ANALYSIS

This course provides an adequate theoretical foundation and general concept of chemical analysis. Types of concentration; Molarity, Molality, Normality will be discussed. Statistical analysis for data evaluation, Sampling in chemical analysis will be done. The course also covers Gravimetric and volumetric analysis. Emphasis will be on laboratory activity where selected experiments include: determination of chloride (argentometry); Acid base titration, etc.



INSTRUMENTAL ANALYSIS

This course consists primarily of theory of instrumental analysis. It covers the main principles and applications of spectroscopy as an analytic technique. This includes instrumental analysis and classical analysis; general components of analytical instruments; UV-VIS spectroscopy; IR spectroscopy; atomic absorption and emission spectroscopy. Selected experiments are performed.



NATURAL PRODUCTS OF CHEMISTRY

This course is designed to serve as a comprehensive overview of secondary metabolite and the origin of small molecule natural products: it describes their sources such as plants, animals and macro-organisms. It puts emphasis on a suitable isolation method for separations, their structure elucidation. These include terpenoids, steroids, alkaloids and phenolic compounds and their important herbal medicinal use.

○

ENVIRONMENTAL CHEMISTRY

This course is designed to explain the sources, reactions, transport, effects, and fates of chemical species in water, soil, air, and living environments, and the effects of technology thereon. Followed by the study of five spheres; atmosphere, hydrosphere, biosphere, geosphere and lithosphere. The course also focuses on the determination of the nature and quantity of specific pollutants in the environment in order to solve environmental problems such as water, soil and air pollution.

○

INTRODUCTION TO INDUSTRIAL CHEMISTRY

This course is intended to describe the operation principles of selected unit operations and unit processes. We focus on some basic inorganic industrial processes that synthesize products from a variety of raw materials. They include manufacture of ammonia, sulphuric acid and fertilizer. The study of organic industrial chemistry then starts with petroleum refining followed by the manufacture of selected petrochemicals and polymers. The module closes with the study of pharmaceuticals, soaps and detergents.

○

ORGAN METALLIC CHEMISTRY

The first part in this course surveys the basic principles of coordination chemistry and the definition of coordination complexes, Werner's contributions to coordination chemistry, Ligands, Application and importance of coordination compounds, nomenclature and coordination number of complexes, IUPAC System of naming metal complexes, Coordination number of metal complexes, isomerism in complexes, structural isomerism, stereoisomerism. The second part of the course deals in depth with Organ metallic chemistry of the main group elements, and d-block transition metals; calculation of 16 and 18 electron rule, metal carbonyls, nitrosyls, alkyls, carbenes; carbynes, carbides, alkenes and alkynes; organ metallic compounds: reactions, mechanisms, catalysis and bio-inorganic chemistry.



MAJOR IN MATHEMATICS MINOR IN PHYSICS

—○—

GENERAL CHEMISTRY I

Chemistry I provide learners with knowledge of the fundamental principles of chemistry with an emphasis on chemical bonding, structure and properties, states of matter, stoichiometry, solutions, and acids and bases. The student also applies strategies in scenario and problem activities.

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GENERAL BIOLOGY I

This is a general education course for students not majoring or minoring in biology. It is a brief survey of animal and plant life and classification, morphology, the physiology, and mode of life of selected phyla and classes. The course emphasizes human biology and flowering plants.

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GENERAL BIOLOGY II

This is a continuation of General Biology I. Learners will go on exploring animal and plant life in depth. The main themes of this course include classification of animal and plant life as well as their various adaptation approaches. Learners are expected to acquire holistic understanding of the various functions of plant organs as well as human organs.

—○—

ANALYTIC GEOMETRY AND ALGEBRA

This is an introductory course for analytic geometry and Algebra emphasizing the correspondence between geometric curves and algebraic equations. This correspondence makes it possible to reformulate problems in geometry as equivalent problems in algebra, and vice versa. Curves studied include straight lines, circles, parabolas, ellipses, and hyperbolas. Coordinate transformations, polar coordinates, and parametric equations are also studied.

—○—

CALCULUS I

This is considered a first course in calculus, primarily for students intending to continue to advanced courses in calculus, and mathematics in general. Students conduct a detailed study of differential calculus and its applications, and are introduced to anti-derivatives. Calculus I is intended to develop practical skills in differential and integral calculus.

—○—

ELECTRICITY AND MAGNETISM

This introductory course presents electrical and magnetic phenomena as they appear in nature. Learners will analyze the concepts of electric potential, currents, conductors and induction. The focus is to foster problem solving skills as well as creating knowledge based on various theories and laws.

—○—

GENERAL CHEMISTRY II

This course is a continuation of Chemistry I, leading to an elaborate study of chemical bonding, theories of chemical bonding, intermolecular forces of liquids and solids, properties of solution, Chemical kinetics and chemical equilibrium, phase diagrams; acid-base concepts and additional Aspects of Aqueous Equilibrium; chemistry of the environment will be introduced. The student will also apply Solving problem strategies in scenario and Chapter Problem activities. Recommend completion and Success of Chemistry I.



CALCULUS II

Calculus II is a continuation of Calculus I. Students will be engaged in evaluating finite sums, sum of infinite and limits, and calculate definite integrals. Learners will use trigonometric substitutions to evaluate integrals and use partial fractions to evaluate integrals. The course is designed to enable students to represent plane curves in parametric form and also compute areas with the assistance of polar coordinates.



SET THEORY & LOGIC

Set Theory & Logic (Discrete Mathematics) describes processes that consist of a sequence of individual steps. The goal of this course is to provide a clear, accessible treatment of Set theory & Logic for students majoring or minoring in mathematics and mathematics education. By combining theory and practice, it clarifies that mathematics has engaging and important applications as well as being interesting and beautiful in its own right. The main themes of a first course in discrete mathematics are logic and proof.



GEOMETRY I

Geometry I is a branch of mathematics mainly concerned with two and three-dimensional figures and their properties. Students will learn and apply definitions, postulates, and theorems in mathematical situations involving points, lines, rays, angles, and planes. Two column proofs are used extensively throughout the course in investigating the congruence or similarity of various geometric figures. Also students will learn the method of analytic geometry, vectors and their properties, parametric and non-parametric equations of lines and planes, second degree curves, a survey on second degree surface.



THERMODYNAMICS

This course provides a detailed treatment of the principles of thermodynamics. Topics include the equations of state, the first law of thermodynamics, work and heat, heat capacities of gases, change of phase, heat engines and the second law of thermodynamics, entropy, and physics of low temperature, probability and definition of temperature.



GEOMETRIC OPTICS

This course is designed to introduce the important concepts on geometrical and physical optics. The course consists of two sections: a) instruction and b) laboratory. Topics in geometrical optics include ray analysis, lenses, prisms, and optical fibers. Topics in physical optics include polarization, interference, interferometers, and diffraction. In the laboratory section, we will explore optics through experiments in thin lenses, fiber optics and communication, interferometer, diffraction, filters, lasers, and frequency conversion.



CALCULUS III

Topics in Calculus III include analytic geometry of three dimensions, determinants and linear equations, vector analysis, partial differentiation, cylindrical and spherical coordinates, and applications. The use of a graphing calculator is required for this course to further the exploration of these topics and their applications.



PROBABILITY AND STATISTICS

This course is an introduction to statistics, which includes frequency distributions, their representation through graphs and numbers, ideas about probability, and applications of descriptive and inferential statistics. The idea is to show the learner basic statistical principles and their application to problems of general interest.

○

LINEAR ALGEBRA

Linear algebra is the study of linear systems of equations, vector spaces, and linear transformations. Solving systems of linear equations is a basic tool of many mathematical procedures used for solving problems in science and engineering. In this class we will concentrate on the mathematical theory and methods of linear algebra. Students are expected to become competent in solving linear equations, performing matrix algebra, calculating determinants, and finding eigenvalues and eigenvectors. On the theoretical side, the students will come to understand a matrix as a linear transformation relative to a basis of a vector space.

○

CLASSICAL MECHANICS

Classical Mechanics covers the following topics: Newtonian Mechanics including conservation theorems, the concept of gravitation field and potential, the central force motion of a two body system, the dynamics of a system of particles and the concept of the center of mass, and introduction to motion in non-inertial frames of references.

○

COMPLEX VARIABLES

Topics include : sums and product complex numbers , basic algebraic properties , moduli, complex conjugate , exponential form, product and quotients in exponential form , roots of complex number , regions in the complex plane , functions of complex variable ,limits, derivatives, Cauchy - Riemann equations , analytic functions , the exponential functions , the logarithmic functions , complex exponents , trigonometric functions , hyperbolic functions , derivative of functions $w(t)$, definite integrals of functions $w(t)$, contours , contours integrals, anti-derivatives, Cauchy theorem

○

CALCULUS IV

Topics in Calculus IV include : functions of several variables , limits and continuity of functions of several variables , partial derivatives , higher order partial derivatives , chain rule , directional derivatives , and gradient , equation of tangent plane , double integrals over rectangular region , double integrals over every region , area by double integrals , double integrals in polar form , triple integrals in cylindrical and spherical coordinates , substitution in multiple integrals.

○

DIFFERENTIAL EQUATION I

This course is a broad study of the methods of solution and applications of ordinary differential equations. Topics include: first and second order equations, existence and uniqueness of solutions, separation of variables, exact equations, integrating factors, linear equations, undetermined coefficients, variation of parameters, transform methods, series solutions, systems of equations and elementary numerical methods.

○

QUANTUM MECHANICS

The course covers Bohr model of the atom ,Quantum effects , Wave function and probability amplitude , Schrodinger's equation for a free particle and for a particle in a box, Energy eigenvalues and Eigen functions, Linear operator, and Commutation relations of operators.

○

VECTOR ANALYSIS

This course is an introduction to the theory of vector fields in two and three dimensions and some associated differential geometry and will focus on topics include: Algebra and calculus of vectors, vector differential operators, Green's and Stokes' theorems, curvilinear coordinates, tensors.

○

NUMBER THEORY

Relations: types, algebraic and geometric interpretations, ordered relations, and Hassel diagrams are introduced in Number Theory. Recurrence relations: creating functions, the Fibonacci numbers, the Lucas numbers and their several interpretations are also evaluated at length. Other topics that learners will interact are methods of theorem proving, Boolean algebra, selected topics in a graph theory: basic definitions and notions, characterization of trees, vector vacuum of a graph, and planarity of graphs.

○

DIFFERENTIAL EQUATION II

Topics covered in the this course include systems of ODEs, series solutions of ODEs, series solutions of second order linear equations, periodic functions and the Laplace transform. Periodic functions, Fourier series, Beta function, gamma function and solution of linear partial differential equations will be examined using the method of separation of variables.

○

VIBRATION MOTION

The analysis of motion, velocity, acceleration, and forces in mechanisms and machines. Emphasis is placed on the analytical methods suitable for computerized analysis as well as graphical methods for visualization and preliminary design studies. Also an introduction to vibration theory, including the modeling and analysis of oscillatory phenomena found in linear discrete and continuous mechanical systems

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GEOMETRY II

This course includes an in-depth analysis of plane, solid, and coordinate geometry as they relate to both abstract mathematical concepts as well as real-world problem situations. Students will learn what defines a quadrilateral, and will learn the various types, as well as circles, including arc measures, and the areas and lengths of sectors. Students will go on to learn to find the area and perimeter of various shapes, and will learn to solve for the surface area and volume of three dimensional shapes. Finally, students will learn the basic types of transformations and will learn to conduct compositions of transformations.

○

REAL ANALYSIS

This course covers the fundamentals of mathematical analysis: convergence of sequences and series, continuity, differentiability, Riemann integral, sequences and series of functions, uniformity, and the interchange of limit operations. It shows the utility of abstract concepts and teaches an understanding and construction of proofs.

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ABSTRACT ALGEBRA

Abstract Algebra covers the following topics: groups, subgroups, cyclic groups, symmetric groups, direct product, homomorphism and isomorphism, co-sets and Lagrange's theorem, normal subgroups and quotient groups, finite Abelian groups.

○

MODERN PHYSICS

During the study of the first part of this course, the student will learn some material science topics which relate to modern technologies and in the second, the student will examine the basic quantum mechanical model for the electronic structure of atoms to understand the nature of atoms and their interaction with other materials.

○

INTRODUCTION TO ASTRONOMY

This introductory course is intended to provide learners with basic theoretical understanding of the properties, conditions and motion of bodies in space. Learners will examine, in depth, the contents of the universe and gain a conceptual understanding into the solar system in general and the earth system in particular.

MAJOR IN ENGLISH MINOR IN HISTORY

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ENGLISH I

This course is intended to reinforce the English learned by entrant students at the secondary school level. The emphasis is on improving the language abilities of the students with special attention to fluency of speech and accuracy of writing, pronunciation, intonation, stress and rhythm, reading comprehension and note-taking, vocabulary reinforcement, phrases and idiomatic expressions, as well as sentence patterns.

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COMPOSITION I

This course focuses attention on language with particular emphasis on its functions as a medium for communication. Practical exercises are given on short and long sentences with attention on simple, compound and complex structures. Emphasis is given to outlining and techniques of paragraph development. Some attention is devoted to descriptive, narrative and expository paragraph writing.

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FOUNDATION READING

This course is aimed at students whose native language is not English and studying at academic institutions. The objective of this program is to introduce students to reading the genre of academic texts, to train them to use efficient reading strategies and to provide them with skills for reading on their own. The program offers topics that can be combined in a variety of ways to suit individual class or student needs. These include: Guided Reading: graded texts with tasks for before, during and after reading, including close reading work with language forms- Skills: explanations and extensive practice in interpreting language signals - such as sentence structure, verb forms, discourse markers and substitute words - to unlock meaning- Appendix: glossary of academic words and list of affixes for reference Reading Academic English can be used for a range of levels, with texts ranging from simplified press articles of general interest to authentic academic journal articles dealing with topical issues in education.

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ANCIENT HISTORY

This course traces the history of humans from the family communes of hunters, fishermen, cattle breeders and farmers to the rise of selected ancient civilizations. For comparative purposes the civilizations of Egypt, Mesopotamia, India and China will be surveyed to pave the way for a more detailed study of ancient Greece and Rome. The course outlines the origins of the Roman Empire and the rise of Christianity up until the fall of the Roman Empire. An outline history of the medieval period up to 1500 A. D. will be presented.

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PRINCIPLES OF GEOGRAPHY

This course aims to describe major trends of geography including: luminaries and solar system, latitude and longitude, the motion of the earth, the lithosphere rocks and minerals, changes of the earth's crust, diastrophism, landforms, atmosphere, and the hydrosphere. It will also examine human geography including demography: population size, growth, structure and distributions, the migration patterns, urbanization, and production activities such agricultural infrastructure, livestock sector, and commerce. The course will finally train learners on map work.

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ENGLISH II

This course continues to reinforce the English learned by students in English I. The major emphasis of this course is on reading and writing skills. Additionally, film is used for listening comprehension. Selection of supplementary graded readers is used for extensive reading practice.

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COMPOSITION II

This course is a continuation with emphasis on elements of rhetoric and logic. The course has three parts: the first deals with rhetoric, logic, and style; the second discusses various types of essay writing such as narration, description, argument, and explanation including the techniques of writing research papers; the final part includes analysis of editorials, political speeches, and advertisements.

○

LISTENING AND SPEAKING I

The course aims to build on the background knowledge of uttering words description in order to basically understand the use of sounds in spoken language; train students in the skill of listening to spoken languages particularly English; Towards the end of the successful completion of the course, the students will have the ability to understand and use English to express ideas and opinions related to students' real life experiences inside and outside the classroom and give reasons (substantiating) justifying their view, the course also gives understanding and using signal markers, as well as extracting information and make notes from lectures.

○

AFRICAN HISTORY I

The course is examines the emergence of the African man. Topics include: early attempts to control the environment; the independent changes from hunting and cattle herding to the development of agriculture and use of the iron; and, the development of trade and the growth of cities and states. Early kingdom of Egypt and Kush, as well as the medieval of Cost City states in East Africa, Ghana, Mali and Songhai in the West Africa.

○

SOMALI GEOGRAPHY

The course aims to present a holistic geographical profile of Somalia. These profiles include the physical location of Somalia and its importance, topography, physical features such as mountains and rivers. The human geography of Somalia will also be analyzed including the economic activities of its inhabitants as well as culture and language. Finally the course will attempt to explore the current and future impact of climate change, globalization and migration.

○

WORLD HISTORY SINCE 1800

This course is a survey of the main events that shaped world history between 1500-1800 such as the great European transformation from feudalism to capitalism, from the end of the middle ages to Enlightenment. Emphasis will be placed on economic Expansion, intellectual changes, impact of expansion into Africa and Asia and resulting resistance by the Muslim peoples and the people of the Far East. The course also examines developments in Africa.

○

ENGLISH III

Major emphasis is on oral practices of the living language with exhaustive exercises in comprehension and vocabulary building. In addition to the detailed study of the prescribed oral language passages, various exercises in language structure are utilized that aim at strict practice in correct usage of different parts of speech and punctuation.

○

INTRODUCTION TO LINGUISTICS

This course introduces the students to acquire knowledge of the sound system of contemporary English; an understanding of the formation of English words and of their grammatical modification; a comprehension of the structure of both simple and complex sentences in English; a recognition of complexities in the expression of meaning, on both the word and sentence level; and an understanding of the effects of context and function of use upon the structure of the language.

○

GRAMMAR I

The aim is to introduce the students to some basic concepts of traditional English grammar to enable them to understand, analyze and enhance their own grammatical competence. This basically builds the students deeply comprehend the different parts of speech. It will also help them transmit these concepts in their own teaching.

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CLASSICAL LITERATURE (GREEK)

Classical Literature is a survey course of Greek literature continuing to masterpieces of Homeric Greece, the middle Ages, and the Renaissance. Selected works representative of neo-Classicism, Romanticism, the course surveys trends in modern literature. Readings included selected works from Homer, Virgil, Aristotle, Dante, Chaucer, Montaigne, Shakespeare, Pope, Milton, Shelley, Coleridge and Keats.

○

AFRICAN HISTORY II

The course of African History II examines the emergence of the African continent in modern history. Topics include: Portuguese Exploration and Colonization, Slave trade, Africa in the Early Years of the 19th Century and the scramble for Africa until the independence of African Countries. The course covers also the political and socio-economic development of African nations during the European Colonies period as well as the political economic and environmental challenges in the postcolonial period.

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ENGLISH IV

English IV will build on the content learned in the previous three English courses. The aim is to facilitate the composition skills, interpretation of plots, and creative writing. The course will also focus on speaking and listening skills of learners where a variety of educational aids such as short films, videos, and plays will be used.

○

GRAMMAR II

The course focuses on morphology of modern English. This is followed by a study of the sound system of modern English including articulators' phonetics and a description of the segmental and supra-segmental phonemes. It introduces students to the internal structure of words and sentences, presenting them to the theory and practice of the structural grammar of the English language. By the end of this course students will be able to do a detailed analysis of English morphemes as well as sentences.

○

ENGLISH LITERATURE II

This is an extensive survey of English literature from the Anglo-Saxon times to present day. Students are introduced to the major trends in English literature spanning 19th centuries up to the 20th. An exhaustive study of critical works of literature is concluded with discussions of significant contemporary trends.

○

MODERN DRAMA

This course is a comprehensive study of the major trends in drama, extended to include a few American and African masterpieces. It begins with the mid-19th Century revival of English drama and proceeds to the study of Continental masterpieces. Various theatrical movements including the concept of the "Epic Theatre" and the "Theatre of the Absurd" will be examined with illustrative plays. The course concludes with the study of African playwrights. Realism, Naturalism, Symbolism and Existentialism will be examined in the context of drama. As far as the aim of introducing one act and other plays is concerned, it is to familiarize the readers with fundamentals of drama i.e. character, plot, setting, dialogue. It would prepare students for a mature understanding of drama as a popular genre in literature.

○

PHONETICS AND PHONOLOGY

The purpose of this course is to introduce students to the theory and practice of phonology (how sounds pattern in language, and how those patterns can be represented and explained). The course attempts to characterize these patterns in a minimal way through explicit formalisms, and attempts to explain why sounds pattern in the way they do by reference to such things as historical processes, speech physiology, and cognitive constraints on the speech system. A secondary and related goal is to develop the student's skills at linguistic argumentation: students will learn to understand, develop, and evaluate linguistic arguments, the assumptions underlying those arguments, and the evidence used to support them.

○

MUSLIM WORLD HISTORY

The course outlines the rise of Islam. From introductory purpose, the course begins with Arab History before Islam. Topics discussed in-depth include: the life and teaching of the Prophet Mohammed; the early Islamic states and the establishment and organization of the Umayyid Empire; the classical age of the Abbasid Caliphate; and the Muslim Culture of Spain. Other topics include: the Turkish invasions; the Crusades and the Contribution of Islamic culture to medieval European thought. The Ottoman Empire is briefly introduced.

○

SOMALI HISTORY I

This course attempts to identify the peoples of the Horn of Africa in general, and the Somalis in particular, and study their cultural, socio-economic, and ethnic relationships. Emphasis is placed on the study of Somalia within the historical context of its pre-colonial period. Topics covered include: early relations with the Mediterranean, Near East, and Far East civilizations; the coming of Islam and its political and cultural impacts. The course surveys also the modern history of the Somali people. The time period covered spans right from the arrival of colonial imperialism to the present day. Topics to be covered include processes of the colonial scramble such as explorations, treaties, partition, and establishment of colonial administrations.

○

ENGLISH LITERATURE I

This course surveys British literature from 1600-1800 with a focus on both historic and poetic forms, drama and emerging prose fiction. The literature is tightly interwoven with the turbulent Puritanism, political and social history of the period, and so the class will also be learning about English society in the aftermath of the civil war and interregnum, the restoration and reign of the Stuart kings and the glorious revolution. The literature draws heavily from three major figures: John Dryden; John Milton; and other writers will be included.

○

SHORT STORY

Short story studies the modern short story from its origins in the early 19th century to its current form. Areas of focus will include: the history/development of the short story as a prose fiction form, the short story as a reflection of social and cultural movements/issues, and the use of the form as a mode of personal expression and identity. Readings will include a variety of authors, notably key figures in the development of the form as well as contemporary voices poised to influence the future of the genre.

○

SHAKESPEARE

This course begins with a detailed analysis of the major trends in Elizabethan drama with emphasis on the prevailing stage conditions in the context of the advent of William Shakespeare. A general survey of his prolific literary output follows. The prescribed plays for intensive study are Hamlet, Macbeth, Julius Caesar, The Tempest, Henry IV, Twelfth Night, Romeo and Juliet. In addition, a study of his sonnets will be made to facilitate an overall assessment of Shakespeare's contribution to drama and poetry.

○

SOMALI HISTORY II

This course surveys the contemporary history of the Somali people. The time period covered spans right from the rise of Somali nationalism to the present day. Topics to be covered include process of the national resistance in the form of proto-religious movements and organized political parties, as well as the process of independence and building of Somali state. Post-Independence history, including the impact of the cold war and foreign aid, until the collapse of Somali state and beyond is also surveyed.

○

INTRODUCTION TO NOVEL

This course will focus on “formation novel.” “Growing up,” “coming of age,” “loss of innocence,” “reaching the age of consent (dissent),” these expressions all describe the movement from childhood to maturity. In literature, these stories of the “rites of passage” to adulthood make up a particular kind of novel, while studying the theme of growing up; we will also analyze the formal elements of fiction such as plot, character, point of view, structure, imagery, irony, parody, and so on. In addition, we will consider issues such as gender roles, class, ethnicity, race, and colonialism. Emphasis will be on close critical reading of the novels: how to read and interpret fiction, how to enjoy reading, and how to learn from interpretation.

○

MODERN POETRY

This course focuses attention on the major trends in British and American poetry since World War I. Issues such as obscurity in poetry, alienation of the poet, as well as political and ideological commitment are examined. An intensive study of the modern poetical theories and their practical applications are included. The major poets represented include Yeats, T.S. Eliot, Holmes, Ezra Pound, Auden, Stephen Spender, Frost, and Wallace Stevens.

○

AFRICAN LITERATURE

The course provides an introduction to modern African literature. Selected African writers will be chosen for serious discussion on selected themes, trends and styles. The aim to familiarize the learner with major topics that shaped the modern African literature including slavery, colonization, struggle for independence and the societal upheavals that followed independence.

○

SOMALI LITERATURE

This course provides an introduction to Somali literature in general and presents all the necessary literary terms. It also gives an overall view of various sections of Somali literature such as oral literature, children's literature, Somali drama, and poetry. (English translation of Somali materials will be used.) Somali literature presents to the literary tradition of Somalia. Also teaches oral tradition when it comes to ancient folktales, stories which were passed on from generation to generation.

○

LITERARY CRITICISM

Literary Criticism aims at creating a greater awareness of and sharpened sensibility towards literary writing by helping students develop powers of critical analysis. The students will become familiar with various literary genres. Attempts will be made to answer basic questions concerning literary style.



BACHELOR OF SOCIAL WORK

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INTRODUCTION TO SOCIAL WORK

This course provides an introduction to social work including the role and purpose of social work, the history of social work, social work values, and career opportunities. The IFSW ethical standards are examined in the context of the profession's commitment to human rights. Basic problem solving is introduced. The role of primary and secondary trauma in the lives of social workers is explored in the context of self-care. Critical thinking and critical self-reflection are emphasized. Islam and the life of the Prophet (PBUH) inform our understanding of social work practice in Somalia.

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ISLAMIC SOCIAL WORK PRACTICE

This course introduces a proposed Islamic social work practice model. Islam informs every aspect of life for Muslims, so understanding the Islamic worldview on the nature of problems, preventing problems and solving problems is essential. The concepts of helping, problem solving and transformation used in Islamic social work are fully explored. The behaviors of the Prophet Mohamed (PBUH) are used to inform social work practice including the use of non-verbal behaviors to establish relationships, assessment, interventions, implementation and evaluation. While the similarities in Islam and social work are used for practice, areas of divergence are also acknowledged.

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HUMAN BEHAVIOR ACROSS THE LIFESPAN

Human development across the lifespan provides context for understanding human behavior in the social environment. Physical, emotional and social development from infancy to old age are covered. A primary focus is on positive youth development and resilience.

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SWK FRAMEWORKS: HUMAN RIGHTS

Social work ethics are grounded in human rights. The concepts and critiques of human rights are examined. This course examines the history of human rights from before the Common Era (BCE) to present day United Nations, human rights documents. Islamic teachings about human rights are studied to form a solid basis for our social work practice. The organization and function of the United Nations is explored. The concept of restorative justice is introduced.

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SWK THEORIES

Theory provides the foundation for understanding the practice of social work. This course will begin with Friere's Pedagogy of the Oppressed and examine other core theories of social work including, but not limited to: systems theory, feminist theory, empowerment theory, strengths perspective, norms theory and conflict theory. These theories are examined in the context of social work practice in Somalia

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SWK ENGAGEMENT & ASSESSMENT

Establishing relationships with individuals, families, groups, organizational actors and communities is the first step for effective social work practice. This course will cover active listening; verbal and non-verbal communication; establishing rapport; critical self-reflection; and, critical thinking. Initial and ongoing assessment using a collaborative process that focuses on strengths, identifying resources and resilience with various client systems is emphasized. Modeling of non-hierarchical collaboration will be modeled via the teacher-learner relationship.

○

GENDER BASED VIOLENCE

This course examines gender in the context of power imbalances, structural oppression and social and economic injustice experienced by women and girls. Beginning with an exploration of gender and gender socialization, the course examines sexual and gender-based violence as one form of gender inequality. Prevention, assessment and interventions to stop and respond to gender-based violence are emphasized, including the role men and boys must play.

○

SWK CASEWORK

This course focuses on case management in social work. This course is designed to introduce students to a variety of ways in which case management is used to assist a variety of client populations. The course explores the history and advancement of case management and care/service coordination; the models of case management; application of the theory of change; service delivery planning and coordination and ethical considerations in case management. An IT case management system is utilized to improve record keeping and client services.

○

CHILD PROTECTION

This course covers the knowledge, values and skills needed to provide social work services in child protection, child protection in emergencies and juvenile justice systems. It presents a model that is community based, family focused and child centered for helping families. It addresses an array of services ranging from prevention, family support and family preservation through child protective services. The role of the police, the courts, and institutions is explored. Child abuse and neglect, youth offenders, and the unique needs of young people are explored. The course is grounded in ecological approaches, inclusion, principles of family continuity, and the historic values of the social work profession. CPIMS is utilized throughout the course.

○

SOCIAL WORK COMMUNICATION

Effective communication is essential for successful social work practice. Social workers must be able to communicate with people of diverse backgrounds and life experiences. The essentials of communicating ideas to small and large groups is a focus. This course will support the student to develop effective verbal, non-verbal and written communication skills. Documentation, reports and case notes are discussed. Creating community awareness campaigns and campaigns to change social norms are fully explored.

○

CRISIS INTERVENTION

Individuals and communities in crisis experience intense trauma and are amazingly resilient. Students will learn the application of crisis intervention theories, skills in community mobilization, collaborative practices, support group facilitation, crisis and trauma responses, recovery strategies, psychological first aid and psychosocial support in crisis. Individual and community assets and resilience will be studied as means of transforming trauma and enhancing psychosocial well-being during and after complex violence and disaster situations. The overarching influences of poverty, gender, age and minority status on violence and natural disasters in Africa are examined. (in syllabus include resilience; recurring cycle of crisis, voluntary SWK)

SWK FRAME WORKS: SOCIAL INCLUSION OF MINORITY POPULATIONS

A major focus of social work practice is work with vulnerable and minority populations: people with disabilities, IDPs, refugees, women, elders, immigrants, minority clans, convicts, etc. Our IFSW Code of Ethics implores us to confront all forms of inequality and injustice. Using a human rights and critical multiculturalism perspective, this course explores the politics of difference; histories of oppressions including colonization; the way policy and legislation are used to marginalize certain groups; and current vulnerable groups in Somalia. Strategies for effective practice with minorities, including universal design and urban planning, are included. This lives of the Prophet (PBUH) are highlighted to illustrate the principles of inclusion.

SWK PRACTICE WITH INDIVIDUALS & FAMILIES

This course emphasizes interventions with individuals and families from a social work perspective. Skill development includes interviewing and recording skills, analysis of need, use of self, communication techniques, and use of the problem-solving process. Various forms of interventions will be explored for application with diverse client systems including, but not limited to,; psychosocial support; crisis intervention; family group conferencing; family mediation; advocacy; practice evaluation; advocacy; and, case management. The IFSW and other relevant codes of professional values and ethics are applied. Issues of inclusion and working with minority populations are integrated.

SWK MENTAL HEALTH & PSYCHO-SOCIAL SUPPORT

Whenever there is human suffering, emotional pain, grief, anger and frustration are experienced. Providing psychosocial support is part of responding to emotional distress in variety of circumstances. This course explores individual and community based models with psychosocial support as a standalone or fully integrated response. Assessment, planning and implementation, coordination, training, evaluation, care of self and volunteers, and exit planning are covered. "Counseling," transformative social work practices, narratives and storying/re-storying are examples of MHPSS intervention that are covered.

SWK RESEARCH METHODS I

Since research is considered a form of social work practice, many of the same knowledge and value requirements for professional practice are necessary to conduct and understand social work research. In this course, students will examine research from the perspective of social work values & ethics, implications of areas of research inquiry, and theoretical assumptions embedded in various methods and data collection instruments. Students will identify an area for inquiry; develop research questions; identify a sampling strategy; identify a data collection strategy; create, identify or modify a data collection tool; and, plan qualitative and quantitative analysis.

SWK PRACTICE WITH COMMUNITIES

This course examines the imperatives for social workers to engage politically in community practice. The course covers the knowledge and skills needed to make an entry and gaining acceptance in a community; engage in awareness-raising and capacity building; challenge exploitative and oppressive community power structures; and ensure sustainable community development. In many situations, social workers need to focus on the fundamental values and principles of social work and Islam and actively engage with local politics and power structures so as to improve the living conditions of people and local communities. The course explores theories, models and approaches to organizing, advocacy and community development; and emphasizes the organizing skills necessary to empower people so they can improve their communities. (In syllabus: community engagement; community political participation; awareness raising; social norms, changing social norms).

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SWK PRACTICE WITH/IN GROUPS

Much work in social work is accomplished in or with groups. The types of groups studied will include families, clans, task, education, self-help, psychosocial support, treatment, social advocacy and non-traditional groups. Group assessment, intervention, termination and evaluation; power within groups and group dynamics; group's stages and roles are explored. Students apply the IFSW code of ethics and Islamic perspectives to working with diverse populations, including minority groups. Skill development includes use of self, communication techniques, and the problem-solving process.

○

SWK IN SOMALIA

Social work is a relatively young profession in Somalia which must be understood within the historical context of its pre-colonial and post-colonial experience. Given the current context in Somalia, a primary focus of social work is social development, as determined by the people themselves, and the consequent creation or alteration of communities and institutions to create a capacity for meeting human needs of all people (especially the most vulnerable), and for improving the quality of human relationships and relationships between people, families, clans, communities and social institutions. Somali social structures, traditional healing and natural helpers, Islamic perspective to understand and resolve social problems, social politics and policies, and cultural traditions are explored as they influence, and are influenced by, social work practice.

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YOUTH EMPOWERMENT & ENGAGEMENT

Youth engagement is important to any intervention strategy in the community. Topics to be discussed include the social role and value placed on youth, young people's education and health, their involvement in labor and contribution to livelihood strategies, environmental issues, the situation of young people living in especially difficult circumstances, and youth's engagement in peace building, social and economic justice and community organizing. This course considers core concepts of youth empowerment at the individual, organizational, and community levels; models and methods of practice; age-appropriate and culturally-responsive approaches; roles of young people and adult allies; and perspectives on practice in a diverse democracy. Resilience, historical oppression, marginalization, social exclusion, and poverty are examined as key factors in youth engagement and empowerment.

○

SWK SUSTAINABLE SOCIAL DEVELOPMENT

Social development is a process of planned social change designed to promote the well-being of the population as a whole in conjunction with a dynamic process of economic development. This course takes a holistic approach to social development and prepares students to engage in sustainable social development that improves individual and family well-being through the enjoyment of human rights, the provision of economic opportunities, the reduction of poverty, and access to social security, social protection and social services. The course will cover the ideas of participation, institution building, and distributive justice with a focus on development in Somalia and Africa. Other topics include how to build or maintain social relations, structures and institutions; human capital development; social capital development; engagement with clan leadership, traditional elders and imams; and, productive employment projects as social development intervention strategies relevant for social work.

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SWK PREVENTION PRACTICE

Primary prevention involves coordinated efforts to prevent predictable problems, to protect existing states of healthy functioning, and to promote desired goals for individuals, groups and communities, while taking into consideration the physical and sociocultural environments that may encourage or discourage these efforts. This course reviews major theories that guide preventive thinking and action. Practice methods are presented for increasing individual, group and/or community strengths and supports while decreasing limitations and social stresses, which together characterize most contemporary preventive services. Universal (targeted at an entire population group), selective (aimed at those who are at an elevated risk) and indicated (aimed those who already demonstrate signs or symptoms of the targeted problem) prevention strategies are covered. A particular focus is on prevention of violence, including gender-based violence, child abuse, conflict and war.

○

FIELD PRACTICUM I

This field practicum requires the student to be in the field 16 hours per week. Students are engaged in supervised social work practice that provides experience in the application of the theory, values, ethical principles and skills. The practicum emphasizes the processes of social work practice, including social work assessment and interventions, and local and indigenous knowledge. The mechanism for supporting the integration of students' class and field learning is reflective supervision, journaling and mentoring by community or agency based social workers and/or university social work faculty. (240 hours total).

○

ECONOMICS FOR SWKERS

This course introduces the general definitions and concepts of economics and uses case studies in social work to develop applied knowledge. The course covers the economics of poverty, health economics, household economics, the economics of labor and unemployment, humanitarian aid and government failure. Case studies of job training, substance abuse centers, counseling, psychosocial support, and child protective services are used to apply the knowledge and skills from this and other courses.

○

FIELD INTERNSHIP II

This field internship requires the student to be in their field internship 16 hours per week. Students are engaged in supervised social work practice that provides experience in the application of the theory, values, ethical principles and skills acquired in the foundation areas. The internship emphasizes the processes of advanced social work practice, with emphasis on power, inequality, oppression, socio-structural inadequacies, socio-structural, political and economic conditions that disempower, marginalize and exclude people. Social work assessment and interventions are explored along with local and indigenous knowledge. The mechanism for supporting the integration of students' class and field learning is reflective supervision, journaling and mentoring by community or agency based social workers and/or university social work faculty. (240hours total)

○

ORGANIZATIONAL LEADERSHIP AND MANAGEMENT IN SWK

This course examines the social work organizational leadership and management. Students learn how to define, design and implement services grounded in human rights, Islam, IFSW code of ethics and Somali culture to meet the needs of diverse services users. Social work management, supervision, leadership, budgeting, funding, project planning and entrepreneurship are taught. Strategies for organizational change are explored.

○

SWK IN EMERGENCIES (HUMANITARIAN AID)

This course is designed to provide and improve skills of social work practice in extreme events. Students are to be provided with necessary social work knowledge, values, ethical principles, and skills to be practiced in natural/human-made disaster situations. This course covers skills needed for challenges of humanitarian work practice, that is, crisis intervention, relief work, advocacy, and rapid response. Child protection and gender based violence in emergencies are emphasized. The course sheds the light on psycho-social interventions for population at risk (e.g., IDPs) in extreme events as well as the role of humanitarian organizations in the transition of society from a humanitarian crisis to social and economic stabilization. Inclusion of community members and affected populations to enhance community capacity is a foundation of community-based response to emergencies.

○

SWK SOCIAL POLICY ANALYSIS & ADVOCACY

This course is designed to provide students with the knowledge, values and skills for policy analysis and advocacy. The course explores the historical, economic, and other social conditions that influenced the policy developed overtime in the Somalia. It is designed to develop students' ability to identify and develop public policy priorities, conduct public policy analysis and apply various tactics to influence public policy in Somalia, the region, Africa and globally. Relevant global mandates such as the UN Declaration on Human Rights, CRC, CEDAW; Somalia law and legislation; and, Islam and Sharia; are examined as they apply to social work practice in Somalia.(include in syllabus: social politics; existing laws, legislation, constitution ;political justice; Influencing; raising awareness; Civic engagement; citizenship rights & responsibilities)

○

RESEARCH PROJECT/THESIS

Each student will conduct original research that concludes with the thesis. Using prior research knowledge and social work practice in the field, each student will develop and implement a research project. This will require a literature review, data collection and analysis, and report writing.

○

FIELD INTERNSHIP III

This field internship continues to require the student to be in their field internship 16 hours per week. Students continue to engage in social work practice that provides experience in the application of the theory, values, ethical principles and skills acquired throughout their social work education. (240hours total).



DIPLOMA IN PRIMARY EDUCATION

SCIENCE I

This course provides introductory concepts in the natural sciences such as biology, chemistry and physics. It is designed to provide students with a basic understanding of the following topics: cell biology, plants, matter, heat and its effects. Upon completion, students will be able to identify the features of living things in an organism, state the characteristics of plants, explain the three states of matter, identify the joules as units of heat, and use rulers, measuring cylinders and stop watches.

SOCIAL STUDIES I

Social Studies I is intended to enable learners to gain knowledge and insights into the structure of both our physical and human environment. The focus is to provide complete understanding of the interaction and relationship between humans and their environment. The structure of the earth, uses of the resources such as rivers, seas, oceans and mineral deposits will also be explored.

MATHEMATICS I

This course is designed to expose the student to a wide range of primary mathematics. Problem solving and critical thinking skills, along with the use of primary tools, will be emphasized and reinforced throughout the course as the student becomes actively involved in solving and calculating problems. Topics include: : Numbers 1, Algebra I ,Geometry I , Sets 1 Statistics 1 .Upon completion, students should be able to Define direct numbers , simplify algebraic expressions by grouping like terms, ,Introduce simple equation and solve it using algebraic and balance methods, Define the basic terms of geometry, Define sets, members of sets and finite and infinite sets ,Define statistics and data ,Present organized data by bar charts, line graphs and pie charts.

ARABIC I

تضم مادة هذا المقرر مهارات اللغة العربية الأربعة الاستماع (فهم المسموع)، الكلام (الحديث)، القراءة (فهم المقروء)، الكتابة (الألية والإبداعية)، والعناصر اللغوية الثلاثة، وهي: الأصوات (الظواهر الصوتية المختلفة)، والمُفردات (التعبير السياقية والاصطلاحية)، والتراكيب النحوية (مع قدر ملائم من قواعد النحو والصرف والإملاء). ويقدم المقرر بصورة متدرجة من السهولة إلى الصعوبة، ومن الموقف البسيط إلى المركب، مع مراعات مستويات الطلاب المبتدئين.

ISLAMIC STUDIES I

من خلال هذه المادة يتعرف الطالب على التربية الإسلامية و المسائل المتعلقة بها بحيث يتم التركيز على مبادئ التربية الإسلامية السامية ومصادر الأساسية كالقرآن الكريم و السنة النبوية الشريفة. و سيكون المواضيع التي يدرسها الطالب في هذه المرحلة . تعريف الثقافة الإسلامية و مصادر الثقافة الإسلامية، الفقه الإسلامي، الحديث النبوي الشريف، هي: تفسير القرآن الكريم

PHYSICAL EDUCATION I

This course is designed to investigate and apply the basic concepts and principle of lifetime, physical fitness and other health related factors. Emphasis is on stretching, conditioning exercise, proper clothing, walking, and jogging or running as a means of achieving fitness .Upon completion, students should be able to plan a personal, lifelong fitness program, participate in recreational walking programs based on individual needs, abilities and interests.

○

SOMALI STUDIES I

This course presents future teachers with a holistic background into the Somali heritage, language and its development. The aim of the course is to enable student-teachers to gain insights into the fundamentals of teaching Somali to young pupils. Spelling and pronunciation are key elements of this course.

○

ENGLISH I

The course aims at developing a wide range of skills in language development, which involves grammar and extensive vocabulary learning. The course also aims at improving writing skills, which have a specific focus on literacy and short essays, and memoranda, notes. Emphasis is also given to reading which involves study of instructional business-related texts of topical relevance. This will be complemented by listening skills which include comprehension of gist and detailed information. The course will culminate in developing communication skills of the student-teachers.

○

FOUNDATIONS OF EDUCATION I

This course is designed to examine educational practice from diverse perspectives such as historical, philosophical, sociological, and legal perspectives. The course will address issues of educational equity, socio cultural influences on teaching and learning. Students will explore education as a lifelong process, and traditional African education, Islamic education, and the art and science of teaching in general.

○

SCIENCE II

The course is designed to provide students with a basic understanding of the following topics: measurement, length, time and scales, mass, and food and nutrition. The course will also delve into the atomic structure and periodicity, and structure of atoms. Learners will be exposed to the importance of ecology and health education, definition and description of basic ecology, types of habitats, adaptations of organism to their habitats, and factors affecting population growth.

○

SOCIAL STUDIES II

Social Studies II begins with a close examination of our habitat and surrounding. Learners will explore different occupations in the society and the contributions of these occupations. Social problems such as pollution and crime will also be covered. The course will conclude with a brief overview of the history of Islam and its impact on Somalis.

○

MATHEMATICS II

This course introduces students to mathematics used in business and other fields. The main topic areas are: number (2), fractions and their equivalences, lowest terms, proper, improper and mixed numbers, decimals and their operations. Algebra (2), inequalities, solving simultaneous equations by graph and substitution and quadratic equations by factorization. Geometry 2, interior and exterior angles of a polygon, types of triangles and their properties and circle. Sets 2, universal sets, complement set and venn diagrams. Statistics 2, mean of grouped data, grouped data of discrete and continuous and modal class of grouped data. Ratio, proportion and rates (2), direct proportion, indirect proportion, rates and differentiate rate and ratio.

ARABIC II

من ضمن المواضيع التي يدرسها الطالب في هذه المرحلة: المطالعة، قواعد إملائية، قصائد شعرية، النحو. دراسة الشخصيات التالية: بلال بن رباح وعامر بن شرحبيل الشعبي.

ISLAMIC STUDIES II

من خلال هذه المادة سيدرس الطالب في هذه المرحلة: تفسير القرآن الكريم: (آداب المعاشرة والاجتماع، الناس سواسي كأسنان المشط، حقيقة الإيمان). أيضا الحديث النبوي: (الإحسان إلى كل الكائنات الحية، أداء الحقوق، موالاة أولياء الله). كذلك الفقه: (فروض الوضوء ونواقضه وسننه، موجبات الغسل وفرائضه، المسح على الخفين والتيمم). ومن خلال السيرة يتم التركيز على (مولد النبي، بدء الوحي، هدي النبي في النسك). واخيرا يبسط الضوء على وظائف الثقافة الإسلامية، خصائصها وقضايا ثقافية اخرى.

PHYSICAL EDUCATION II

This course provides special instruction designed to help students facilitate movement and change behavioral patterns by focusing on appropriate physical activities. Topics covered include sport psychology, physical education, basic activities; jump the snake, bull in the ring, rocking the man and buffalo fight. The course will endeavor to develop the versatility and agility of students as well as coordination and balance.

SOMALI STUDIES II

This course will introduce basic Somali children's songs and lullabies. The aim of these songs is to develop the speaking and pronunciation skills of the pupils. Basic spelling of Somali will also be featured in this extensively. Student-teachers will be expected to recite Somali children's songs and lullabies and incorporate them into their teaching of Somali at primary level.

ENGLISH II

This course is intended to help student-teachers improve their English skills in preparation for teaching English language. Particularly, it focuses on developing reading and writing skills, speaking, pronunciation, listening, spelling, and grammar. It also enables students to increase their vocabulary. During this course, students are taught the four ways of learning English such as: reading, writing, speaking and listening.

FOUNDATIONS OF EDUCATION II

Foundations of Education II presents philosophical concepts underpinning education and its impact not only on the learner but the society in general. Topics include pragmatism, humanism, perennials, experiential and traditionalism as well. The intent is for the student-teachers to examine the various educational philosophies. The course will also discuss educational psychology and how the theories and concepts can be translated into working approaches and frameworks in the classroom.

SCIENCE III

This course is designed to help students understand basic science principles and master problem-solving skills. Students will develop an understanding of how scientific concepts and skills are relevant to other courses and their daily lives. Science topics covered in the course include light and sound, straight propagation of light, light and shadows, reflection of light, and laws of reflection. The course will also discuss animals and their general characteristics, comparison of characteristics of animals, and classification of farm animals according to their products.

SOCIAL STUDIES III

This course will concentrate on the modern and contemporary Somali society. It will provide complete analysis of the rural and urban life today in the Somali territories. Culture and language and the change that has been effected in these two domains in the last century will also be examined in this course. The changes that occurred in the Horn of Africa and the Middle East and their ramification on the Somali people will also be examined.

MATHEMATICS III

The course is intended to give students who have demonstrated general competence in the skills of Stage 2 Mathematics an understanding of and competence in some further aspects of mathematics which are applicable to the real world. Area covered includes: Numbers (3), Rational and irrational numbers Sequences and series. Algebra (3), Word problems on factorization of quadratic equation, Quadratic equation by completing the squares, by formula and by graph and Linear inequalities. Geometry (3), Solids, Faces, edges and vertices of solids.

ARABIC III

تركز هذه المادة على الصرف بحيث تقدم المادة نبذة ومقدمة عن الصرف، تعريف المجرى والمزيد. بالإضافة على ذلك سيتم تسليط الضوء على بعض المواضيع النحوية مثل: النكرة والمعرفة، المبتدأ والخبر. كذلك التركيز على القراءة والمطالعة بحيث يتم عرض مواضيع مثل: مهنة التعليم، الحياة في البادية، البحر والعرب، في البيت، الطفل القارئ، وسائل الإعلام ومستقبل الطفل العربي، أثر الرحالة المسلمين في التعرف بالمجتمعات الإسلامية.

ISLAMIC STUDIES III

تتعلق مادة التربية الإسلامية بدراسة: القرآن وعلومه، والحديث وعلومه، والفقهاء الإسلامي، والسيرة النبوية، وما ينتج عن تفاعل المسلم مع القرآن والسنة وتمثله للسيرة النبوية وبناء حياته اليومية على ذلك وهو ما يطلق عليه بـ (الثقافة الإسلامية). هذه المادة تزود الطالب معلومات، وتكسبه اتجاهات ومهارات تتعلق بدينه الإسلامي. ومن خلال دراسة المتدرب لهذه المادة يقف على إهتمام الإسلام بالمجتمع المسلم، وما يجب أن يسوده من علاقات اجتماعية طيبة تتحول إلى ثقافة أصيلة.

PHYSICAL EDUCATION III

The main purpose of this course is to develop knowledge and understanding, attitudes and behaviors, and skills that will enable each student to develop a lifestyle in which regular vigorous physical activity is practiced. This course will allow the students to participate in developmentally appropriate activities; it will develop and reinforce cooperative behavior. Areas covered in this semester includes: Major activities in Grades 5 and 6, physical education syllabi in schools, terms of sports, physical movements, activities regulations, skills of athletics and basic skills in football.

SCIENCE IV

This course is a continuation of the science courses undertaken previously. Student-teachers will be introduced to the concepts of force, effects of force and how to measure forces. Other major topics that will be covered in this course include the basic structure and anatomy of human beings, functions of organs and detailed description of the various systems in the human body. Finally, this course will culminate in the adverse of drugs on the human body and mind.

SOMALI STUDIES III

Somali Studies III puts special emphasis on the nuclear and extended Somali families. The course will explore the traditional Somali marriage and family building. Somali stories and fairy tales will constitute a major component of this course. The aim of this course is to enable to student-teacher to teach Somali cultural heritage and folklore to the young effectively.

ENGLISH III

English III is a continuation of the previous English courses undertaken. This course will attempt to engender the creative aspects of the English language. Student-teachers will be required to write short stories and passages using the guidelines taught. The aim is to produce teachers who are able to inspire their pupils to express themselves through writing and storytelling.

FOUNDATIONS OF EDUCATION III

This course will put emphasis on the art and science of teaching. Special skills such as lesson planning and preparation of schemes of work will take the bulk of this course. The aim of the course is to enable student-teachers to plan for and deliver effective lessons that meet their instructional objectives. Micro-teaching will also be introduced in this course.

SOCIAL STUDIES IV

Social Studies IV will introduce the concept of population, the factors that cause population growth and decline as well as population density and distribution. A major topic that will also be covered in this topic is government and civic education. Student-teachers will examine the various roles citizens play in public life and how they affect government.

MATHEMATICS IV

The final installment of mathematics in this program will introduce trigonometry and its uses in (1), Angle measure degree, radian, Right-triangle and trigonometric ratios, Pythagoras theorem and solution of right-triangles. Another major topic is statistics and the cumulative frequency curve, median, quartiles and percentiles. The course will end with an introduction to business, business transactions and profit and loss and their percentages.

ARABIC IV

تركز هذه المادة على الصرف بحيث تقدم المادة نبذة ومقدمة عن الصرف، تعريف المجرد والمزيد. بالإضافة على ذلك سيتم تسليط الضوء على بعض المواضيع النحوية مثل: النكرة والمعرفة، المبتدأ والخبر كذلك التركيز على القراءة والمطالعة بحيث يتم عرض مواضيع مثل: مهنة التعليم، الحياة في البادية، البحر والعرب، في البيت، الطفل القارئ، وسائل الإعلام ومستقبل الطفل العربي، أثر الرحالة المسلمين في التعرف بالمجتمعات الإسلامية.

ISLAMIC STUDIES IV

تتعلق مادة التربية الإسلامية بدراسة: القرآن وعلومه، والحديث وعلومه، والفقهاء الإسلامي، والسيرة النبوية، وما ينتج عن تفاعل المسلم مع القرآن والسنة وتمثله للسيرة النبوية وبناء حياته اليومية على ذلك وهو ما يطلق عليه بـ (الثقافة الإسلامية). هذه المادة تزود الطالب معلومات، وتكسبه اتجاهات ومهارات تتعلق بدينه الإسلامي. ومن خلال دراسة المتدرب لهذه المادة يقف على إهتمام الإسلام بالمجتمع المسلم، وما يجب أن يسوده من علاقات اجتماعية طيبة تتحول إلى ثقافة أصيلة.

○

PHYSICAL EDUCATION IV

Physical Education IV is designed to equip student-teachers with skills and knowledge pertaining to tournament scheduling, types of tournament, round robin tournaments, single elimination tournaments and double elimination tournaments. Student-teachers will also gain skills in ball Games such as basketball, passing, dribbling, shooting, defense and offence. The course will put emphasis on essentials of physical education, warming up and cooling down and psychological factors affecting physical performance.

○

SOMALI STUDIES IV

Somali Studies IV presents Somalia in the large African and Arabic context and examines issues and problems facing the nation in this 21st century. This picture will be put in place with the help of historical analysis of the region. The African kingdoms that dominated the region as well as the colonial powers and their influence will be discussed at length. The aim of the course is to evaluate the future that Somalia will chart in the context of African and Islamic environment.

○

ENGLISH IV

English is the culmination of the English courses undertaken previously. Emphasis will be placed on grammar and the correct construction of sentences and phrases. Word combination and roots of words will also be explored. Spelling is another major component of English IV. Student-teachers will be instructed on the most effective methods of teaching spelling alongside phonics.

○

FOUNDATIONS OF EDUCATION IV

Foundations of Education IV will feature classroom management and student motivation extensively. Student-teachers will explore the factors affecting classrooms such as indiscipline and classroom arrangement. Student needs and interests and their influence on classroom management and student performance will also be examined. Finally, the course will cover the best techniques teachers can use in motivating their students.



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

JAAMACADDA UMMADDA SOOMAALIYEED



الجامعة الوطنية الصومالية

SOMALI NATIONAL UNIVERSITY

CURRICULUM & COURSE DESCRIPTIONS

FACULTY OF ENGINEERING



2018 - 2019

BRIEF PROFILE

Faculty of engineering was established in 1973-74 and first Somalia Engineers were graduated 1978, it was with two departments of Industrial and civil and environmental engineering. The faculty was giving fresh engineers each year until 1990, when civil war erupted in the country. Right now the faculty is re-established (2016-2017), and within five years' time it will assume producing new Somali engineers Insha'Allah.

INTRODUCTION

Faculty of Engineering is the indispensable part of Somali Community development; its curriculum will answer our community concerns towards infrastructure and development. The faculty is established and supported for community welfare and development.

Objectives of the faculty

Objectives of the faculty are to cover the necessity of the engineers in the country and to answer for the national development plan which could not be achieved without capable engineers in the country. This faculty will stand and encourage our country's industrial and infrastructure development.

Vision

Our vision is to uniquely position the Faculty as a leader in innovation and excellence in engineering through education, research and scholarship for those front runners from the students in a professional framework reflecting our social responsibility. The Faculty believes its prime driver for success in all these areas should emanate from targeted research that attracts highly qualified faculty graduate students, and enhances the attractiveness and quality of the undergraduate program. The Faculty will continue to support the individual research initiatives of its professors, but will promote a strong focus on inter-disciplinary research in high-interest and impact areas as perceived by governments and industry requirements: faculty focuses on

- Critical infrastructure design and survivability
- Sustainable energy and environmental technologies
- Creation of standards for the country's engineering systems.

Mission

The Faculty of Engineering provides its graduates with top quality education in engineering with its departments (Civil & Environmental, Mechanical, Electrical as well as computer engineering), it is preparing students to practice their professions competently to meet the ever-changing needs of society, and to continue learning their discipline, allowing them to move into the real world needs. Excellence and diversity in research are essential to the future of our students.

Our mission is to build dependable engineers in the future their country and the world as well. We forecast that we will engage strong collaboration with country industries and government research laboratories. The Faculty encourages a spirit of national and international level of technology competition amongst its students and personnel. The Faculty strives to provide a learning environment that promotes excellence and innovation, ethical practice and responsibility towards society. The Faculty is committed to a culture built on respect of the individual and fair treatment for all.

Values

The Faculty of Engineering at the Somali National University is designed to be a dynamic community of students. Faculty members and future researchers are both the base of proposed excellence in education, research, and professional services to the engineering.





**CURRICULUM OF FACULTY OF ENGINEERING
FIVE YEARS PROGRAM**

DEPARTMENT OF CIVIL ENGINEERING

ACADEMIC YEAR ONE

First Semester				Second Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
MTH1101	Mathematics I	160		AEM 1201	Advanced Engineering Mathematics	120	
PHY1102	Physics I	120		PHY 1202	Physics II	120	
CH1103	Gen. Chemistry	120		EM 1203	Engineering Materials	104	
AA1104	Analytic Geometry & linear Algebra	160		ED 1204	Engineering Drawing	120	
AL1105	Arabic Language I	80		FCS 1205	Fundamentals of Computer Sciences	90	
EL1106	English Language I	80		AL 1206	Arabic II	80	
				EL 1207	English Language II	80	
TOTAL		720		TOTAL		714	

ACADEMIC YEAR TWO

Third Semester				Fourth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
AC 2301	Applied Chemistry	104		HYD 2402	Hydraulics & Fluid Dynamics	120	
THT 2302	Thermodynamics & Heat Transfer	120		EMM 2406	Engineering Mathematics Methods	104	
CD 2304	Civil Design	90		FEE 2407	Fund. of Environmental Engineering	90	
IEE 2305	Intr. to Electrical Engineering	90		ITC 2408	Islamic Thoughts & Concepts	80	
SE 2306	Safety Engineering	90					
TW 2307	Transactions & Worship	80					
EL 2308	English Language III	80					
TOTAL		654		TOTAL		394	

ACADEMIC YEAR THREE

Fifth Semester				Sixth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
HYS 3501	Hydraulic Systems	120		CT 3601	Construction Technology II	120	
AEM 3503	Applied Engineering Mechanics	120		PL 3606	Civic, Public law	80	
CT 3506	Construction Technology I	120		HYD 3607	Hydraulics: Construction & Design	120	
SM 3507	Strength of Materials	104		DIS 3609	Design of Illumination Systems	90	
WR 3508	Water Resource	104					
TSM 3509	Topography, Survey & Mapping	120					
SM 3510	Soil Mechanics	104					
TOTAL		792		TOTAL		410	

ACADEMIC YEAR FOUR

Seventh Semester				Eighth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
RC 4705	Road Construction	120		GT 4809	Geotechnics	104	
AG 4706	Applied Geology	90		TRD 4810	Town & Rural Design	104	
TPL 4707	Transportation Planning and Logistics	104		WRM4811	Water Resources Management	120	
SH 4713	Somali History	80		ADT 4812	Architectural Design & Technology I	104	
				SL 4817	Somali Literature	80	
TOTAL		394		TOTAL		512	

ACADEMIC YEAR FIVE

Ninth Semester				Tenth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
PM 5903	Project Management	104		AAD 51003	Architectural Design & Technology II	120	
RCD 904	Reinforced Concrete & Steel Struct. Design I	120		RCS51004	Reinforced Concrete & Steel Struct. Design II	104	
DTS 905	Design of Transportation Systems	90			Senior Project Stage II		
RAD 906	Road & Airport Design	104					
EEC 913	Engineering Economics	104					
	Senior Project Stage I						
TOTAL		522		TOTAL		224	





CURRICULUM OF FACULTY OF ENGINEERING

FIVE YEARS PROGRAM

DEPARTMENT OF COMPUTER ENGINEERING

ACADEMIC YEAR ONE

First Semester				Second Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
MTH 1101	Mathematics I	160		AEM 1201	Advanced Engineering Mathematics	120	
PHY 1102	Physics I	120		PHY 1202	Physics II	120	
CH 1103	Gen. Chemistry	120		EM 1203	Engineering Materials	104	
AA 1104	Analytic Geometry & linear Algebra	160		ED 1204	Engineering Drawing	120	
AL 1105	Arabic Language I	80		FCS 1205	Fundamentals of Computer Sciences	90	
EL 1106	English Language I	80		AL 1206	Arabic II	80	
				EL 1207	English Language II	80	
TOTAL		720		TOTAL		714	

ACADEMIC YEAR TWO

Third Semester				Fourth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
AC 2301	Applied Chemistry	104		AM 2401	Analytic Mechanics	120	
THT 2302	Thermodynamics & Heat Transfer	120		HYD 2402	Hydraulics & Fluid Dynamics	120	
MCD 2303	Machine Computer Aided Design	90		IES 2403	Introduction to Energy Systems	90	
IEE 2305	Intr. to Electrical Engineering	90		AE 2404	Applied Electricity	90	
SE 2306	Safety Engineering	90		FE 2405	Fundamentals of Electronics	90	
TW 2307	Transactions & Worship	80		EMM 2406	Engineering Mathematics Methods	104	
EL 2308	English Language III	80		ITC 2408	Islamic Thoughts & Concepts	80	
TOTAL		654		TOTAL		694	

ACADEMIC YEAR THREE

Fifth Semester				Sixth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
MM 3502	Mechanics of Materials	104		EPS 3602	Electrical Power Station	90	
AEM 3503	Applied Engineering Mechanics	120		RE 3603	Renewable Energy	90	
AEEM 3504	Applied Elec. & El. Machines	104		FEM 3604	Fund. Electrical Measurements	90	
MED 3505	Machine Elements Design	90		MT 3605	Machine Tools	90	
CT 3506	Construction Technology I	120		PL 3606	Civic, Public law	80	
				FD 3608	Fluid Dynamics	90	
				EM 3610	Electric Machines	120	
TOTAL		538		TOTAL		650	

ACADEMIC YEAR FOUR

Seventh Semester				Eighth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
DM 4702	Discrete Mathematics	120		ESS 4805	Electronic Sensing Systems	90	
EPC 4708	Elementary Programming Concept w/lab.	104		PIDS 4806	Programming & Intro. To Data structure w/Lab.	120	
CS 4711	Control System I	90		AIS 807	Automation Industrial Systems I	104	
SH 4713	Somali History	80		ICO 4808	Introduction to Computer Organization	90	
				SL 817	Somali Literature	80	
TOTAL		394		TOTAL		484	

ACADEMIC YEAR FIVE

Ninth Semester				Tenth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
PM 903	Project Management	104		AP 51007	Advanced Programming (Object Oriented) w/lab.	104	
MC 5910	Mobile Computing w/ Lab.	90		IESD 1008	Introduction to Embedded Systems Design	90	
CS 5911	Computer Security	104			Senior Project Stage II		
IAWS 5912	Introduction to Antennas & Wireless Systems	104					
EEC 5913	Engineering Economics	104					
	Senior Project Stage I						
TOTAL		506		TOTAL		194	





CURRICULUM OF FACULTY OF ENGINEERING

FIVE YEARS PROGRAM

DEPARTMENT OF ELECTRICAL ENGINEERING

ACADEMIC YEAR ONE

First Semester				Second Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
MTH 1101	Mathematics I	160		AEM 1201	Advanced Engineering Mathematics	120	
PHY 1102	Physics I	120		PHY 1202	Physics II	120	
CH 1103	Gen. Chemistry	120		EM 1203	Engineering Materials	104	
AA 1104	Analytic Geometry & linear Algebra	160		ED 1204	Engineering Drawing	120	
AL 1105	Arabic Language I	80		FCS 1205	Fundamentals of Computer Sciences	90	
EL 1106	English Language I	80		AL 1206	Arabic II	80	
				EL 1207	English Language II	80	
TOTAL		720		TOTAL		714	

ACADEMIC YEAR TWO

Third Semester				Fourth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
AC 2301	Applied Chemistry	104		AM 2401	Analytic Mechanics	120	
THT 2302	Thermodynamics & Heat Transfer	120		HYD 2402	Hydraulics & Fluid Dynamics	120	
MCD 2303	Machine Computer Aided Design	90		IES 2403	Introduction to Energy Systems	90	
IEE 2305	Intr. to Electrical Engineering	90		AE 2404	Applied Electricity	90	
SE 2306	Safety Engineering	90		FE 2405	Fundamentals of Electronics	90	
TW 2307	Transactions & Worship	80		EMM 2406	Engineering Mathematics Methods	104	
EL 2308	English Language III	80		ITC 2408	Islamic Thoughts & Concepts	80	
TOTAL		654		TOTAL		694	

ACADEMIC YEAR THREE

Fifth Semester				Sixth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
MM 3502	Mechanics of Materials	104		EPS 3602	Electrical Power Station	90	
AEM 3503	Applied Engineering Mechanics	120		RE 3603	Renewable Energy	90	
AEEM 3504	Applied Elec. & El. Machines	104		FEM 3604	Fund. Electrical Measurements	90	
MED 3505	Machine Elements Design	90		MT 3605	Machine Tools	90	
CT 3506	Construction Technology I	120		PL 3606	Civic, Public law	80	
				FD 3608	Fluid Dynamics	90	
				EM 3610	Electric Machines	120	
TOTAL		538		TOTAL		650	

ACADEMIC YEAR FOUR

Seventh Semester				Eighth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
MSD 4703	Mechanical Systems Design	104		EPS 4813	Electric Power System II	120	
TPP 4704	Thermal Power Plant	104		CS 4814	Control System II	90	
MT 4712	Mechanical Technology	104		EM 4815	Electrical Measurements	90	
SH 4713	Somali History	80		EMD 4816	Electric Machine and Drives	120	
				SL 4817	Somali Literature	80	
TOTAL		392		TOTAL		500	

ACADEMIC YEAR FIVE

Ninth Semester				Tenth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
HVE 5907	High Voltage Engineering	104		DPDS 51005	Design of Power Distribution Systems	104	
EPSA 5908	Electric Power Systems Applications	104		PE 51006	Power Electronics	120	
MEA 5909	Materials of Electrical Applications	104			Senior Project Stage II		
PM 5903	Project Management	104					
EEC 5913	Engineering Economics	104					
	Senior Project Stage I						
TOTAL		520		TOTAL		224	





**CURRICULUM OF FACULTY OF ENGINEERING
FIVE YEARS PROGRAM**

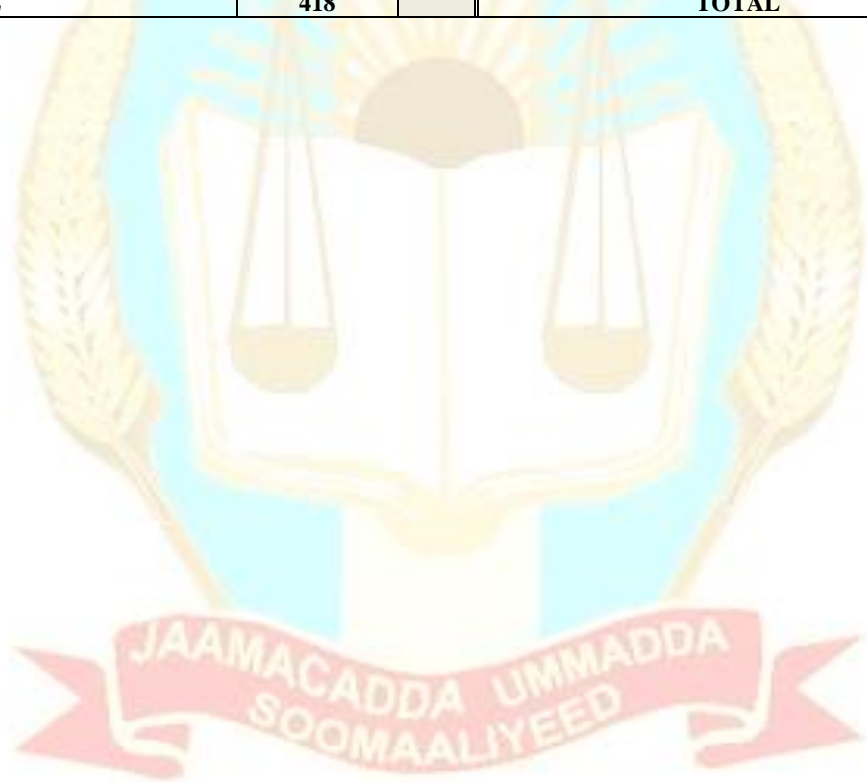
DEPARTMENT OF MECHANICAL ENGINEERING						
ACADEMIC YEAR ONE						
First Semester				Second Semester		
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours
MTH 1101	Mathematics I	160		AEM 1201	Advanced Engineering Mathematics	120
PHY 1102	Physics I	120		PHY 1202	Physics II	120
CH 1103	Gen. Chemistry	120		EM 1203	Engineering Materials	104
AA 1104	Analytic Geometry & linear Algebra	160		ED 1204	Engineering Drawing	120
AL 1105	Arabic Language I	80		FCS 1205	Fundamentals of Computer Sciences	90
EL 1106	English Language I	80		AL 1206	Arabic II	80
				EL 1207	English Language II	80
TOTAL		720		TOTAL		714
ACADEMIC YEAR TWO						
Third Semester				Fourth Semester		
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours
AC 2301	Applied Chemistry	104		AM 2401	Analytic Mechanics	120
THT 2302	Thermodynamics & Heat Transfer	120		HYD 2402	Hydraulics & Fluid Dynamics	120
MCD 2303	Machine Computer Aided Design	90		IES 2403	Introduction to Energy Systems	90
IEE 2305	Intr. to Electrical Engineering	90		AE 2404	Applied Electricity	90
SE 2306	Safety Engineering	90		FE 2405	Fundamentals of Electronics	90
TW 2307	Transactions & Worship	80		EMM 2406	Engineering Mathematics Methods	104
EL 2308	English Language III	80		ITC 2408	Islamic Thoughts & Concepts	80
TOTAL		654		TOTAL		694
ACADEMIC YEAR THREE						
Fifth Semester				Sixth Semester		
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours
MM 3502	Mechanics of Materials	104		EPS 3602	Electrical Power Station	90
AEM 3503	Applied Engineering Mechanics	120		RE 3603	Renewable Energy	90
AEEM 3504	Applied Elec. & El. Machines	104		FEM 3604	Fund. Electrical Measurements	90
MED 3505	Machine Elements Design	90		MT 3605	Machine Tools	90
CT 3506	Construction Technology I	120		PL 3606	Civic, Public law	80
				FD 3608	Fluid Dynamics	90
				EM 3610	Electric Machines	120
TOTAL		538		TOTAL		650

ACADEMIC YEAR FOUR

Seventh Semester				Eighth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
MSD 4703	Mechanical Systems Design	104		BBD 4801	Boilers and Boilers Design	120	
TPP 4704	Thermal Power Plant	104		ICE 4802	Internal Combustion Engines	104	
MT 4712	Mechanical Technology	104		MM 4803	Mechanical Measurements	90	
SH 4713	Somali History	80		FPS 4804	Fluid power Systems	104	
EM 4714	Engineering Metallurgy	104		SL 4817	Somali Literature	80	
TOTAL		496		TOTAL		498	

ACADEMIC YEAR FIVE

Ninth Semester				Tenth Semester			
C. No.	Course Name	Semester Hours		C. No.	Course Name	Semester Hours	
SEF5901	Systems Engineering Fundamentals	90		EACS 51001	Engineering Auto. Control Systems	104	
HYPT 902	Hydroelectric Power & Turbomachinery	120		IP51002	Industrial Plants	104	
PM 5903	Project Management	104			Senior Project Stage II		
EEC 5913	Engineering Economics	104					
	Senior Project Stage I						
TOTAL		418		TOTAL		208	



COURSE DESCRIPTIONS

CORE SUBJECTS AND FACULTY REQUIREMENTS

MATHEMATICS I

Revision of fractions decimals and percentage, Indices, Standard form and Engineering Notations, Indices, Standard form and Engineering Notations, Computer Numbering System, Computer Numbering System, Calculations and Evaluation of formula, Calculations and Evaluation of formula, Areas of plan Figures. Areas of plan Figures, The circle and its properties, the circle and its properties. Volumes and surface areas of common solids, Volumes and surface areas of common solids, Volumes and surface areas of common solids. Volumes and surface areas of common solids, Volumes and surface areas of common solids. Irregular areas and volumes and mean values of waveforms.

GENERAL CHEMISTRY

The aim of this course unit is to provide participants/students with the skills, knowledge and attitudes required to perform General chemistry and processes for solution of engineering problems, particularly the use of physical and chemical properties of substance, in short, subject aims to show the relevance of General chemistry to engineering and applied sciences. Contents covered include: Introduction to chemistry and Stoichiometry, Atoms, Molecules, and Ions, Reactions in Aqueous Solutions, The Periodic Table, Chemical Bonding, Introduction to Organic Chemistry, Chemicals, Chemical Kinetics, Chemical Equilibrium, Acids and Bases, Redox Reactions and Electrochemistry, Acids and Bases, Organic Polymers and Nuclear Chemistry.

PHYSICS I

This is a calculus-based physics course covering the basic laws and phenomena in mechanics. The course contains the following topics: Introduction to physics, branches of physics, importance of physics, units, measurements, unit conversion, problem solving strategies, errors, vectors, Kinematics in One Dimension, Kinematics in Two or Three Dimensions, Projectile Motion, Newton's Method, Force, Newton's Laws of Motion, The Inclined Plane, Atwood's Machine, Statics, Friction, Energy, Linear Momentum, Impulse, Collisions, Moment of Inertia, Torque, Elasticity and Gravity.

MATHEMATICS II

This course aims to provide students with the skills, knowledge and attitudes required to perform fundamental mathematical procedures and processes for solution of engineering problems, particularly the use of integral calculus, differential equations. Contents include: Standard integration, Standard integration, Standard integrals, Application of integration, Integration using algebraic substitutions, Integration of trigonometric functions, Integration using trigonometric substitutions, Integration using partial fractions, Integration by parts, Reduction formulae, Double and triple integrals, Numerical integration, Laplace transforms, Solutions to differential equations using Laplace transforms and Fourier series.

○

ENGINEERING MATERIAL

The purpose of this course is to serve as an introduction to internal structure, properties, processing and applications of engineering material. This course ensures that engineers should be knowledgeable about the internal structure and properties of materials so that they will be able to select the most suitable ones for each applications and be able to develop the best processing methods. Contents include: Introduction of engineering material, Metal structure and bonding in materials, General properties of engineering materials, Materials Testing, Polymers and Plastics, Corrosion and its prevention and Ceramics.

○

ENGINEERING DRAWING I

This is a beginning drawing course. Students are introduced to fundamental knowledge and skills such as line work, lettering, scale use, and sketching, multi-view drawings, sectional views, with the basics of manual drafting techniques and the use of drafting equipment. Contents include: Drawing instruments and accessories, Lettering and dimensioning practice, Scales, Geometrical Constructions, Construction of pentagon, hexagon and octagon, Definitions of ellipse, parabola and hyperbola, Construction of cycloids, epicycloids and hypocycloid, orthographic projection, Multi-view(orthographic)projection; VP; HP; front view; top view, First and third angle projection, Projection of points and straight lines, introduction of isometric projection and Methods of constructing isometric drawing.

○

ENGLISH II

This course is to take university-level students with a high level in English as a second language The basic tools that focus are these three areas with confidence grammar, vocabulary and pronunciation(G,V,P). Contents include: Grammar: question formation, auxiliary verbs, present perfect (simple and continuous), using adjectives, adverbs and adverbial phrases, passive (all forms), unreal conditions, gerunds & infinitives, articles. Writing: an informal letter / email, a short story, expressing your opinion, an article, a formal letter and a report.

○

PHYSICS II

This is designed to acquire knowledge of the physical nature of an industrial and scientific approach analysis and advancement in the concept of electricity, magnetism, optics, and modern physics. This course also enables students understanding the fundamental problem solving procedures and formulation of applied physics. Contents include: oscillatory motion, motion of an object attached to a spring, analysis model: particle in simple harmonic motion, forced oscillation, damped oscillation, wave motion, propagation of a disturbance, analysis model: traveling wave, rate of energy transfer by sinusoidal waves on strings, the linear wave equation, sound waves, speed of sound waves, intensity of periodic sound waves, the Doppler effect, superposition and standing waves, beats: interference in time, non-sinusoidal wave patterns, electric fields, gauss's law, electric potential, capacitance, current and resistance, direct-current circuits, magnetic fields, sources of the magnetic field, faraday's law, inductance, alternating-current circuits and electromagnetic waves.

○

HYDRAULICS

The Basic Hydraulics course covers hydraulic principles of mechanical maintenance, types of hydraulic fluids and their characteristics. Describes components of the hydraulic system and their functions for maintenance procedures, including filters and strainers, reservoirs and accumulators, pumps, piping, tubing and hoses, control valves, relief valves, and actuating devices. Units covered include: Hydraulics basics, hydraulic systems, Pumps, hydraulic actuators, Valves, circuit diagrams and troubleshooting, Electrical devices.

COMPUTER AIDED DESIGN FOR ELECTROMECHANICAL ENGINEERING

The primary objective of this course is to teach the student the basic commands necessary for professional 2D drawing, design and drafting using AutoCAD and also to teach students powerful tools and techniques for drawing, dimensioning and printing 2D drawings. Contents include: Introduction to computer & auto cad, Learning basic commands to get started, Line, Circle & poly line, Learning basic commands to get started, Dimensioning a drawing, and modifying dimension, Complete mechanical block drawing with 2D, Using rectangular 3D coordinates, the right-hand rule of drawing, Understanding viewports, creating viewports, drawing in multiple viewports, regenerating viewports, and creating a standard engineering layout, Properties, align, rotate3d, mirror3d, 3darray, fillet, and chamfer and constructing enclosed surfaces with EDGESURF, creating a surface mesh with RULESURF, constructing tabulated surfaces with TABSURF.

BASIC ELECTRICAL ENGINEERING

The main objectives of this course include: to understand charge, current, voltage, resistance, ohm's law, the concept of power and energy, electric source, electric circuit, capacitance, and inductance. Topic covered include: introduction of electrical, systems of units, charge, force, current and voltage and resistance, series circuits, parallel elements, Kirchhoff's current law, series-parallel networks, current sources, nodal analysis, y - d (t - p) and d - y (p - t) conversions, network theorems, introduction capacitor, faraday's law of electromagnetic induction, self-inductance, types of inductors, induced voltage, r-l transients: storage cycle, sinusoidal alternating waveforms, the three-phase generator, and the y -connected generator.

APPLIED CHEMISTRY

The main objectives of this course include: Understand the fundamentals energy, forms and types p of renewable energy, understand the fundamentals of corrosion and development of different techniques in corrosion control. Analysis of water for its various parameters and its significance in industrial applications, improve the fundamental science and engineering principles of combustion and fuels. Understand the concept of lubricant and lubrications. Topics covered: Fuel, Definition, classification of fuels, Liquid fuels: Petroleum and its refining, Cracking: Fixed bed catalytic cracking; Knocking, fuel and combustion, Composition, characteristics and applications of Natural gas, LPG and CNG, Energy, Corrosion, Chemical and electrochemical corrosion with mechanism, Lubricants and fuels, Polymer Chemistry and Organic chemistry.

APPLIED ENGINEERING MECHANICS

This course has been designed to provide basic knowledge of engineering mechanics to the students so that it would be helpful for them to understand structural engineering stress analysis principles in later courses or to use basics of mechanics in their branch of engineering. Topics covered include: Introduction to dynamics, kinematics of a particle, rectilinear motion, curvilinear motion, dependent motion analysis, relative-motion analysis, force and acceleration, Newton's 2nd law of motion, equation of motion, equation of motion for a system of particles, equation of motion - rectangular coordinates, equation of motion - normal and tangential coordinates, equation of motion - cylindrical coordinates, work and energy), the work of a force, principle of work and energy, principle of work and energy for system of particles, conservative forces and potential energy, conservation of energy, impulse and momentum, principle of linear impulse and momentum, conservation of linear momentum, impact, angular momentum, relation between moment of a force and angular momentum, principle of angular impulse and momentum, Planar kinematics of a rigid body, rigid-body motion, translation, rotation about a fixed axis, relative-motion analysis - velocity, instantaneous center of zero velocity, relative motion analysis - acceleration.

○

CIVIL DESIGN I

The objectives of this course include: use AutoCAD for daily working process, navigate throughout AutoCAD using major navigating tools, understand the concept and techniques to draw, create multiple designs using several of tools, create layers to control the objects' visibility. Topics covered are: introducing auto-cad interface, creating your first drawing, organizing objects, editing and reusing data work efficiently, navigating the AutoCAD civil 3d, user interface, leveraging a dynamic environment, establishing existing conditions using survey data, modeling the existing terrain using surfaces, designing in 2D using alignments, displaying and annotating, alignments, designing vertically using profiles.

○

FUNDAMENTALS OF COMPUTER SCIENCES

This course is to enhance student's knowledge; understanding and basic skills of applying the fundamental of computer and basic application. Topics covered include: Introducing today's technologies: computers, devices, and the Web, Connecting and Communicating Online: The Internet, Websites, and Media, Digital Security, Ethics, and Privacy: Threats, Issues, and Defenses, Computing Components: Processors, Memory, the Cloud, and More, Input and Output: Extending Capabilities of Computers and Mobile Devices, DIGITAL STORAGE, Operating Systems: Managing, Coordinating, and Monitoring Resources, The Windows 10 environment, Devices and resources, Microsoft Office 2016, Microsoft Excel 2016 and Microsoft PowerPoint 2016.

○

SAFETY ENGINEERING

The main objective include: to provide students with the skills, knowledge and attitudes required to perform fundamental of safety-based systems design, and processes for solution of engineering safety estimations, particularly in design, installation, operation and maintenance of systems. Topics to be covered are: the problem, engineering role, engineering design guidelines, general design considerations, safety requirements, ingredients for safety program, the quality of truth and safety, incompleteness, risk assessment, design codes, quality assurance, system reliability, acceptable risks, sociology of safety and process industry safety, the role of regulations and codes.

○

APPLIED ELECTRICITY

This is a hands-on foundation exploring and applying fundamental electrical and electronics theory to practical application in everyday industrial settings. Applied Electricity provides students with broad understanding of the technology of the manufacture, installation, maintenance and repairs of domestic and industrial equipment using electrical and test apparatus correctly and safely. topics covered include: introduction to powers of 10, electricity, resistors, ohm's law, series circuits, parallel circuits, series-parallel circuits, voltage dividers and current dividers, analog and digital millimeters, Kirchhoff's laws, network theorems, conductors and insulators, magnetism, alternating voltage and current, capacitance, capacitive reactance, capacitive circuits, inductance, alternating current circuits, diodes and diode applications, bipolar junction transistors.

○

ENVIRONMENTAL ENGINEERING

The aim of the course is to make students aware of the environmental effects of pollutants and should be able to understand the pollutants, their characteristics and manage systems to mitigate them Topics to be covered include: introduction environmental engineering, civil engineering, public health, ethics, measurement of water quality, water treatment, collection of wastewater, wastewater treatment, sludge treatment and disposal, hazardous waste, radioactive waste, solid and hazardous waste law, air pollution control and noise pollution.

○

MECHANICS OF MATERIALS

Mechanics of materials is a basic engineering subject that must be understood by anyone concerned with the strength and physical performance of structures, whether those structures are man-made or natural. The subject matter includes such fundamental concepts as stresses and strains, deformations and displacements, elasticity and inelasticity, strain energy, and load-carrying capacity. These concepts underlie the design and analysis of a huge variety of mechanical and structural systems. Topics to be covered include: Tension, Compression, and Shear, Axially Loaded Members, Torsion, Shear Forces and Bending Moments, Stresses in Beams (Basic Topics), Analysis of Stress and Strain and Applications of Plane Stress.

○

BASIC ELECTRONICS

This course will focus on the physics of semiconductor devices and the principals of their operation. The initial parts of the courses will be used to understanding Diode semiconductor device, characteristics and also its applications. The major part of the course will be focused on different types of transistors such as bipolar transistor (BJT), metal oxide semiconductor field effect transistors (MOSFETS) and JFET devices which are the dominant type of devices in the semiconductor device market. And also will focus on the use of operational amplifier and their design and optimization for integrated circuit applications will be presented in detail.

○

ENGLISH IV

The aim of the course is designed to develop the student's ability to communicate effectively in English, both orally and in writing, on business related topics and Students will increase vocabulary and practice using business English in everyday business situations on the telephone, and in meetings, presentations or negotiations. In addition, students will develop business English skills by writing e-mails, memos and business letters. Topics covered include: business communication basics, speaking, listening and non-verbal communication, use of English, introducing the business letter, rules of good writing, recruitment correspondence, memos, reports, meetings, reformulating and summarizing, oral presentation skills and translation skills.

○

ANALYTICAL MECHANICS

Objective of the course include: to provide definition of force and moment vectors and give necessary vector algebra, to explain the concept of equilibrium of particles and rigid bodies in plane and 3D space, To give information about support types and to give ability to calculate support reactions, To explain the equilibrium of structures and internal forces in trusses, and frames. Units covered: General Principles, equilibrium of a particle, force system resultants, principle of moments, equilibrium of a rigid body, structural analysis, internal forces, friction, center of gravity and centroid, moments of inertia, virtual work.

○

CIVIL DESIGN II

This the second phase of the course Civil design I, The objectives include: use AutoCAD for daily working process, navigate throughout AutoCAD using major navigating tools, understand the concept and techniques to draw, create multiple designs using several of tools, create layers to control the objects' visibility navigating the AutoCAD civil 3D user interface, leveraging a dynamic environment, establishing existing conditions using survey data, modeling the existing terrain using surfaces, designing in 2d using alignments, displaying and annotating, alignments, designing vertically using profiles, designing in 3d using corridors, creating cross sections of the design, displaying and annotating sections, designing and analyzing boundaries using parcels.

○

SOIL MECHANICS

The course involves using scientific methods and principles of engineering to collect and interpret the physical properties of the ground for use in building and construction. Main objectives include: Letting the engineering student have ability to analyze a given problem in a simple and logical manner, Applying to the solution a few fundamental and well-understood principles in real life engineering, Being capable of understanding characteristics of materials in structure and consequence of reactions of interaction of different materials, Driving a formulas and make use of coherent and reasonable way Sympathetically can classify materials and their behavior. Topics to be covered are: geotechnical engineering—a historical perspective, origin of soil and grain size, weight–volume relationships, plasticity and structure of soil, classification of soil, soil compaction, permeability.

○

MACHINE ELEMENT DESIGN

The main objectives of this course unit include: to understand how to design machine and machine parts, to understand how to calculate the theoretical calculation of designing machine parts, to understand in concise way how to design machine elements. Topics covered include: introduction of machine Design, engineering material and their properties, manufacturing consideration in machine design, Simple stress in machine design, Shear stress and strain, Welded Joints, Spring, Rolling contact bearing, spur gears, helical gear.

○

CONSTRUCTION TECHNOLOGY

Main objectives of this course include: explain safety practices and procedures, Describe commonly used building materials, Describe methods and techniques for various types of construction. Topics to be covered include: setting out of new building, substructure, walls and partitions, masonry construction in bricks and blocks, timber upper floor, openings in masonry walls, roof structure, roof covering, doors, and windows.

○

ENGINEERING MATHEMATICAL METHODS

The objective of the course include: to provide participants / students with the skills, knowledge and attitudes required to perform fundamental mathematical procedures and processes for solution of engineering problems, particularly the use of integral calculus, differential equations, to provides an introduction to special function, power series solution to differential equations. This subject aims to show the importance of mathematics to engineering and applied sciences. Topics covered include: special functions, gamma function, beta function, power series method of solving ordinary differential equation, Bessel's equation and Bessel's functions, Legendre's equation and Legendre polynomials, Laplace transforms, properties of Laplace transform, inverse Laplace transforms, Laplace transform of Heaviside function, solutions to differential equations using Laplace transforms, Fourier series.

○

WATER RESOURCES ENGINEERING

This course provides a detailed overview of water resource engineering including both analysis and design elements. The main objectives of this course include: to develop the ability among students to synthesis data and technical concepts for application in hydrology and water resources engineering. Topics covered include: introduction to water resources engineering, precipitation, water losses, runoff, hydrographs, stream gauging, ground water, types of aquifers and formations, confined and, unconfined aquifers, Darcy's law, transmissibility , well hydraulics, specific gravity, cavity wells, hydraulics of open wells, construction of open wells, spacing of wells.

○

ELECTRIC MACHINE

This course intends to equip students with the skills needed to analyze the performance of a simple power system with a single source and single load, Use the per unit system in circuit analysis, Analyze the performance of a piece of power apparatus (transformer, transmission line, synchronous machine). Topics to be covered are as follows: Mechanical and Electrical Basics, Magnetic Circuits, Electromagnetic Basics (Motor Action and Generator Action), Transformers, AC Machinery Fundamentals, Synchronous Generators and Synchronous Motors.

○

HYDRAULIC SYSTEM

The objectives of this course entails: to develop a physical awareness of the phenomena of fluid motion, to present the fundamental laws which govern all fluid behavior and their applications, to develop practical methodologies for solving engineering flow problems, to illustrate the extremely wide variety of fluid-related phenomena in everyday life and in modern technology. Topics discussed include: Introduction, definition of hydraulic fluid, method of analysis, dimension and analysis, Basic concepts of hydraulic fluid mechanics, fluid properties and continuum approach, stress and velocity fields, Viscosity (Newtonian and non-newtonian fluids), description and classification of fluid motions, Fluid statics, basic equation, pressure variation in static fluid, measurement of pressure, Bernoulli's equation, Newton's second law, examples of the use of Bernoulli's equation, restriction on the use of Bernoulli's equation, Basic equations in integral form, basic law for a system, conservation of mass, momentum equations, energy equation, Differential analysis of fluid motion, differential mass balance, motion of a fluid element (kinematics), differential momentum equation, incompressible inviscid flow, Navier Stokes equations, Dimensional analysis, Buckingham pi theorem, similarity, Fully developed laminar flow between parallel plates, fully developed laminar pipe flow, shear stress distribution in fully developed pipe flow, flow in pipes, flow measurement, Fluid machinery/industrial hydraulic, velocity polygon analysis, Euler turbo machine equation, work absorbing machines, work producing machines.

○

SURVEYING

This course related to the construction industry. Emphasis is placed on obtaining field skills in linear measurement and the operation of levels, transits, theodolites and total stations. Elevations, horizontal, vertical, and spiral curves are explored units to be covered include: introduction, measurement of horizontal distances, measurement of vertical distances, measurement of angles and directions, traversing principles, topographical surveying, curves, triangulation and trilateration and photogrammetry

○

INTRODUCTION TO ENERGY SYSTEM

Modern society is based on the availability of low cost and reliable energy. Most of this energy currently comes from fossil fuels and with recent technological breakthroughs making unconventional oil and gas resources economic to produce, it appears that we might be able to continue to rely on oil, natural gas and coal for another one or more centuries. This course seeks to provide students with a broad understanding of the current energy system, its challenges - particularly with respect to the environment, and possible paths to a sustainable energy future, it will also give students a framework for thinking about why energy-related events are happening in the world, what they may mean for future energy use and by extension societal and environmental well-being, and how we might improve our current energy system moving forward. Units covered include: Energy and the Environment, The Fossil Fuels, Heat Engines, Renewable Energy Sources I: Solar Energy, Renewable Energy Sources II: Alternatives, The Promise and Problems of Nuclear Energy, Energy Conservation, Transportation, Air Pollution and Global Effects

○

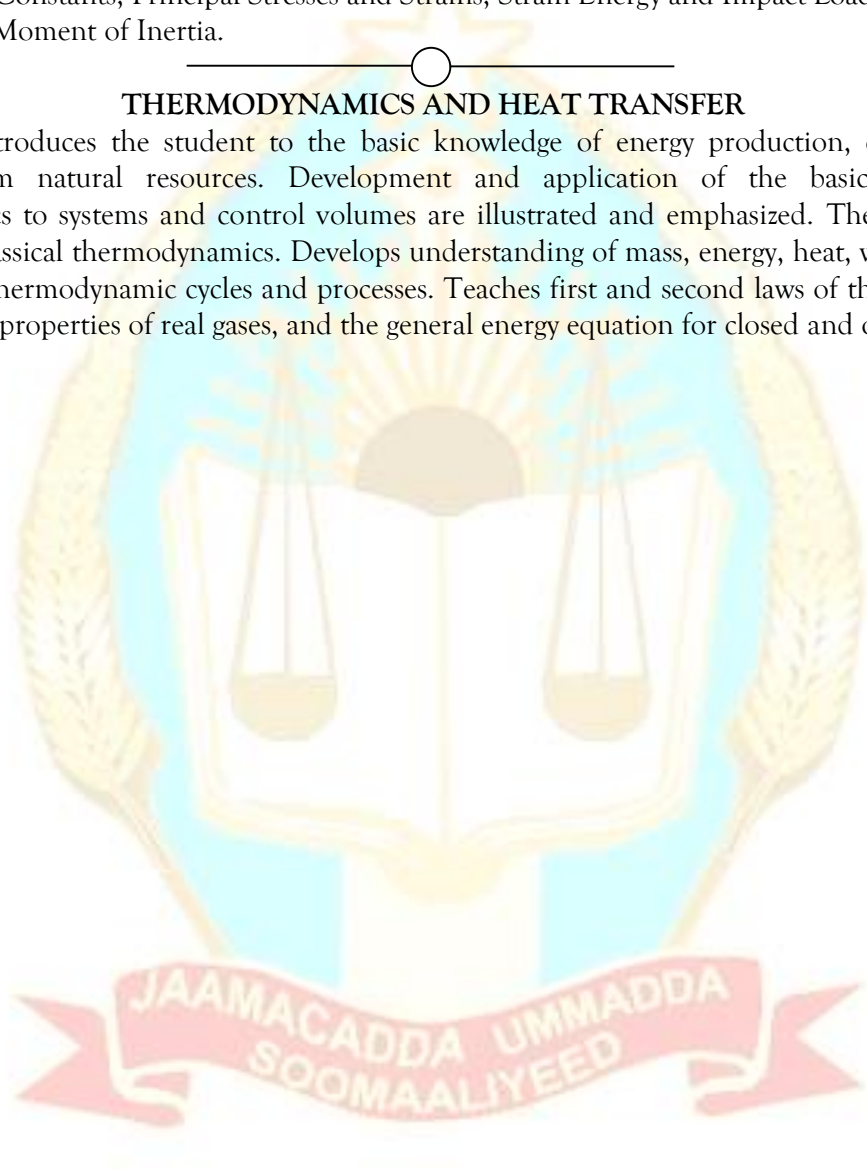
STRENGTH OF MATERIALS I

The strength of materials is based on the understanding of a few basic concepts and on the use of simplified models. This approach makes possible students to develop all the necessary formulas in a rational and logical manner, and to clearly indicate the conditions under which they can be safely applied to the analysis and design of actual engineering structures and machine components. After completing the course students will have ability to analyze a given problem in a simple and logical manner Apply to the solution a few fundamental and well-understood principles in real life engineering, capable of understanding characteristics of materials in structure and consequence of reactions of interaction of different materials. Units covered include: Introduction of Strength of Materials, Simple Stresses and Strains, Elastic Constants, Principal Stresses and Strains, Strain Energy and Impact Loading and Center of Gravity and Moment of Inertia.

○

THERMODYNAMICS AND HEAT TRANSFER

This course introduces the student to the basic knowledge of energy production, conversion and utilization from natural resources. Development and application of the basic principles of thermodynamics to systems and control volumes are illustrated and emphasized. The course covers: principles of classical thermodynamics. Develops understanding of mass, energy, heat, work, efficiency, ideal and real thermodynamic cycles and processes. Teaches first and second laws of thermodynamics, perfect gas law, properties of real gases, and the general energy equation for closed and open systems.



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

JAAMACADDA UMMADDA SOOMAALIYEED



الجامعة الوطنية الصومالية

SOMALI NATIONAL UNIVERSITY

CURRICULUM & COURSE DESCRIPTIONS

FACULTY OF LAW

JAAMACADDA UMMADDA
SOOMAALIYEED

2018 - 2019

BRIEF PROFILE

AFIS (Amministrazione fiduciaria della Somalia) established in 1954 the Institute of law which was satellite of the universities of Rome and Padova. In December 1969 the institute of law was transformed into the faculty of law. Under the auspices of the Italian Technical Cooperation, the SNU faculty of law reached its highest potential.

After the outbreak of the civil war in 1991 all the institutions and infrastructures were completely destroyed and the country faced a total collapse. The faculty of law was re-established again in 2014, enrolling 60 students after a pass in admission exam. Some students dropped out for different reasons. Currently the faculty has 45 students in the class.

The Somali society is characterized by long lasting civil war and remains deeply affected by poverty, internal displacement, tribalism human rights violation, weak rule of law, weak law enforcement machineries. SNU faculty of law firmly believes that the only way to overcome the challenges facing the Somali state building, to restore the rule of law, and redress the wide range of social differences, inter clan clashes, injustice and Human right violations, is to raise the public awareness on the law of the country.

VISION

Somalia National University, Faculty of law aspires to be a center of quality in higher learning and research with scholars devoted to producing well-trained, competent, and responsible legal professionals who could make a significant impact in Somalia's socio-economic development, democracy, good governance, and social justice

MISSION

SNU Faculty of law seeks to enhance democracy, good governance, equality social justice and economic developments for the people of Somalia through quality programs of teaching, research and public services based in variation of our internal problems.

OBJECTIVES

- Manage the faculty of law efficiently
- Produce quality graduates
- Contribute to knowledge, development and innovation
- Developing all staff and students to their fullest potential;
- Attracting a culturally and internationally diverse community of scholars.

- Establishing within the faculty, centers that deal with our most pressing internal problems.
- Guaranteeing international competitive qualifications.
- Providing an intellectually and socially stimulating environment;

CORE VALUES

In order to realize our vision and mission certain values must be nurtured by the faculty. The faculty shall:

- Espouse the virtues of integrity, honesty, tolerance, professionalism, truth, and teamwork
- Uphold the ethics of teaching, learning, and research
- Ensuring openness and transparency in all its dealings and operations
- Respect the believes of others
- Respect and protect the environment
- Be at the forefront in providing leadership in National agenda

BASIC LEGAL EDUCATION PROGRAM

Every law graduate is trained in all parts of the law. The Law degree provides students with a sound knowledge of the general principles of the Somalia legal system, and an ability to use legal materials effectively. Graduates should be able critically to assess, interpret and apply the law and have the historical, comparative background that is essential for a systematic and critical understanding of law and legal institutions. The courses taken for the faculty are offered in four years.

PROGRAM STRUCTURE

Academic Calendar

- The course of study for the laurea in law is 4 years. The normal academic year will run 40 weeks or ten calendar months, 20 weeks per semester, 6 days a week and 6 hours per day.
- Theory-Based Courses
- Many of the first, second, and third year required courses are to help students to familiarize themselves with the major law subjects like private law, public law, sharia law, constitutional law, administrative law, and criminal law etc..
- Skills-Based Courses
- Other courses in the first, and second year, are designed to help the student learn by doing. This includes legal research and legal writing courses.
 - By the third and fourth year students will be introduced to the practical aspects of the practice of law like practicing law in the courts, and practicing legislative drafting in the Parliament.
 - In addition to that, it is compulsory for the students to write a research article (thesis) under the direction of a faculty expert.

FACULTY DEPARTMENTS

The faculty of law is composed of three department namely private law, Public law, penal and criminology.

1. **Department of Private law** is that part of a civil law legal system that involves relationships between individuals, such as the law of contracts and the law of obligations (as it is called in civil legal systems). It is to be distinguished from public law, which deals with relationships between both natural and artificial persons (i.e., organizations) and the state, including regulatory statutes, penal law and other law that affects the public order. In general terms, private law involves interactions between private citizens, whereas public law involves interrelations between the state and the general population.
2. **Department of Public law** is that part of law which governs relationships between individuals and the government, and those relationships between individuals which are of direct concern to the society. Public law comprises constitutional law, administrative law, tax law and criminal law, as well as all procedural law.
3. **Department of Criminology** is the scientific study of the nature, extent, management, causes, control, consequences, and prevention of criminal behavior, both on the individual and social levels. Criminology is an interdisciplinary field in the behavioral sciences, drawing especially upon the research of sociologists, psychologists, psychiatrists, social anthropologists, as well as scholars of law.



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

JAAMACADDA UMMADDA SOOMAALIYEED

Kulliyadda Qaanuunka



الجامعة الوطنية الصومالية

كلية القانون

Semester one				
No	Course code	المواد Subjects	ساعات الفترية Total hours/semester	Comparison of .
1	IPL 1101	Introduction to private law	120	Old
2	IF 1103	Islamic faith and worship	80	New
3	AL 1104-1	Arabic I	80	Old
4	EL 1105-1	English I	80	New
5	CL 1106	Customary law	80	Old
6	PL 1102	Public law	120	Old
7	RM 1107	Research methodology	120	New
8	ISL 1108-1	Introduction to sharia law	80	Old
Semester two				
No	Course code	المواد Subjects	ساعات الفترية Total hours/semester	
1	IPL 1109	Islamic thought & contemporary	80	New
2	PL 1110	Conflict resolution	80	New
3	AL 1104-2	Arabic II	80	New
4	IF 1111	Civics	40	New
5	EL 1205-2	English II	80	New
6	CL 1212	Obligation	120	Old
7	RM 1213	Constitutional law	120	Old
8	ISL 1214	Sociology	80	Old
Semester three				
No	Course code	المواد Subjects	ساعات الفترية Total hours/semester	
1	SL 2315	Somali literature	80	New
2	CTRS 1116	Contracts	120	Old
3	AL 1117-1	Administrative law I	120	Old
4	PL 1118-1	Penal law I	120	Old
5	SHL 1108-2	Sharia law-family law	120	Old
6	EL 2305-3	English III	80	New
7	PEC 2319	Principles of economics	80	Old
Semester four				
No	Course code	المواد Subjects	ساعات الفترية Total hours/semester	

1	CL2420-1	Commercial law I	80	Old
2	AL 1117-2	Administrative law II	120	Old
3	SHL1108-3	Sharia law –principles of jurisprudence	80	New
4	PF 11121	Public finance	80	Old
5	SH1122	Somali history	80	New
6	CT1123	Critical thinking	80	New
7	LE 2424	Legal English	80	New
8	PL2418-2	Penal law II	120	Old
Semester five				
No	Course code	المواد Subjects	ساعات الفترية Total hours/semester	
1	CL 1120-2	Commercial law II	120	Old
2	PIL 1125	Public international law	120	Old
3	LL 1108-4	Sharia law –islamic transactions Jurisprudence	80	New
4	PP 1126-1	Penal procedure law I	120	Old
5	CP 1127-1	Civil procedure law I	120	Old
Semester six				
No	Course code	المواد Subjects	ساعات الفترية Total hours/semester	
1	PIL 1128	Private international law	120	Old
2	PP 1126-2	Penal procedure law II	120	Old
3	LL 1129	Labour law	120	Old
4	CP 1127-2	Civil procedure law II	120	Old
5	IHL 1130-1	International human rights law	120	New
6	CL 1131	Comparative law	120	Old
Semester seven				
No	Course code	المواد Subjects	ساعات الفترية Total hours/semester	
1	PER 1141	Professional ethics and responsibility	120	New
2	CM 1133	Criminology	120	Old
3	ENV 1134	Environmental & natural resources	120	New
4	IO 1135	Law of International organizations	80	Old
5	LF 1136	Legal field work	120	Old
6	IHL1130-2	International humanitarian law	80	new
Semester eight				
No	Course code	المواد Subjects	ساعات الفترية Total hours/semester	
1	ML4838	Medical law	120	New
2	CL 1139	Cyber law	80	New

3	FC 1140	Financial crime	120	Old
4	LF 1136	Legal field work	120	Old
5	TH 1137	International law of the seas(maritime)	80	New
6	TL 4840	Thesis /Research	120	Old



COURSE DESCRIPTIONS

CORE SUBJECTS AND FACULTY REQUIREMENTS

PUBLIC LAW

This is an introductory course and it acts as foundation for the study of constitutional and administrative laws. The course deals with: norms, subjects and objects in Public Law, partition of Public Law, Sources, interpretation and effectiveness of the Public Law; the State, its elements and its organs; The forms of State and forms of government; Functions and fundamental acts of the State, ~Partnerships with other agencies of the State; The Modern State and its structure: the legislative, the executive and the judicial function and The Modern State and the Citizen.

INTRODUCTION TO PRIVATE LAW

In this course, student will learn about private laws that are applied every day, such as the rights of the individual; legal personality; personality rights; legal capacity to act; legal persons (associations and foundations); subjective laws: statute of limitations and expiry; legal negotiations. Contents include: Private law, of law in general, Structure of the law, the legal process. Sources of the law, legislation and custom, decided cases, legal writing, super-eminent, The repeal of laws, Interpretation, application of laws, The system of Private Law: Introduction, The person and the law, Patrimonial Law and Goods and private Law.

CYBER LAW

This course explores technical, legal, and social issues related to cybercrime. Cybercrime is a broad term that includes offences where a computer may be the target, crimes where a computer may be a tool used in the commission of an existing offence, and crimes where a computer may play a subsidiary role such as offering evidence for the commission of an offence. The operation of computers and the internet will be discussed. The origins and extent of cybercrime, responses from legal systems to cyber-criminals, and the social impact of cybercrimes will be addressed. Various types of cybercrimes, cyber-criminals, as well as the motivations and methods involved in cyber-offences will be explored. The etiology of cybercrimes will be analyzed from cultural, subcultural, sociological, and opportunity perspectives. International issues and jurisdictional challenges will be critically examined.

CIVIL PROCEDURE LAW I

The courses' objectives are directed to build up the learning capacity of the students in the fields of Civil Procedure Law in order to prepare them to acquire the theoretical and practical aspects of the civil procedural course. The contents of course include: the foundations of the civil procedure, main principles of law universally recognized and comprises organization of the Judiciary, competences, parties in the trial, defense lawyer, responsibilities of the Judge, the Prosecutor General, trial hearing, exercise of the legal action, legal date terms, nullities, trial in abstention, sending the case into a judicial sentence, suspension and interruption of the trial, etc.

○

CIVIL PROCEDURE LAW II

This is a continuation of civil procedure I course and also courses' objectives are directed to build up the learning capacity of the students in the fields of Civil Procedure Law in order to prepare them to acquire the theoretical and practical aspects of the civil procedural course. This course entails crucial topics which are among others: post judicial sentence stage and covers means of appeals, the appeal in the jurisdiction, the judicial resort action to the Supreme Court, the revocation action, precautionary judicial actions by the Judge, judicial enforceability of the sentences or claims on credit instruments, home eviction validations, seizure of movable and immovable goods, interdiction and judicial incapacities, recognition of foreign judicial sentences, arbitrations, expropriations of movable and immovable goods, execution in the auctions and sale of goods, etc

○

CONTACTS LAW

The main objective of this course is to familiarize students with certain of the key Somali civil law concepts relevant to resolving three fundamental (not always distinct) questions relating to agreements between parties. This course focuses on the study and analysis of the basic principles of contracts law. Furthermore the course acquaints students with the Civil law system of rules relating to enforceable and un-enforceable agreements in general form. Topics covered include : Conceptual and historical introduction ; Sources of contracts ;Formation of contracts ; Elements of contracts ; performance of contracts ;contracts forbidden by law and if permitted defeat the law ; Classification of contracts ; Resolution of contacts and Remedies ;Law of agency ; and Partnership.

○

CONSTITUTIONAL LAW

The core objective to this course is to familiarize the students with the fundamental premises and design of the constitutional system and government of the United States and to expose the guiding principles and applicable doctrines of select subfields of constitutional law. The field of constitutional law, allows students to examine the structure of governmental structure, the role of statutes and the Constitution in legal system, and the ways in which the Somali Constitution distributes power among the various units of government in the Somali political system, and limits the exercise of those powers – in particular the proper role of the judiciary in limiting the action of other branches of government. Students interested in Constitutional Law also need to understand the Constitution's guarantees, such as the freedoms of speech, press, and assembly. And learn the principles, doctrines and controversies regarding the basic structure of and division of powers in Somalia. Specific topics include the roles of the executive, legislative, and judicial branches in determining limits of national and state powers and protection of the individual rights, federalism, federal and state powers and immunities and the separation of powers among the branches of the federal government other basic topics include: Sources of the Constitutional Law, Classification of constitutions, Separation of powers , the rule of law, Merits and Demerits of Decentralization System, Decentralization System of governments, Parliamentary System of Government, Presidential System of Government, System of Governments Characteristics of a federal system of government

○

CRIMINOLOGY STUDY

The course aims to provide student with knowledge; understanding of criminology and related disciplines at breadth and depth appropriate to the first degree qualifications. More generally, the course imparts an understanding of criminality and institutions of criminal justice within their social, economic and political context and seeks to promote an appreciation of the rule of law' in the criminal justice system. This course is designed to provide a comprehensive introduction to the theoretical understanding of crime in Somalia. Throughout the course we will look at how crime is defined, different ways of thinking about and understanding/explaining crime, and how accurate our knowledge of crime and criminal behavior is. Topics include, but are not limited to, the history and origins of the study of crime and criminology, the methodologies used to measure crime and criminal activity, classical and modern theories utilized to explain crime and criminal behavior and their social implications, and different typologies of crime.

○

OBLIGATION LAW

This course is about study of the possible obligation rights and duties of the parties concerned in a state that are adopted by civil law system in general and by the private code of Somalia in particular. This course is aimed at providing the undergraduate students in the Somali national university, to obtain sufficient know how and necessary and basic knowledge about what obligation is meant, how ,its sources ,types of obligation ,performance ,transfer of it ,its effects ,termination and proof of the obligation as well as its basic elements

○

INTRODUCTION TO SOCIOLOGY

This course introduces the students to the sociological perspective, this course will enable student to think critically about the social world in which you live. Since our society not only influences us, but is also influenced by us, the main aim of our sociological knowledge will be to enable us to understand, explain, predict, and to suggest solutions to observed social problems. Topics covered include: Defining Sociology, Culture, Socialization, Macro-Sociology: Social Structure and Societies Mass Media and Society, Social Groups and Formal Organizations, Deviance, Conformity, Crime and Social Control, Global Stratification, Race and Ethnic Inequality and Social Institutions

○

PUBLIC INTERNATIONAL LAW

This course examines the legal rules and institutions that govern and influence world politics, as well as analyzing the politics of international law. International law today is more complex and more interesting than at any time in history. Public international law is composed of rules and principles governing relations between sovereign states, intergovernmental organizations and non-states. The public international laws define and determine the rights and responsibilities of the members of the international community following the principle that all sovereign states are equal and can enjoy the same scope of privileges. Topics covered include: Introductory Note The nature and development of international law, International law and Municipal (internal) law, Sources and Hierarchies of law in general (roots of law), Subjects of International law, States in international law, Spatial definition of states, Dispute settlements between states, international Cooperation, United Nations, Neutrality and non-alignment Politics.

○

PROFESSIONAL ETHICS AND RESPONSIBILITY

This course is intended on dealing with the professional ethics of the lawyers. It specifies the standard of minimally acceptable conduct with in law profession, involving the duties that its members owe one another, their client and the court. The course is intended to deal with issues pertaining professional ethical standards, legal responsibility and general professional conduct. The topics covered include: Ethics and law Judicial conduct, Ethics of the judges, judicial conduct, Ethics of the judges, Advocates' ethics, Ethical requirement in relation to their clients and Ethics of the public prosecutors.

○

INTERNATIONAL HUMAN RIGHTS LAW

This course provides students with the various topics on the introductory course in Human Rights Law. It is prepared for students in the second year study in Law in the Somali National University. Human Rights Law is an area of Law which deals with the study of human rights and authorities of the state and the organization of the state. Traditionally, Human Rights law has often been studied by means of volume and very large textbooks; this guide provides the student with concise understanding of the basic principles and focuses on views that are germane in the study of Human Rights Law. Topics covered include: Definition Meaning and Classes of Human Rights, Introduction to Human Rights and Civil Liberties, Human Rights as a Universal Concern, Fundamental Rights, Fundamental Human Rights Cases, Violation – Consequences of Disobedience, Right to Life, and Right to Life and the Scope and Limit of Exercise of Police Powers.

○

SOMALI CUSTOMARY LAWS

Somali customary laws introduces students about the history of Somali Customary laws, and the past Somalis which used to have special by-laws or rules for every specific community. Main objectives of this course include: Describe and explain how past Somali people resolve their cases. Describe and explain the difference between the current Somali people and past Somali people. Describe and explain how to resolve the special cases or knees in the sand (complicated case). Describe and explain the relation between Somali customary laws and Islamic Laws. The topics covered included: towns people rules, farmers rules, merchants rules, nomadic people rules, youngsters rules, camel herders rules, cattle herders rules, coat herders rules, hunters and forest people rules, horsemen rules, war rules, marriage and family rules, poetry and oratory rules and messengers of peace rules.

○

COMMERCIAL LAW I

This course introduces students to the laws governing commercial transactions, primarily in the area of personal property. The course deals at length with the Sale of Goods Act 1923 (NSW) and with product liability. Objectives of the courses are understanding basic principles and origins in the area of commercial law. Theoretical and practical preparation enabling students to acquire knowledge and skills related to commercial law. Understanding basic principles and origins in the area of commercial law. Theoretical and practical preparation enabling students to acquire knowledge and skills related to commercial law. Topics to study include: Introduction to Law, The law of persons, Companies in Commercial law, Shares as company securities, who May become A Member, Directories of companies and Their Duties, and Company Secretaries.

○

COMMERCIAL LAW II

This is a continuation and the second phase of commercial law I course introduces students to the laws governing commercial transactions, primarily in the area of personal property. The course deals at length with the Sale of Goods Act 1923 (NSW) and with product liability, topic contained are: General Contract and Commercial Relations, Agency, Definition of Agency and Theories of Agency, Agency and Other Relationships, Agent and Trustee, Agent, Servant and Independent Contractor, Arbitrations Definition of Arbitration, Commercial Arbitration, Advantages of Arbitration, Arbitral Institution, Types of Arbitrations Applicable Laws, Taxation, Introduction to taxation, The Definition and Nature of Taxation, Component of a Good Tax, The importance of Taxation, Classifications of Taxes, Direct/Indirect Taxation, Proportional, Progressive and Regressive Taxation, Bank, Definition of bank, Types of Bank Account, Checking account Bank Savings Account Bank, Money Market Account Bank, Individual Retirement Account Bank, Bank money Orders and personal money order and Check of Banks.

○

MARINE LAW

This course equips students with a broad range of topic under maritime law. This field of law has its own rules and regulations relating to jurisdiction and procedure. Classically, maritime law was a species of commercial law, and in many countries, it is still treated as such. Objectives of the course include: To learn the basic structure and design of the maritime system and the seafarers and international maritime borders of Somalia and specifically to the current situation of the state of Somalia looking at the federal system prospective. The course covers topics such as charter parties, carriage of goods, and marine insurance. There are also areas of maritime law that are peculiar to the subject matter such as the law of collision, towage, pilotage, salvage, limitation of liability, maritime liens, personal injury and death and general average are unique to maritime law.

○

COMPARATIVE LAW

In this course students are introduced to comparative law as a method of legal enquiry, which is of significant import to the cosmopolitan lawyer who often requires knowledge of more than one legal system. They will consider the practical aims and theoretical underpinnings of the comparative legal method and examine the historical development of the process of comparing rules, principles, and institutions of different countries. Emphasis is placed on the contemporary use of the comparative method in both public and private law by legal actors such as lawyers, judges, and legislators. They will develop an international perspective by making substantive connections between the Australian common law and a range of legal traditions, questioning whether national legal systems and institutions are converging or whether differing economic, political, and social contexts preserve legal diversity. Topic to be covered include: Introduction to comparative law, Three major legal systems in the world, Common law legal system, Civil law legal system, Religious law, Similarities of all legal systems, The differences between common law and civil law legal system, The differences between western law and socialist law, Brief history of mixed legal system countries

○

LEGAL ENGLISH

The course is designed to help students who will work in the juridical field, acquire and perfect their linguistic skills. The aim is to improve conversation skills, communication, listening, reading and writing. The course is based on a variety of legal issues including immigration, categories of criminal offences, organized crime etc. It also covers a series of topics including modern letter writing skills, expressing opinions, agreement and disagreement, “legal correspondence” and legal English in general. Topics to

be covered include: Legal English, Business law and practice, Company formation, Marketing agreements, civil litigation, Employment law, Law bulletin, Legal English for Criminal Lawyers, Accurate modern letter writing skills, Presenting information and legal opinions, Conducting interviews with asylum seekers and immigrants, Fundamental rights within the European Union, Categories of criminal offences, Judicial cooperation in criminal matters, Fight against organized crime, Countering terrorism and Practical aspects

○

ADMINISTRATIVE LAW

This course studies law making and law application by the executive departments of government. Law made by administrative agencies dominates the modern legal system and modern legal practice. This course examines the legal and practical foundations of the modern administrative state. The central theme of the course is how the law manages the tension between "rule of law" values and the desire for flexible, effective administrative governance. Topic to be covered include: Introduction to administrative law, Constitutional foundation and limitation of administrative law, Administrative agencies: subjects of administrative law, Rule-making (quasi-legislative) power of administrative agencies (delegated legislation), Judicial power of administrative agencies, Controlling mechanisms of governmental powers and Judicial review, judicial review and remedies and government (administrative) liability.

○

RESEARCH METHODOLOGY

This course is about research methodology and report writing techniques and includes class lecturing, participation, and contribution, discussion, and group and individual data assignment presentation, the main objectives of the course are: to teach student basic concepts of research and its methodologies course of method/methodology and report writing & research design, To provide student the ability to carry out research application on their own capacity of data presentation, To determine help students the possibility of conducting study to contribute new data in the existing knowledge using of the terms research method and methodology. The contents covered include: An introduction of the research methodology, Defining the research problem, Research designs, Sampling designs, Measurement and scaling techniques and Methods of Data Collection.

○

INTRODUCTION OF LABOR LAW

The objective of this course is to provide a theoretical and experiential foundation for understanding of labor law. Contents include: General Provisions For representations of employees, Representations of employees, Rights and duties of employee representations, Posting an employee, International employment, Contracts of employment, Collective labor agreement, Subcontractors, Individual contract of employment, Conditions of work, Occupational health and safety, Administration supervisory authority, Advisory authority, Registrations of workers, Methods of supervision, Duties and rights of employees, Duties of employee, Liabilities of employee, Rights of employee, Amendments to contracts of employee.

○

CRIMINAL LAW I

The course aims to acquire the fundamental knowledge in the field of criminal law, as well as the essential methodological tools, able to allow the student to face and deepen even the most complex theoretical and applicative questions required in the exercise of legal Professions. Topics covered include the fundamentals of the subject, from the principles that govern the criminal system to the purpose of punishment, as well as the centralized system of registration for examinations. Legal programs that make up the structure of the crime: typical facts, objective anti-juridical and guiltiness.

○

CRIMINAL LAW II

This is a continuation of the course criminal law I, its aims are to acquire the fundamental knowledge in the field of criminal law, as well as the essential methodological tools, able to allow the student to face and deepen even the most complex theoretical and applicative questions required in the exercise of legal Professions. Contents include: forms of manifestation of the crimes: circumstances of the crime, attempt, concurrence of people in the crime and the concurrence of crimes. Then follows the treatment of the sanctions discipline of crimes: the system of punishment, punishment and its extinctive causes. The course also extends to the study of the special part. After highlighting the methodological and content peculiarities of the analysis of the single types of crime, the attention is directed to the deepening of two of the most significant classes of crimes: crimes against the person and crimes against property.

○

PRINCIPLES OF ECONOMICS

This course introduces the fundamental theories of microeconomics and macroeconomics. The economic principles studied in this course apply to everyday life as students research an industry, debate issues with trade agreements, and discuss the effects of shifts in supply and demand. This course also examines principle economic concepts such as opportunity cost and absolute advantage, as well as explores fiscal and monetary policies, market structures, and decision making for efficient results. Contents include: ten principles of economics, think like economist, the market forces of supply and demand, elasticity and its application supply, demand and government policies, consumer, producer and the efficiency of the market, the cost of production, firms in competitive market, monopoly, monopolistic competition, oligopoly, measuring national income, measuring the cost of living, aggregate demand and aggregate supply, the short run trade-off between inflation and unemployment, interdependence gain from trade.

○

CONFLICT RESOLUTION

The objective of the course is to help students gain a thorough grounding in the theory of conflict and its solution., explore the social, psychological, political, structural, and cultural factors, which give rise to conflict and shape its course. Topics covered are: Introduction to Conflict Resolution, Conflict & Resolution Analyze, and Responding to Conflict, Communication Skills, Mediation (Mediator), and Negotiation, Leadership and Concept of Peace and Peace building.

○

LAW OF FINANCIAL CRIME

The course explores the taxonomy of financial crime, examining the nature and extent of financial crime, its social and economic impact and the perceived ambivalence to the prosecution of financial crime offenders. The course explores a definition of fraud through a consideration of notions of dishonesty and deception, examining the role of consent and the interaction between the criminal law and civil law notions of property and trust, Finally, the course explores financial crime in Somali context by focusing anti money laundering act of 2016 and the difficulties of controlling money laundering in Somalia.

○

MEDICAL LAW

The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients. It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, and the rights of the dying and the legal definition of death.

○

ENVIRONMENTAL AND NATURAL RESOURCE LAW

Environmental law is one of the most dynamic and exciting areas of legal practice, and it plays a pivotal role in protecting our personal health and welfare, guiding economic development and business life, and shielding our most precious natural treasures and resources from misuse or harm. The course will explore this broad field together with three goals: to acquaint you with the unique aspects of environmental law and how they present important challenges and opportunities, to help you hone the thinking and analytical skills that govern this area and to give you a practical sense of the key tools and materials you would need to start handling environmental projects. Contents include: Introduction to environmental law, Basic principles of environmental law, Introduction to environmental rights, Common legal mechanisms of environmental protection and Legal framework of environmental litigation.

○

PUBLIC FINANCE

This course is designed to introduce you to the economics of government spending and taxation. The course focuses on analyzing the effects of expenditure programs and taxation policies on the economic behavior of individual consumers, households and firms. The efficiency and equity effects of public policy will be discussed. Special emphasis will be placed on issues and challenges facing Somalia. The topics to be studied include: The Theory of Public Goods, Public Expenditure, Public Revenue, Incidence and Shifting, Taxes of the Centre and the States, Public Debt, Deficit Financing, Financial Administration, Federal Financing, Local Finance, Fiscal Policy, Public Enterprise and Black Money.

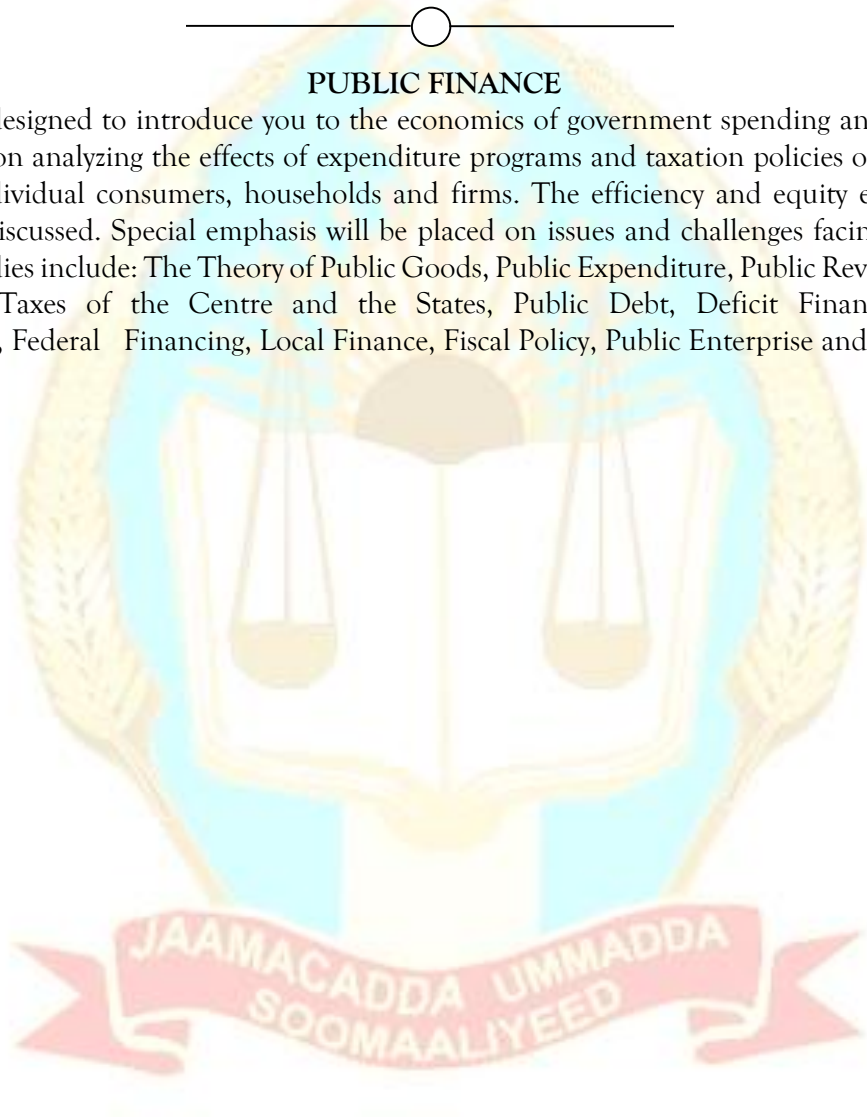


Table 1: Some details of the Required Offices, Centres, Laboratories Research for the faculty of Sciences of Somali National University

Departments	Institutes	No. Lecture rooms	No. Offices	Laboratories	Centres
Geology	<ul style="list-style-type: none"> Hydrocarbon Institute Mineral Resources Institute Hydrogeological Institute 	8	12	<ul style="list-style-type: none"> Chemical Petrographic Geophysical Geochemistry Sedimentary Geomodelling Computer Labs Petroleum Computer Lab General Computer lab 	<ul style="list-style-type: none"> Remote Sensing Geological data modelling Petrographic
Marine Science	<ul style="list-style-type: none"> Nautical institute Marine science 	6	12	<ul style="list-style-type: none"> Marine Labs 	Oceanographic Centre
Biotechnology	<ul style="list-style-type: none"> Microbiology Biochemistry Molecular Biology 	6	12	<ul style="list-style-type: none"> Biotechnological Labs 	
Chemical Sciences	<ul style="list-style-type: none"> Organic Chemistry Inorganic Chemistry Analytical chemistry Physical chemistry Applied Chemistry 	6	12	<ul style="list-style-type: none"> Organic labs Inorganic labs AAS, ICP, XRF, XRD etc 	
Computer Science	<ul style="list-style-type: none"> Broadband and Mobile Networks, Software Engineering, Program Testing and Verification, Robotics, Natural Language Processing, and Machine Learning. 	6	12	<ul style="list-style-type: none"> Computer Labs 	
Physical Sciences	<ul style="list-style-type: none"> Solid State Physics and Nanoscience Astronomy Alternative energy Applied Physics 	6	12		
Environmental Sciences		6	12		
Biological Sciences		6	12	<ul style="list-style-type: none"> Biological labs 	
Mathematical and Statistical Sciences		6	12		
Meteorology and Atmospheric Science		6	12		

Welcome to The Faculty of Sciences

Somali National University

Somali National University (SNU) is currently the only publicly funded higher education institution (HEI) that provides free, quality education to Somali nationals. SNU has an illustrious history.

Prior to its closing in 1990 due to the protracted civil war, SNU had over 7,500 students enrolled in 11 different faculties. The university has educated thousands of students. It has produced some of the present leaders including myself and many of my colleagues.

Faculty of Sciences at Gaheyr campus was first created in 1987. It composed of chemistry, geology, mathematics, physics, biology and agriculture.

In the year of 2019, Management of the university decided to reopen faculty of Science. Two Earth Sciences departments i.e. Geological and Marine Sciences. Other departments including Chemical, biological, atmospheric sciences which includes atmospheric chemistry and atmospheric physics, computer science, statistical, environmental science, mathematical and physical science etc will in the coming years be reopened.

The Faculty will be equipped with a vast range of infrastructure and state-of-the-art equipment linked to ongoing research projects, enabling prospective students and researchers the opportunity to explore many different areas of specialization.

Faculty of Sciences at Somali National University (SNU) will be an important centre of research in Somalia and Africa. It will equip graduates with necessary academic and research skills and gives them the ability to succeed in the market place.

The Faculty of Science of Somali National University will provide a three BSc courses and two year MSc degrees in all its departments to those professionals who are willing to excel in their chosen industry.

Faculty of Sciences at Somali National University (SNU) will in near future pride itself on its strong and diverse teaching programmes, at both undergraduate and postgraduate level, and research strength. It will have well developed international links with researchers across the world, the Faculty will be a major contributor to regional and globally appropriate research. Our goal is to be internationally recognised as one of the leading, research-intensive Faculty and the top Science Faculty on the region, creating research that is globally competitive and locally relevant.

We know that Somalia is poised to develop its hydrocarbon potential and untapped mineral ores deposits. So in this regards, it is worthwhile to create research centres i.e. water and environmental, mineral resource and hydrocarbon research centres. Additionally a marine science research centre has to be created. Research facilities like remote sensing and meteorological/oceanographic centres, geological and marine science laboratories are also badly needed. This will equip the staff and students of science faculty with its several departments and particularly the departments of marine science and

geology (or Earth Science) that are necessary for in depth knowledge of the natural resources of Somalia.

At the same time, we will be a major contributor to educating scientists through our future many and varied undergraduate and postgraduate programs. Our degrees will be internationally recognized, thus ensuring that graduates are globally mobile. The majority of our staff will have strong international research profiles and will have active research programs covering a wide range of science disciplines that will involve collaborations with leading researchers across the world.

In addition to the present two departments the faculty is planning to include in future the following basic science department, Chemical, biological, physical, mathematical and statistical sciences and applied sciences including Computer, environmental, biotechnology, metrological and atmospheric sciences

1. Marine Science

Marine sciences also known as oceanography or oceanology is the branch of Earth Science that studies the ocean. It covers a wide range of topics, including marine organisms and ecosystem dynamics; ocean currents, waves, and geophysical fluid dynamics; plate tectonics and the geology of the sea floor; and fluxes of various chemical substances and physical properties within the ocean and across its boundaries. These diverse topics reflect multiple disciplines that oceanographers blend to further knowledge of the world ocean and understanding of processes within astronomy, biology, chemistry, climatology, geography, geology, hydrology, meteorology and physics.

Nautical Science: The aim of the Nautical Science program is the proper training of Somali students in order for them to acquire key positions at the existing and forth-coming commercial ports and on merchant marine ships. The training provided is in accordance with the standards of the United Nations International Maritime Organization (IMO) and it is in full compliance with the provisions set out by the International Convention on Standards of Training, Certification and Watch-keeping for Seafarers (STCW).

It is a technical course focuses on fundamentals in mathematics, information technology, physics and the basic nautical knowledge. The course focuses on the specialized knowledge of theoretical and practical aspects of Nautical Technology, with an emphasis on those skills and competencies that are required for Navigation, Cargo Operations and Ship Maintenance and Operations. The program is structured into six academic semesters and its duration is three years.

The course is re-established to tackle to huge demand for Somali professionals in the maritime industry. The dire need for pilots at the different ports of the country, captains and marine engineers galvanized the cadres and experts at the SNU to kick start this course to fill the void.

2. Earth Science

Earth science or **Geoscience** is an all-embracing term for the sciences related to the planet Earth and not only geology. It is possibly a special case in planetary science, the Earth being the only known life-bearing planet. The formal discipline of Earth sciences may include the study of the atmosphere, hydrosphere, oceans and biosphere, as well as the solid earth. Typically, Earth scientists will use tools from physics, chemistry, biology, chronology, and mathematics to build a quantitative understanding of how the Earth system works, and how it evolved to its current state.

Earth science or geoscience includes all fields of natural science related to the planet Earth. This is a branch of science dealing with the physical and chemical composition of the Earth and its atmosphere. Earth science can be considered to be a branch of planetary science, but with a much older history. Earth science encompasses four main branches of study, the lithosphere, the hydrosphere, the atmosphere and the biosphere in which each branch is further broken down into more specialized fields.

It is also the study of Earth and its neighbours in space. Some Earth scientists use their knowledge of the planet to locate and develop energy and mineral resources. Others study the impact of human activity on Earth's environment, and design methods to protect the planet.

Some use their knowledge about earth processes such as volcanoes, earthquakes, and hurricane to plan communities that will not expose people to these dangerous events.

The Earth sciences can include the study of geology, the lithosphere, and the large-scale structure of the Earth's interior, as well as the atmosphere, hydrosphere, and biosphere. Usually, Earth scientists use tools from geology, geochronology, physics, chemistry, geography, biology and mathematics to build a quantitative understanding of how the Earth works and evolves. Earth science affects our everyday lives.

For example, meteorologists study the weather and watch for dangerous storms. Hydrologists study water and warn of floods. Seismologists study earthquakes and try to understand where they will strike. Geologists study rocks and help to locate useful minerals. Earth scientists often work in the field and perhaps climbing mountains, exploring the seabed, crawling through caves, or walking in swamps. They measure and collect samples (such as rocks or river water and sediments), then they record their findings on charts and maps.

Departments planned to open in the coming years:

3. CHEMICAL SCIENCES

In the undergraduate studies of the Chemical Sciences will include some of the sub-disciplines listed below. In reality these sub-disciplines will support and enhance each other, and there are no clear boundaries delineating them. Your experience to these fields during your undergraduate years will help you determine which interest you have most. If you decide to continue with postgraduate studies in Chemistry, you may select one or more of these fields to specialise in.

- a) **Organic Chemistry** is the study of the reactions of carbon-based compounds, their structure, reactions and synthesis. You will study organic chemistry because just about all of the molecules that make life possible—proteins, enzymes, vitamins, lipids, carbohydrates and nucleic acids—contain carbon; thus, the chemical reactions that take place in living systems are organic reactions.
- b) **Inorganic Chemistry** is the branch of chemistry concerned with compounds of elements other than carbon; their structure, properties, reactions and synthesis. Inorganic materials have mainly non-biological origins and find application in every aspect of the chemical industry—including catalysis, materials science, pigments, surfactants, coatings, medicine, fuel, and agriculture. Inorganic and organic chemistry overlap significantly in the sub-discipline of organometallic chemistry.
- c) **Analytical chemistry** is the study of the separation, identification, and quantification of the chemical components of natural and artificial materials. Analytical chemistry is also focused on improvements in experimental design, chemometrics, and the creation of new measurement tools to provide better chemical information. Analytical chemistry has applications in forensics, bioanalysis, clinical analysis, environmental analysis, and materials analysis.

- d) **Physical chemistry** is the study of macroscopic, atomic, subatomic, and particulate phenomena in chemical systems in terms of laws and concepts of physics. It applies the principles, practices and concepts of physics such as motion, energy, force, time, thermodynamics, quantum chemistry, statistical mechanics and dynamics.
- e) **Environmental chemistry** is the scientific study of the chemical and biochemical phenomena that occur in natural places. It can be defined as the study of the sources, reactions, transport, effects, and fates of chemical species in the air, soil, and water environments; and the effect of human activity on these. Environmental chemistry is an interdisciplinary science that includes atmospheric, aquatic and soil chemistry, as well as heavily relying on analytical chemistry and being related to environmental and other areas of science.
- f) **Applied Chemistry** is the application of chemistry knowledge to new and existing challenges related to the production and transformation of matter and energy.

4. COMPUTER SCIENCES

The Department of Computer Science will be amongst the strongest in the country and home to academic staff who will be well regarded both nationally and internationally. The Department will play an important role in local industry and will provides services to industries through technology transfer and applied research. The department produce top quality well rounded and market relevant Computer Scientists. This will be achieved by providing innovative programs in Computer Science to empower graduates to assist in improving the quality of life for all the students through the development and application of Information and Communication Technologies (ICT's).

5. Biological Sciences

What is Biological Sciences?

Biology is a diverse field that focuses on living things and their interaction with the environment. The planned courses combine practical and theory work with a mixture of lectures and lab work. Biological Sciences offers you a wide choice of study areas, ranging from botany to ecology and zoology.

6. PHYSICAL SCIENCES

The Department of Physics at Faculty of Science at the Somali National University (SNU) will distinguishes itself as a major contributor to the research needs both locally and regionally. The department will collaborate with several national and international research institutions.

The department focuses on the following research areas:

- **Solid State Physics and Nanoscience:** This group specializes in materials science, nanoscience and nanotechnology, and strongly correlated electron systems with application in the areas of photonics, renewable energy and superconductors.

Specific projects include nano-crystalline silicon, silicon-carbide and silicon-nitride thin films for photovoltaic applications; the synthesis and characterization of zinc-oxide and organic nanostructures; organic/inorganic blend thin films for photovoltaic applications; transport and magnetic properties of heavy-fermions and Kondo cerium compounds

- **Physics Education:** The Physics Education Research group specializes in Student Learning. In our Somali context, the Physics education research is motivated by the need to widen access to undergraduate science studies and to improve the quality and throughout of our science graduates.

7. Mathematical and Statistical Sciences

The Department of Mathematical and Statistical Sciences will soon be available on our campuses under the Faculty of Science. It will be comprised of two subject groups, namely Mathematics and Applied Mathematics and Statistics. Students are able to choose a programme that combines either of these two subject groups with other subject groups offered within the faculty.

On an undergraduate level students are offered a three year BSc Degree. Post graduate studies can be undertaken with a Master's Degree and finally a PhD.

8. Environmental Science

The environmental Science will be very cross-cutting interdisciplinary subject, its degrees will challenge students to combine skills and knowledge from a variety of different fields. This could mean exploring aspects of biology, chemistry, physics, geography, earth and marine science and also social science. The idea will be to combine multiple perspectives and data sources, to build up a full understanding of natural and human environments.

Fieldwork will be an important part of most environmental science degrees, which often include trips to a various parts of the country and maybe neighbouring countries, giving those who **study environmental science** the opportunity to experience different habitats, climates, land formations and societies. You can also expect to spend a fair amount of time in the lab, learning how to carry out different types of tests and analysis. In addition, students often undertake voluntary work in an environment-related role, which provides valuable experience to prepare them for future **environmental science careers**.

9. Meteorology and Atmospheric Science

Atmospheric Science is the study of weather and climate. Our undergraduate specialization will focuses on meteorological fields including air quality, environment, climate change, weather monitoring & instrumentation, and consulting.

The highly interdisciplinary Atmospheric Sciences specialization will have close cooperation with both the Department of Geology and the Department of Marine Science.

Undergraduates in the specialization make use of many modern facilities. The Geological Sciences Building will includes a weather-instrument platform for research and teaching, modern labs for marine science research, wet labs, and computer classrooms. There will extensive hands-on labs and equipment to introduce students to biometeorology, micrometeorology, urban meteorology, weather instruments like LIDAR Satellite and atmospheric chemistry and physics. The Atmospheric Science department will also own cluster of computers for numerical weather and climate simulations.

10. BIOTECHNOLOGY DEPARTMENT

The planned Biotechnology department will consist of three main streams:

- **Microbiology** - the study of microorganisms, including viruses, prokaryotes and simple eukaryotes, today, most of the work in microbiology is done using methods from molecular biology.
- **Biochemistry** - studying the molecules and chemical reactions catalyzed by enzymes that take place in all living organisms, thus the chemistry of life.
- **Molecular Biology** - the science of studying the genetic composition, and mechanism of living organisms at the molecular level, it historically refers to the understanding and manipulation of genes (DNA).

This programme of study will provides an appropriate academic background for a professional career in the traditional and emerging biotechnology industries. Standards are high but career prospects are excellent.

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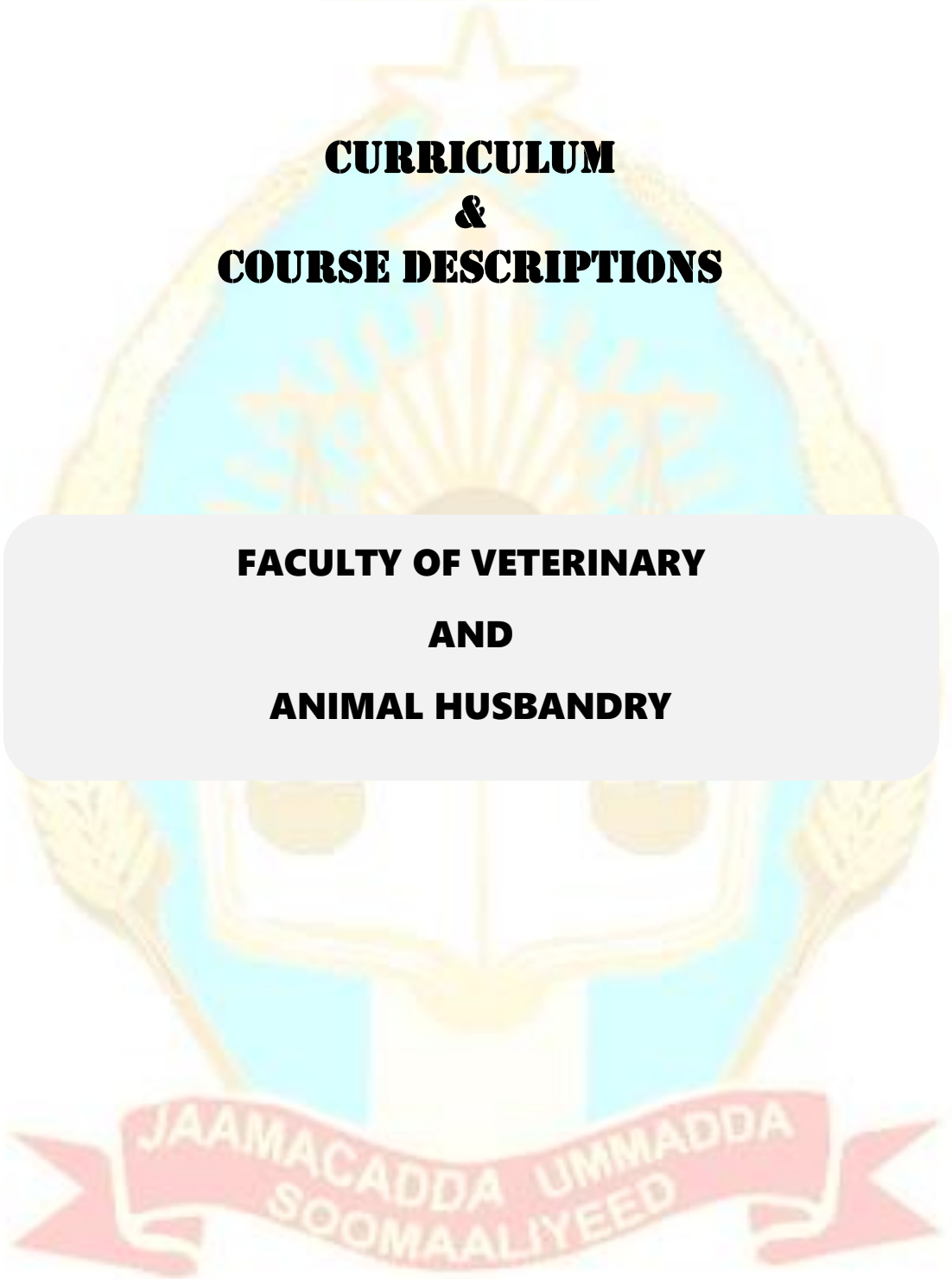


الجامعة الوطنية الصومالية

SOMALI NATIONAL UNIVERSITY

CURRICULUM & COURSE DESCRIPTIONS

**FACULTY OF VETERINARY
AND
ANIMAL HUSBANDRY**



2018 - 2019



BRIEF PROFILE

The faculty of Veterinary Medicine and Animal Husbandry is a public institution run by democratically elected management organ in accordance with Somali National University Act. The faculty was established in 1973, reached its climax during eighties in providing technical services to Somali people. It functioned in seven academic departments offering two Laurea degree (BSc) programs on Animal Husbandry and Veterinary Medicine.

The faculty had employees of fifty qualified academics, twenty technicians, fifteen supporting staff and twenty laborers. The faculty played a leading role in educating people in Veterinary Medicine and Animal production as well as conducting research, facilitating technology transfers and development in the area of livestock and rural community sectors.

During that period, animal health situations improved substantially, livestock export increased significantly and public health enhanced due to efforts made to control epizootic disease outbreaks and zoonotic diseases as well as meat inspection throughout the country. It had also contributed to the well-being of the Somali community in giving appropriate consultancy and offering sound extension services in animal health and production. The efforts made impacted positively to pastoral and agro pastoral communities' livelihoods as well as the country's economy at large. Unfortunately, the whole country ruined itself in 1990 due to civil war, when all Somalia institutions and infrastructures overwhelmingly collapsed. Chaos and instability sustained for decades resulting devastations and human tragedy with millions of people fled from the country cross-borders and/or internally displaced.

After almost a quarter of a century with little hope; Somali Government ultimately had re-established the faculty of Veterinary Medicine and Animal Husbandry. It made priority and paid efforts in teaching and research; securing livelihoods of the Somali pastorals and agro-pastoral communities in the remote areas of the country where rangeland resources are depleted and alternative options are scarce for income, employment, and food security. Research priorities will focus mainly on alleviating the animal production constrains that may hinder livelihoods of the community; considerations are given to traditional livestock production systems, improved breeds, local breed performance, adaptability of exotic breeds, feeds and feeding, seasonal availability of feedstuffs, droughts and pastoralism; also epizootic and zoonotic diseases as well as parasites infestations.

VISION

The faculty envisions that Somali society manages sustainably its resources, generate substantial wealth and achieve self-reliance and good quality of life.

MISSION

- To advance the animal productivity and consequently well-being of the Somali people through education, research, and public service.

OBJECTIVES

- To develop adequate human resource through training and research.
- To improve grass-root communities' livelihoods through consultancy, awareness raising and innovations.
- To contribute the overall economy of the country.

STRATEGY

- Lobby & Advocacy with key stakeholders for creating suitable environment for teaching and research.
- Assessments, documentations, recommendations, and proposals.



Faculty curriculum (Batch 01)

Basic Subjects: 27

Professional subjects: Animal Husbandry department. : 20

Veterinary medicine department: 21

No	1 st Year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
1	1	1	Cell Biology	6	120	
2	1	1	Zoology	6	120	
3	1	1	Mathematics	6	120	
4	1	1	Inorganic Chemistry	6	120	
5	1	1	Physics	6	120	
6	1	1	Islamic studies I	2	40	
7	1	1	English I	4	80	
8	1	1	Arabic I	2	40	
						760
No	1 st Year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
9	1	2	Organic chemistry	6	120	
10	1	2	Botany	6	120	
11	1	2	Anatomy I	8	160	
12	1	2	English II	4	80	
13	1	2	Embryology	6	120	
14	1	2	Bio-statistics	6	120	
15	1	2	Islamic Studies II	2	40	
16	1	2	Arabic II	2	40	
						800
No	2 nd year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
17	2	3	Bio-chemistry	6	120	
18	2	3	Physiology I	6	120	
19	2	3	Genetics & Animal Breeding	6	120	
20	2	3	Anatomy II	8	160	
21	2	3	Animal Husbandry	6	120	
22	2	3	English III	4	80	
						720
No	2 nd Year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
23	2	4	Physiology II	8	160	
24	2	4	Animal Nutrition	8	160	
25	2	4	Microbiology/Immunology	8	160	
26	2	4	Animal behavior & welfare	6	120	
27	2	4	Applied computer	6	120	
						720

Animal Husbandry department professional subjects

No	3 rd Year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
1	3	5	Poultry Production	8	160	
2	3	5	Animal hygiene & Prophylaxis I	6	120	
3	3	5	Fundamental of Soil Science	8	160	
4	3	5	Range mgt, Forage Production & Conservations	8	160	
5	3	5	Principles and Procedures of Statistics	6	120	

720

No	3 rd Year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
6	3	6	Farm Machinery	8	160	
7	3	6	Dairy Science	8	160	
8	3	6	General Agronomy	8	160	
9	3	6	Small Ruminants Production	4	80	
10	3	6	Animal Hygiene and Prophylaxis II	6	120	

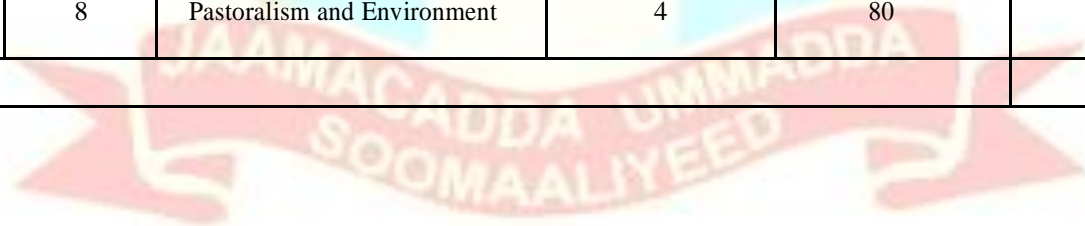
680

No	4 th year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
11	4	7	Artificial Insemination	8	160	
12	4	7	Beef Production	8	160	
13	4	7	Principals of Farm Economy	8	160	
14	4	7	Research Methodology	2	40	

520

No	4 th year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
15	4	8	Farm Economy & Management	8	160	
16	4	8	Rural Economy	4	80	
17	4	8	Bee Culture	4	80	
18	4	8	Food Technology	8	160	
19	4	8	Fishing Industry	8	160	
20	4	8	Pastoralism and Environment	4	80	

720



Veterinary Medicine department professional subject

No	3 rd Year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
1	3	5	General Pathology	8	160	
2	3	5	Medical Diagnoses.(Semiotics)	8	160	
3	3	5	Pharmacology (incl. Chemotherapy)	8	160	
4	3	5	Parasitology I	8	160	
5	3	5	Principles and Procedures of Statistics	6	120	
						760

No	3 rd Year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
6	3	6	Parasitology II	8	160	
7	3	6	Obstetrics & Gynecology	8	160	
8	3	6	Medical Clinics	8	160	
9	3	6	Toxicology	4	80	
10	3	6	Special Pathology	8	160	
						720

No	4 th year	Semester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
11	4	7	Anatomical Pathology & Autopsy	8	160	
12	4	7	Infectious Disease I (Bacterial & Fung)	8	160	
13	4	7	Research Methodology	2	40	
14	4	7	Veterinary Public healthy & Food safety	4	80	
15	4	7	Epidemiology	6	120	
16	4	7	Pastoral economy	2	40	
17	4	7	General Surgery & Anesthesia	6	120	
						720

No	4 th year	Sem7ester	Subject	Hours Per week	Total hrs/ sub.	Total semester hours
18	4	8	Systematic Surgery & Radiology	6	120	
19	4	8	Infectious Disease II (Viral & Parasite)	8	160	
20	4	8	Clinical Laboratory	6	120	
21	4	8	Poultry Medicine, Fish Disease and Veterinary Ethics & Legislation	6	120	
						520

COURSE DESCRIPTIONS

BASIC SUBJECTS

CELL BIOLOGY

The Cell Biology course provides a basic and comprehensive grounding in the multidisciplinary science of eukaryotic cell biology. The composition, structure and function of organelles and other cellular components are discussed in the context of the cells they constitute and their biological activities. Examples from microbes, plants and animals are examined. The cellular and subcellular specializations, and characteristics of higher tissue assemblies, are studied to understand how cells contribute to the overall functioning of the organism, and how malfunctions at the subcellular level lead to diseases such as cancer.

ZOOLOGY

This Zoology course provides a general understanding of animal classification, taxonomy, physiology, cell and structure, biodiversity, evolution, ecology and behavior. Major objective is to provide students' knowledge of animals with different biodiversity, ecology, reproduction, animal behavior etc. and to make students able to identify animals through their taxonomy, phylogenetic etc.

INORGANIC CHEMISTRY

The course is designed to provide an overview of inorganic and physical chemistry. During the course period, it will cover the Atoms, molecules and atomic structure, Stoichiometry, covalent and ionic bonding. Chemical reactions, chemical calculations, acids, bases, solutions and equilibrium in chemistry also will cover in this course. Chemical kinetics, chemical elements as groups, thermo chemistry, electrochemistry, and radio-chemistry will be included in this course.

PHYSICS

The course is designed to provide the students with the knowledge and practical experience in Physics. The student should learn the following topics: Units and Measurements, Waves, Property of materials, Mechanics, Electricity, Fields, Atomic and Nuclear Physics, and Further Physics etc.

MATH

This course is designed to provide the foundation students require for the success in faculty program. skills targeted include critical thinking, and problem solving. Students will explore operations on algebraic expressions, and apply mathematical properties to algebraic equations other topics include Basic Algebraic Operations, Equations and Inequalities, Graphs and Exponential and Logarithmic Functions etc.

ANATOMY I

This course will describe first part of the microscopic anatomy, or histology and then 5 parts of gross anatomy (macroscopic anatomy). The main objective of this course is to provide the fundamentals of Micro and Macro-anatomy so as to understand both the structures and the positions of different animal organ systems. This course comprises the following units: Histology (Epithelial tissues, Connective tissues, Muscular tissues and Nervous tissues), Nervous system, Digestive system, Circulatory system, skeletal system and Muscular system.

BIOSTATISTICS

The main goal of the course unit is to describe the nature, major areas of statistics. topics to be covered include: Sample Space, Events, The probability of an event, Some rules of probability, Conditional probability, Independent events, Bayes' theorem, Random variables, Probability distribution, The Binomial distribution, The Normal distribution, Sampling, Data representations (Tabular and graphical), Measures of Central Tendency, Measures of dispersion, Simple regression, Simple Correlation analysis, Covariance, Interval Estimation of (means, difference between means), Testing hypothesis concerning (means, difference between means).

BOTANY

The course intends to expose students to meanings and significance of plant morphology, anatomy and taxonomy as a science; functions of different organs of wood and herbaceous plants and translocational and physiological role of different plant tissues. Plant specimen collection methods and procedures to prepare a herbarium so as to classify plants to different taxonomical groups will be discussed.

EMBRYOLOGY

This course mainly focuses on anatomical and cellular processes that occur during embryonic development of multiple animals in order to understand the similarities and differences of avian and mammalian embryogenesis. The course teaches fundamental stages of embryonic development. Topics to be covered include: Introduction to Veterinary Embryology, The process of fertilization, early development, determination of the initial body structures (notochord, endoderm, mesoderm, and ectoderm), formation of body axes, defects, organogenesis, development of nervous, and digestive, integumentary, cardiovascular, respiratory, urogenital systems.

ORGANIC CHEMISTRY

The main objective of the course is to learn the basic concepts of organic chemistry and its applications in veterinary sciences, topics covered include: General features of a covalent bond, types of hybridization of carbon compounds, the two types of hydrocarbons (Aliphatic and Aromatic), physical properties and chemical properties of alkanes, alkenes and alkynes, and the functional groups present in a molecule, and the methods for preparation of organic compounds. IUPAC names of various compounds belonging to different classes, lipids and amino acids, identification of organic compounds structure by using UV, IR and chromatography.

ANATOMY II

This is a continuation of the course anatomy I, the course mainly will describe the gross (macroscopic) anatomy and covers the remaining chapters of various systems. These systems are Respiratory system, Reproductive system, Endocrine system, Urinary system and integumentary system

ANIMAL HUSBANDRY

The main goal of Animal husbandry course is to offer a flexible and convenient way to learn about the proper care and maintenance of farm animals. Topics to be covered include, how to care for farm animals. basic domestic animal husbandry techniques includes the role of livestock in the society, animal handling and restraint of farm animals ,basic feeding principles, behavior of the farm animals, effect of the climate and draught animal management, species and breed identification and the importance of their interdependence with humans.

BIOCHEMISTRY

The main focus of the course is to understand chemical constituents of life and their metabolisms, carbohydrates, lipids, proteins and amino acids, enzymes and vitamins. Examples of the application and context of key biochemical concepts to areas of animal science and veterinary medicine will be used to highlight the importance of biochemistry to all sectors of these sciences. The course will give students an advanced knowledge and understanding in the following core areas: concept of biochemistry, metabolic pathways of carbohydrates, proteins, lipids glycolysis, citric acid cycle, gluconeogenesis, .glycogenesis, Glycogenolysis.

GENETICS AND ANIMAL BREEDING

The main objective of the course unit is to provide the student full knowledge on animal breeding through genetic science in order to upgrade livestock production. It is about the traits and their transmission from generation to the next. The study of genetics and animal breeding provides a part of scientific education that link to the other branches of the science. This course presents to the undergraduate students detailed instruction on genetics and the breeding of animals, genes on the chromosomes, crossing between two pure line animals, and between hybrid ones and even the parents and their progeny and vice versa.

PHYSIOLOGY I

This is an introductory undergraduate course with a comprehensive overview of animal physiology from molecular, cellular and whole animal systems approaches. The main objective of the course is to give students a better understanding of various physiological organ-systems and their importance to the integrative functions of the animal body and to be able to apply knowledge of a physiological mechanism to explaining how a whole animal physiological process occurs (i.e. gestation, lactation, etc.), topics to be covered include: body fluids and homeostasis, neurophysiology, muscle physiology, bones, and joints etc.

ANIMAL BEHAVIOR AND WELFARE

This a comprehensive study course about the behavior of animals. Students will understand the proximate controls of behavior including instinctive versus learning behavior, communication behavior, and the role of hormones, abnormal behavior, the animal's genotype and the animal's environment in the development of behavior. Much of the courses work will take an observation and approaching of factors that stimuli and responses of animal behave through nerve system and hormonal reactions, consequently, students should have a comprehensive understanding of the adaptive significance of behavior, emphasizing animal communication, social behavior, territoriality, sexual selection and mating systems, the animal rights, the prevention of cruelty to animals, the rescue of animals and having more information about any changing welfare policies.

ANIMAL NUTRITION AND FEEDING

The objectives of the course include to have a basic understanding of the principles of animal nutrition explaining the concepts of proximate analyses, feed digestibility, nutritive value and utilization, understand nutrient requirements of livestock for growth, maintenance, reproduction and lactation and ration formulation The contents of the course will provide a comprehensive introduction to the science and practice of animal nutrition. It covers the following main areas: the basic feed constituents, digestion, adsorption and metabolism. Evaluation the energy and nutrient content of feedstuffs. description the characteristics of commonly used feedstuffs such as roughages, concentrates, supplements and the assessment of nutritional requirements and ration formulation and Finally feed composition tables and feeding standards for farm animals.

MICROBIOLOGY & IMMUNOLOGY

The aim of this course is to introduce students to veterinary microbiology and immunological processes taught in principles of disease and also learn laboratory techniques and procedures, also to help students learn how to use of these techniques to investigate the diversity, growth, and pathogenicity of microbes, focusing on the importance of microbes in animal health and disease. The contents include the structure and function of bacteria, viruses and fungi of veterinary significance as well as the pathological and immunological processes.

PHYSIOLOGY II

This is a completion of the course physiology I, the course will cover the remaining contents of physiology one which include: Endocrine system, Reproductive system and Lactation, Renal physiology, Respiratory system and Integumentary systems etc.

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ANIMAL HUSBANDRY SUBJECTS

ANIMAL HYGIENE AND PROPHYLAXIS I

The course focuses on applied veterinary aspects of infectious disease in domestic animals. Emphasis will be on how host, agent and environmental factors influence the spread of infectious diseases and skills necessary to investigate situations where infectious agents may be contributing to decreased production, illness or mortalities in animals. Contents include: common bacterial and viral disease of livestock and understand their causes/etiology, risk factors, geographical distribution/epidemiology, clinical signs and pathological lesions. Treatment of common bacterial and viral diseases of veterinary importance. Control and prevention strategies for bacterial and viral infections. Protocols for herd health management.

FUNDAMENTALS OF SOIL SCIENCE

This course introduces the students to natural and agriculturally influenced soils. It also illustrates Soil as part of natural and managed ecosystems and landscapes, Soil physical properties, soil colloids and their reactions in the soil, soil moisture and water movement in soil, Soil organisms and their types, plant nutrient acquisition and use. It also explores soil development, management and use. Likewise, it will highlight the fundamental importance of soil organic matter and how and ways to raise the organic matter content of soil for fodder and food crop production. Furthermore, the course will describe organic and inorganic fertilizers and their use. Finally, the course will explain soil assessment as a fundamental tool for soil fertility management.

POULTRY PRODUCTION

The course on poultry production provides students with knowledge on essential building and equipment, incubation of eggs, hatchery management, principles for successful production, breeds and breeding, brooding of chicks and management techniques, how to rear chicks, table egg and meat production and health management practices. Topics to be covered include: The need for poultry building, its features and equipment necessary for raising poultry, different facets in the management of poultry, role of hatchery in modern poultry production, Poultry feed requirements and feed formulation, Poultry biosecurity system, health management and vaccination practice, Poultry farm economics and farm records.

PRINCIPLES AND PROCEDURES OF STATISTICS

This course is an advanced level of principles of analytical statistics. Topics to be covered include: estimate and test a population variance, estimation and test for comparing two population variances, inferences about (y - intercept) and (slope) and inferences concerning $E(Y)$, analyzing completely randomized design (one - way classification), Randomized block design and Latin square design, analyze a randomized block design with one or more missing observations and a Latin square design with missing data and tests of goodness of fit and independent (contingency table).

RANGE MANAGEMENT, FORAGE PRODUCTION & CONSERVATION

This course covers the rangeland management, the physical characteristics of rangeland, assessment of rangeland, role of forage crops in livestock sector, the effect of growth and development on forage quality. Each of the forage legumes and grasses will be presented as to their role and management in today's livestock production and grassland ecology. It also entails various environmental aspects related to forage establishment & management, development, seed production, measuring productivity of a pasture. Conservation management is also discussed as to how to produce and preserve quality forages

ANIMAL HYGIENE AND PROPHYLAXIS II

The main goal of the course is to give students an understanding and capture the essential information on Parasite, fungal, nutritional and metabolic diseases and conditions of domestic animals so as to properly diagnose, treat, prevent and control them, the general concept of predisposing and risk factors for these diseases and taking samples for laboratory diagnosis and how to preserve and transport these samples. The course focuses on applied veterinary aspects of infectious disease in domestic animals. Emphasis will be on how host, agent and environmental factors influence the spread of infectious diseases and skills necessary to investigate situations where infectious agents may be contributing to decreased production, illness or mortalities in animals.

DAIRY SCIENCE

Dairy science is more specific and mostly is concerning about dairy breeds and its products with various processing techniques. This course is about the study of milk and milk-derived food products from a food science perspective. Dairy cattle are cows bred for their ability to produce milk from which dairy foods are made. It focuses on the biological, chemical, physical, and microbiological aspects of milk itself, and on the technological (processing) aspects of the transformation of milk into its various consumer products, including beverages, fermented products, concentrated and dried products, butter and ice cream.

FARM MACHINERY

This course is a course meant to introduce students in Animal husbandry to farm power and machinery. Topics to be covered include: Farm power sources; selection and management of farm tractors and implement. Types of farm machinery. Principles of construction, operation and adjustment of farm implements for: primary tillage, secondary tillage, planting, fertilizer application, weed control (cultivation), spraying, harvesting and on-the-farm processing. Farm construction materials, classification of farm structure livestock housing, milking, feeding and watering equipment, waste management and recycling of organic matter.

GENERAL AGRONOMY

This course introduces the students to Meaning and scope of Agronomy, Relationship with other sciences, Role of Agronomist, National and international agricultural research institutes, Agro-climatic zones of Somalia. It will also explain soil fertility and productivity, Tillage and tilth – Definition, objectives, types of tillage, implements used, modern concepts of tillage, tilth and characteristics of ideal tilth, Classification of crops, Seeds and sowing – quality of seed, seed testing, seed multiplication, seed treatment, sowing methods, crop stand establishment, planting geometry and its effect on growth and yield. It will also clarify Manures and fertilizers – Plant nutrients and their role in crop production, classification of manures and fertilizers and green manuring, Weed – Definition, characteristics, merits

and demerits, Cropping systems – Definition, types, advantages and disadvantages, precision, farming and Harvesting – Signs of maturity, methods of harvesting.

○

SMALL RUMINANTS PRODUCTION

The main objective is to provide the student full knowledge on small ruminants and their production. Topics to be covered include: introduction to small ruminants, small ruminants production over view, sheep and goat similarity, uses of sheep and goat, sheep and goat grazing behavior, grazing preference, multi species grazing, grazing methods, grazing management, production stage, sheep and goat feeding sheep and goat housing, traditional and modern housing.

○

ARTIFICIAL INSEMINATION

This is an in-depth course on Artificial Insemination (AI) of large animal (sheep, goat, cattle and equine). The basic anatomy and physiology of the male and female reproductive system are discussed, as well as the basic endocrinology and reproductive cycles in all species. The course also covers semen collection techniques, evaluation, processing and storage. The course includes a 60 per cent practical component and serves as requirement to become certified inseminators of all livestock.

○

BEEF PRODUCTION

This course provides a detailed overview of the necessary subject matter for students who are studying in Animal Husbandry in order to be fully equipped and able perform quality farm managers and practitioner. The course offers knowledge into the key principles of intensive, semi-intensive and extensive beef herd production management, with special emphasis on dry land ecosystems. Topic to be covered include: General Management, Growth and Development, Carcass composition and quality, Housing and facilities, Beef Cattle Breeding Management and Marketing

○

PRINCIPLES OF FARM ECONOMY

This courses gives students the skills to apply principles of economics in agricultural settings. Topics to be covered include: Introduction to micro economics , Goods , needs , utility , types of utility, law of diminishing marginal utility, Production , the profit function, the production function , average of marginal product, Costs , production cost in short run, production cost in long run, Market: Supply , low of supply, supply schedule, supply curve , factors influencing supply, supply functions, perfect competition, Game of , Markets, market equilibrium, and changes in market equilibrium.

○

RESEARCH METHODOLOGY

The main goal of the course is to improve student's capability for conducting research and make them able review scientific literature and analyze. Topics covered include: Research process, identifying a research problem, reviewing the literature, sampling, reliability and validity in research, qualitative and quantitative data analysis, research reporting, logistical and ethical issues in research, writing a research and project proposal and report.

FARM ECONOMICS & MANAGEMENT

This course is designed to provide students with economic concepts that can be applied to management decisions using farm and ranch situations, and to develop skills in planning and budgeting, business financial analysis, and investment analysis. Topics to be covered include: Introduction to Farm economics and management, Farm management decision making process, Production, operational, strategic, administrative and marketing management decisions, Basic concepts in farm management. Production, types of resources, choice indicators, costs, revenue, profit, total, average & marginal concepts, Factor - Product relationship, Law of diminishing returns, Cost concepts & interrelations, Economies of scale, Returns to scale - Economies, Factor - Factor relationship - Principle of substitution - isoquant, isocline, Product - Product relationship Equi-marginal returns and Opportunity cost - comparative advantage, Concepts of Risk and uncertainty, Management of Important Farm Resources, Farm Financial Analysis, Farm Investment Analysis, Farm Budgeting.

FISHING INDUSTRY

The main goal of the course is to explain the scope and the principal sectors of the fishing industry. This course is designed to provide an introduction and overview of current fishing industry topics in the context of fisheries management and conservation. The course covers the following: Overview of the principal sectors of the fishing industry, Fish biology, Fishing gears and crafts, Fish handling on board, Fish spoilage, Fish processing, preservation and Fish canning, Seafood packaging, aquaculture history and its present state, Design and Construction of Aquafarms, Nutrition and Feeds, Health and Diseases, Control of Weeds, Pests and Predators, Harvesting and Post-Harvest Technology, Marketing of fish and fishery products, recreational fishing.

FOOD TECHNOLOGY

This course provides an overview of the food processing industry. Emphasis will be given to many of the key areas of responsibility of a food technologist. Food processing techniques, particularly techniques for processing milk, cheese and meat processing goods will be described. Management operations including total quality management, plant hygiene and sanitation, occupational health, safety and welfare, HACCP and legislation will be overviewed. The course may include industry tours by selected industries.

PASTORALISM AND ENVIRONMENT

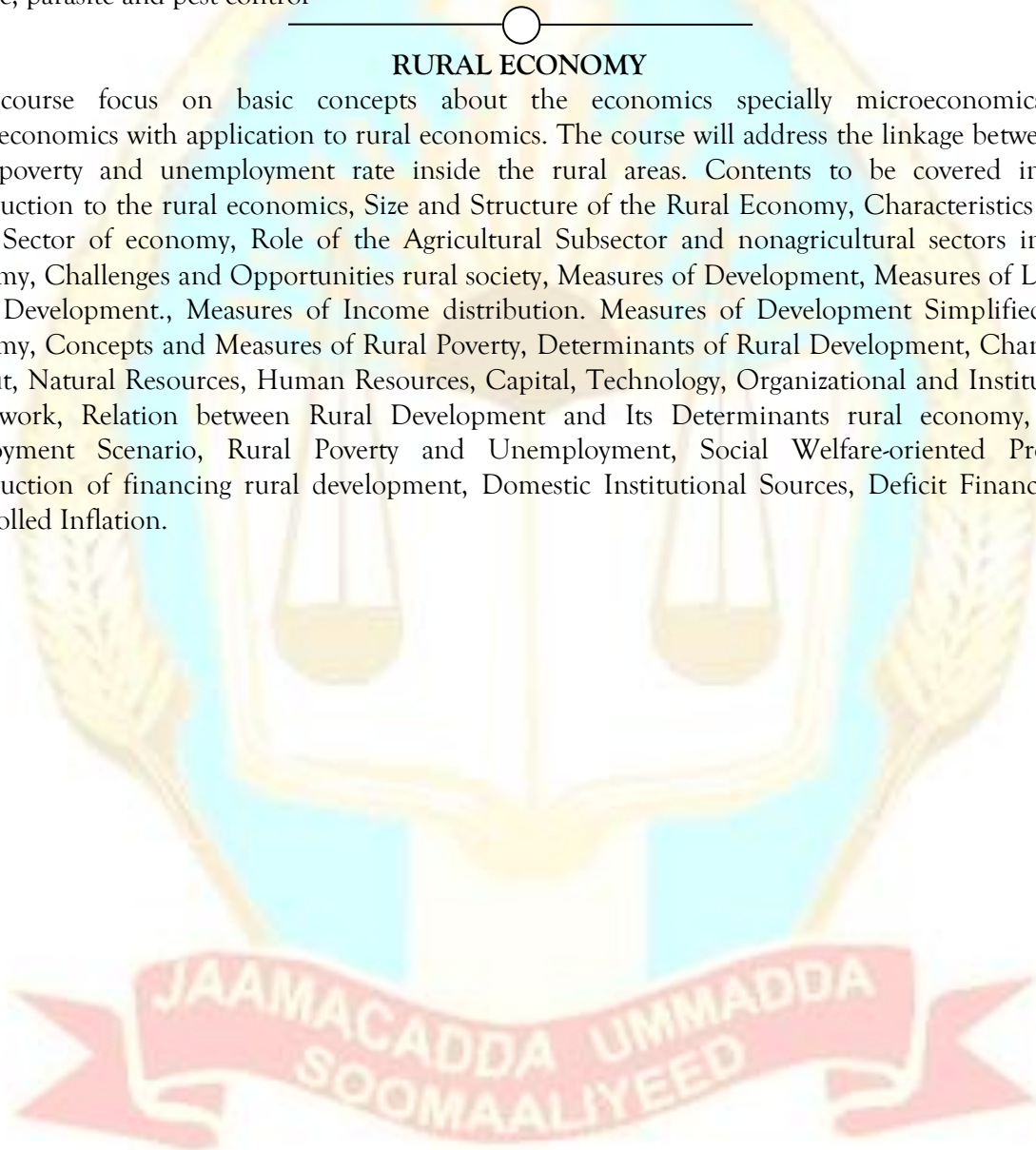
The overall goal of the course is to make environmental awareness for the students and to promote sustainable land resource utilizations and consequently better of reliable income and livelihoods for the primary users. It is an introduction to Holistic Management how pastoralism as means of livelihood affects the environments and land resources and ultimately will highlight how it will affect climate, landscape health and livelihoods. Contents of the course includes: Pastoralism in Somalia, Decision making through Holistic Management, Three parts Goal, Eco-system Foundation Blocks, Tools for Improvement, Guidelines (Testing questions and Management), Monitoring, Range Management Principles, Dry land degradation/Desertification.

BEEKEEPING (APICULTURE)

The main objective of the course is to provide the student full knowledge on agricultural insects, in particular bees and their characteristics, and bee housing. It is about the useful insects like bees provides a part of scientific education that link to the other branches of the science. This course presents to the undergraduate students detailed instruction on bee and their production (Honey, Royal jelly and pollen), their housing (Hive and its components) and even their management in the different sessions (like suitable and unsuitable and even when there is a disease). Contents covered include: Introduction to beekeeping, Colony and its organization, Beekeeping Equipment, Hive (Types of hives), Hive Components, Hive ancillary, Protective clothes, Starting with Bees) Package Bees, Nucleus Colonies, Buying Established Colonies, Selecting the Right Type of Bee for Your Operation, Beekeeping in the Urban/Suburban, Colony Management , Suitable condition Management and Disease, parasite and pest control

RURAL ECONOMY

This course focus on basic concepts about the economics specially microeconomics and macroeconomics with application to rural economics. The course will address the linkage between the rural poverty and unemployment rate inside the rural areas. Contents to be covered include: Introduction to the rural economics, Size and Structure of the Rural Economy, Characteristics of the Rural Sector of economy, Role of the Agricultural Subsector and nonagricultural sectors in rural economy, Challenges and Opportunities rural society, Measures of Development, Measures of Level of Rural Development., Measures of Income distribution. Measures of Development Simplified rural economy, Concepts and Measures of Rural Poverty, Determinants of Rural Development, Changes in Output, Natural Resources, Human Resources, Capital, Technology, Organizational and Institutional Framework, Relation between Rural Development and Its Determinants rural economy, Rural Employment Scenario, Rural Poverty and Unemployment, Social Welfare-oriented Program, Introduction of financing rural development, Domestic Institutional Sources, Deficit Financing or Controlled Inflation.



VETERINARY MEDICINE COURSES

GENERAL PATHOLOGY

Pathology is a core discipline in veterinary medicine. Students will learn general principles about the processes involved in disease. The course will contribute to the students' achievement in understanding fundamental principles of disease and recognizing disease states across the range of species, focusing upon domestic animals. Contents covered include: Epithelium, Connective tissue, Muscle Tissue, Nervous tissue, Cartilage, Bone tissue, Genetic disorders developmental anomalies and monsters, Disturbances in growth, in circulation, in cell metabolism, Necrosis, gangrene and post-mortem changes, in calcification and pigment metabolism, Inflammation and healing, Concretions, Immunity and Immunopathology.

PARASITOLOGY I

Parasitology I This course will cover the scientific discipline of veterinary parasitology and the relationship between parasites and disease at the tissue and animal level in various animal hosts and body systems. The course will provide students with the theoretical and practical skills required in veterinary parasitology, including the diagnosis, control and treatment of common parasite diseases, including zoonosis. It consists of veterinary protozoology, veterinary entomology and acarology, veterinary helminthology 1&2.

MEDICAL DIAGNOSIS

The aim of this course is to introduce students to veterinary diagnosis and learn diagnostic techniques and procedures, also to help students learn how to use of these techniques to investigate the clinical abnormalities and pathogenicity of the diseases, focusing on the importance of clinical examination in animal health and disease. To apply general inspection, palpation, percussion and auscultation methods used to detect clinical signs of abnormalities. Generally, it covers basic principles of medicine and veterinary diagnosis and provides an introduction to the techniques of clinical examination, clinical sign and pathogenesis of the diseases which are the basic requirements for clinician in his/her good diagnostic approach.

PHARMACOLOGY

The contents of the course will provide introduction of the Medicines used in veterinary practice as and it will cater as a basis for students to understand the selection, preparation, preservation and ways of the dispensing the medical substances in the form of tablets, syrups, capsules, and sterile solution for injection. In addition to that students will understand and able to describe the measurement taken for treatment of a disease including the nurse and physiotherapy. Topics covered include: Historical development of pharmacology, Branches of the pharmacology, Abbreviation of the prescription, Measurements of the temperature , Factors affecting the drugs, Incompatibility of the various ingredients, Routes of the drug and administration, Topical or external administration, Parenteral route as IM, IV, SC, epidural , Anti-bacterial drugs, Anti-fungal, Anti-helmenthic, Anti-protozoal and finally Practical administration of the drugs and exercise.

PRINCIPLES AND PROCEDURES OF STATISTICS

This course is an advanced level of principles of analytical statistics. Topics to be covered include: estimate and test a population variance, estimation and test for comparing two population variances, inferences about (y - intercept) and (slope) and inferences concerning $E(Y)$, analyzing completely randomized design (one - way classification), Randomized block design and Latin square design, analyze a randomized block design with one or more missing observations and a Latin square design with missing data and tests of goodness of fit and independent (contingency table).

MEDICAL CLINICS

This course covers principles of internal medicine, and veterinary diagnosis and provides clinical examination, clinical signs, pathogenesis of the diseases and the therapeutics which are the basic requirements for clinician in his/her good diagnostic and treatment approach. The aim of this course is to introduce students to veterinary diagnosis and learn diagnostic techniques and procedures, also to help students learn how to use of these techniques to investigate the clinical abnormalities and pathogenicity of the diseases, focusing on the importance of clinical, laboratorial examination in animal health and disease and its treatment. Contents to be covered include: General systemic states, Digestive system, Respiratory system, Cardiovascular system, Diagnostic laboratory, Sampling techniques and types of the specimen, Handling and transportation of the specimen, Medical prescription, Urinary system, Sample processing and testing fecal samples, Nervous system, Urinary System, Sample processing and testing blood samples, Sample processing and testing blood samples, Nervous system, Sample processing and testing milk and urine samples, Drug dosage form, Routes of drug administration, Metabolic diseases. The course has Field practice for students.

THERIOGENOLOGY (OBSTETRICS AND GYNECOLOGY)

This course builds on basic reproduction and teach applied concepts used in veterinary practice. Students will learn breeding management of the male and female, pregnancy diagnosis in all species, care of pregnant animals as well as management of parturition and dystocia, and aspects of neonatal medicine. Students will also learn how to diagnose sub-fertility in male and female animal species. Advanced reproductive techniques such as preservation of semen, IVF, synchronization, embryo transfer and stem cell technologies will also be introduced. Through the use of lectures, practical and tutorials, students will develop skills in clinical reproduction and obstetrics. By developing these skills, students will be adept at the diagnosis of sub- and infertility in individual and groups of animals. Students will also develop clinical abilities in the diagnosis and management of pregnancy in all species, as well as management of dystocia, and how pregnancy management can impact pregnancy and the neonate. The course is run over two

PARASITOLOGY II

This course is the completion of parasitology I course, it covers the scientific discipline of veterinary parasitology and the relationship between parasites and disease at the tissue and animal level in various animal hosts and body systems. The course will provide students with the theoretical and practical skills required in veterinary parasitology, including the diagnosis, control and treatment of common parasite diseases, including zoonoses. This course entails the following topics: Introduction, history, classification, general account and economic importance of platyhelminths, Conventional and novel methods of control of helminth, Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of nematodes, Introduction to the concept of zoonotic infections, Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of cestodes.

SYSTEMIC PATHOLOGY

This course is about studying in the alterations in (a) tissue (b) organs of a particular system as the respiratory system, urinary system, and reproductive system. It mainly focuses on Etiology, Diseases, Pathogenesis, Case fatality, Effect of the disease Symptoms and signs for different organ systems. It also entails topics about medical terminology used by the health practitioners and also medical terms of the systemic pathology, Skin and its appendages, pathology of the respiratory system, diseases of the digestive system, diseases of the urinary system, Circulatory disturbances, pathology of the reproductive system, Diseases of the endocrine glands, Diseases of the cardio-vascular system, Diseases of the arteries, veins, and lymphatic, vessels, Diseases of the nervous system, pathology of the muscular-skeletal system.

TOXICOLOGY

This course deals with the studying of the toxic substances by equipping the students with the skills needed to Detecting the toxics, Studying their chemistry, Establishing antidotes, Treatment of the toxic manifestation And methods of controlling contents include: General toxicology introductions, Kinds of toxins and their relative toxicity, Acute and chronic toxicity, Sources originating the toxins, Toxicity from agro chemicals, Venom bites and stings, Toxicity due to commonly used drugs, Toxicity caused by metals and non-metals, Toxicity caused by food additives, Radioactive hazards, Environmental toxicity, Plants toxicity, Indigenous drugs.

ANATOMICAL PATHOLOGY AND AUTOPSY

The overall goal of this course is to promote investigative cross lesion to better understand pathologic processes, acquisition of knowledge and provide experience about anatomical pathology, conduct Autopsy Technique and Write an Autopsy report. Contents include: Anatomical Pathology of different organ systems, General information of Autopsy, Necropsy Request Form, Autopsy Report, Autopsy hygiene and Fatal Diseases or Conditions with No Lesions

VETERINARY EPIDEMIOLOGY

This course provides students a good understanding and sound knowledge on all aspects of veterinary epidemiology including: occurrence and dynamics of disease transmission; disease events in a population, disease ecology, epidemiological studies; diagnostic tests, risk analysis, anti-epizootic measures and investigation of epidemics; animal diseases control regulations; prevention of major important diseases of camels and ruminants. The contents of the course include: Introduction to Epidemiology, Environmental Factors, Agents as Determinants of Disease, Modes of Transmission, Measures of disease frequency and occurrence, Prevalence, incidence, Mortality, Case fatality, Interpretation of laboratory results, Diagnostic strategies, Practical application of diagnostic tests, Disease Ecology, Natural History of a Disease, Anti-epizootic measures, Slaughter, Quarantine, Reduction of contract, Mass Treatment, Analytical observational study designs, Measures of association.

SURGERY I (GENERAL SURGERY AND ANESTHESIA)

Surgery one entails the introductory surgery and lays the ground work for surgery two. In these course students will be prepared to conduct pre-surgical assessment, subject preparation, surgical Asepsis, they will be exposed to surgical instrumentation, suture patterns, suture materials and ideal layout of surgical theatre. Wound healing and management, homeostasis, and application of bandages. Throughout the course students will conduct minor surgeries so that they can develop confidence to

practical apply all procedure that will be taught in surgery two. The major parts of this course will be practical and the rest will be interactive and student centered discussions.

○

INFECTIOUS DISEASE I (BACTERIA AND FUNGI)

Infectious diseases I is a core subject in veterinary medicine. Students will learn the etiology, clinical signs, diagnosis, treatment, prevention and control of livestock diseases caused by bacteria and fungi particularly those diseases that are endemic in Somalia. Contents include: Introduction Mode of disease transmission, Concept of infectious disease, Disease control and prevention, Herd Health Management, Hemorrhagic septicemia, common and locally endemic such as Anthrax, Black quarter, Tetanus, Braxy Malignant edema Enterotoxaemia, Botulism, Infectious hemoglobinuria, Infectious necrotic hepatitis etc.

○

PASTORAL ECONOMY

This course focuses on basic concepts about the economy with application to pastoralism and their livelihoods. The course also classified the value of pastoralism in two parts direct and indirect value of pastoralism. The course explained ways of pastoral marketing works and how as pastoralism society can irradiate poverty. The contents of the course include: Introduction of pastoral economy Economics and values of pastoral systems, Pastoral poverty in the marketplace, and the value of pastoralism, Products and productivity, Additional livestock products and market niches, Pastoralist markets and marketing, the opportunity costs of replacing pastoralism, Pastoral Marketing, Trends in pastoral economies and the economic outlook for pastoralism.

○

RESEARCH METHODOLOGY

The main goal of the course is to improve student's capability for conducting research and make them able review scientific literature and analyze. Topics covered include: Research process, identifying a research problem, reviewing the literature, sampling, reliability and validity in research, qualitative and quantitative data analysis, research reporting, logistical and ethical issues in research, writing a research and project proposal and report.

○

VETERINARY PUBLIC HEALTH AND FOOD SAFETY

This course explores the public health aspects of zoonotic diseases, their etiology, and transmission, group at risk, epidemiology, ecology and approaches to control. The course also highlights examples of the major bacterial, viral, rickettsia, parasitic, and fungal infections transmitted from animals to humans. It will also focus on food safety particularly meat and milk hygiene. Topics include: introduction and classification of zoonosis, introduction to VPH, Introduction to food safety, Food borne diseases, Diagnosis of food borne diseases, Veterinarians role in food safety, Food borne outbreak investigation, Food borne disease surveillance, good farming practices for animal production.

○

VETERINARY CLINICAL LABORATORY

The clinical laboratory provides students the necessary knowledge for collecting and diagnosis different clinical specimens from animals. The course focuses the different types of veterinary laboratory, such as microscopy, immunological assays, biochemical assays, bacteriology, virology and molecular techniques to diagnose animal disease and disorders. The course will also provide some histopathological techniques uses as an aid for diagnostic purposes in veterinary medicine. The course entails the following main topics: Clinical laboratory set up, Examination of Bone Marrow and Blood, Examination of Urine, Cultural examination, Examination of milk, Examination of Cerebrospinal Fluid, Examination of Synovial Fluid, Examination of Feces, Examination of Skin Scrapings,

Microbiological Examination of Immunological and Serological Tests, Molecular Biology Techniques, and Diagnosis of Toxins and Poisons.

○

INFECTIOUS DISEASES II (VIRAL AND PARASITE)

This course provides students a good understanding and sound knowledge on all aspects of infectious diseases. Selected diseases of ruminants: foot and mouth diseases, rinderpest, PPR, bluetongue, Avian Influenza, Bovine Viral Diarrhea and calf, lampy skin disease, malignant catarrhal fever, Nairobi Sheep Disease, Orf, Rabies, Rift Valley Fever, sheep and goat pox, contagious skin necrosis, Trypanosomiasis, Theileriosis, Babesiosis, hydatid cyst, Taeniasis, Schistosomiasis, Fasciolosis and others

○

POULTRY MEDICINE, FISH DISEASE AND VETERINARY ETHICS AND LEGISLATION

The course contains a wide variety of advanced concepts related to poultry medicine, fish diseases and concepts related to ethics and legislation, animal health and food security; Food safety; Public health (zoonotic diseases) and security (stray animals). The course includes the following: Introduction to poultry medicine, viral disease, bacterial disease, Parasitic diseases, Nutritional deficiency disorders, miscellaneous conditions in poultry, poultry vaccines, fish disease, Viral disease, fish disease, Introduction to fish disease, Bacterial disease, Fungal disease, Parasitic disease, Protozoa Diseases of Fishes, Veterinary legislation, veterinary Ethics.

○

SURGERY II (SYSTEMATIC SURGERY) AND RADIOLOGY

Surgery II entails the practical surgery and procedures that are organized systemically. In these course students will be prepared to conduct and handle surgical cases by going through the following protocols: assessment, patient preparation, surgical Asepsis, they will be exposed to the use application of the surgical instrumentation, suture patterns, suture materials and ideal layout of surgical theatre. They will handle patients postoperatively by applying Wound healing and management, homeostasis, and application of bandages. Throughout the course students will conduct major surgeries so that they can develop confidence to practically apply all procedures. Almost half of this course is practical and the rest will be interactive and student centered discussions. It also contains chapters related to, Radiology, Principles of radiography, Image formation, Radiographic equipment, x-ray machine



Science		Tipo	Posti	Quantità	Numero Utenti	mq/Utente MIN	mq/Utente MAX	mq tot MIN	mq tot MAX	mq MEDIA	Note
1. Spazi didattica e studio	Aule classiche	Grande	200	5	2500	0,84	0,87	840	870	855	Eventualmente divisibili?
		Piccole	50	30		1,15	1,82	1725	2730	2227,5	Da rendere comunicanti?
	Aule attrezzate	Aule-laboratorio	20	16	320	4,5	5,5	1440	1760	1600	
	Sale studio	-	24	5	120	1,2	1,5	144	180	162	Ad ogni piano?
	Biblioteca	-	100	1	100	0,98	1,5	98	150	124	
	Aule conferenze	-	200	1	200	0,88	1,5	176	300	238	
	Meeting rooms	-	60	6	360	1,2	1,5	432	540	486	
	Studi docenti	-	18	10	180	10	12	1800	2160	1980	
2. Spazi amministrativi	Presidenza	-	6	1	6	18	24,5	108	147	127,5	
	Segreteria	-	5	1	5	10	16	50	80	65	
	Uffici amministrativi	Ufficio generico	1	1	25	6,5	12	6,5	12	9,25	
			2	2		12	15	48	60	54	
			4	5		21	24,5	420	490	455	
Sala riunione	-	15	1	15	1,6	2	24	30	27		
mq TOTALI								7311,5	9509	8410,25	

Engineering		Tipo	Posti	Quantità	Numero Utenti	mq/Utente MIN	mq/Utente MAX	mq tot MIN	mq tot MAX	mq MEDIA	Note
1. Spazi didattica e studio	Aule classiche	Grande	200	5	1750	0,84	0,87	840	870	855	Eventualmente divisibili?
		Piccole	50	15		1,15	1,82	862,5	1365	1113,75	Da rendere comunicanti?
	Aule attrezzate	Aule-laboratorio	20	14	280	4,5	5,5	1260	1540	1400	
	Sale studio	-	24	6	144	1,2	1,5	172,8	216	194,4	Ad ogni piano?
	Biblioteca	-	100	1	100	0,98	1,5	98	150	124	30 mq laboratori struttura
	Aule conferenze	-	200	1	200	0,88	1,5	176	300	238	
	Meeting rooms	-	60	6	360	1,2	1,5	432	540	486	
2. Spazi amministrativi	Studi docenti	-	23	7	160	10	12	1600	1920	1760	
	Presidenza	-	6	1	6	18	24,5	108	147	127,5	
	Segreteria	-	5	1	5	10	16	50	80	65	
	Uffici amministrativi	Ufficio generico	1	1	24	6,5	12	6,5	12	9,25	
			2	2		12	15	48	60	54	
			3	1		14	18	42	54	48	
4			4	21		24,5	336	392	364		
Sale riunione	-	15	1	15	1,6	2	24	30	27		
mq TOTALI								6055,8	7676	6865,9	

Law		Tipo	Posti	Quantità	Numero Utenti	mq/Utente MIN	mq/Utente MAX	mq tot MIN	mq tot MAX	mq MEDIA	Note
1. Spazi didattica e studio	Aule classiche	Grande	100	1	500	0,98	1,5	98	150	124	Eventualmente divisibili?
		Piccole	50	8		1,15	1,82	460	728	594	Da rendere comunicanti?
	Sale studio	-	24	2	48	1,2	1,5	57,6	72	64,8	Una per piano?
	Biblioteca	-	100	1	100	0,98	1,5	98	150	124	
	Aule conferenze	-	100	1	100	0,88	1,5	88	150	119	
	Meeting rooms	-	80	1	80	1,2	1,5	96	120	108	
	Studi docenti	-	5	5	25	10	12	250	300	275	
2. Spazi amministrativi	Presidenza	-	6	1	6	18	24,5	108	147	127,5	
	Segreteria	-	5	1	5	10	16	50	80	65	
	Uffici amministrativi	Ufficio generico	1	1	6	6,5	12	6,5	12	9,25	
			2	1		12	15	24	30	27	
			3	1		14	18	42	54	48	
	Sale riunione	-	15	1	15	1,6	2	24	30	27	
mq TOTALI								1402,1	2023	1712,55	

Economics and Management		Tipo	Posti	Quantità	Numero Utenti	mq/Utente MIN	mq/Utente MAX	mq tot MIN	mq tot MAX	mq MEDIA	Note
1. Spazi didattica e studio	Aule classiche	Grande	200	4	1500	0,84	0,87	672	696	684	Eventualmente divisibili?
		Piccole	50	14		1,15	1,82	805	1274	1039,5	Da rendere comunicanti?
	Sale studio	-	24	3	72	1,2	1,5	86,4	108	97,2	Ad ogni piano?
	Biblioteca	-	100	1	100	0,98	1,5	98	150	124	
	Aule conferenze	-	200	1	200	0,88	1,5	176	300	238	
	Meeting rooms	-	80	1	80	1,2	1,5	96	120	108	
	Studi docenti	-	12	6	70	10	12	700	840	770	
2. Spazi amministrativi	Presidenza	-	6	1	6	18	24,5	108	147	127,5	
	Segreteria	-	5	1	5	10	16	50	80	65	
	Uffici amministrativi	Ufficio generico	1	1	15	6,5	12	6,5	12	9,25	
			2	1		12	15	24	30	27	
			3	4		14	18	168	216	192	
Sale riunione	-	15	1	15	1,6	2	24	30	27		
mq TOTALI								3013,9	4003	3508,45	

Social Science		Tipo	Posti	Quantità	Numero Utenti	mq/Utente MIN	mq/Utente MAX	mq tot MIN	mq tot MAX	mq MEDIA	Note
1. Spazi didattica e studio	Aule classiche	Grande	200	5	3000	0,84	0,87	840	870	855	Eventualmente divisibili?
		Piccole	50	31		1,15	1,82	1782,5	2821	2301,75	Da rendere comunicanti?
			30	15		1,65	2,16	742,5	972	857,25	
	Aule attrezzate	Laboratorio linguistico	20			2	2,75	0	0	0	
			30			1,85	2,35	0	0	0	
			40			1,75	2,25	0	0	0	
		Aule-laboratorio	20			4,5	5,5	0	0	0	
			40			4,15	5	0	0	0	
			60			3,85	4,5	0	0	0	
		Laboratori di informatica	20			4,75	5,75	0	0	0	
			40			4,15	4,75	0	0	0	
			60			3,85	4,35	0	0	0	
	Sale studio	-	24	6	144	1,2	1,5	172,8	216	194,4	Ad ogni piano?
	Biblioteca	-	100	1	100	0,98	1,5	98	150	124	
	Aule conferenze	-	200	1	200	0,88	1,5	176	300	238	
Meeting rooms	-	80	6	480	1,2	1,5	576	720	648		
Studi docenti	-	13	12	160	10	12	1600	1920	1760		
2. Spazi amministrativi	Presidenza	-	6	1	6	18	24,5	108	147	127,5	
	Segreteria	-	5	1	5	10	16	50	80	65	
	Uffici amministrativi	Ufficio generico	2	2	24	12	15	48	60	54	
			4	5		21	24,5	420	490	455	
Sale riunione	-	15	1	15	1,6	2	24	30	27		
mq TOTALI								6637,8	8776	7706,9	

Veterinary & Animal Science		Tipo	Posti	Quantità	Numero Utenti	mq/Utente MIN	mq/Utente MAX	mq tot MIN	mq tot MAX	mq MEDIA	Note
1. Spazi didattica e studio	Aule classiche	Grande	200	4	1500	0,84	0,87	672	696	684	Eventualmente divisibili?
		Piccole	50	14		1,15	1,82	805	1274	1039,5	Da rendere comunicanti?
	Aule attrezzate	Aule-laboratorio	20	10	200	4,5	5,5	900	1100	1000	
	Sale studio	-	24	3	72	1,2	1,5	86,4	108	97,2	Ad ogni piano?
	Biblioteca	-	100	1	100	0,98	1,5	98	150	124	
	Aule conferenze	-	200	1	200	0,88	1,5	176	300	238	
	Meeting rooms	-	80	5	400	1,2	1,5	480	600	540	
	Studi docenti	-	8	15	120	10	12	1200	1440	1320	
2. Spazi amministrativi	Presidenza	-	6	1	6	18	24,5	108	147	127,5	
	Segreteria	-	5	1	5	10	16	50	80	65	
	Uffici amministrativi	Ufficio generico	1	1	20	6,5	12	6,5	12	9,25	
			2	2		12	15	48	60	54	
			3	1		14	18	42	54	48	
			4	3		21	24,5	252	294	273	
Sale riunione	-	15	1	15	1,6	2	24	30	27		
mq TOTALI								4947,9	6345	5646,45	

Agricoltura		Tipo	Posti	Quantità	Numero Utenti	mq/Utente MIN	mq/Utente MAX	mq tot MIN	mq tot MAX	mq MEDIA	Note
1. Spazi didattica e studio	Aule classiche	Grande	200	4	1500	0,84	0,87	672	696	684	Eventualmente divisibili?
		Piccole	50	14		1,15	1,82	805	1274	1039,5	Da rendere comunicanti?
	Aule attrezzate	Aule-laboratorio	20	10	200	4,5	5,5	900	1100	1000	
	Sale studio	-	24	3	72	1,2	1,5	86,4	108	97,2	Ad ogni piano?
	Biblioteca	-	100	1	100	0,98	1,5	98	150	124	
	Aule conferenze	-	200	1	200	0,88	1,5	176	300	238	
	Meeting rooms	-	80	5	400	1,2	1,5	480	600	540	
2. Spazi amministrativi	Studi docenti	-	10	12	120	10	12	1200	1440	1320	
	Presidenza	-	6	1	6	18	24,5	108	147	127,5	
	Segreteria	-	5	1	5	10	16	50	80	65	
	Uffici amministrativi	Ufficio generico	1	1	20	6,5	12	6,5	12	9,25	
			3	1		14	18	42	54	48	
4			4	21		24,5	336	392	364		
Sale riunione	-	15	1	15	1,6	2	24	30	27		
mq TOTALI								4983,9	6383	5683,45	

Altro		Posti	Quantità	Numero Utenti	mq/Utente MIN	mq/Utente e MAX	mq tot MIN	mq tot MAX	mq MEDIA	larghezza MIN	larghezza MAX	larghezza MEDIA	Note
1. Spazi di distribuzione	Corridoi	-	-	-	-	-	-	-	-	2	4	3	
	Rampe	-	-	-	-	-	-	-	-	1,5	3	2,25	
	Scale	-	-	-	-	-	-	-	-	1,2	1,8	1,5	
2. Spazi di servizio	Archivi	-	1	-	-	-	1500	-	-	-	-	-	Non ci sono. Rettorato?
	Depositi	-	7	-	-	-	1,5	3	2,25	-	-	-	Uno per facoltà.
	Spogliatoi	-	7	-	-	-	1,5	3	2,25	-	-	-	
	Locali pulizie	-	7	-	-	-	1,5	3	2,25	-	-	-	
	Bar/mensa	100	3	300	1,38	1,84	414	552	483	-	-	-	Uno ogni due facoltà appross.
	Servizi igienici	30	7	210	1,1	1,8	231	378	304,5	-	-	-	Uno per facoltà. Bagno al piano
	Spazi per la preghiera	-	2							-	-	-	Uno maschile e uno femminile
3. Case dello studente (maschile e femminile)	Stanze doppie	40	2	160	9,5	16	760	1280	1020	-	-	-	Più di due piani
	Servizi igienici	20	2	80	1,8	3	72	120	96	-	-	-	Bagno al piano
	Cucine	20	2	80	6	8	240	320	280	-	-	-	
	Mensa	20	2	80	1,38	1,84	55,2	73,6	64,4	-	-	-	
	Aule studio	50	2	100	1,2	1,5	120	150	135	-	-	-	
	Spazi per la preghiera	10	2							-	-	-	
4. Foresteria	Stanze doppie	20	1	40	9,5	16	190	320	255	-	-	-	
	Servizi igienici	10	1	20	1,8	3	18	30	24	-	-	-	Bagno al piano
	Cucine	10	1	20	6	8	60	80	70	-	-	-	
	Mensa	10	1	20	1,38	1,84	13,8	18,4	16,1	-	-	-	
	Spazi per la preghiera	10	2							-	-	-	Uno maschile e uno femminile
5. Moschea										-	-	-	
										-	-	-	
										-	-	-	
										-	-	-	
										-	-	-	

,`1+	Faculties	1
		Science
	Students/year	500
	Total students	2500
	Courses	10
	Administrative staff	25
	Teaching staff	180
Required spaces [m ²]	<i>Faculty dean + deputy Dean</i>	2 uffici + Staff
	<i>Classroom</i>	20 di capienza 70 students, 15 aule di 40 studenti e 3 Aule Magne di 300
	<i>Study rooms</i>	6 silent rooms + Library
	<i>Library</i>	1 biblioteca commune + 1 mini biblioteca in ogni dipartimento
	<i>Meeting rooms</i>	1 di capienza 200 e 6 di capienza 60 persona
	<i>Laboratories</i>	16
	<i>Departments offices</i>	10 +staff
	<i>Administrative staff offices</i>	20
	<i>Other spaces (toilets, corridors, etc.)</i>	
	<i>Rectorate (administration, lecture hall, conference halls, libraries, etc..)</i>	
	<i>Restoration</i>	
	<i>Sports areas</i>	
	<i>Retail areas</i>	
	<i>Start-ups</i>	Start up center

1) Facolta' di Economia avra' 6 laurea, che sono Economia, Finanza pubblica, Comercio, economia agraria, Statistica applicata e economia aziendale

2) Facolta' di Ingegneria avra' 8 Laurea che sono **Ingegneria Elettrica, Meccanica, elettronica, Civile, architettura, Meccatronica, Urban planning e chemical Engineering**

Facolta di Scienza puo avere piu' di 10 Lauree tra cui **Geology, Marine Science, Environmental Science, Microbiology & Immunology, Industrial Chemistry, Pharmacy, Anatomy, Fisica e Fisiologia e Chimica**

4) Facolta di Scienze Sociali Puo' avere 12 Laurea tra cui **Scienze Politiche, Psicologia, Scienze Media, Social worker, International Relations, Lingue (Italian, English, France e Arabico), Geografia, Antropologia e Storia**

5) Facolta' di Veterinaria e Zootecnia puo' avere 5 laurea che sono Medicina Veterinaria, Zootecnia, Scienza tecnologia alimentare, sicurezza Alimentare e Scienza forestale e Range

6) Facolta' di Agraria puo' avere 6 Laurea tra cui Scienza del Suolo, Produzione della Coltura, Economia Agraria, Protezione della Piante, Nutrizione, Horticultura e agricultural Extension

2	3	4
Engineering	Law	Economics and Management
350	100	300
2800	500	1500
8	1	6
24	6	15
160	25	70
2 uffici + Staff	2 uffici + Staff	2 uffici con staff
16 class di capienza 70 student+ 4 Aule magne di 350 studenti + 10 Aule di capienza 45	1 Aula Magna di capienza 100 studenti piu' 8 classe di 60 giacuno	14 di capienza 50 studenti + 3 aulea magne di capienza 300 studnti
6 silent rooms + Library	2 silent rooms + Library	4 silent rooms + Library
1	1	1
1 di capienza 200 e 6 di capienza 60 persona	1 di capienza di 80 persone	1 di capienza di 80 persone
14		
7 + staff	5 + staff	6 + staff
10		6

Stadio per il Calcio, Centro sportivo per femine e uno per I Maschi e una linea per correre

Pharmacy, Biochemistry, Biology, Matamatica applicata, Chimica, Physiology, anatomy

5	6	7
Social science	Vet. & Animal science	Agriculture
600	300	300
3000	1500	1500
12	5	6
24	20	20
160	120	120
2 uffici + Staff	2 uffici con staff	
30 di capienza 50 students, 15 aule di 40 studenti e 5 Aule Magne di 200	14 di capienza 50 studenti + 3 aulea magne di capienza 300 studnti	14 di capienza 50 studenti + 3 aulea magne di capienza 300 studnti
6 silent rooms + Library		
1	1	1
1 di capienza 600 e 6 di capienza 80 persona	1 di capienza 300 e 5 di capienza 80 persona	1 di capienza 300 e 5 di capienza 80 persona
	10	10
12 + staff	15 + staff	12 + staff