STUDENT HANDBOOK
Academic Year 2019/2020

Undergraduate Courses

FACULTY OF ENGINEERING

UNIVERSITY OF JAFFNA

SRI LANKA

Name : _____

Address : _____

Phone : _____

E-mail : _____

Published by:

Faculty of Engineering,
University of Jaffna,
Ariviyal Nagar,
Kilinochchi 44000,
Sri Lanka.

The policies and regulations set out here are for the information of the students admitted to the Bachelor of the Science of Engineering Degree Program from 2013 until otherwise subsequently amended (2019).

OFFICERS OF THE UNIVERSITY OF JAFFNA

Vice-Chancellor

Prof. S. Sri Satkunarajah

Rector, Vavuniya Campus

Dr. T. Mangaleswaran

Deans of Faculties

Agriculture	: Dr. K. Sooriyakumar
Allied Health Sciences	: Mrs. D. Thabotharan
Applied Sciences	: Dr. (Mrs.) A. Nanthakumaran
Arts	: Dr. K. Suthakar
Business Studies	: Dr. Y. Nanthagopan
Engineering	: Prof. A. Atputharajah
Graduate Studies	: Prof. G. Mikunthan
Hindu Studies	: Dr. (Mrs.) S. Srimuralitharan
Management and Commerce	: Prof. B. Nimalathasan
Medicine	: Prof. S. Raviraj
Science	: Prof. P. Ravirajan
Technology	: Dr. (Mrs.) S. Sivachandran
Technological Studies	: Mr. S.S. Suthakar

Registrar

Mr. V. Kandeepan

Librarian (Acting)

Dr. (Mrs). K. Chandrasekar

Bursar

Mr. K. Sureshkumar

This Page is Intentionally Left Blank

OFFICERS OF THE
FACULTY OF ENGINEERING

Dean

Prof. A. Atputharajah, BScEng(Hons) *Peradeniya*, PhD *Manchester*, Senior Member of the IEEE, C.Eng., MIE(SL)

Heads of Departments

Civil Engineering

Eng. M. Vignarajah, BScEng (Hons) *Peradeniya*, MSc(USA), MPhil *Peradeniya*, AMIE(SL)

Computer Engineering

Dr. A. Kaneswaran, BScEng (Hons) *Peradeniya*, PhD *QUT, Australia*, AMIE(SL), MIEEE

Electrical and Electronic Engineering

Dr. T. Thiruvaran, BScEng (Hons) *Peradeniya*, PhD *UNSW, Australia*, AMIE(SL), MIEEE

Interdisciplinary Studies

Dr. K. Pirapaharan, BScEng (Hons) *Peradeniya*, M.Eng *Kindai*, PhD *Kindai*, C.Eng (UK), MIEEE, MIE(SL)

Assistant Registrar

Ms. J.C. Aravintharaj, BSc(Hons) in Agriculture Technology and Management *Peradeniya*, MSc *Peradeniya*

CONTACT

POSTAL ADDRESS

Faculty of Engineering
University of Jaffna
Ariviyal Nagar
Kilinochchi 44000
SRI LANKA

TELEPHONE

Dean	(021) 2060160
AR Office	(021) 2060161

FAX

(021) 2060161

E-MAIL

deansoffice@eng.jfn.ac.lk

WEB PAGE

http://www.eng.jfn.ac.lk

MISSION STATEMENT OF THE FACULTY

" The mission of the Faculty of Engineering is to foster and promote engineering nationally and globally by producing competent Engineers with social, economic and ethical values, and environmental consciousness, who contribute to sustainable development."

This Page is Intentionally Left Blank

Contents

***

Chapter 1

Introduction

***

> *Meipporul Kaanpathu Arivu*
> *(Discernment is Wisdom)*
>
> — **Motto of University of Jaffna**

The University of Jaffna was founded in 1974 as the Jaffna Campus of the University of Sri Lanka. The Jaffna Campus was launched with two faculties, the Faculty of Science and the Faculty of Humanities. On first of January 1979, the Jaffna Campus of the University of Sri Lanka became an independent autonomous national university with the implementation of the Universities Act No.16 of 1978 and was named as University of Jaffna, Sri Lanka. While fulfilling its commitment as a higher educational institution of the nation, University of Jaffna has been playing a major role in promoting educational values to international standard and promoting cultural values of the Northern region of Sri Lanka. The University of Jaffna is committed to the search for truth, as it has been emphasized in its motto.

1.1 Vision

Vision of University of Jaffna is

> To be a leading centre of excellence in teaching, learning, research and scholarship.

1.2 Mission

Mission of University of Jaffna is

> To produce intellectually and professionally competent and capable graduates to meet the emerging needs of the national and international community, with special emphasis on the social, economic and cultural needs of Northern Sri Lanka.

The main administrative premise of the University of Jaffna is located in Thirunelveli, Jaffna. The academic entities of the university are in Jaffna, Kilinochchi and Vavuniya.

1.3 Establishment of the Faculty of Engineering

The establishment of Faculty of Engineering had been a long standing request of the University of Jaffna and a long felt need and expectation of the people of the region. With the establishment of the Faculty of Engineering, aspirations of the university and the people of the region have been consummated. New Faculty of Engineering, like jewel in the crown, makes the University of Jaffna fully fledged.

1.4 Early Years of Discussions

As early as in 1979, the Senate and the Council of University of Jaffna decided to establish the Faculty of Engineering in Kilinochchi. In 1988, the University Grants Commission (UGC) also accepted the request made by the University of Jaffna to establish the Faculty of Engineering in Kilinochchi. Although a number of steps were taken by the University for establishing the Faculty in Kilinochchi, it had been delayed due to an unfavorable situation that prevailed in the region.

In 2010, as the situation was improving in the region, the Senate and the Council of University of Jaffna, the UGC, the Ministry of Higher Education, the general public and professionals wanted to give top priority to the establishment of the Faculty of Engineering in Kilinochchi to fulfill the aspirations of the community. In this regard, the Senate of University of Jaffna at its 353rd meeting held on 29th October 2010 appointed a sub-committee to study and report to the Senate on the establishment of the Faculty of Engineering. The sub-committee, considering the reports of the previous sub-committees, present trends of the Engineering Education and the Government's commitment on restoration of normalcy and the development of the region, submitted its proposal.

The Senate of University of Jaffna approved the proposal at its 357th meeting on 29th March 2011. Then, at the meeting held on 3rd April 2011, Council of University of Jaffna decided to establish the Faculty of Engineering in Kilinochchi adjoining the Faculty of Agriculture, initially with the following departments:

(1) Department of Civil Engineering,

(2) Department of Computer Engineering,

(3) Department of Electrical and Electronic Engineering, and

(4) Department of Inter-disciplinary Studies.

1.5 Goal and Objectives

The primary goal of the Faculty of Engineering is to acquire, develop, and impart state-of-the-art engineering education, while contributing to the regional, national and global development. The objectives of the Faculty of Engineering are:

- to offer a degree program, which produces graduates who should be able to

(i) apply fundamentals of science, mathematics, and engineering to address contemporary and future needs of society;

(ii) design and develop sustainable solutions through identifying, formulating and analyzing engineering problems while taking social, environmental and economical constraints into consideration;

(iii) function effectively as an individual and as a team member in a multi-disciplinary environment;

(iv) commit to work with professional and ethical responsibility while promoting social harmony;

(v) communicate competently and amicably at every level;

(vi) demonstrate the ability to manage one's own work, teams and projects;

(vii) adapt state-of-the-art tools and technology;

(viii) adhere to independent lifelong learning to develop in-depth knowledge towards wisdom,

- to provide services in conjunction with knowledge sharing to fulfill engineering needs of the industry and community,
- to engage in cutting-edge research that enables value addition, and development of new technologies, products and services.

1.6 Desired Graduate Profile

The desired profile of the graduate from the Faculty of Engineering encompasses intellectuality, research ability, attitude and managerial skill. At the end of the degree program, the engineering graduate shall exhibit substantial knowledge in fundamental sciences, mathematics and engineering principles, and contribute to sustainable development while taking social, environmental and economical constraints into consideration.

The graduate profile is aligned with Level 7 (Honors Bachelors) category of Sri Lanka Qualifications Framework (SLQF).

The schematic outline of desired graduate profile of Faculty of Engineering is given in Figure (1.1).

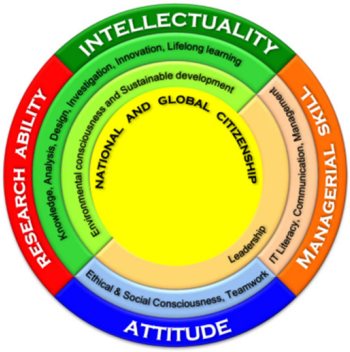

Figure 1.1: Schematic diagram of desired graduate profile

Chapter 2

Undergraduate Courses

***

2.1 Introduction

Faculty of Engineering, University of Jaffna offers the engineering degree program for four academic years leading to the degree in Bachelor of the Science of Engineering, abbreviated to BScEng. The degree program comprises of General Program followed by Special Program in various fields of engineering specialization.

Admission to the undergraduate program in the Faculty of Engineering is subject to government policy on university admissions. The minimum requirements are passes at the GCE (Advanced Level) Examination in the following subjects: *Combined Mathematics, Physics, and Chemistry.*

2.2 Registration

Students admitted to the Faculty of Engineering shall register as full-time students. A student should pay fees prescribed by the University and maintain annual registration during the period of study (**not more than 8 years**).

A student shall register for course modules during the last week of previous semester as prescribed by the Faculty Board. A student is required to consult with the designated academic adviser before the registration in every semester regarding the academic work-load and options available.

With relevant permissions, a student is allowed to `ADD or DROP` course modules within the first two weeks of the semester.

2.3 Framework of the Degree Program

The entire degree program operates on a modularized credit valued with semester based course unit system which operates full-time for four academic years. The medium of instruction is English.

An **academic credit** is defined as fifteen (15) hours of lectures or thirty (30) hours of tutorial or forty five (45) hours of assignment or fieldwork or laboratory work or suitable combination of all.

An **academic year** consists of two semesters and a vacation where each semester will be at least fifteen weeks of in-class activities or assignment or field work or laboratory work.

Students will follow General Program during the first three semesters and Special Program in the last five semesters. The General Program provides the fundamentals together with basic designs of day to day utilities of different branches of engineering. The Special Program enriches in-depth knowledge of a particular field of engineering specialization, a student belongs to.

In addition, each student must complete Industrial Training – I of twelve (12) weeks at the end of 5th semester and Industrial Training – II of twelve (12) weeks at the end of 7th semester.

During the entire degree program, a student is required to earn **153** academic credits including 6 from Industrial Training. The total number of earned academic credits should include minimum of 15 academic credits for studies in management, engineering economics and communication, and 5 academic credits in humanities, social sciences and engineering ethics.

The maximum number of academic credits a student can enroll per semester is 24. Under exceptional circumstances, deviations to these limit may be permitted by the Dean, with the consent of the heads of the departments, which is subjected to the approval of the Faculty Board.

Entire course units offered during the degree program are classified into the following categories.

- Core course units
- Elective course units
  - Technical elective course unit
  - Complementary course units
- Industrial training
  - Industrial Training – I
  - Industrial Training – II

Core course units are compulsory course units covering the principle areas of different branches of engineering.

Elective course units are open to the choice of the students, divided into technical elective course units and complementary course units. Technical elective course units are designed to give a deeper understanding in some selected areas within the core or provide technical knowledge to supplement the core. Complementary course units offer additional knowledge outside the field of specialization.

Industrial Training would bring the students into direct exposure with engineering industry and the engineering profession.

Entire course units are offered by four departments and a centre.

2.4 Special Features

The students enrolled in the Faculty of Engineering learn Common Courses in Engineering Fundamentals with basic designs for the first three Semesters. This is very special for the Faculty of Engineering, University of Jaffna, that brings in-depth understanding of day to day utilities and their designs. Also it provides avenue for easy path learning as the students learn basic designs from the known entities. After third semester the student will be empowered to enter into the detail designs with codes of practices. Specialization is offered from the fourth semester onward. The curriculum is designed to meet the requirements of SLQF Level 7.

2.5 General Program in Engineering

The general program is common for all the students, spans for three semesters from first semester to third semester. The objectives of the general program are to provide the basics in Engineering and to prepare students for the special program. At the end of the general program, a student should be able to

(1) demonstrate fundamental concepts in core engineering disciplines (Civil and Environmental, Electrical and Electronics, Computer, and Mechanical and Process);

(2) integrate fundamental science and mathematical concepts for engineering applications;

(3) demonstrate simple design process;

(4) troubleshoot computers and use computing to solve engineering problems systematically;

(5) seek to clarify environmental concerns when solving engineering problems;

(6) develop teamwork with dedication by actively participating in group work;

(7) practice safety procedures in engineering;

(8) communicate competently in English.

In the General Program, there are compulsory core course units amount to 54 academic credits and Soft-skill Development Program amount to 3 academic credits. The list of course units offered under the general program is given in Table (2.1).

Table 2.1: Course units offered under general program

Semester	Course Unit	Code	Credits
1	English Language Enhancement	MC1010	3
	Mathematics	MC1020	3
	Engineering Drawing	ID1010	3
	Computing	EC1011	3
	Applied Electricity	EC1020	3
	Engineering Metrology	ID1021	3

	Soft skill Development Program - I	MC1030	3
2	Environmental Pollution and Control	ID2010	3
	Materials Science for Engineering	ID2020	3
	Linear Algebra	MC2020	3
	Computer Programming	EC2010	3
	Engineering Mechanics	CE2021	3
	Thermodynamics	MP2010	3
3	Kinematics and Dynamics	MP3010	3
	Differential Equations and Numerical Methods	MC3010	3
	Mechanics of Materials	CE3010	3
	Design and Prototyping	ID3020	3
	Introduction to Electronics and Instrumentation	EC3011	3
	Probability and Statistics	MC3020	3
	Total		***57***

2.6 Special Program in Engineering

Special Program spans for five semesters from 4th semester to 8th semester. In Special Program, there are compulsory core course units, technical elective course units, and non-technical elective course units amount to 90 academic credits, and mandatory industrial trainings (I and II) amounts to 6 academic credits. Special program offers specializations in the following fields:

(1) Civil and Environmental Engineering

(2) Computer Engineering

(3) Electrical and Electronic Engineering

(4) Mechanical and Process Engineering

The structure of the course units offered under each specialization are given in Table (2.2)

Table 2.2: Credits to be earned in Special Program in Engineering

Specialization	**Courses / Projects**	**Credits**
Civil Engineering	Core courses Regular core courses and design projects Research projects	66
	Elective Courses Technical electives Non-Technical electives	24 12 12
Computer Engineering	Core courses Regular core courses and design projects Research projects	66
	Elective Courses Technical electives Non-Technical electives	24 12 12

Electrical and Electronic Engineering	Core courses Regular core courses and design projects Research projects	66
	Elective Courses Technical electives Non-Technical electives	24 12 12
Mechanical and Process Engineering	Core courses Regular core courses and design projects Research projects	66
	Elective Courses Technical electives Non-Technical electives	24 12 12
	Industrial trainings (I and II)	6
Total Credits = 96		

2.7 Volume of Learning

The minimum number of academic credits to be enrolled by a student in each semester from different categories of course units is shown below in Table (2.3).

Table 2.3: Required minimum number of credits for graduation

Semester	Course Unit Status						Credits
	Core		Elective		Industrial Training	Soft Skill	
	General	Special	Technical	Non Technical			
1	18	–	–	–	–	–	18
	–	–	–	–	–	03	03
2	18	–	–	–	–	–	18
3	18	–	–	–	–	–	18
3 month break							
4	–	18	–	–	–	–	18
5	–	18	–	–	–	–	18
3 month industrial training					03	–	03
6	–	15	12	12	–	–	57
7	–	09			–	–	
3 month industrial training					03	–	
8	–	06			–	–	
Total credits of the program							**153**

2.8 Teaching and Assessments

The Faculty of Engineering has adopted a student-centered, outcomes-based educational (OBE) method for teaching and assessment. Teaching methods are designed in such a way to achieve predetermined intended learning outcomes (ILOs) of a particular course unit whereas assessments are to ensure that a student has achieved stipulated level of competency in each intended learning outcome.

For each course unit, a teaching panel and an external reviewer shall be nominated by the Heads of the Departments and both nominations should be approved by the Faculty Board at the beginning of the Semester in which the course unit is offered. The teaching panel consists of a course coordinator, lecturer(s) and a moderator. Lecturer(s) shall engage in both teaching and assessment of the particular course unit. Course coordinator shall finalize the marks and grades along with the help of course moderator. After the completion of the particular course unit, complete details of the course unit including both teaching and assessments shall be sent to the external reviewer. The external reviewer shall provide feedback on the completed course unit, which will be used to revise or update the particular course unit before offering it next time.

Performance of students in each course unit shall be assessed by formative (in-course) assessments and evaluated by summative (end of course) assessments. The methods involved in formative and summative assessments their criteria are given in Table (2.4).

Table 2.4: Methods of formative and summative assessments

Assessment Type	**Assessment Method**	**Evaluation Criteria (Pass)**
Formative	Assignment Quiz Student Presentation Oral Examination Lab/Field Reports Mid Semester Examination	Assessment marks ≥ 35 %
Summative	End Semester Assessment	End semester marks ≥ 35 %

2.8.1 Formative Assessment

Formative assessments consists of suitable combinations of assignment, quiz, student presentation, oral examination, laboratory report, fieldwork report, and mid semester assessment.

All formative assessments of a course unit shall be carried out during the period of that course unit. The dates and times for the formative assessments except mid semester assessment shall be decided by the teaching panel of the particular course unit. The date and time for mid semester assessment shall be decided by the Office of the Dean at the beginning of each semester. Teaching panel of the particular course unit shall handle the exceptions related to the formative assessments.

2.8.2 Summative Assessment

Summative assessment for each course unit shall be conducted at the end of the course unit or at the end of the semester in which the teaching of the course unit is completed. The date and time of the summative assessment shall be decided by the Office of the Dean at the beginning of each semester.

Industrial Training will be supervised by engineers in the place of training and National Apprentice and Industrial Training Authority (NAITA). Members of the Faculty of Engineering may periodically monitor the students.

2.8.3 Attendance and related issues

Ideally students are expected to be present for all scheduled work in a course unit. In any case, each student is required to have a minimum attendance level of 80% in a course unit in order to be eligible to earn a grade. If a student fails to satisfy attendance requirements in a course unit then the student shall not be allowed to appear for the End of Course Evaluation and the student shall be assigned a Grade of 'E'. A student who obtained Grade 'E' shall reattempt the particular course unit to improve the grade.

If a student is absent for an in-class activity or assessment or evaluation, **the reason for the absence should be informed to the Office of the Dean, within one week** from the date of absence, and supporting documents should be submitted within two weeks. The Office of the Dean shall forward the reason for the absence of a student to the relevant panel for the particular course unit, who is authorized to handle matters related to attendance and absence on in-course assessments. Faculty Board shall handle the matters related to absence on End of Course Evaluation.

A student absent for an assessment or evaluation and submits valid reason which is acceptable to the panel of a particular course unit or Faculty Board, the student shall be given a make-up assessment or evaluation or equivalent work. If the student fails to submit a valid reason for the absence, then the student shall be awarded a mark of zero for the relevant assessment or evaluation.

Student who satisfies 80% attendance requirement of a course unit may carry forward the student's attendance record when the student reattempts the particular course unit to improve the grade, if required.

2.9 Examination System

The panel of a course unit shall send the marks list giving the marks scored by the students in each in-course assessment component and the end of the course evaluation to the head of the department concerned. The overall provisional grade of that particular course unit shall be displayed by the panel after getting the consent of the relevant head of the department.

The coordinator of the particular course unit shall hand over the final grades to the Office of the Dean. The Dean shall summon a meeting of the Pre-result Board of the Faculty.

The Pre-result Board, chaired by the Dean, consists of the Heads of the Departments and all Examiners (internal and external), all Professors and Senior Professors (By Law). The Pre-result Board of the faculty shall scrutinize, finalize and release the final results of all course units in the particular semester.

Office of the Dean shall forward the finalized grades to the Examination Branch of the university. The Examination Branch will release the results of all course units in the particular semester and forward them to the Senate for confirmation.

At the end of the eighth semester, Examination Branch of the university shall decide the GPA and the Class of Honors obtained by the students who have fulfilled the requirements for the degree program in that academic year and forward it to the Senate for confirmation.

2.9.1 Examination rules

(1) Candidates shall be in attendance outside the examination hall at least 15 minutes before the commencement of each paper but shall not enter the halls until they are requested to do so by the supervisor.

(2) On admission to the hall candidate shall occupy the seat allotted to him/her and shall not change it except on the specific instructions of the supervisor.

(3) No candidate shall be admitted to the examination hall for any reason whatsoever after the expiry of thirty (30) minutes from the commencement of the examination. Nor shall a candidate be allowed to leave the hall until half an hour has lapsed from the commencement of the examination or during the last 15 minutes of the paper.

(4) A candidate shall have his/her record book with him/her in the examination hall on every occasion he/she presents himself/ herself for a paper. His/her candidature is liable to be cancelled if does not produce the same. If he/she fail to bring them on any occasion he/she shall sign a declaration in respect of the paper for which he/she had not produced them in the form provided for it, and produce them on the next occasion when he/she appears for the examination. If it is the last paper or the only paper he/she is sitting, he/she shall produce them to the Deputy Registrar/ Examination, on the following day. If a candidate loses his document in the course of examination, he/she shall obtain a duplicate one from the Deputy Registrar /Examination for production at the examination hall.

(5) No candidate shall have on his/her person or in his/her clothes, or on timetable or on student admission card, any notes signs or formulae etc. Books, notes, parcels, handbags etc, which a candidate has brought with him should be kept at a place indicated by the Supervisor. A candidate may be requested by the Supervisor to declare any item in his/her possession or person.

(6) No candidate shall copy or attempt to copy from any book or paper or notes or similar material or from the scripts.

(7) Candidate shall bring their own pens, pencils or any other approved instruments to the examination hall.

(8) Examination stationary (i.e. writing paper, graph paper, drawing paper, etc.) will be supplied as and when necessary. No sheet of paper or answer book supplied to a candidate may be torn, crumpled, folded or otherwise mutilated. Log tables or any other material should be provided with care.

(9) Every candidate shall enter his / her registration number on the answer book and on every continuation paper.

(10) Absolute silence shall be maintained in the examination hall. A candidates is not permitted for any reason what so ever to communicate or to have any dealings with any person other than the supervisor / invigilator.

(11) During the course of answering a paper no student shall be permitted to leave the examination hall 41.0 surveillance.

(12) No candidate shall impersonate a candidate at the examination. Not shall any candidate allow himself / herself to be so impersonated by another candidate.

(13) Every candidate shall hand over the answer script personally to the supervisor / invigilator. It will be collected at his/her seat.

(14) Every candidate who registers for an examination shall be deemed to have sat the examination unless he/she withdraws from the examination within the specified period or valid reason prior to the commencement of the examination or submits a Medical certificate (MC). The MC shall be from the university medical officer (UMO). If this not possible the MC should be obtained from a Government medical practitioner and submitted to the Dean of the Faculty concerned at the earliest possible time.

(15) When a candidate is unable to present himself / herself for any paper / section of an examination, he/she shall notify or cause to be notified to the Senior Assistant Registrar (Examination) or Dean of the respective Faculty within one week from the date of absence. This should be confirmed in writing with supporting documents within two weeks from the date of absence by registered post.

(16) No mobile phones are allowed in the examination hall. Candidates shall switch their phones off and put them at a place directed by the supervisor at his/her own risk.

2.9.2 Examination offenses and punishments

(1) Any candidate violates the rules of examination shall be deemed guilty of the offense.

(2) It is suggested that there shall be examination disciplinary committee which will look into the offense and punishment will be made accordingly and it will be recorded at personal file of respective student.

(3) This documentation is prepared according to the manual for conducting university examination prepared by UGC. If any further details required please refer the UGC manual.

(4) A student will be eligible for award of class if all requirements for the award of class are met within the prescribed period for the degree. However, candidate found guilty of an examination offense shall not be eligible for award of class. (*Clause 43 of Examination By Law*)

2.10 Academic Advisers

At the beginning of each academic year, from among the members of the academic staff of the Faculty shall be appointed as Academic Advisers. Each student shall be assigned an Academic Adviser. Student may approach his/her academic adviser to discuss field of interest (specialization), career development, resolving academic matters, etc.

Students are required to consult their respective Academic Advisers and get the approval for selection of course units and academic load before enrolling themselves in the next semester.

Students are required to consult their respective Academic Advisers prior ADD or DROP classes with in the period set by the rules of the Faculty or obtaining leave from academic activities.

A student shall appeal to the Dean, when he/she disagrees with the decisions of his/her Academic Adviser.

2.11 Grading System

Performance of students in a course unit is graded according to the following grading system as per the regulations given by UGC Circular No. 901. A grade and Grade Point Value (GPV) is assigned to percentage marks as indicated in the Table (2.5);

Table 2.5: Grades and grade point values for percentile marks

Marks (%)	Grade	GPV
85 and Above	A+	4.00
80 - 84	A	4.00
75 - 79	A-	3.70
70 - 74	B+	3.30
65 - 69	B	3.00
60 - 64	B-	2.70
55 - 59	C+	2.30
50 - 54	C	2.00
45 - 49	C-	1.70
40 - 44	D+	1.30
35 - 39	D	1.00
34 and Below	E	0.00
-	I	Incomplete

Faculty Board may authorize awarding an incomplete grade 'I', to a student who fails to comply with a compulsory requirement of a course unit if the student submits written document supporting compelling reasons to the Faculty Board. A student who obtained 'Incomplete' grade shall complete that particular course unit at a later date.

2.11.1 Grade Point Average (GPA)

The Grade Point Average (GPA) is the weighted average of the GPV secured by the student in the course units that are valid for calculating the GPA for the program concerned. GPA is calculated as,

$$\mathrm{GPA} = \frac{\sum_1^N C_i * G_i}{\sum_1^N C_i}$$

where, C_i is the academic credit of the ith course unit, G_i is the best GPV earned for the course unit and N is total number of course units offered that are valid for the calculation of the GPA. All course units excluding Industrial Training will be considered for the calculation of GPA, so that: $\sum_{i=1}^N C_i = 147$. The GPA is rounded up to the nearest 0.05

2.12 Academic Progression

To proceed from the General Program to the Special Program, a student should obtain grades 'C' or above in course units aggregate to at least 42 academic credits out of 54 academic credits offered during General Program. The student should obtain grade 'C' or above in English Language Enhancement course unit.

If a student obtains grade below 'C' in English Language Enhancement, the student should follow a mandatory special class during Second Semester. The student should upgrade to grade 'C' to proceed to Special Program.

To be eligible to follow a course unit with prerequisite(s), a student should obtain a grade 'D' or above in every course unit that is stipulated as prerequisite(s).

A student who obtained a grade below 'C' for a course unit may re-attempt the required assessment / evaluation to improve the grade. The highest grade that could be awarded for a re-attempted course unit is 'C'. A student who re-attempts for a particular course unit shall complete it within eight academic years since the student registered for the degree program in order to become eligible for graduation.

2.13 Criteria for Awarding Degree

A student shall be eligible to receive the Bachelor of the Science of Engineering (BScEng) Honors degree with Class eligibility or Pass if the student has:

(1) obtained grade 'C' or above in all claimed course units, and

(2) earned total of 153 academic credits which includes:

   (a) 120 academic credits earned from core course units,
   (b) 12 academic credits earned from technical elective course units,
   (c) 12 academic credits earned from complementary course units,
   (d) 6 academic credits earned from industrial training,
   (e) 3 academic credits earned from soft skill development program.

Effective date of degree awarded shall be the date of the last assessment or evaluation of the semester in which a student completes the degree program.

2.13.1 Award of Classes

As per the regulations given by UGC Circular No. 901, the class will be determined based on student's GPA as shown in Table (2.6).

Table 2.6: Criteria for award of classes

Criteria	Academic Stand
GPA $\geq$ 3.70	First Class
3.30 $\leq$ GPA $<$ 3.70	Second Class (Upper Division)
3.00 $\leq$ GPA $<$ 3.30	Second Class (Lower Division)
2.00 $\leq$ GPA $<$ 3.00	Pass

2.14 Special Considerations

Not withstanding the above provisions, each individual case may be dealt with on the basis of its own merit by the Faculty Board, subject to approval by the Senate.

Chapter 3

Departments of Study

***

3.1 Department of Civil Engineering

The civil engineering curriculum covers a wide range of subjects in the following streams:

- Materials and Structural Engineering
- Geotechnical and Transportation Engineering
- Water Resources and Environmental Engineering

The department offers specialized courses (technical electives) in Material and Structural Engineering, Water Resources and Environmental Engineering, Geotechnical and Transportation Engineering.

Field visits, seminars and undergraduate research projects form a part of the curriculum. Practical aspects of civil engineering are emphasized through laboratory, field design classes, multidisciplinary projects and a field camp.

Department has structural, geotechnical, hydraulic, environmental, transportation and surveying laboratories with specialized facilities for teaching, research and consultancy services.

Civil Engineering Department links with industry through consulting, Continuing Professional Development (CPD) courses and seminars conducted by academic staff.

3.1.1 Academic Staff

Head of the Department
M. Vignarajah, BScEng(Hons) *Peradeniya*, MSc *USA*, MPhil *Peradeniya*, AMASCE, AMIE(SL)

Senior Lecturers

S.S. Sivakumar, BScEng(Hons) *Peradeniya*, MSc *IIT, Roorkee*, PhD *Moratuwa*, C.Eng, FIE(SL)

M. Vignarajah, BScEng(Hons) *Peradeniya*, MSc *USA*, MPhil *Peradeniya*, AMASCE, AMIE(SL)

N. Sathiparan, B.Sc.Eng.(Hons) *Moratuwa*, MEng *Tokyo*, PhD *Tokyo*

A. Anburuvel, BScEng(Hons) *Peradeniya*, PhD *Hokkaido, Japan*, AMIE(SL)

B. Ketheesan, BScEng(Hons) *Peradeniya*, M.S in Env.Eng *NMSU, USA*, PhD *NMSU, USA*
D.N. Subramaniam, BSc.Eng(Hons) *Moratuwa*, MSc. *UK*, PhD *QUT, Australia*
S.D. Sampath, BScEng(Hons) *Peradeniya*, MPhil *Peradeniya*, AMIE(SL)
H.M.C.C Somarathna, BSc.Eng.(Hons) *Moratuwa*, PhD *UKM*, AMIE(SL)
B. Janarthanan, BSc.Eng(Hons) *Moratuwa*, PhD *QUT, Australia*
R. Nishanthan, BScEng(Hons) *Peradeniya*, PhD *WSU Australia*

3.1.2 Course Structure for Civil Engineering

Semester	Course Title	Course Code	Course Credit	Pre-requisite(s)
4	Surveying and Fieldwork	CE4010	3	
	Civil Engineering Construction	CE4020	3	
	Engineering Hydrology	CE4030	3	
	Fluid Mechanics	CE4050	3	
	Structural Analysis – I	CE4060	2	CE3010
	Concrete Technology	CE4070	2	
	Geology for Civil Engineering	CE4080	2	
5	Geomechanics	CE5021	2	
	Water and Wastewater Engineering	CE5031	3	
	Hydraulic Engineering and Design	CE5040	3	
	Contaminated Land and Groundwater Remediation	CE5060	3	
	Transportation Engineering	CE5070	3	
	Design of Concrete Structures	CE5080	4	CE4060
	Industrial Training – I	MC5010	3	
6	Geotechnical Engineering and Design	CE6010	3	
	Solid Waste Management	CE6030	3	
	Civil Engineering Research Project – I	CE6050	3	
	Continuum Mechanics	CE6070	2	CE3010
	Design of Steel Structures	CE6080	2	CE4060
	Structural Analysis – II	CE6090	2	CE3010
7	Project Management and Engineering Industry	ID7010	3	
	Computational Methods in Civil Engineering	CE7020	2	
	Civil Engineering Fieldwork	CE7030	1	
	Civil Engineering Research Project – II	CE7050	3	CE6050
	Industrial Training – II	MC7020	3	
8	Multi Disciplinary Design Project	CE8010	3	
	Civil Engineering Research Project – III	CE8050	3	CE7050
6/7/8	Technical electives		12	
6/7/8	Non-technical electives		12	
	Total		**96**	

3.1.3 Courses offered by Department of Civil Engineering

CE2021 Engineering Mechanics

CE3010 Mechanics of Materials

CE4010 Surveying and Field Work
CE4020 Civil Engineering Construction
CE4030 Engineering Hydrology
CE4050 Fluid Mechanics
CE4060 Structural Analysis – I
CE4070 Concrete Technology
CE4080 Geology for Civil Engineering

CE5021 Geomechanics
CE5031 Water and Wastewater Engineering
CE5040 Hydraulic Engineering and Design
CE5060 Contaminated land, groundwater and Remediation
CE5070 Transportation Engineering
CE5080 Design of Concrete Structures

CE6010 Geotechnical Engineering and Design
CE6030 Solid Waste Management
CE6070 Continuum Mechanics
CE6080 Design of Steel Structures
CE6090 Structural Analysis – II
CE6050 Civil Engineering Research Project – I

CE7020 Computational Methods in Civil Engineering
CE7030 Civil Engineering Fieldwork
CE7050 Civil Engineering Research Project – II

CE8010 Multidisciplinary Design Project
CE8050 Civil Engineering Research Project – III

Technical elective courses

CE9010 Advanced Structural Designs
CE9020 Applied Finite Element Methods
CE9030 Structural Dynamics and Vibrations
CE9040 Earth Slopes and Retaining Structures
CE9050 Highway Engineering
CE9060 Environmental Microbiology and Biotechnology
CE9080 Air Quality Engineering
CE9090 Integrated Water Resource Management
CE9100 Advanced Irrigation Engineering

CE9110 Wave Theory and Coastal Engineering
CE9120 GIS and Remote Sensing
CE9130 Design of Masonry and Timber Structures
CE9140 Advanced Wastewater Treatment
CE9160 Bridge Engineering
CE9170 Foundation Engineering
CE9180 Constitutive Modeling of Geomaterials

3.2 Department of Computer Engineering

The Department offers Bachelor of the Science of Engineering Honors Degree specialized in Computer Engineering. It offers courses not only for the students from Department of Computer Engineering but also for the students who specialize in Electrical and Electronic Engineering. In addition, it offers two courses for the students from all the departments in the General Program, Computing in Semester 1 and Computer Programming in Semester 2.

Department has following laboratories with specialized facilities for teaching and research:

(1) Microprocessor lab
(2) Machine Learning and Computer Vision lab
(3) Network Engineering lab
(4) Computing Lab I
(5) Computing Lab II
(6) Sensor and wearable devices lab

3.2.1 Academic Staff

Head of the Department
A. Kaneswaran, BScEng(Hons) *Peradeniya*, PhD *QUT, Australia*, AMIE(SL), MIEEE

Senior Lecturers
A. Kaneswaran, BScEng(Hons) *Peradeniya*, PhD *QUT, Australia*, AMIE(SL), MIEEE
P. Jeyananthan, BSc(Hons) in Computer Science *Jaffna*

Lecturers
S. Jananie, BSc(Hons) in Computer Science *Jaffna*
R. Muralitharan, B.Sc.Eng.(Hons) *Moratuwa*
U. Thanuja, B.Sc.Eng.(Hons) *Moratuwa*
S. Mathuranthagaa, B.Sc.Eng.(Hons) *Moratuwa*
B. Yaalini, BScEng(Hons) *Peradeniya*, MBA(PIM-SJP), MIE(SL)

3.2.2 Course Structure for Computer Engineering

Semester	Course Title	Course Code	Course Credit	Pre-requisite(s)
4	Digital Design	EC4010	3	
	Signals and Systems	EC4040	3	
	Electronic Circuits and Devices	EC4050	3	
	Computer and Data Networks	EC4060	3	
	Data Structures and Algorithms	EC4070	3	EC2010
	Discrete Mathematics	MC4010	3	
5	Digital Signal Processing	EC5010	3	EC4040
	Analogue and Digital Communication	EC5020	3	
	Control Systems	EC5030	3	
	Database Systems	EC5070	3	
	Software Construction	EC5080	3	EC2010
	Computer Architecture and Organization	EC5110	3	EC4010
	Industrial Training - I	MC5010	3	
6	Embedded Systems Design	EC6020	3	EC2010
	Software Engineering	EC6060	3	EC5070, EC5080
	Computer Engineering Research Project – I	EC6070	3	
	Robotics and Automation	EC6090	3	
	Operating Systems	EC6110	3	EC4070
7	Project Management and Engineering Industry	ID7010	3	
	Computer and Network Security	EC7020	3	EC4060
	Computer Engineering Research Project – II	EC7070	3	EC6070
	Industrial Training - II	MC7020	3	
8	Computer Engineering Design Proficiency	EC8020	3	
	Computer Engineering Research Project – III	EC8070	3	EC7070
6/7/8	Technical electives		12	
6/7/8	Non-technical electives		12	
	Total		**96**	

3.2.3 Courses offered by Department of Computer Engineering

EC1011 Computing

EC2010 Computer Programming

EC4010 Digital Design
EC4060 Computer and Data Networks
EC4070 Data Structures and Algorithms
EC5070 Database Systems
EC5080 Software Construction
EC5110 Computer Architecture and Organization

EC6020 Embedded Systems Design

EC6060 Software Engineering
EC6070 Computer Engineering Research Project – I
EC6110 Operating Systems

EC7020 Computer and Network Security
EC7070 Computer Engineering Research Project – II

EC8020 Computer Engineering Design Proficiency
EC8070 Computer Engineering Research Project – III

Technical elective courses

EC9040 Advanced Digital Design and Synthesis
EC9500 Advanced Computer Architecture
EC9510 High Performance Computing Systems
EC9520 Advanced Computer and Data Networks
EC9530 Compiler Construction
EC9540 Human Computer Interaction
EC9550 Intelligent Systems Design
EC9560 Data Mining
EC9570 Digital Image Processing
EC9580 Computer Vision
EC9590 Network Application Design
EC9600 Applied Algorithms
EC9610 Communication Network Design for Computer Engineering
EC9620 Wireless and Mobile Communications for Computer Engineering
EC9630 Machine Learning
EC9640 Artificial Intelligence

3.3 Department of Electrical and Electronic Engineering

The Department offers courses for the students from Electrical and Electronic Engineering, Computer Engineering and General Program in Engineering.

Department has following laboratories with specialized facilities for teaching and research: (1) Electric Machines Lab (2) Electric Power Lab (3) Control and Robotics Lab (4) RF and Microwave Lab (5) Electronics Lab (6) Biomedical and Signal Processing Lab (7) Elementary Lab (8) Simulation Lab (9) Fabrication Lab

3.3.1 Academic Staff

Head of the Department
T. Thiruvaran, BScEng(Hons)*Peradeniya*, PhD *UNSW, Australia*, MIEEE, AMIE(SL)

Professor

A. Atputharajah, BScEng(Hons) *Peradeniya*, PhD *Manchester*, MIEEE, C.Eng., MIE(SL)

Senior Lecturers

T. Thiruvaran, BScEng(Hons) *Peradeniya*, PhD *UNSW, Australia*, MIEEE, AMIE(SL)

K. Pirapaharan, BScEng(Hons) *Peradeniya*, M.Eng *Kindai*, PhD *Kindai*, C.Eng.(UK), MIEEE, MIE(SL)

M.K. Ahilan, BScEng(Hons) *Peradeniya*, PhD *QUT, Australia*, AMIE(SL)

S. Thananjeyan,B.Sc.Eng(Hons)*Moratuwa*, MBA-IT *Moratuwa*

Lecturers

R. Valluvan, BScEng(Hons) *Peradeniya*, MSc *USA*, AMIE(SL)

S. Vinothine, BScEng(Hons) *Peradeniya*

T. Mukunthan, B.Sc.Eng(Hons) *Moratuwa*

J. Adhuran, B.Sc.Eng(Hons) *AIT*, M.Eng *AIT*

S. Sangar, BScEng(Hons) *Jaffna*

R. Rajan, BScEng(Hons) *Jaffna*

M. Yuvaraj, BScEng(Hons) *Jaffna*

3.3.2 Course Structure for Electrical and Electronic Engineering

Semester	Course Title	Course Code	Course Credit	Pre-requisite(s)
4	Digital Design	EC4010	3	
	Electromagnetic Engineering	EC4021	3	
	Electric Power	EC4030	3	EC1020
	Signals and Systems	EC4040	3	
	Electronic Circuits and Devices	EC4050	3	
	Computer and Data Networks	EC4060	3	
5	Digital Signal Processing	EC5010	3	EC4040
	Analogue and Digital Communication	EC5020	3	
	Control Systems	EC5030	3	
	Electric Machines	EC5040	3	
	Power Electronics and Design	EC5050	3	EC4050
	Computer Architecture and Organization	EC5110	3	EC4010
	Industrial Training – I	MC5010	3	
6	Embedded Systems Design	EC6020	3	EC2010
	Power Systems	EC6030	3	
	Electrical and Electronic Engineering Research Project – I	EC6080	3	
	Robotics and Automation	EC6090	3	
	Wireless and Mobile Communications	EC6100	3	

Semester	Course Title	Course Code	Course Credit	Pre-requisite(s)
7	Project Management and Engineering Industry	ID7010	3	
	Electrical and Electronic Engineering Research Project – II	EC7080	3	EC6080
	Communication Network Design	EC7090	3	EC5020
	Industrial Training – II	MC7020	3	
8	Electrical and Electronic Engineering Design Proficiency	EC8010	3	
	Electrical and Electronic Engineering Research Project – III	EC8080	3	EC7080
6/7/8	Technical electives		12	
6/7/8	Non-technical electives		12	
	Total		**96**	

3.3.3 Courses offered by Department of Electrical and Electronic Engineering

EC1020 Applied Electricity

EC3011 Introduction to Electronics and Instrumentation

EC4021 Electromagnetic Engineering
EC4030 Electric Power
EC4040 Signals and Systems
EC4050 Electronic Circuits and Devices

EC5010 Digital Signal Processing
EC5020 Analogue and Digital Communications
EC5030 Control Systems
EC5040 Electric Machines
EC5050 Power Electronics and Design

EC6030 Power Systems
EC6080 Electrical and Electronic Engineering Research Project – I
EC6090 Robotics and Automation
EC6100 Wireless and Mobile Communications

EC7080 Electrical and Electronic Engineering Research Project – II
EC7090 Communication Network Design

EC8010 Electrical and Electronic Engineering Design Proficiency
EC8080 Electrical and Electronic Engineering Research Project – III

Technical elective courses

EC9010	High Voltage Engineering
EC9020	Power System Control and Stability
EC9030	Electricity Generation from Renewable Energy Sources
EC9050	Software Construction for Electrical and Electronic Engineers
EC9060	Microwave Engineering
EC9070	Advanced Electronics
EC9080	Electronic Product Design and Manufacture
EC9090	Introduction to Biomedical Engineering
EC9100	Optical Communications
EC9110	Modern Mobile Communication Architecture and Applications
EC9120	Advanced Electric Machines and Drives
EC9130	Distribution, Automation and Smart Grid
EC9140	Advanced Digital Signal Processing
EC9150	VLSI Design

3.4 Department of Interdisciplinary Studies

Department of Interdisciplinary Studies (IDS), Faculty of Engineering, University of Jaffna was established in order to foster working across disciplines. In addition to boosting cross-disciplinary engineering studies, it involves in various academic activities. Presently, the following academic activities come under the purview of Department of Interdisciplinary studies

(1) Offering courses related to Mechanical and Process Engineering specialization

(2) Offering Interdisciplinary courses

(3) Offering Mathematics and English courses

(4) Offering Complementary courses (Management, Economics, etc.)

Mechanical and process engineering specialization comprised of sub- disciplines such as Chemical and Processing, Thermodynamics, Manufacturing, Robotic, Applied Mechanics, Strength of Materials, Mechatronics, Automation, Biomechanics, Fluid dynamics, Machinery and Materials.

The department have received LKR 251 million worth of building comprising 06 major labs, lecture rooms, offices, etc.

The total area of the building is approximately 4200 square meters. The labs are equipped with approximately LKR 120 million worth of state -of-the-art equipment.

3.4.1 Academic Staff

Head of the Department
A. Anburuvel, BScEng(Hons) *Peradeniya*, PhD *Hokkaido, Japan*, AMIE(SL)

Senior Lecturers

P. Kathirgamanathan, B.Sc (Hons) *Jaffna*, Dip in IT, MCMS *Waikato*, PhD (Mathematics), PhD (Mechanical Engineering)

T. Thanihaichelvan, B.Sc(Hons) *Jaffna*, PhD *UM, Malaysia.*

Lecturers

R. Ramachandran, BScEng(Hons) *Peradeniya*

V. Mugilgeethan, BSc.Eng(Hons) *Ruhuna*

S. Vijendiran, BSc.(Hons) in Mathematics, *Jaffna*

T. Mayooran, BSc.(Hons) *Jaffna*, MSc. *USA*

U. Anuraj, BScEng(Hons), *SEUSL*

3.4.2 Course Structure for Mechanical and Process Engineering

Semester	Course Title	Course Code	Course Credit	Pre-requisite(s)
4	Solid Mechanics	MP4050	3	CE3010
	Applied Thermodynamics	MP4010	3	
	Machine Drawing	MP4020	3	
	Mechanics of Machines	MP4030	3	MP3010
	Fluid Mechanics for Mechanical Engineers	ID4031	3	
	Materials Engineering and Manufacturing Technology	MP4040	3	
5	Thermal Power Generation	MP5010	3	
	Dynamics of Mechanical Systems and Control	MP5020	3	
	Fluid Machinery	MP5030	3	
	Process Engineering	MP5040	3	
	Machine Design	MP5050	3	
	Advanced Mechanics of Machines	MP5060	3	
	Industrial Training – I	MC5010	3	
6	Elements of Heat and Mass Transfer and Principles of Refrigeration	MP6011	3	
	Advanced Machine Design	MP6020	3	
	Mechatronics	MP6030	3	
	Advanced Vibration Analysis	MP6040	3	
	Mechanical Engineering Research Project – I	MP6050	3	
7	Project Management and Engineering Industry	ID7010	3	
	Production Engineering	MP7010	3	
	Mechanical Engineering Research Project – II	MP7050	3	MP6050
	Industrial Training – II	MC7020	3	
8	Advanced Tribology	MP8010	3	MP4030, MP5050, ID4031
	Mechanical Engineering Research Project — III	MP8050	3	MP7050
6/7/8	Technical electives		12	
6/7/8	Non-technical electives		12	
	Total		**96**	

3.4.3 Courses offered by Department of Interdisciplinary Studies

MC1010	English Language Enhancement
MC1020	Mathematics
ID1010	Engineering Drawing
ID1021	Engineering Metrology
ID2010	Environmental Pollution and Control
ID2020	Materials Science for Engineering
MC2020	Linear Algebra
MP2010	Thermodynamics
MP3010	Kinematics and Dynamics
MC3010	Differential Equations and Numerical Methods
ID3020	Design and Prototyping
MC3020	Probability and Statistics
MP4050	Solid Mechanics
MP4010	Applied Thermodynamics
MP4020	Machine Drawing
MP4030	Mechanics of Machines
ID4031	Fluid Mechanics for Mechanical Engineers
MP4040	Materials Engineering and Manufacturing Technology
MP5010	Thermal Power Generation
MP5020	Dynamics of Mechanical Systems and Control
MP5030	Fluid Machinery
MP5040	Process Engineering
MP5050	Machine Design
MP5060	Advanced Mechanics of Machines
MP6011	Elements of Heat and Mass Transfer and Principles of Refrigeration
MP6020	Advanced Machine Design
MP6030	Mechatronics
MP6040	Advanced Vibration Analysis
MP6050	Mechanical Engineering Research Project – I
ID7010	Project Management and Engineering Industry
MP7010	Production Engineering
MP7050	Mechanical Engineering Research Project – II
MP8010	Advanced Tribology
MP8050	Mechanical Engineering Research Project – III

Technical elective courses

MP9010	Advanced Fluid Mechanics
MP9020	Gas Dynamics
MP9030	Robotics
MP9040	Advanced Heat and Mass Transfer
MP9050	CAD/ CAM
ID9010	Advanced Mechanics of Materials

ID9020 Composite Materials
ID9030 Production planning and control
ID9040 Elementary Industrial Engineering

3.5 Non-Technical Elective Courses

MC9010 Management in Practice with Case studies
MC9020 Business Law
MC9030 Marketing and Financial Management
MC9040 Industrial Safety and Resource Management
MC9050 Technology and Economic Development
MC9060 Rural Economic Development and Technology
MC9070 Engineer as an Entrepreneur
MC9080 Advanced English Communication
MC9090 Advanced Written English
MC9100 Society and the Engineer
MC9111 Appreciating Music
MC9120 Cinema and Television
MC9130 Graphic Design
MC9140 Physical Development and Health Management
MC9150 Sustainable Development
MC9160 Active Citizenship
MC9170 Community Work

3.6 Selection Scheme for Non Technical Electives

Course Unit	Course Code	Academic Credit	Management	Engineering Economics	Communications	Humanities, Social Sciences	Professional Ethics
Management in Practice with Case Studies	MC9010	2	✓				
Business Law	MC9020	2	✓				
Marketing and Financial Management	MC9030	2	✓				
Industrial Safety and Resource Management	MC9040	2	✓				
Technology and Economic Development	MC9050	2		✓			
Rural Economic Development and Technology	MC9060	2		✓			
Engineer as an Entrepreneur	MC9070	2		✓			
Advanced English Communications	MC9080	2			✓		
Advanced Written English	MC9090	2			✓		
Society and Engineer	MC9100	2				✓	✓
Appreciating Music	MC9111	2				✓	
Cinema and Television	MC9120	2				✓	
Graphic Design	MC9130	2				✓	
Physical Development and Health Management	MC9140	2				✓	
Sustainable Development	MC9150	2					✓
Active Citizenship	MC9160	2				✓	
Community Work	MC9170	2				✓	
Minimum Requirements			**7**			**4**	

From the complementary (elective) course units a minimum of seven (7) academic credits for studies in Management, Engineering Economics and Communication and four (4) academic credits in Humanities, Social Sciences and Professional Ethics are to be earned to satisfy the 3rd degree awarding criteria.

Out of four (4) academic credits in Humanities, Social Sciences, Art and Professional Ethics category one course unit should be taken from Professional Ethics category.

Chapter 4

Industrial Training Unit and Career Guidance Cell

***

4.1 Industrial Training Unit

Industrial Training Unit (ITU), Faculty of Engineering, University of Jaffna is an establishment to facilitate Industrial Training for engineering undergraduates of the Faculty of Engineering, University of Jaffna to cater the standards of Professional Engineers. ITU focuses on creating engineers, who can foresee the future and proceed initiatives for innovations with the best practices obtained by the industrial training program facilitated by ITU.

The functions of the ITU as follows:

- coordinating the industrial training with the contacts of the organizations who are capable of providing standard training programs to Engineering undergraduates
- monitoring the training facility in the industrial sector
- being in contact with National Apprentice and Industrial Training Authority (NAITA) to confirm a guaranteed training program for each undergraduate

Senior Lecturer

H.M.C.C Somarathna, BSc.Eng.(Hons) *Moratuwa*, PhD *UKM*, AMIE(SL)

4.2 Career Guidance Cell

The aim of the Career Guidance Program is to assist the engineering undergraduates to improve their awareness about their careers and also assist them to face interview processes. In addition to the leadership development and management skills development programs organized by the University of Jaffna Career Guidance Unit, this program focuses on the Engineering career guidance aspects. The students are encouraged and facilities are provided to attend the both University and the faculty career guidance programs.

There are two parts of this program. First is the improvement of their career related skills and improve their awareness of the engineering careers in Sri Lanka. The second is the

arrangement of a carrier fair. This is to expose the undergraduates to the industrial interview processes, provide them an opportunity to demonstrate their skills via presentations to the industry and also get the feedback from the industry.

Senior Lecturer

K. Pirapaharan, BScEng (Hons) *Peradeniya*, M.Eng *Kindai*, PhD *Kindai*, C.Eng (UK), MIEEE, MIE(SL)

Chapter 5

Fees

***

Fees payable by students will be determined in accordance with the decisions made by the university authorities and are subject to revision from time to time. Concessions are available to teachers and officers of the University of Jaffna. Refund of fees is made only under exceptional circumstances.

Sri Lankan students should pay fees to the credit of the relevant account of the University of Jaffna at the Bank of Ceylon (BOC).

5.1 Fees Payable by New Entrants

Description	Amount (Rs)
Registration fee	250
Student Identity Card	250
Student Handbook	250
Orientation fee	250
Laboratory deposit	500
Library deposit	500
Hostel deposit/admission	250
Bursary Book	Free
Student Record Book	Free

Other* Fees

Description	Amount (Rs)
Medical fee	250
Submission of MC	250
Upgrading results	250
Hostel fee (Monthly)	200
Student Charter	100

5.2 Fees Payable in each Academic Year

Description	Amount (Rs)
Renewal of Registration	150
Proper Examination Entry	Free
Repeat Examination Entry (per subject)	250
Other* Fees	Varies

5.3 Examination Fees

The undergraduate student is not required to pay any fees for the first attempt of an End-of-Semester examination. Fees are payable for subsequent attempts of the an End-of-Semester

examinations of the semesters and special session in the General Program in Engineering and Specialization Program in Engineering.

* The fees payable are reviewed by the Faculty and the rates that apply will be announced at the beginning of each semester.

5.4 Convocation Fees

Description	Amount (Rs)
Convocation fee	3100
Cloak fee	1000
Degree certificate fee	1000
Photo fee	900
Total	6000

Convocation fees shall be paid through **People's Bank Account**.

In Person	970000052100308
In Absentia	970000052100340

5.5 Transcripts and Curriculum

Description	Amount (Rs)
Statement of results fee	100
Duplicate results sheet	500
Transcript (without postal)	500
Transcript – online procession	500
Issue of copy of curriculum	100
Transfer certificate	100

5.6 Lost or Damaged Items

Description	Amount (Rs)
Duplicate Bursary book if damaged	500
Duplicate Bursary book if lost	1000
Duplicate Record book if damaged	500
Duplicate Record Book if lost	1000
Duplicate Identity Card if damaged	500
Duplicate Identity Card if lost	1000
Duplicate exam Admission Card	150

Chapter 6

Financial Aid

***

Sri Lankan undergraduate students enrolled in state universities are generally supported by Mahapola Scholarship and other awards by individuals and organizations.

6.1 Mahapola Scholarships

Mahapola Scholarship is introduced by Government of Sri Lanka as a national scheme to financially support deserving students in higher education. The Mahapola Scholarship Trust Fund set up for this purpose offers two categories of Scholarships:

(1) *Mahapola Higher Education Merit Scholarships* awarded on the basis of merit

(2) *Mahapola Higher Education Scholarships* awarded to needy students in the form of bursaries

The general conditions on which these scholarships are awarded are:

(a) Scholarship moneys are payable for only ten-months of the academic year.

(b) A student receiving a Mahapola Scholarship cannot benefit financially from any other scholarship, but the student has the option to choose the scholarship from which he/she may receive financial support.

(c) The Board of Trustees may withdraw the scholarship awarded to a student if his/her work, conduct or attendance is reported to be unsatisfactory by the University Grants Commission or if the student fails an examination at the first attempt.

6.2 Endowed Academic Awards

The following awards are available to students of the Faculty of Engineering. While merit is the sole criterion for the award of Medals, Prizes and Scholarships, financial need is an important consideration in the award of Studentships.

6.2.1 Medals

(1) *Prof. A. Thurairajah Gold Medal* for University of Jaffna

(2) *Prof. A. Thurairajah Gold Medal* for field top of the Department of Civil Engineering

(3) *Prof. S. Mahalingam Gold Medal* for the field top of the Mechanical and Process Engineering

(4) *Prof. Kumar David Gold Medal* for the field top of the Department of Computer Engineering

(5) *Prof. Eliathamby Ambikairajah Gold Medal* for the field top of the Department of Electrical and Electronics Engineering

6.2.2 Prizes for overall performance

(1) *Prof. S. Mahalingam Memorial Award* for innovative project proposal

(2) *Prof. Ambikairajah Award* for the best performance in Engineering in each Semester

(3) *Innovative Project Award* for an innovative project proposal from the students of the Engineering Faculty University of Jaffna

6.2.3 Prizes for performance in a subject

(1) *Mr. Perampalam Viveganathan Endowment* for best performance in the Course Unit EC6030 Power Systems

6.2.4 Open studentships

(1) *Engineering Studentship I*, endowed by Mr. Sunith Fernando, Eng. M. Muralidas and Mr. Noel Selvanayaham

(2) *Engineering Studentship II*, endowed by Mr. Thev Theivendran, President–Tamil Engineers Foundation of Australia

(3) *Engineering Studentship III*, endowed by Mr. Kugan N. Kuganenthira, USA

(4) *Engineering Studentship IV*, endowed by Sri Priya and Bhamathy Parameswaran, UK

(5) *Engineering Studentship V*, endowed by Isabelle Hayhoe, Winton Capital Management Limited, UK

(6) *Engineering Studentship VI*, endowed by Mr. Edwin Manoraj, UK

(7) *Prof. Ambikairajah Studentship*, endowed by Prof. Eliathamby Ambikairajah, University of New South Wales, Australia

(8) *Siva-Thaya-Thayakaran–Ramesh Memorial Studentship*, endowed by Mr. T. Rishi Rishindran, USA

(9) *Maheswary-Jayanthi Memorial Studentship*, endowed by Dr. S. Jayakumaran

(10) *Prof. S. Mahalingam Memorial Studentship*, endowed by Eur Ing. Selva Selvakumaran, UK

6.2.5 Studentships for third year students

(l) *Rasaratnam Logendran Studentship*, endowed by Mr. Rasaratnam Logendran, Oregon State University, USA

6.2.6 Studentships for fourth year students

(l) *Rasaratnam Logendran Studentship*, endowed by Mr. Rasaratnam Logendran, Oregon State University, USA

Chapter 7

Academic Facilities

***

7.1 Engineering Library

The Engineering Library serves the needs of the undergraduates and academic staff of the Faculty by providing the reference materials for their studies. The Library contains a fairly good collection of wide spectrum of books ranging from classic to modern. Books and periodicals are available in the field of Civil Engineering, Electrical Engineering, Mechanical Engineering, Computer Engineering, and Engineering Mathematics.

Students are required to get registered themselves at the Library in the beginning of the academic year, so that they may be issued with necessary tickets for borrowing books. Orientation programs are provided on the general use of the Library early in a student's career, followed by more specific instructions on the literature subject fields, so that a student may have some insight into the depth and breadth of information available to him/her as and when him/her requires it.

Library Hours

Monday to Friday	:	7.30 a.m – 8.30 p.m
Saturday and Sundays	:	On discussion
Public Holidays	:	Closed

Undergraduate students should be able to find most of the material that they require for the study within the Library itself. Every effort is made to upgrade the Library to serve the academic staff in their cutting-edge research and study. Further details of the Library services may be found in the help desk.

Senior Assistant Librarian

Mrs. Latha Umashankar, BSc(Hons) in Agriculture, MSc in Library and Information Science

Assistant Librarian

Mrs. T. Janen, BSc in (Agri Tech and Mgt), MSc in Library and Information Science

Chapter 8

Outline of Syllabi

***

Notations:

`L-Lecture, T-Tutorial, P-Practical(Lab/Field), A-Assignment, PR.-Prerequisite`

8.1 Courses for the General Programme in Engineering

`MC1010` ***English Language Enhancement*** `3 Cr.`

General and Academic Reading: Understanding general academic meaning of a short text, functions of discourse markers ■ General and Academic Writing: combined sentences, writing short descriptions, relative clause, passive structures ■ General Academic Listening: understanding simple information, statements etc., understanding instruction of a process ■ General and Academic Speaking: speaking about people and things, giving directions, gather information (WH-Questions), delivering short speech (`L=39,A=18`)

`MC1020` ***Mathematics*** `3 Cr.`

Basic set theory: definition and examples, algebra of sets, real numbers and basic properties ■ Vectors in euclidean space: vector algebra, dot and cross products, lines and planes ■ Functions of a single variable: definitions, limits and continuity, differentiability, mean value theorem, Taylor's theorem, L'Hôpital's rule, curve sketching, Reimann integral and properties ■ Sequences: definitions and properties, convergence ■ Infinite Series: definitions, convergence ■ Power Series: radius and interval of convergence, Taylor and McLaurin series ■ Complex Numbers: properties, Euler form ■ Functions of Several Variables: partial derivatives, tangent planes, directional derivatives, gradient, maxima andminima ■ Curve Fitting: linear regression, least square approximation (`L=34,T=22`)

`ID1010` ***Engineering Drawing*** `3 Cr.`

Fundamentals of Engineering Drawing ■ Projections: drawing in first and third angle orthographic projections, international standards in engineering drawing practice ■ Mechanical, architectural and household wiring drawing ■ Engineering graphics ■ Freehand Sketching ■ Computer Aided Drafting: fundamental knowledge in computer aided drawing (`L=9,P=72`)

EC1011 ***Computing*** 3 Cr.

Classes and Components of a Computer: current trends in computing, computability and Turing machine, CPU, memory, BUS, ports and peripherals, storage, types of computers and their applications ■ Computer Network: LAN, MAN, WAN and internet, network topology, media and network requirement ■ Classification of Software: software layers and functions ■ Cloud Computing: introduction, cloud deployment models, cloud service models ■ Data Representation: number representation, letters and strings, arithmetic and logical operation on binary scheme ■ Designing Program ■ Domain Specific Languages: elementary functions and matrix manipulations, user io, control flows, plotting, user defined functions. (L=25,T=12,P=42)

EC1020 ***Applied Electricity*** 3 Cr.

Network Theorems: Ohm's law, Kirchhoff's law, Thevenin's theorem, Norton's theorem, superposition theorem, maximum power transfer; ■ Introducing Computer Software Package for Circuit Analysis ■ AC Circuits: AC current representations; introduction to three phase system; power in AC circuits and power factor correction ■ Household Wiring: circuit breakers and fuses; Earthing, lightening protection, electric shock, wiring regulations (IEE), installation testing; complete household electrical circuit design, introduction to solar power system ■ Basics of Electromagnetism: electrostatic theory; basics of magnetism ■ Introduction to Electrical Machines: DC generator and motor; synchronous AC generator and motor, induction motor. (L=33,T=6,P=18,A=9)

ID1021 ***Engineering Metrology*** 3 Cr.

Introduction to engineering measurements, units and standards ■ Measurements of quantities in different engineering disciplines ■ Errors in measurements and error minimization procedures ■ Performance indicators and error propagation ■ Calibration ■ Presentation of engineering information ■ Time and frequency domain measurement and analysis of signals (L=28,P=36,A=15)

* * *

ID2010 ***Environmental Pollution and Control*** 3 Cr.

Introduction to Environmental Pollution: definition, types of pollution, pollution causes and effects, hazards of pollution on human beings and ecosystems ■ Water Pollution: sources of pollution, oxygen depletion, eutrophication, toxins, water quality standards ■ Solid Waste Management: introduction to solid waste generation, characterization and disposal ■ Air Pollution: types and sources of air pollution, particulate and gaseous pollutants and quality standards; air pollution control technologies ■ Engineering for the Environment ■ Environmental Management: strategies, laws, regulations and incentives; introduction to types and components of EIA. ■ Community Development Project: (L=26,T=6,P=39,A=9)

ID2020 ***Materials Science for Engineering*** 3 Cr.

Introduction: types of materials, selecting right material, selection criteria ■ Structures of Materials: inter-atomic bonding in solids, packing of atoms, crystals and non-crystal structure, crystal defects, diffusion in solids ■ Properties of Engineering Materials: mechanical and thermal properties, electrical and magnetic properties ■ Application of Materials in

Engineering: metals, polymers, ceramics, composites and advanced materials ■ Phase Diagrams: maps of equilibrium phases (L=35,P=21,A=9)

MC2020 ***Linear Algebra*** 3 Cr.

Matrix Theory: introduction to matrices, operations, properties and types; elementary matrices, Echelon forms and inverse; applications ■ Determinants and System of Linear Equations: determinants properties and expansion, system of linear equations, matrix form, existence and uniqueness of the solution, solution techniques, Gaussian elimination, Cramer's rule, application ■ Vector Spaces: definition, subspaces and examples, spanning, linear independence, basis and dimension, geometrical concepts, norms, inner products, orthogonal projection, Gram-Schimidt orthogonolization process ■ Linear Transformations: definition and examples, matrix representation and change of basis, geometrical aspects of rotation, reflection and shear ■ Eigenvalues, eigenvectors and quadratic forms (L=31,T=28)

EC2010 ***Computer Programming*** 3 Cr.

Program Structure: basic structure of programming languages; compilers and interpreters; using library functions for input / output ■ Data types and expressions: variables/ identifiers; basic data types; constants, formatting and naming conventions; operators, expressions, literals; type conversions; arrays ■ Controlling Program Flow: decisions constructs; loop constructs; break and continue ■ Program Building Blocks: methods / functions; elements of methods; function calls and return; arguments and parameters; recursion ■ Pointers and Memory Handling: introduction to pointers; arguments passing by value and reference ■ Introduction to Object Oriented Programming: introduction to objected oriented concept; classes and objects ■ Graphical User Interface Designing: introduction to GUI libraries (L=26,T=12,P=24,A=15)

CE2021 ***Engineering Mechanics*** 3 Cr.

Laws of Nature and Fundamental Concepts: forces and Newton's laws, static equilibrium of rigid body, force-moment systems ■ Centre of Gravity and Centroid ■ Analysis of Simple Structures: classification of elements, free body diagrams, internal forces, analysis of trusses, analysis of beams, sign convention, internal forces and moments, statically determinate and indeterminate structures ■ Work and Energy Theorems: virtual displacements and work, strain and potential energy, energy principles, unit load method ■ Static Friction: friction between solid bodies, stick-slip, angle of friction, wedges, belt friction ■ Fluid Pressure: fluids in equilibrium, pressure variation in constant / variable density media, pressure gauges and measurements ■ Fluid Statics: forces on plane/curved surface, buoyancy and floatation, stability of floating bodies, compressible fluids, forces on dams (L=30,T=16,P=18,A=3)

MP2010 ***Thermodynamics*** 3 Cr.

Thermodynamic Systems and Thermal Processes ■ Thermodynamic Properties: extensive or intensive properties, molecular hypothesis, kinetic theory of ideal gases, pure substance, solid-vapor phase equilibrium, two-property rule; properties of steam ■ First Law of Thermodynamics: statement of first law, definition of heat and work, internal energy; application of first law to closed system ■ Second Law of Thermodynamics: statement of second law, Kelvin-Plank and Clausius statements; Caratheodary statement and implications;

entropy and its meaning; energy conversion and conservation; Carnot efficiency; absolute temperature.(L=36,P=12,A=15)

* * *

MP3010 ***Kinematics and Dynamics*** 3 Cr.

Rigid Body Dynamics: description of 3D rigid body motion (kinematics) - parameterization of rigid body motion, body angular velocity, spatial angular velocity; force moments and inertia; Euler's rigid body equations; kinetic energy of rotating and translating rigid bodies ■ Applications of Rigid Body Dynamics: conservation of spatial angular momentum and the conservation of the magnitude of the body angular momentum; gyroscopic motion and the spinning top; working principle of mems accelerometers and gyroscopes ■ Linkage Mechanisms: kinematic chains, mechanisms, and kinematic inversions; kinematic pairs and degrees of freedom; four bar mechanisms – geometric inversion, dead center, and Grashof's law; instantaneous center and Kennedy's theorem ■ Gear Trains and Cam Drives: gear types and trains; law of gear meshing and gear design parameters; cam drives (L=29,T=12,P=12,A=18)

MC3010 ***Differential Equations and Numerical Methods*** 3 Cr.

Introduction; modeling with differential equations; first order equations, solution methods ■ Higher Order Linear Ordinary Differential Equations ■ Laplace Transformation ■ Surfaces and Curvilinear Coordinates and Multiple Integrals ■ Numerical Errors: numerical vs analytical; truncation errors and round off errors; Taylor series ■ Roots of Equations and System of Linear Equations; open methods; order of convergence, Gaussian elimination; LU decomposition; Cholesky Decomposition and QR decomposition ■ Numerical Integration and Differentiation; Gauss Quadrature; numerical differentiation ■ Numerical Solution of Ordinary Differential Equations (L=29,T=32)

CE3010 ***Mechanics of Materials*** 3 Cr.

Introduction ■ Material behavior: material constants, compressibility, relation between material constants, Hook's law. ■ Axially Loaded Members ■ Bending of Beams ■ Bending Moment and Shear Force Diagrams ■ Normal and Shear Stresses in Beams ■ Stresses in an Arbitrary Plane: stress transformation relationship, principle stresses and principle planes, Mohr's circle of stress and strains. ■ Deflection in Beams ■ Buckling of Columns: buckling of columns with different supporting condition, equivalent columns length, slenderness ratio, column with eccentric loading. ■ Torsion: torsion of a thin circular tube, torsion of a solid circular shaft, transmission of power, compound shafts, torque diagram for a circular shaft. ■ Vibrations of Shafts and beams: (L=31,T=14,P=9,A=12)

ID3020 ***Design and Prototyping*** 3 Cr.

Concept of Design and Prototyping ■ Problem Formulation and Discussion ■ Preliminary Design ■ Detailed Design and Prototyping ■ Presentation of Design (P=75,A=60)

EC3011 ***Introduction to Electronics and Instrumentation*** 3 Cr.

Applications of Diodes ■ BJTs and MOSFETs: Transistor Configurations, Biasing circuit and DC analysis of transistor circuits; Small signal analysis; Operation and characterization;

Transistor as switch, Transistor amplifier design, cascading transistor amplifiers. MOSFET types , and configurations and applications as switches and amplifiers, MOSFET types, and configurations and applications as switches and amplifiers ■ Operational Amplifier: ideal op-amp; characteristics of op-amp; simple op-amp circuits ■ RC, RL Circuit Transient Behavior: step response and parameters; RC, RL transient and steady state first order and second order circuit analysis ■ Implementation of an Amplifier Circuit ■ DAQ: introduction to simple sensor, properties of sensors and thermal, strain and light sensors and their applications. digital and analog signals, introduction to frequency domain representation of signals, ideal filters, Nyquist theorem, sampling, quantization, noise, anti-aliasing filtering, pcm modulation. introduction to PC based DAQ, ADC types, DAC types, multiplexing, USB Serial Port ■ Introduction to Motor Control(L=36 , T=4 , P=15 , A=6)

MC3020 ***Probability and Statistics*** 3 Cr.

Introduction ■ Random Variables and Probability Distributions ■ Sampling Distributions and Basic Statistical Inference: Simple random sampling; sampling distributions of sample means and sample variance, Methods of estimation; confidence intervals for mean, variance, and proportion, paired samples, Introduction to hypothesis testing; one and two-tailed tests, p-value, level of significance, power of the test, one and two samples test on means variances and proportions, choice of sample size for testing means ■ Statistical Modeling: Simple linear regression, least square estimation, coefficient of determination, multiple linear regression, categorical explanatory variables, sequential methods for model selection, residual analysis, model selection using cross validation, C_p and other criteria ■ Curve Fitting and Interpolation ■ Time Series Analysis: Introduction to Time series, stationarity, Time series models (MA, AR, ARMA, ARIMA), estimation ■ Software handling: MATLAB and MINITAB. (L=30 , T=20 , P=6 , A=9)

8.2 Courses for the Special Program in Engineering

8.2.1 Civil Engineering

CE4010 ***Surveying and Field work*** 3 Cr.

Basic Concepts of Surveying ■ Error and Uncertainty: units, significant figures, rounding numbers, errors in measurements, weight, rejection outliers ■ Vertical Control: introduction, leveling, curvature and refraction, equipment, instrument adjustment, sources of error, error distribution, applications, types of leveling ■ Distance Measurement: taping, electronic distance measurement (EDM) ■ Angle Measurement: the theodolite, instrumental errors, sources of error ■ Conventional Control Surveys: traversing, triangulation ■ Geodetic Surveying ■ Global Positioning System (GPS) and Geographical Information System (GIS) ■ Earthworks: areas, volumes ■ Setting Out: buildings, controlling verticality, roads ■ Fieldwork and Field camp (L=30 , P=45)

CE4020 ***Civil Engineering Construction*** 3 Cr.

Problem Solving ■ Civil Engineering Projects: building projects, building plan and architecture, building services, irrigation project, road and railway project, water supply project ■ Constructibility analysis ■ Construction materials and techniques, Sustainable construction ■ Preparation of BOQ and Value analysis ■ Estimation and rate analysis ■ Term Project (L=32,P=18,A=21)

CE4030 ***Engineering Hydrology*** 3 Cr.

Hydrological Process: Atmospheric water and hydrologic cycle, Estimation of evapotranspiration, Stream flow ■ Hydrological measurements: Weather station, Determination of areal rainfall, rainfall-runoff measurements, effective rainfall■ Hydrograph analysis: component of Hydrograph, synthetic unit hydrograph, instantaneous unit hydrograph, Hydrologic storage routing, Hydrologic channel routing, Hydrologic channel routing, flood routing ■ Frequency analysis: Flow duration curves, Return period, Extreme value distribution, Probability plotting, Risk analysis ■ LAB: Software: HEC-HMS, HEC-RAS, CROPWAT, WEAP ■ Water resource in Sri Lanka and its management ■ Ground water hydrology: Subsurface water, Aquifer properties, Steady and unsteady ground water flow, Well hydraulics, Ground water and contaminant transport (L=29,T=18,P=6,A=15)

CE4050 ***Fluid Mechanics*** 3 Cr.

Bernoulli's Equation, vorticity, flow visualization, pressure distribution for ideal and real fluids ■ Control Volume approach, Continuity equation, Momentum equation, Energy Equation ■ Uniform Laminar flow, Pressure gradient effects of boundary layers, Laminar and Turbulent flows, Predicting shear force ■ Pipe Flow, Moody diagram, Hydraulic losses, Systems of pipes and pipe net works ■ Hydraulic machines ■ Hydraulic transients – water hammer, surge tanks ■ drag and lift ■ fluid dynamics problems, continuity equation, Navier-Stokes equation ■ Laboratory experiments (L=31,T=10,P=12,A=15)

CE4060 ***Structural Analysis – I*** 2 Cr. PR. CE3010

Loading on structural elements ■ Introduction to statically determinate structures ■ Energy methods: strain energy density, Castigliano's theorems (I and II) energy of a stressed continuum body, limitations of energy theorems ■ Principle of virtual displacements ■ Analysis of statically determinate structures ■ Introduction to statically indeterminate structures ■ Analysis of statically indeterminate structures: Moment area theorems, slope-deflection method, moment distribution method, three moment equations, energy methods, matrix analysis of structures ■ Application of structural analysis theory (L=24,T=4,P=6,A=6)

CE4070 ***Concrete Technology*** 2 Cr.

Historical introduction ■ Properties of cement; Tests for cement ■ Aggregate and Properties ■ Admixtures: Mineral admixtures (fly-ash, blast-furnace slag, silica fume, rice-husk ash); Chemical admixtures ■ Properties of Concrete: Durability, rusting, strength, permeability, workability, pumpability, slump, heat generation ■ Mix design of Concrete: Simple mix designs (DoE and ACI), Using computerized comprehensive method, Based on laboratory trials and material properties ■ Special Types of Concrete: Ready-mix concrete, High Performance Concrete, Self-Consolidating Concrete, Fibre reinforced concrete, Foam Concrete, Sprayed concrete, Grouting and grout, Porous Concrete (L=23,P=12,A=9)

CE4080 ***Geology for Civil Engineering*** 2 Cr.

Earth composition and geological variation with time ■ Geology and Soils of Sri Lanka ■ Granular and clayey soils and their basic physical properties: Fundamental differences in behaviour of granular and clayey soils, activity and structure of clay minerals, volume weight relationships, unit weights and relative density ■ Particle size distribution and Atterburg Limits ■ Soil Classification: Classification of soils using different systems, Engineering use charts ■ Geological Structures: Foliation, Dip, strike, joint systems, faults, folds in rocks ■ Geological maps and interpretation: Geological maps of Sri Lanka, geological cross-sections, Identification of geological structures (L=20,T=6,P=12,A=9)

* * *

CE5021 ***Geomechanics*** 2 Cr.

Soil compaction: conventional earth work, Proctor tests and Proctor curve, degree of compaction, field compaction methods, and estimation of degree of compaction in the field ■ Permeability: Hydraulic heads and Bernoulli's equation, Darcy's law, lab and field tests ■ Seepage: Two-dimensional flow and Laplace equation, Solution to Laplace equation, Flow net and seepage calculation, and Uplift pressure calculation ■ In-situ stress: Total stress, Pore water pressure and effective stress, Terzaghi's effective stress concept, and Effective stress in soils with upward and downward flow ■ Stresses in soil mass ■ Compressibility of soils: Elastic and time dependent settlement of soils, Primary and secondary consolidation, Amount and rate of settlement, Oedometer test and determination of consolidation parameters ■ Shear strength of soil: frictional strength, cohesion strength, Mohr's circle, Mohr-Coulomb failure criterion, Determination of shear strength parameters from direct shear and triaxial test results, Stress-strain and volume change behavior of soils (L=21,T=6,P=9,A=9)

CE5031 ***Water and Wastewater Engineering*** 3 Cr.

Introduction: water quality parameters, water quality guidelines ■ Reactor kinetics: continuously stirred batch reactor, continuously stirred flow reactor, plug flow reactor, reaction kinetics ■ Water treatment and reuse: Water demand, Basic treatment train design, Coagulation and flocculation, Gravity separation, Filtration, Disinfection ■ Wastewater treatment: Type of wastewater, Characteristic of municipal wastewater, Wastewater treatment systems (basic) ■ Laboratory sessions: Water quality measurements ■ Design: Design of basic components of standard water and wastewater treatment plants (L=31,T=6,P=24,A=9)

CE5040 ***Hydraulic Engineering and Design*** 3 Cr.

Design of hydraulic structures and coastal design: Reservoir, dam, spillway, sluice, stilling basin, culvert, Reservoir intake structures, cavitation in hydraulic structures, Irrigation Engineering Design, Design of coastal structures ■ Coastal Engineering: Introduction, Coastal Environment and near-shore processes, Application of wave theory, Various coastal structures and shore Protection and coastal zone management ■ Open channel flow: steady or unsteady flow, uniform or non-uniform flow, Energy and momentum principles, hydraulic jump, flow measurements ■ Sediment transport: Introduction to sediment motion, shields diagram, stable channel design, transport formulæ (L=27,T=10,P=36,A=3)

CE5060 ***Contaminated Land, Groundwater and Remediation*** 3 Cr.

Introduction to Soil Contamination; Risk assessment for contaminated land and groundwater;

Site investigation; Monitoring: field techniques ■ Contaminated Land Remediation: Ex-situ concepts; Chemical stabilization; Bioremediation; Low-temperature thermal desorption ■ Groundwater Contamination and Contaminant Transport: Groundwater contamination; Sources and impacts; Mobility of contaminants; Transportation of contaminants; Mathematical representation; Non-standard Groundwater flow; Contaminant mixing and mixing depth. ■ Groundwater Remediation: Active remediation; Passive remediation; Bio and phyto remediation (L=31,T=4,P=12,A=24)

CE5070 ***Transportation Engineering*** 3 Cr.

Introduction ■ Travel demand modeling: Four-step method ■ Traffic flow theory: Fundamental parameters of traffic flow and their relationship, Measurement of traffic flow parameters, Shock wave ■ Simulation of traffic flow: Macroscopic and Microscopic simulation models, Software package ■ Traffic control and management: Control strategies and mechanisms, Intersection control, Traffic signal design, Parking, Demand and supply management ■ Highway capacity of freeways and highways: Capacity, Level of service ■ Intelligent Transportation Systems (ITS) ■ Geometric design of curves ■ Highway Engineering: Pavements, Pavement Design ■ Contemporary traffic control and management in Sri Lanka: Policies, Rule and regulations, Present traffic condition ■ Lab (Traffic survey, CBR test, aggregate test, bitumen test, Marshal test) (L=35,P=18,A=12)

CE5080 ***Design of Concrete Structures*** 4 Cr. PR. CE4060

Introduction to structural designs and Euro code structure; Difference between principles and rules; Classification of actions; Load combinations; Partial safety factors; Design strength and load; Load combinations ■ Analysis of structures: beams and frames; Moment redistribution ■ Introduction to reinforced concrete: Stress-strain Curves for steel and concrete; Compressive, tensile and flexural properties of concrete; Durability and cover to reinforcement ■ Design of flexural members: Design of single & doubly reinforced beams; Shear design; Serviceability conditions; Crack controls; Bond and anchorage; Detailing and curtailment ■ Design of slabs: one-way and two-way spanning slabs; Deflection; Detailing and curtailment ■ Design of columns: classification of columns; Effective height of columns; Buckling of columns; Design of short and slender columns; Biaxial bending of columns ■ Design of foundations ■ Design of staircase (L=42,T=20,A=24)

* * *

CE6010 ***Geotechnical Engineering and Design*** 3 Cr. PR. CE5021

Introduction ■ Subsurface Exploration; Drilling and sampling methods; In-situ tests; Geophysical explorations ■ Stability of Slopes ■ Principal Type of Foundations and Design Criteria; Design methods ■ Ultimate Bearing Capacity of Shallow Foundation ■ Settlement and Allowable Bearing Capacity of Shallow Foundation: Vertical stress increase due to foundation loading; Elastic and consolidation settlement calculation; Allowable total and differential settlement ■ Ultimate Bearing Capacity of Driven Piles and Drilled Shafts: Toe resistance; Frictional resistance; Elastic settlement of piles; Pile load test ■ Lateral Earth Pressure: At-rest, active and passive conditions, Rankine method, Coulomb method ■ Retaining Wall Design: Overturning check; Sliding check; Bearing capacity check (L=32,T=12,A=21)

CE6030 ***Solid Waste Management*** 3 Cr.

Introduction to Solid Wastes; Material flow and waste generation in a technological society; Projection for future; Future challenges and opportunities ■ General Strategies for Management of Municipal Solid Waste ■ Composting: Process description; Design and operational consideration of aerobic composting; Design and operational consideration of anaerobic composting ■ Waste Energy: Energy from compost; Practical viability and current technological limitations; Incineration technology, and design of systems; Environmental impacts; Advancement for future adaptability ■ Landfill Structure and Design: Landfill construction; QA; Monitoring and closure ■ Construction and Demolition Waste: Management of C & D waste; Processing of recycled aggregates from C & D waste; Applications of recycled aggregates from C & D waste; Environmental issues and advantages (L=33,T=4,P=12,A=18)

CE6050 ***Civil Engineering Research Project – I*** 3 Cr.

Introduction: Research methodology; Review of research articles; Research proposal writing; Plagiarism; Literature review; Prepare preliminary report; How to select easy reading papers for start-up? ■ Research project (L=2,A=129)

CE6070 ***Continuum Mechanics*** 2 Cr. PR. CE3010

Introduction: basic concepts and limitations; simple problem formulation ■ Introduction to Tensor Analysis ■ Kinematics and Kinetics: concepts of deformation and displacement gradients, various strain measures, strain displacement relations; measure of stress, stress tensor, transformation of stress or strain tensor ■ Balance Laws and Field Equations: conservation principles of mass, momentum and energy ■ Boundary Value Problem: problem formulation, strong form, principle of virtual displacement, weak form, linear elastic material laws; application of weak form in solid mechanics, solution strategy ■ Solution of Simple Continuum Mechanics Problems: plane elasticity problems, elasto-plastic problems; closed form solution, approximate numerical solution (FEM), error estimate, solution accuracy and validation ■ Computer Simulation (L=24,T=4,P=12)

CE6080 ***Design of Steel Structures*** 2 Cr. PR. CE4060

Introduction to EC3; Principles and application rules; Introduction to national annexes; Structural member notations and axes ■ Actions on Structures; Partial factors of safety; Material strengths; Characteristic and design strengths; Combination of actions ■ Design of Tension Members ■ Design of Steel Columns ■ Design of Steel Beams: Determination of cross-section resistance in bending and lateral torsional buckling resistance of members. Shear buckling and yielding of steel sections, Combined bending and shear; Bearing and buckling Design of Beam-Columns ■ Connections of Steel Members: Clearance and positioning bolts holes; Tension and shear capacity of bolts; Design for block tearing and combined shear and moment, Design of welded connection (L=19,T=14,A=12)

CE6090 ***Structural Analysis – II*** 2 Cr. PR. CE3010

Arch Bridges ■ Suspension bridges ■ Influence Line: Influence line for beams, Influence line for arch and cables, Maximum influence at a point due to series of concentrated loads, Absolute maximum shear and moment ■ Theories of failure: Elastic and plastic behavior, maximum principal stress theory, maximum shear stress theory, maximum shear strain theory, plastic bending of beams and shape factor ■ Plastic theory for design of structures:

Stress-strain relationship of material and load-defection relationship of structures, plastic collapse mechanisms of beams and portal frames ■ Yield line theory for slabs: Yield line analysis, yield line patterns, evaluation of yield lines, methods to determine failure loads. (L=24,T=4,P=6,A=6)

* * *

CE7020 ***Computational Methods in Civil Engineering*** 2 Cr.

Introduction to modeling, interpretation and computation ■ Analysis types: elastic versus inelastic, static versus dynamics, small versus large displacement, demand versus capacity ■ Numerical and modeling errors: types and sources of errors in numerical modeling, precision and accuracy ■ Finite element method (FEM): degrees of freedom, element stiffness, types of elements, structure stiffness and assembly, work equivalent nodal loads, equation solving ■ Software packages ■ Model validation: equilibrium checks, solution errors; Acceptance criteria, element performance; Local effects, remeshing and fine tune model ■ Application: skeletal structures, plane type problems; Advanced topics (L=22,P=21,A=3)

CE7030 ***Civil Engineering Fieldwork*** 1 Cr.

Surveying Camp: Group surveying exercises comprising engineering and detail surveys with substantial amount of fieldwork in triangulation, traversing, leveling and contouring complete with necessary office work, setting out and volume calculations ■ Construction equipment training (P=45)

CE7050 ***Civil Engineering Research Project – II*** 3 Cr. PR. CE6050

Introduction: Thesis writing; Methods of analysis; Referencing; Presentation skills; Critical analysis ■ Research project (L=2,A=129)

* * *

CE8010 ***Multidisciplinary Design Project*** 3 Cr.

Introduction to Multidisciplinary Design Project ■ Conduct and EIA or IEE as seen adequate ■ Analyze the entities of the projects ■ Construct preliminary designs: based on the analysis, prepare a few preliminary designs of different contexts, while being aligned to the problem ■ Analyze viability of the designs and select the best performing design ■ Construct a detailed design ■ Prepare a BOQ for the design: compose a BOQ for the complete design of the project ■ Prepare comprehensive design document (including tender documents) (L=5,P=30,A=90)

CE8050 ***Civil Engineering Research Project – III*** 3 Cr. PR. CE7050

Introduction: Effective presentation; Journal or conference paper writing; Research grant proposal writing; Sample research grants ■ Research project (L=2,A=129)

CE9010 ***Advanced Structural Designs*** 2 Cr. PR. CE5080

Basic Principles ■ Prestressing Fundamentals ■ Prestressing Practice ■ Prestressed Concrete Section Analysis: Eccentricity of prestressing force; Section modulus; Minimum requirements of section modulus; Transfer and service conditions; Code requirements; Controlling cracks; Section inequalities; Magnel's diagram for feasible solution ■ Design of Prestressed Concrete Structure ■ Introduction to Liquid Retaining Structures ■ Design Considerations of Liquid Retaining Structures: Service and ultimate limit state designs; Controlling of cracks; Thermal and shrinkage strains; Active and passive loading due to soil pressure; Critical loadings; Reinforcement detailing; Water stops; Water proofing ■ Design of Liquid Retaining Structure: Design of a septic tank for a community of specified number of persons.(L=23,A=21)

CE9020 ***Applied Finite Element Methods*** 2 Cr. PR. CE4060

Introduction to finite elements ■ Formulation of finite element system ■ Assembly and Solution of Global Equations ■ Performance of Finite Elements ■ Model Preparation of Simple Structures ■ Model Preparation of Complex Structures ■ Modal analysis; Response spectrum analysis; Time-history analysis; Buckling analysis; Performance based designs of structures ■ Reliability of finite element solutions: Risk involved in finite element solutions; Problem of numerical model;Modeling errors; Numerical errors; Solving correct problem; Historical disasters of finite element solutions; Capturing correct solutions by proper modeling; Engineering judgments; Estimation of reliable results (L=20,P=30)

CE9030 ***Structural Dynamics and Vibrations*** 2 Cr. PR. CE4060

Introduction to Structural Dynamics ■ Single Degree of Freedom System ■ Multi Degree of Freedom System ■ Dynamics of Continuous Structures: Exact solution of beam bending problem; Series solutions; Approximate analysis – Bolton's method; ■ Solution of Dynamic Equilibrium Equations: Newmark family of Solutions; Predictor-multi corrector algorithm; Wilson-θ method; Hilber-Hughes-Taylor algorithm; Hobolt method; Comparison of dynamic algorithm and their numerical stability ■ Practical Design Considerations: Human induced vibration; Pedestrian loading on bridges; Resonance; Practical method of measuring damping; Design rule of thumb ■ Independent Semester Project (L=20,P=18,A=12)

CE9040 ***Earth Slopes and Retaining Structures*** 3 Cr. PR. CE5021

Introduction ■ Natural and man-made slopes and compaction techniques; compaction methods and equipment; degree of compaction and field measurements ■ Seepage Analysis: flow through earth dams and levees; flow net and computer simulations ■ Shear strength of soil and modes of slope failures: Mohr-Coulomb failure criterion; modes of slope failures, and terminologies ■ Slope stability analysis: limit equilibrium concept; factor of safety; infinite and finite slopes; planar and curved failure surface; method of slip circle and slice and computer simulation ■ Slope stabilization methods: vegetation; drainage; unloading; buttressing, and retaining systems such as soil nails; tie backs; drilled shafts and application of geosynthetics ■ Lateral earth pressures: at rest; active and passive conditions; Rankine method; Coulomb method ■ Retaining wall design: overturning check; sliding check, and bearing capacity check (L=36,T=8,A=15)

CE9050 ***Highway Engineering*** 2 Cr. PR. CE5021,CE5070

Pavement and drainage structures; construction of pavement structures; estimation of surface runoff; pavement and shoulder cross-slopes; filter criteria; construction of culverts and drains ■ Highway materials ■ Flexible pavement design: equivalent single axle load concept; California bearing ratio test ; resilient modulus; BS method of design - Road Note 31; AASHTO method of design ■ Introduction to concrete pavement design: AASHTO method ■ Highway maintenance and rehabilitation: introduction to pavement evaluation; pavement rehabilitation; use of geosynthetics; asphalt concrete recycling ■ Term Project: collect relevant traffic data and perform a simple asphalt pavement design (L=20,P=9,A=21)

CE9060 ***Environmental Microbiology and Biotechnology*** 3 Cr. PR. ?CHK

Basics of microorganisms: cell structure; classification of organisms ■ Microbiology of environmental engineering systems: microbial nutrition; microbial ecosystems; microbial growth and death; diversity of microorganisms ■ Microbial metabolism: dissimilatory and assimilatory (carbon, nitrogen, phosphorus, sulphur and iron) metabolism ■ Biological treatment systems: suspended growth systems; attached growth systems; sequencing batch reactor; membrane bioreactors; flotation biological systems (L=32,T=8,A=27)

CE9080 ***Air Quality Engineering*** 2 Cr. PR. ?CHK

Introduction: fate and transport; priority air pollutants; indoor air quality; effects of air pollution on human health ■ Industrial air pollutants characteristics and sources: VOC and HAP; Nitrogen oxides (NO_x), SO_2, particulate, etc. ■ Ventilation and indoor air quality control ventilation; VOC and HAP control, Particulate control, (NO_x) and SO_2 control ■ Dispersion of air borne pollutants (L=20,T=4,P=12,A=12)

CE9090 ***Integrated Water Resources Management*** 2 Cr.

Introduction to Integrated Water Resources Management ■ Water quality and waster waste water management: over view on generation; discharge; collection and transport; treatment & processing; disposal ■ Water supply and sanitation ■ Ground Water Management: groundwater related issues; groundwater monitoring mechanism ■ Irrigation water management: climate; soil; land form and drainage characteristics of an area; selection of suitable crops; computation of irrigation requirement; selection of appropriate irrigation method; management of irrigation water ■ Conflict management and negotiations: conflict types; multiple user sharing; negotiation methods ■ Water governance and stakeholder engagement: social dimension; economic dimension; political dimension; environmental dimension (L=12,P=39,A=15)

CE9100 ***Advanced Irrigation Engineering*** 2 Cr.

Planning of Irrigation Development: Project identification; Feasibility studies; Implementation and operation; Problems of irrigation practice ■ Soil Water and Plant Relationship: Classes and availability of soil; Water and plant growth; Water absorption; Conduction and transpiration ■ Evapotranspiration: Direct measurements and empirical methods ■ Water Requirements: Crop water requirements; Effective rainfall; Leaching requirements; Land preparation ■ Water Delivery Systems: Continuous system; Rotational system; Supply and demand ■ Method of Irrigation: Surface irrigation; sub-surface irrigation; Overhead and drip irrigation ■ Irrigation Water Management: Yields response to water; Irrigation scheduling

techniques ■ Drainage Requirements and Systems: Factors affecting drainage; Surface and sub-surface drainage systems (L=23,T=6,A=12)

CE9110 ***Wave Theory and Coastal Engineering*** 3 Cr.

Basic Oceanography ■ Wave Equations and Characteristics ■ Wave Reflection, Diffraction and Reflection: Refraction by currents; Wave diffraction; Combined refraction and diffraction and wave reflection ■ Long Waves: Long wave theory; Tides, tsunamis, basin oscillations and storm surges ■ Wind Generated Waves: Wind-wave generation and decay; Wave height and period analysis; Wave spectral characteristics and wave prediction ■ Coastal Structures: Hydrodynamic forces analysis; Pipes, pipelines and cables; Submerged structures, breakwaters and vertical structures ■ Coastal Zone Processes: Beach sediments (properties); Beach profile and profile change; Near shore circulation; Shore response to coastal structures; Beach nourishment and sediment bypassing; Wind transport and dune stabilization; Sediment budgets and impact of climate change ■ Field and Laboratory: Wind-wave measurements; Coastal morphology and sedimentary processes; Beach profiling (L=35,T=4,P=18,A=6)

CE9120 ***GIS and Remote Sensing*** 3 Cr.

Fundamentals of GIS ■ Tools in ArcGIS ■ Remote Sensed Data: Active and passive remote sensing; SAR data; Overview and concepts of Remote Sensing technology; Basics of photogrammetry; Practical uses of aerial photographs/satellite photographs in various disciplines ■ Introduction to Geographic Positioning Systems: The earth; Spherical earth & mathematical model; Absolute and relative coordinate systems for positioning on the earth; Ellipsoidal model of the earth and mathematical model; Equipotential surfaces & geoid, geoid undulations; Positioning; Introduction to GPS; Map projections and coordinate transformations; GPS basic concepts; GPS accuracy and precision; Map production and update; GPS/GIS applications ■ Application in Civil Engineering: Hydrological modeling with spatial data; Water resources; Environmental engineering; Coastal engineering; Surveying; etc. (L=20,T=10,P=48,A=12)

CE9130 ***Design of Masonry and Timber Structures*** 3 Cr.

Introduction to masonry structures: properties of masonry materials, introduction to code of practices ■ Design of masonry structures: treatment of loads, limit state design, selection of different types of section, design process ■ Seismic resistance masonry designs: load evaluation, design process and analysis for dynamic loads ■ Introduction to timber materials: properties of timber, modification factor, timber preservative methods ■ Design of axially loaded members: tension members, compression members ■ Design of flexural members ■ Design of timber connections (L=35,T=10,P=3,A=12)

CE9140 ***Advanced Wastewater Treatment*** 3 Cr. PR. CE5031

Overview of wastewater management: diverse nature of wastewater and its characteristics, sanitary and stormwater collection systems ■ Wastewater treatment kinetics and microbiology: fundamentals of environmental microbiology and biochemistry, kinetics and stoichiometry development ■ Wastewater treatment: current state of art, advances in suspended, attached growth systems and nutrient removal – rotating biological contactors, stabilization ponds, sequential batch reactor, constructed wetlands etc., advanced processes in wastewater treatment – chemical coagulation, carbon adsorption, media filtration, membrane processes,

disinfection ■ Sludge treatment and disposal: gravity and flotation thickening, dewatering, sludge digestion, vacuum and pressure filtration ■ Wastewater to bioenergy: wastewater to bioenergy conversion technologies, bio-hydrogen and bio-diesel (L=32,T=12,A=21)

CE9160 ***Bridge Engineering*** 3 Cr. PR. CE5080,CE6080

Introduction: types of bridges ■ Loading of bridges: Types of actions, primary and secondary traffic loads for highway, railway and foot bridges, temperature and shrinkage effects, Combinations of actions ■ Structural Analysis of bridge decks ■ Bridge dynamic ■ Design of concrete and pre-stressed concrete bridges ■ Design of steel bridges ■ Composite construction: Precast concrete composites, Steel-concrete composite beams, steel-concrete composite box girders, steel-concrete composite columns ■ Design of Arch, suspension and cable stayed bridges ■ Design of substructures and bridge accessories Abutment design calculations, bridge column and piers Parapets, expansion joints, drainage and water proofing (L=35,T=8,P=9,A=9)

CE9170 ***Foundation Engineering*** 3 Cr. PR. CE6010

Introduction ■ Shallow Foundations: Modes of failures, Lower & Upper bound theorems, Analysis of combined footings and raft foundation ■ Deep foundation: Pile load tests, Driven piles, Negative skin friction, Laterally loaded piles, Pull-out resistance, Rock socket, computer Simulations ■ Foundation on problematic soil: Types of collapsible soils, Identification, Calculation of Collapse settlement, foundation design ■ Embedded walls: Cantilever walls and Anchored walls, Analysis using free earth support method, Fixed earth support method, computer simulations ■ Braced cuts: Earth pressure envelopes, design of struts, design of sheet piles, Critical depth of excavation, Basal heave ■ Reinforced earth: Materials and general considerations, Design and Stability ■ Soil improvement techniques: Compaction, Pre-compression, sand drains, prefabricated vertical drains, Lime stabilisation, cement stabilisation, stone columns. (L=36,T=8,P=15)

CE9180 ***Constitutive Modeling of Geomaterials*** 3 Cr. PR. CE5021

Introduction ■ Stress paths and critical state: stress invariants, triaxial stress state, total and effective stress paths in various drained and undrained triaxial tests, critical state, behavior of clays, sands, and silts under various triaxial stress paths ■ Mathematical preliminaries: index notation, 3-dimensional stress states, 3-dimensional stress and strain invariants ■ Elasticity: isotropic and transverse isotropic elasticity, total and effective elastic parameters, elastic behavior in drained and undrained tests, nonlinear elasticity ■ Elastoplasticity: Yield criterion, flow rule, hardening law, consistency condition, yield surface, plastic potential, associative and non-associative flow rules, Tresca, Von Mises, and Mohr-Coulomb yield criteria ■ Yielding of soils: experimental identification of yield surface for soils ■ Modeling clays: original cam clay and modified cam clay models in triaxial space, calculations in the general stress space, development of a single element computer code ■ Modeling sands: differences between clay and sand models, modeling techniques for sands ■ bounding surface models ■ Modeling unsaturated soils (L=41,A=12)

8.2.2 *Computer Engineering*

EC4010 ***Digital Design*** 3 Cr.

Introduction to digital design ■ Combinational logic circuit ■ Sequential logic circuits and memory elements ■ Modular Design of digital circuit ■ Design of synchronous sequential circuits ■ Analysis and design of asynchronous sequential circuits ■ Digital circuit design and implementation. (L=28,P=21,A=30)

EC4060 ***Computer and Data Networks*** 3 Cr.

Principles of networking ■ Networking models and protocols ■ Physical layer ■ Data link layer ■ Medium access sub-layer ■ Network layer ■ Transport layer ■ Application layer ■ Independent learning and implementation assignment. (L=28,T=8,P=15,A=24)

EC4070 ***Data Structures and Algorithms*** 3 Cr. PR. EC2010

Running time and time complexity ■ Divide and conquer ■ Linear abstract data types ■ Hashing and the set ADT ■ Trees ■ Graphs ■ Greedy algorithms ■ Dynamic programming. (L=30,P=27,A=18)

* * *

EC5060 ***Operating Systems*** 3 Cr. PR. EC4070

Introduction ■ Process and Threads ■ Memory management ■ File systems ■ Input/output ■ OS implementation methods ■ Self-study. (L=31,P=18,A=24)

EC5070 ***Database Systems*** 3 Cr.

Introduction to database systems ■ Data modelling ■ RDBMS concepts ■ Database query languages ■ Database programming techniques ■ Introduction to indexes and query optimization ■ Introduction to transaction processing ■ Independent learning and implementation assignment Project. (L=31,T=8,P=18,A=12)

EC5080 ***Software Construction*** 3 Cr. PR. EC2010

Introduction of features of a selected language ■ Data collections (containers) ■ Input/output, error handling and parsing textual formats ■ Declarative programming ■ Classes and objects ■ Event-driven programming ■ Concurrency and network clients ■ Code quality. (L=25,T=12,P=30,A=12)

* * *

EC6020 ***Embedded Systems Design*** 3 Cr. PR. EC2010

Introduction to Embedded Systems ■ Embedded Microcontrollers ■ Interfacing and Mixed-Signal Systems ■ Real-time Operating Systems ■ Low-power Computing ■ Reliable System Design ■ Design Methodologies ■ Tool Support ■ Embedded Multiprocessors ■ Networked Embedded Systems ■ Design task. (L=34,P=12,A=21)

EC6040 ***Computer Network and Security*** 3 Cr. PR. EC4060

Overview ■ Basic Attack Techniques and Defenses ■ Overview of Cryptography ■ Web Security ■ Network Security ■ Security of Mobile Platforms. (L=32,T=4,P=18,A=15)

EC6050 ***Computer Architecture and Organization*** 3 Cr. PR. EC4010

Overview ■ Computer Abstractions and Technology ■ Instruction Set Architecture ■ CPU Organization ■ Pipelining ■ Processor Design and Simulation ■ Memory Hierarchies ■ Interfacing and Communication ■ Performance Issues ■ Multiprocessors and Current Trends. (L=37,P=12,A=12)

EC6060 ***Software Engineering*** 3 Cr. PR. EC5070, EC5080

Introduction ■ Lightweight Processes ■ Requirements Specification ■ Domain Modeling ■ Implementation Transition ■ Testing and Contracts ■ Principled Object-Orientation ■ Architectural Techniques ■ Software Re-engineering ■ Software Engineering Project. (L=30,T=4,P=12,A=27)

EC6070 ***Computer Engineering Research Project – I*** 3 Cr.

Introduction ■ Research Project. (L=2,A=129)

* * *

EC7070 ***Computer Engineering Research Project – II*** 3 Cr. PR. EC6070

Introduction ■ Research Project. (L=2,A=129)

* * *

EC8020 ***Computer Engineering Design Proficiency*** 3 Cr.

Review: Product design flow, Engineering Design, Case Studies, Design task in Electronics, Design task in machine learning / high performance computing system ■ data mining ■ artificial intelligence, 2 common and unique tasks will be provided from the following list: signal processing, digital system design, embedded system design, control systems, robotics and automation. (L=9,P=24,A=84)

EC8070 ***Computer Engineering Research Project – III*** 3 Cr. PR. EC7070

Introduction ■ Research Project. (L=2,A=129)

Technical Elective Courses

EC9040 ***Advanced Digital Design and Synthesis*** 2 Cr. PR. EC6050, EC4010

Review ■ Hardware Descriptive Language ■ Design ■ Synthesis and Verification Tools ■ Design of Combinational Logic ■ Design and Optimization of Sequential Circuit ■ Processor Design ■ Memory Design ■ Complex Digital Systems. (L=25,P=6,A=9)

EC9500 ***Advanced Computer Architecture*** 2 Cr. PR. EC6050

Fundamentals of Computer Design ■ Memory Hierarchy Design ■ Instruction Level Parallelism and its Exploitation ■ Data-Level Parallelism in Vector ■ SIMD ■ and GPU Architectures ■ Computer Architecture and Dependability ■ Special Purpose Processors. (L=21,T=6,A=18)

EC9510 ***High Performance Computing Systems*** 2 Cr.

Introduction: Parallel Algorithm Design ■ Interconnection Network and Communication ■ Performance Analysis and Modeling ■ Memory Management ■ GPU Computing ■ Cluster Computing ■ Distributed Architecture. (L=19,P=18,A=15)

EC9520 ***Advanced Computer and Data Networks*** 2 Cr. PR. EC4060

Internet Architecture and Design ■ Network Measurement and Modeling ■ Congestion Control ■ Quality of Service ■ Multicast Routing ■ Web Protocols and Web Caching ■ Mobile and Wireless Networking ■ Peer-to-Peer Networks ■ Software Defined Networking and Functional Virtualization ■ Multimedia over IP networks. (L=24,P=9,A=9)

EC9530 ***Compiler Construction*** 2 Cr.

Overview ■ Scanning ■ Parsing ■ Context Sensitive Analysis ■ Intermediate Representations ■ Inner Workings of a Compiled Code ■ Introduction to Compiler Optimizations ■ Code Selection ■ Instruction Scheduling ■ Register Allocation. (L=21,T=6,A=18)

EC9540 ***Human Computer Interaction*** 2 Cr.

Introduction ■ Human Perception ■ Ergonomics ■ Interface Design ■ Usability and Accessibility analysis ■ Human Body and Device Design ■ Emerging technologies and their specific usability issues. (L=24,P=13,A=5)

EC9550 ***Intelligent System Design*** 2 Cr.

Introduction ■ Searching ■ Knowledge Based System ■ Fuzzy Logic ■ Machine Learning. (L=21,P=15,A=12)

EC9560 ***Data Mining*** 2 Cr.

Introduction: Data representation and pre-processing ■ Experimental setup and evaluation ■ Predictive analytics ■ Structural relationships in data ■ Clustering ■ Applications. (L=21,P=12,A=15)

EC9570 ***Digital Image Processing*** 2 Cr.

Introduction: Point Operations ■ 2D Transforms, Image Segmentation, Morphological Image Processing, Image Compression, Fundamentals of Medical Image processing, Image registration and matching, Independent learning task. (L=21,P=18,A=9)

EC9580 ***Computer Vision*** 2 Cr.

Introduction to Computer Vision ■ Image Formation and Representation ■ Depth Estimation ■ Features and Filters ■ Feature-based alignment ■ Object Detection and Classification ■ Video Processing. (L=23,P=9,A=12)

EC9590 ***Network Application Design*** 2 Cr. PR. EC5080

Internet Protocol Stack ■ Network Servers ■ Design of Application Protocols ■ I/O Concurrency ■ Remote Procedure Calls ■ Dynamic Web Content Generation ■ Web Frameworks ■ Network Application Security (L=18,P=21,A=15)

EC9600 ***Applied Algorithms*** 2 Cr. PR. EC4070

Overview ■ Combinatorial Algorithms and Graph Theory ■ Bioinformatics Algorithms ■ Processing Data Streams ■ Game Theory ■ Localized Algorithms. (L=23,A=21)

EC9610 ***Communication Network Design for Computer Engineering*** 2 Cr. PR. EC3010, EC5020

Signal Propagation ■ Wireless Access Networks ■ Wireless Access ■ Radio Frequency Network Design ■ Core Networks ■ Data Transmission Technologies ■ Data Network simulations using equipment ■ Case study: Design aspects of state of the art wireless technology. (L=19,T=4,P=12,A=15)

EC9620 ***Wireless and Mobile Communications for Computer Engineering*** 2 Cr.

Introduction ■ Wireless Channel Models ■ Flat-Fading Countermeasures ■ Multiuser Systems ■ Cellular System Design and Capacity Analysis. (L=26,P=3,A=9)

EC9630 ***Machine Learning*** 2 Cr.

Introduction to Machine Learning, Review and Background Material, Bayesian pattern classification, Linear Regression, Perceptron algorithm and Proof of convergence, Nonlinear models, Support Vector Machines, Unsupervised Learning. (L=,T=,P=,A=)

EC9640 ***Artificial Intelligence*** 2 Cr.

Introduction: Fundamentals of artificial intelligence ■ Solving problems by searching ■ Knowledge based system representation and inference ■ Expert System ■ Natural Language Processing ■ Artificial Intelligence Applications (L=20,T=4,P=6,A=18)

8.2.3 Electrical and Electronic Engineering

EC4021 ***Electromagnetic Engineering*** 3 Cr.

Static Electric & Magnetic Fields ■ Dynamic Fields ■ Transmission Media ■ Plane Wave Propagation and Polarization ■ Reflection of EM Waves ■ Basics of Antennas ■ Radio Wave Propagation. (L=35,T=4,P=9,A=15)

EC4030 ***Electric Power*** 3 Cr.

Energy conversion ■ Measurement of Power and Energy ■ study on harmonics effect in power systems ■ Three phase Systems ■ Transformers ■ Introduction to Power Systems ■ Transmission System parameters ■ Transmission Line Steady State Operations ■ Admittance Model and Network Calculations. (L=35,T=6,P=12,A=9)

EC4040 ***Signals and Systems*** 3 Cr.

Introduction to Signals and Systems ■ Representation of Linear Time invariant Systems ■ Analysis of LTI System using Laplace transform ■ Frequency Response ■ Resonant Circuits ■ Introduction to Two Port Networks ■ Analogue Filter Design. (L=35,T=4,P=12,A=12)

EC4050 ***Electronic Circuits and Devices*** 3 Cr.

FET ■ MOSFET ■ CMOS ■ OP-AMP theory ■ Making Printed Circuit Board ■ Oscillators ■ Applications ■ Frequency Effects. (L=35,T=4,P=12,A=12)

* * *

EC5010 ***Digital Signal Processing*** 3 Cr.

Digital Signals and Digital Systems ■ Z-Transform ■ Digital Filters ■ Discrete Fourier Transform and Discrete Time Fourier Transform ■ Digital Filter Design ■ Multi rate signal processing ■ Introduction to time-frequency analysis ■ Independent learning and implementation assignment. (L=33,T=6,P=12,A=15)

EC5020 ***Analogue and Digital Communications*** 3 Cr.

Analogue modulation and demodulation ■ Principle of digital transmission of data ■ Random process and noise ■ Performance of analogue and digital communication under noise and interference ■ Introduction to Information Theory and Error Control Coding. (L=36,T=2,P=9,A=15)

EC5030 ***Control Systems*** 3 Cr.

The concept of a control system and its components ■ Dynamic system representation ■ Analysis and properties of linear state space systems ■ System stability analysis: Time and Frequency domain analysis ■ Classic control techniques ■ Modern digital control ■ Control system design and performance analysis. (L=35,T=4,P=12,A=12)

EC5040 ***Electric Machines*** 3 Cr.

AC machines fundamentals ■ Synchronous machines ■ Induction machines ■ DC machines ■ Single phase and special purpose motors ■ Three phase transformers. (L=34,T=8,P=12,A=9)

EC5050 ***Power Electronics and Design*** 3 Cr.

Introduction to power electronic systems ■ Rectifiers ■ Converters ■ Inverters ■ Power supplies ■ AC voltage controllers ■ Design of a power supply. (L=38,P=9,A=12)

* * *

EC6030 ***Power Systems*** 3 Cr.

Power Flows ■ Symmetrical Faults ■ Symmetrical Components ■ Unsymmetrical Faults ■ System Protection ■ Transient stability ■ Power System controls ■ Electricity Tariff and Economic operation of Generators. (L=35,T=4,P=12,A=12)

EC6080 ***Electrical and Electronic Engineering Research Project – I*** 3 Cr.

Introduction ■ Research Project (L=2,A=129)

EC6090 ***Robotics and Automation*** 3 Cr.

Introduction to Autonomous Robots ■ Current and Future Trends in Robotics ■ Motors and Motor Control Techniques ■ Sensors and Actuators ■ Autonomous Mobile Robots and Robot

Intelligence ■ Robot Control Board ■ Pneumatic and Hydraulic Control Systems ■ Machine Vision ■ Programmable Logic Controllers ■ Robot Design Mini Project. (L=30,P=18,A=27)

EC6100 ***Wireless and Mobile Communications*** 3 Cr.

Introduction ■ Wireless Channel Models ■ Impact of Fading and ISI on Wireless Performance ■ Flat-Fading Countermeasures ■ ISI Countermeasures ■ Spread Spectrum Techniques ■ Multiuser Systems ■ Cellular System Design and Capacity Analysis. (L=37,T=2,P=9,A=12)

* * *

EC7080 ***Electrical and Electronic Engineering Research Project – II*** 3 Cr. PR. EC6080

Introduction ■ Research Project (L=2,A=129)

EC7090 ***Communication Network Design*** 3 Cr.

Signal Propagation ■ System Planning ■ Wireless Access Networks ■ Wireless Access ■ Radio Frequency Network Design ■ Core Networks ■ PSTN and Teletraffic engineering ■ Data Transmission Technologies ■ Data Network simulations using equipment ■ Case study: Design aspects of state of the art wireless technology (ex: 4G/LTE Technology). (L=27,T=8,P=15,A=27)

* * *

EC8010 ***Electrical and Electronic Engineering Design Proficiency*** 3 Cr.

Introduction to Electrical Engineering Standards (including safety standards) and Regulations ■ Engineering Design practice and management ■ PCB design techniques for Signal Integrity and EMC ■ Rapid Prototyping (RP) techniques for Enclosure design of electronic applications ■ PCB Testing ■ Design task in Electronics ■ Design task in signal processing ■ Design task in Control System ■ Design task in electric power/ communication systems. (L=13,P=24,A=72)

EC8080 ***Electrical and Electronic Engineering Research Project – III*** 3 Cr. PR. EC7080

Introduction ■ Research Project. (L=2,A=129)

Technical Elective Courses

EC9010 ***High Voltage Engineering*** 3 Cr.

Introduction ■ Generation of High voltages ■ Measurement of High Voltages ■ Electrical breakdown in gases ■ Breakdown of solid and liquid dielectrics ■ Insulation Tests. (L=22,T=4,P=9,A=9)

EC9020 ***Power System Control and Stability*** 2 Cr.

Introduction: Power System Stability ■ Synchronous Machine representation ■ Modelling of power system loads ■ Excitation Systems ■ Prime-movers ■ Active and Reactive power control ■ Small Signal stability ■ Transient Stability ■ Voltage Stability ■ Midterm and long term stability ■ Methods of improving stability. (L=22,T=4,P=9,A=9)

EC9030 ***Electricity Generation from Renewable Energy Sources*** 2 Cr.

Principles of Renewable Energy ■ Solar power plant ■ Hydro Power Generation ■ Wind power plant ■ Wave ■ and Tidal power plants ■ Grid interconnections ■ Institutional and Economic Factors (L=23,T=6,P=6,A=6)

EC9050 ***Software Construction for Electrical and Electronic Engineers*** 2 Cr.

Features of selected languages ■ Data collections ■ Input/Output ■ error handling and parsing textural formats ■ Classes and Objects ■ Event-driven programming ■ Concurrency and network clients (L=19,P=25,A=8)

EC9060 ***Microwave Engineering*** 2 Cr.

Microwave propagation ■ Transmission Media ■ Microwave Network Analysis ■ Microwave Passive devices design ■ simulation and measurements ■ Microwave resonators for different transmission media ■ Microwave Multiplexers and Wave guide Multiplexers ■ Active Microwave components and circuits. (L=23,P=18,A=3)

EC9070 ***Advanced Electronics*** 2 Cr.

Material manipulation to achieve electronic functions ■ Advanced approaches to transistor operation ■ Feedback and stability analysis of transistor circuits ■ Power electronic devices ■ Component Integration and thermal management ■ Photonic devices ■ Imagers ■ Noise Processes in solid-state components. (L=24,P=9,A=9)

EC9080 ***Electronic Product Design and Manufacture*** 3 Cr.

Product design and Development ■ Product design process ■ Estimating power supply requirement (Power supply sizing), Power supply protection devices ■ Noise consideration of a typical system ■ Advanced topics in Analogue and Digital Electronic ■ Circuit Design ■ PCB designing ■ Product testing ■ PCB Testing ■ Enclosure Design ■ Advanced topics in electronic product manufacture ■ Product documentation ■ Electronic product design mini project. (L=31,P=18,A=24)

EC9090 ***Introduction to Biomedical Engineering*** 3 Cr.

Introduction ■ Introduction to Engineering aspects of molecular and cellular principles ■ Physiology ■ and organ systems ■ Bioelectromagnetism ■ Modeling of cardiac system ■ measurements ■ ECG ■ Bioinstrumentation ■ Biomaterials ■ Biomechanics ■ Electrical Safety and Regulation ■ Mechanical and electric models for ventilation ■ respiration and blood pressure measurement ■ Biomedical Imaging Systems: X-ray, CT, PET, MRI, Ultrasound and Optical Imaging. (L=36,T=2,P=12,A=12)

EC9100 ***Optical Communications*** 2 Cr.

Optical Communications; Introduction and Recent Progress ■ Electron-Photon Interactions ■ Transmitters and Receivers ■ Transmission of Light in Optical Fibres ■ System design and performance metrics ■ Optical Amplifiers ■ Passive Optical Devices ■ Design of Optical Communication Links: Link Budgets ■ Dispersion Management and Multi-channel Systems ■ Design ■ Analysis and Simulation Optical Communication Links and Subsystems ■ Introduction to Optical Networks. (L=25,P=6,A=9)

EC9110 ***Modern Mobile Communication Architecture and Applications*** 2 Cr.

LTE/4G Network Architecture ■ 3GPP Specification ■ Evolved Packet Core Deployment and Testing ■ Protocols in LTE/EPC network ■ Mobility in LTE/EPC Network ■ QoS in LTE/EPC ■ LTE/EPC Application and Service ■ LTE-Advanced ■ Requirement of 5G network. (L=22,P=9,A=15)

EC9120 ***Advanced Electric Machines and Drives*** 3 Cr.

Introduction ■ Mechanical Systems ■ Power electronic converters ■ DC Motor Drives ■ Feedback Controllers for Motor Drives ■ AC Machines ■ Induction Motor Drive. (L=39,P=12,A=6)

EC9130 ***Distribution, Automation and Smart Grid*** 2 Cr.

Power System Basics ■ Unbalanced Operation of Power System ■ Power System Measurements ■ Communication for Power System Applications ■ Control of Distribution System ■ Demand Response ■ Course Project. (L=22,T=8,A=12)

EC9140 ***Advanced Digital Signal Processing*** 2 Cr.

Review: Discrete time Signals and System ■ Advanced Topics in Digital Filter Design ■ Finite Word Length Effects ■ Discrete Fourier Transform and Applications ■ Linear Prediction and Adaptive Filtering ■ Advanced topics in Multi rate signal processing ■ Spectral Estimation ■ Mini project. (L=27,A=12)

EC9150 ***VLSI Design*** 2 Cr. PR. EC4050

Digital design concepts: introduction to digital IC design, degital design basics, RTL to netlist mapping, synthesis, high fan-out synthesis, clock tree synthesis ■ Design for test: define modes, DFT insertion techniques ■ Backend Design: floor plan, place & route, layout verification, IO design ■ IP development: IP design flow, IO definition, test methodologies, characterization of IPs ■ RTL2GDS flow: familiarize with tools required for synthesis, place & route, timing analysis, and layout verification, design related problems and fixes (L=26,P=6,A=6)

8.2.4 Interdisciplinary Studies

MP4010 ***Applied Thermodynamics*** 3 Cr.

Air standard cycles (advanced topics), Internal combustion engines ■ Vapour power cycles ■ Applications of steam ■ Theory of combustion (L=36,P=18,A=9)

MP4020 ***Machine Drawing*** 3 Cr.

Drawing of Assembled Objects ■ Assembly of machine components ■ CAD software packages (L=26,P=12,A=26)

MP4030 ***Mechanics of Machines*** 3 Cr.

Machine Drives: belt, chain and rope, gear and, cam and follower ■ General dynamics ■ Vibration of systems ■ Torsional vibration: flywheel, balancing of rotor masses. (L=30,T=12,P=12,A=15)

MP4040 ***Materials Engineering and Manufacturing Technology*** 3 Cr.

Introduction to Production Engineering ■ Material Properties for Manufacture, Elementary Binary Alloy Systems, Enhancing Material Properties ■ Physical Metallurgy of Steels ■ Workshop Practices (L=35,P=18,A=12)

MP4050 ***Solid Mechanics*** 3 Cr.

Introduction ■ Vectors and tensors ■ Stresses, strains and displacements in 3-dimension ■ Plane stress, plane strain and uniaxial problems ■ Principal stresses and principal axes (3D) ■ Constitutive models (linear elasticity) ■ Constitutive models (nonlinear elastoplasticity) ■ Balance laws and field equations: mass balance, momentum balance and principles of thermodynamics ■ Boundary and initial conditions ■ Solutions to simple continuum mechanics problems ■ Computer simulations ■ Applying solid mechanics knowledge for strength based design of engineering components: thick cylinders, rotating disks, auto frettage, theory of thick plates, etc. (L=36,T=6,A=18)

ID4031 ***Fluid Mechanics for Mechanical Engineers*** 3 Cr.

Bernoulli's Equation for Irrotational Flow, Vorticity, Flow Visualization; Pressure Distribution for ideal and real fluids ■ Control Volume Approach ■ Uniform Laminar Flow ■ Pipe Flow; Moody Diagram; Hydraulic Losses; Systems of Pipes (parallel/ series) and Pipe Networks ■ Compressible Fluid Flow: flow of gases and vapors through nozzles and diffusers, choking, stagnation properties, shock wave generation and analysis of flow with shock waves, simple consideration of jet propulsion ■ Drag and Lift ■ Fluid Dynamics Problems: partial differential equations for velocity fields, continuity equation, Navier-Stokes equation ■ Laboratory Experiments (L=31,T=10,P=12,A=15)

* * *

MP5010 ***Thermal Power Generation*** 3 Cr.

Essentials of Thermal Power Plants ■ High Pressure Boilers & Accessories, Condensers and Cooling Towers, Nuclear Power Plant ■ Performance and Operating Characteristics of Power Plants ■ Pollution and its Control, Air Compression (L=31,P=15,A=27)

MP5020 ***Dynamics of Mechanical Systems and Control*** 3 Cr.

Rotor Balancing ■ Vibration of branched-multi rotor systems ■ Mathematical modeling of mechanical systems and stability analysis ■ Frequency domain representation and stability analysis ■ Design and compensation of feedback control systems (L=33,T=10,P=12,A=12)

MP5030 ***Fluid Machinery*** 3 Cr.

Classification of Hydraulic Machines ■ Analysis of Hydraulic Machinery: characteristics, dynamic similarity, specific speed, momentum, blade configuration ■ impeller design and work ■ Applications of Hydraulic Machinery (L=37,P=12,A=12)

MP5040 ***Process Engineering*** 3 Cr.

Flow Chart Representation of Industrial Layout Drawings ■ Process Devices, Processes PESTE Analysis of Process Designs ■ Piping and Instrumentation ■ Safety Considerations (L=37,P=15,A=9)

MP5050 ***Machine Design*** 3 Cr.

Principles and Methodology of Machine Design ■ Power Transmission Units: belt drive, brake and clutch ■ Geometry of Toothed Gearing: involute gears and worm gears ■ Cams and Their Geometry, Theories of lubrication, Bearings ■ Design of a Simple Device (L=36,P=18,A=9)

MP5060 ***Advanced Mechanics of Machines*** 3 Cr.

Friction in Machine Elements: screws, threads, screw jack, bearings and clutches ■ Gyroscopes: stability analysis and applications ■ Governors, Inertia Forces in Reciprocating Mechanisms ■ Brakes and Dynamometers ■ Balancing of Reciprocating Mechanisms (L=36,P=12,A=15)

* * *

MP6011 ***Elements of Heat and Mass Transfer and Principles of Refrigeration*** 3 Cr.

Conduction: steady conduction across slab, cylinder wall and spherical shell ■ Convection, Radiation and heat exchange ■ Heat pump and refrigerator as reversed heat engine ■ Vapour compression refrigeration, Vapour absorption refrigeration (L=36,P=15,A=12)

MP6020 ***Advanced Machine Design*** 3 Cr.

Machine Design Review ■ Failure Modes and Designing to Avoid Failure ■ Material selection, Designing for Machining Process ■ Assembly & Safety ■ Design and Innovation (L=21,T=10,A=57)

MP6030 ***Mechatronics*** 3 Cr.

Computer Control and Logic: micro controller and programmable logic controller ■ Sensors, Signal acquisition and processing ■ Actuators and interfaces ■ Physical system modeling and servo control, Mechatronic system development ■ Design study of a mechatronic system. (L=33,T=8,P=12,A=12)

MP6040 ***Advanced Vibration Analysis*** 3 Cr.

Vibration Analysis and maintenance techniques ■ Multiple degree of freedom rotor bearing systems ■ Continuous systems ■ Flexural vibration of systems with several degree of freedoms ■ Vibration analysis with SOLIDWORKS simulation ■ Vibration signal processing ■ Free and forced torsional vibrations ■ Finite element method analysis (L=38,P=12,A=9)

MP6050 ***Mechanical Engineering Research Project – I*** 3 Cr.

Introduction: Research methodology; Review of research articles; Research proposal writing; Plagiarism; Literature review; Prepare preliminary report; How to select easy reading papers for start-up? ■ Research project (L=2,A=129)

* * *

MP7010 ***Production Engineering*** 3 Cr.

Introduction to Production Engineering ■ Materials Forming Processes ■ Machine Maintenance ■ CAD/ CAM ■ Introduction to Sustainable Manufacturing (L=35,P=18,A=12)

MP7050 ***Mechanical Engineering Research Project – II*** 3 Cr. PR. MP6050

Introduction: Thesis writing; Methods of analysis; Referencing; Presentation skills; Critical analysis ■ Research project (L=2,A=129)

ID7010 ***Project Management and Engineering Industry*** 3 Cr.

Introduction - Course Overview ■ Human Resource Management ■ Process design, Facility Layout ■ Introduction to Project Management Project Management ■ CPM PERT Project Management, Crashing Cost Control, Contracts and Procurement ■ Industrial Law and Ethics Financial Accounting ■ Engineering Economics ■ Entrepreneurship and Marketing ■ New Business, Start-up and Development ■ Guest Lecture by Industry Person (L=39,A=18)

* * *

MP8010 ***Advanced Tribology*** 3 Cr.

Introduction to The Science and Technology of Tribology ■ Friction, Wear: wear modes, wear coefficient, wear assessment ■ Tribology Design, Advanced topics and Special Projects: MEMS, TBA (L=22,T=16,P=21,A=24)

MP8050 ***Mechanical Engineering Research Project – III*** 3 Cr. PR. MP7050

Introduction Effective presentation; Journal or conference paper writing; Research grant proposal writing; Sample research grants ■ Research project (L=2,A=129)

Technical Elective Courses

MP9010 ***Advanced Fluid Mechanics*** 3 Cr. PR. ID4031

Kinematics of The Flow Field ■ Irrotational flow, Equations Governing the Motions of a Fluid ■ Exact solutions of Navier-Stokes equations ■ Low Reynolds number flows, High Reynolds number flows and boundary layer theory ■ Stability of parallel shear flows ■ Turbulent flows. (L=32,P=3,A=36)

MP9020 ***Gas Dynamics*** 3 Cr.

One dimensional flow: adiabatic flow; compressible flow of a perfect gas; generalized steady flow; unsteady compressible flow; Isentropic flow ■ Flows with heat transfer ■ Flows with mass addition, Flow in converging-diverging nozzles ■ Waves and gas dynamics, Fanno flow, Rayleigh flow ■ Small perturbation theory ■ Thin airfoils in supersonic flow ■ Description of a shock tube. (L=23,A=21)

MP9030 ***Robotics*** 3 Cr. PR. MP3010,MP5020/EC5030

Actuators and drives ■ Mechanism configurations, Kinematics 2D ■ Differential motion, Statics: Free-body diagram; Energy method and equivalent joint torques ■ Differential kinematics and statics; Closed-loop kinematic chains ■ Over-actuation, Dynamics: Newton-Euler formulation ■ Lagrangian formulation, Force control, Mobile robots (L=18,P=9,A=27)

MP9040 ***Advanced Heat and Mass Transfer*** 3 Cr. PR. MP6011

Conduction: 2D and 3D conduction; unsteady conduction; conduction with internal heat source, Convection, Boiling and condensation ■ Radiation theory: real Surfaces and media; heat exchange in multi-surface enclosures ■ Combined modes of heat transfer: heat exchanger; heat removal devices ■ Mass transfer: diffusion; Mass transfer operations, Adsorption, Application to combustion, Drying and extraction. (L=20,T=8,A=18)

MP9050 ***CAD / CAM*** 3 Cr. PR. MP4040

Introduction to CAD/CAM/CIM, Modelling ■ Computer graphics and interaction ■ Quality function deployment, Computer integrated manufacturing ■ Concurrent engineering ■ Computer control of manufacturing systems ■ Manufacturing planning and control systems (L=23,T=16,P=24,A=18)

ID9010 ***Advanced Mechanics of Materials*** 2 Cr. PR. CE3010

Introduction to Elasticity ■ Kinematics of Deformation ■ Concept of Stress, Equations of Motion and Equilibrium of Deformable Solids and Work done by Stresses ■ Constitutive Equations - Relations between Stresses and Strains ■ Simple Initial and Boundary Value Problems on Axially and Spherically Symmetric Linear Elastic Bodies ■ Analytical Techniques and Solutions to Linear Elastic Solids ■ Independent Semester Project (L=20,T=10,A=15)

ID9020 ***Composite Materials*** 2 Cr.

Introduction to Composites ■ Elastic Properties of Fiber Reinforced Composites ■ and Particulate Composites ■ Thermal and Electrical Properties ■ Failure Mechanisms ■ Thermal Expansions and Thermal Residual Stresses ■ Natural and Synthetic Hierarchical and Nano Composites ■ Independent Semester Project (L=21,T=10,A=12)

ID9030 ***Production planning and control*** 3 Cr. PR. MC3020

Introduction to Production Planning and Control ■ Forecasting, Resource requirements ■ planning Independent demand inventory systems, scheduling and shop floor control, Line balancing, Just-in-time manufacturing, Term project (L=36,A=27)

ID9040 ***Elementary Industrial Engineering*** 3 Cr.

Introduction to Industrial Engineering ■ Make or Buy Decisions ■ Product Design, Finding a Facility Location ■ Operations and Implications: Sourcing; Production; Delivery ■ Trends in Industrial Engineering: Lean manufacturing; Cleaner production; Life cycle thinking (L=38,T=6,A=12)

8.3 Complementary Studies

MC9010 ***Management in Practice with Case studies*** 2 Cr.

Management: Definition, importance of management, managerial effectiveness, management as a science/arts, management as a profession, management and administration ■ Evolution

of Management Thought: Classical approaches to management. human relations movement, modern approaches to management ■ Principles of Management: Planning, organizing, leading; leadership, motivation and communication and controlling with case study analysis■ Social Responsibilities of a Manager

MC9020 ***Business Law*** 2 Cr.

Introduction: Definition of law, differentiation between business law and common law, sources of law, types of law, importance of understanding law introduction of law ■ Law of Contract: Sole proprietor, partnership, basic of contract, contract violation, factors affecting contract, uses of contract ■ Bills of Exchange: Negotiation, endorsement, acceptance, holder in due course, cheques, promissory notes, liability of party ■ Commercial Law: Types of commercial law, nature of insurance, hire purchase, arbitration, corporate form of business, class of companies, liabilities of limited companies, and liabilities of unlimited companies, formation of companies, incorporation, management and administration. Meaning of service, how service is differ from manufacturing, characteristics of service, difficulties in service marketing. Company Law: Board of directors, power and authority of board directors, meetings, borrowing power, contractual, liabilities, prevention of oppression and miss management, insider dealings, accounts and general meeting ■ Winding up of companies: Voluntary, compulsory, and by courts ■ Sources of Law: Kandiyan law, Thesavalamai law, Muslim law and Dutch law, English law

MC9030 ***Marketing and Financial Management*** 2 Cr.

Marketing: Introduction to marketing; Importance of marketing management in the contemporary business environment, responsibilities and duties of a marketing manager, Integrated marketing management approach with other functional managements ■ Marketing Concepts: Evolution of Marketing concepts and their applications, demand want, needs, marketing functions, different demand patterns, market types ■ Marketing Mixes: Product and service marketing mixes and their applications (7ps), product strategies, place strategies, distribution, and promotional strategies, service marketing and its mixes ■ Market Segmentation: Segmentation, targeting, positioning and marketing strategies ■ Marketing Environment: Marketing environment, challenges, contingency management related to PLEEST, SWOT analysis of an organization ■ Product Management: New product development and product lifecycle, and marketing planning, customer vs market orientation culture in the competitive business. Buying Behavior: Organizational buying behavior, consumer buying behavior, aiming different customer market with appropriate strategies ■ Financial Management

MC9040 ***Industrial Safety and Resource Management*** 2 Cr.

Industrial Safety: Elements of industrial safety and health: conditions affecting employees' safety and health, safety and health issues, hazards in occupational safety and health, the impact of globalization on employee health and safety in the workplace, stress and burnouts, developing occupational health policies, legal considerations on safety and health issues, creating and maintaining a healthy working environment ■ Resource Management: Resources Management, resource availability, structuring resource management, resource economics and welfare cost analysis.

MC9050 ***Technology and Economic Development*** 2 Cr.

Introduction to technological evolution and its impacts on economy and development,

Involvement of technology in economic development ■ Economics of environment pollution, Role of green technology in sustainable economic development ■ Principles and concepts of development, Poverty alleviation and income distribution, Factors of growth Development strategies, Case studies in development projects and assessment on degraded environment induced by technology

MC9060 ***Rural Economic Development and Technology*** 2 Cr.

Introduction to rural economic development and infrastructure in Sri Lanka ■ Opportunities and limitations of place of technology in rural area ■ The role of indigenous and appropriate technologies ■ Student project on rural economic development through engineering design, Report and presentation on student project.

MC9070 ***Engineer as an Entrepreneur*** 2 Cr.

Defining entrepreneurship, Marketing and law governing the formation of a company and getting registered ■ Planning, preparation and scheduling project proposals, Works and budget, Plan implementation and service providers ■ Structure of an organization and laws governing them, Environmental regulations, Duty structure of Sri Lanka ■ Insurance, Management, Acquisition of technology, Technology transfer ■ Awareness of appropriate technology, Financial activities handling and statement, Quality assurance with international standards ■ Leadership and development of management skills

MC9080 ***Advanced English Communication*** 2 Cr.

Presentation skills, Preparing presentation slides, Presenting with time management ■ Effective contact with audience and good manners ■ Preparing for interviews, How to answer the question in an interview ■ Effective telephone conversation and general communication, Oral communication formally and informally ■ Preparing for a given topic with limited time and present in a stage.

MC9090 ***Advanced Written English*** 2 Cr.

Technical writing, How to write proposal, Abstract research paper, Project report and other reports, Letter writing, Bio data, Job applications and other official letters, Objective and technical communication.

MC9100 ***Society and the Engineer*** 2 Cr.

Different roles of engineers, Engineers and their environment ■ Effects of technological advancement on social, culture, economic, legal, health and safety, environment and welfare of the society ■ Sustainable development and engineering sustainability ■ Engineers and ethical obligations in society, Issues in engineering safety ■ The workforce and human relationship with engineers ■ Legal liabilities and legal responsibilities to society, Professionalism.

MC9111 ***Appreciating Music*** 2 Cr.

Introduction to Carnatic music: Origins of Carnatic music, Structure and basics of Carnatic music (Swaram, Shruti, thaalam, raagam), Notation system of Carnatic music, Types of compositions, Instruments used in carnatic music (original and borrowed instruments), Reading and composing melodies ■ Introduction to western classical music: Origin of classical music and eras of classical music, Pitch, scales, key and time signatures, clefs and notation system of western classical music, Instruments and types of orchestras, Types of

compositions, Reading and composing melodies ■ Concept of fusion music and modern trends ■ Listening to compositions and appreciating variety

MC9120 ***Cinema and Television*** 2 Cr.

Introduction to cinema and television ■ Cinema techniques, Camera effects and technique in cinema television ■ Impact on social through cinema and television, Advertising through television ■ Present issues among youngsters by cinema.

MC9130 ***Graphic Design*** 2 Cr.

Introduction to graphic design, Human perception, Graphic design guidelines ■ Techniques for simplicity, Contrast, White space, Balance alignment, Communication, Design, Optical illusion, Area aesthetics, Type composition, External map design.

MC9140 ***Physical Development and Health Management*** 2 Cr.

General introduction to health planning and management ■ Importance of health management, Primary health care, Health care delivery system and health ■ Leadership, Reproductive health indicators, Gender and reproductive health ■ Causes of maternal mortality and morbidity, Family planning.

MC9150 ***Sustainable Development*** 2 Cr.

Definition for sustainable development, Components and importance of sustainable development in engineering point of view, The challenges of sustainable development ■ Impact of sustainable development in environment, economy and society ■ Concepts of human development and economic development ■ Sustainable rural livelihoods, Sustainable urban livelihoods, Impact on public health ■ Industrial and service sectors and their sustainable development, Globalization and its impact on sustainable development ■ Student project in sustainable development in engineering and presentation

MC9160 ***Active Citizenship*** 2 Cr.

Identity: Identify yourself, factors shape your identity, good citizen and active citizen ■ You and Me: Iceberg âĂŞ dialog, Identify and respect others culture, dialogues and debate ■ You, Me and We: Deciders of the identity, society: parts, ways to decision making, conflict management ■ Social Action Project Planning: Need assessment, conflict management, planning a project, forecasting, and sustainability

MC9170 ***Community Work*** 2 Cr.

Community Related Project: Development of proposal based on need analysis, evaluation of the project and feasibility analysis, project implementation.

Chapter 9

Other Details of the Faculty

***

9.1 Engineering Graduates

Degree Program	Graduates
Civil and Environmental Engineering	67
Computer Engineering	8
Electrical and Electronic Engineering	41
Mechanical and Process Engineering	12
Total	128

9.2 The Faculty Color

The official color of the Faculty is Persian Green (#00A693) and is displayed by the garland that the engineering graduand receives at the annual convocation of University of Jaffna.

Chapter 10

Faculty Productions

***

10.1 Publications

(1) Student Handbook 2017 – 2020 (www.eng.jfn.ac.lk/handbook/)

(2) General Regulations (www.eng.jfn.ac.lk)

(3) BScEng Degree Curricula

(4) Annual Report

(5) University Calendar

(6) Academic Calendar

Printed copy of the Student Handbook is available at the Office of the Assistant Registrar, Faculty of Engineering.