§ 1. INTRODUCTION

GENERAL

The Faculty of Applied Sciences of the Wayamba University of Sri Lanka was established with effect from 01 October, 1999 by the Government Notification in the Extraordinary Gazette No. 1093/8 of Tuesday, 17 August, 1999. The Faculty is located at Kuliyapitiya Premises of the University and consists of four Departments of Study namely, Computing & Information Systems, Electronics, Industrial Management and Mathematical Sciences contributing to the degree programmes on Applied Sciences and the Departments of Engineering Technology and Nano Science Technology established recently to initiate the degree programmes on Technology Stream. However, the latter two Departments will be shifted to the Faculty of Technology to be established in due course.

The Department of Mathematical Sciences offers courses in the subject areas of Mathematics & Mathematical Modelling and Statistics and the other three Departments of Computing & Information Systems, Electronics, and Industrial Management offer courses in the subject areas indicated by their titles.

Although the Computer Laboratories of the Department of Computing & Information Systems are primarily intended to facilitate the conduct of practical components in Computing & Information Systems, they would provide facilities for the students undertaking project work and offering other major subjects at the other Departments of Study.

The Information Communication Technology Centre and the English Language Teaching Unit, which come under the purview of the Vice-Chancellor, operate through a Director and a Coordinator respectively, offer service courses to the undergraduates of both Faculties at Kuliyapitiya to further their IT skills and oral & written communication skills.

ACADEMIC

An academic year consists of two semesters of 15 weeks each and academic programmes are based on a course credit system, which embodies characteristics such as modularity, flexibility, and accumulation of credits. After each semester, a study leave period of 2 weeks will be given prior to the commencement of the respective end-semester examinations conducted within a period of 4 weeks. However, examinations of practical components, project work, inplant training programmes etc. may be held prior to the end-semester examination period as decided by the relevant Department of Study.

Each course module is presented in the form of course unit(s) with specific credit values for its corresponding theory/ practical component(s). One credit is equivalent to 1 lecture hour or 2-3 practical hours a week throughout a semester. All academic programmes including examinations are conducted in English Medium and each student will be selected for a 3-subject combination at the beginning of Level 1 based on an internal selection criteria based on the Advanced Level Z-Score and the District Quota.

Three combinations of three subjects in each are available for students at Level 1 and Level 2, which open avenues for the students to qualify themselves to follow one of the 4-Year B.Sc. (Special) Degree, 4-Year B.Sc. (Joint Major) Degree, or the 3-Year B.Sc. (General) Degree over the ensuing years within the original combination.

All students should register for the modules before the commencement of each academic year at the Faculty Office of Applied Sciences. Students are not permitted to change their choice of modules after the first two weeks of the relevant academic year. Students shall be permitted to sit for the examination of a particular module only if they are registered for that module.

All subject combinations comprise of modules from three major disciplines constituted with the following aims of the Faculty:

- to provide an education that will facilitate the engendering of graduates who are not only knowledgeable and skillful, but also confident, enterprising and well versed in communication skills and enriched with correct attitudes.

- to produce graduates of the caliber sought by industry and the public service.

- to respond to the needs of the community in particular through the provision of out-reach programmes.

After embarking on a particular stream (subject combination), a student must offer modules aggregating to a minimum of 30 credits in each academic year including all compulsory modules specified by the respective Departments. As permitted by the semester Time Tables, a student shall be allowed to offer modules aggregating to a maximum of 33 credits in each academic year.
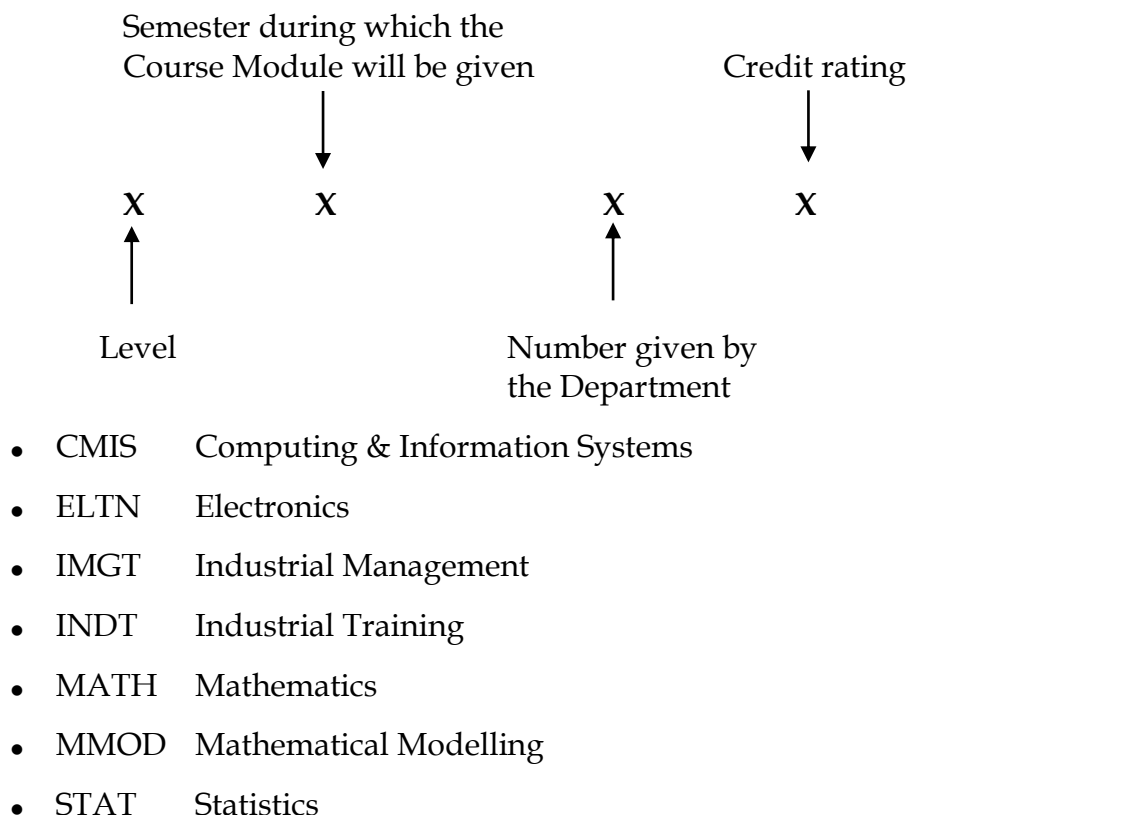

GRADUATE ATTRIBUTES

The graduate attributes of the Faculty encompass not only the future employment and contribution to the economic & social growth of the country but also producing a self contained, committed and inquisitive person who has curiosity for continuous learning.

The undergraduates of the Faculty will be provided with different course modules creating the opportunity to develop the following specific attributes:

  ➢ Social accountability
  ➢ Economic engagement
  ➢ Self containment
  ➢ Lifelong learning

§ 2. ABBREVIATIONS AND NOTATIONS

An alpha numeric code is used to identify a course module. The code consists of four digits prefixed by a set of four letters which refers to the subject area of the module. The first digit denotes the level at which the module is conducted, the second digit the semester during which it is conducted, the third a number assigned by the department which conducts it while the fourth signifies the credit rating of the module.

Semester during which the
Course Module will be given

Credit rating

X   X   X   X

Level

Number given by
the Department

- CMIS   Computing & Information Systems
- ELTN   Electronics
- IMGT   Industrial Management
- INDT   Industrial Training
- MATH   Mathematics
- MMOD   Mathematical Modelling
- STAT   Statistics

Some modules require courses of study that must previously be completed before students are allowed to follow them. Such courses of study are called pre-requisites (PR). Some units require other units to be taken simultaneously, which are called co-requisites (CR). Some of the prerequisites are subjects offered for the GCE (Advanced Level) Examination.

Example :MATH 1234 is the Mathematics Level 1 module conducted during the second semester having course number 3 and a weighting of 4 credits.

The subject areas offered by each Department of Study are as follows:

Department of Computing & Information Systems   :   CMIS

Department of Electronics   :   ELTN

Department of Industrial Management   :   IMGT

Department of Mathematical Sciences   :   MATH & MMOD, STAT

§ 3. ACADEMIC & ADMINISTRATIVE STAFF OF THE FACULTY, LIBRARY AND THE COMMON SUPPORT UNITS

FACULTY OFFICE

Dean:
Prof. E.M.P. Ekanayake,
B.Sc. (Hons.) (Kelaniya), M.Sc. (Kyushu), D.Sc. (Kyushu), Fellow (Oxford)

Assistant Registrar:
Miss. D.M.P.S.K. Dissanayake, *B.Sc. Business Administration (Hons.) (Sri J'pura)*

Academic Staff:

DEPARTMENT OF COMPUTING AND INFORMATION SYSTEMS

Head of the Department:
Dr. L.D.R.D. Perera, *B.Sc. (Hons.), M.Phil. (Kelaniya), D. Eng. (Kyushu)*

Senior Lecturers (Grade II):
Dr. V.G.T.N. Vidanagama, *B.Sc. (Hons.) (Peradeniya), M.Sc., D.Sc. (Waseda)*
Global Information & Telecommunication Studies

Mr. T. Arudchelvam, *B.Sc. (Hons.) (Jaffna), M.Sc., M.Phil. (Peradeniya)*
Computer Science

Mrs. B. Munasinghe, *B.Sc. (Hons.), M.Sc. (SLIIT)*
Computer Science, Information Management

Mr. N.D. Liyanagedera, *B.Sc. (Hons.), M.Phil. (Peradeniya)*
Computer Science

Mrs. H.R.K. Nagahamulla, *BIT (Colombo), B.Sc. (Hons.), M.Phil. (Peradeniya)*
Computer Science

Mrs. R.P.T.H. Gunasekara, *B.Sc. (Hons.) (Kelaniya), M.Sc. (UCSC)*
Statistics, Computer Science

Lecturers:

Mr. J.R.K.C. Jayakody, *B.Sc. (Hons.), M.Sc. (Moratuwa)*
Information Technology

DEPARTMENT OF ELECTRONICS

Head of the Department:
Prof. C.A.N. Fernando, *B.Sc. (Sri J'pura), PG.Dip. (Sri J'pura), M.Phil. (Ruhuna), Ph.D. (Kanazawa)*

Senior Professor:
Prof. C.A.N. Fernando, *B.Sc. (Sri J'pura), PG.Dip. (Sri J'pura), M.Phil. (Ruhuna), Ph.D. (Kanazawa)*
Physics, Solid State Physics, Nano-Technology

Professors:
Prof. K.P. Vidanapathirana, *B.Sc. (Peradeniya), Ph.D. (Peradeniya)*
Physics, Solid State Physics, Polymer Electronics

Prof. (Mrs.) G.A.K.S. Perera, *B.Sc. (Peradeniya), M.Sc. (Peradeniya), Ph.D. (Peradeniya)*
Physics, Solid State Physics, Polymer Electronics

Senior Lecturers (Grade I):
Dr. L.D.R.D. Perera, *B.Sc. (Hons.), M.Phil. (Kelaniya), D. Eng. (Kyushu)*
Physics, Electronic Device Engineering

Mr. M.A.A. Karunarathne, *B.Sc. (Hons.) (Ruhuna), M.Phil. (Moratuwa)*
Physics, Electronic & Telecommunication Engineering

Dr. Y.A.A. Kumarayapa, *B.Sc. (Hons.) (Colombo), M.Sc. (Peradeniya), Ph.D. (HIT)*
Physics, Information & Communication Engineering, Opto-Electronics, Microprocessor Based Systems

Senior Lecturers (Grade II):
Dr. W.A.S. Wijesinghe, *B.Sc. (Hons.) (Sri J'pura), M.Phil. (Colombo), Ph.D. (Wesleyan-USA)*
Configurable Hardware, Embedded Systems Design

Dr. (Mrs.) J.M.J.W. Jayasinghe, *B.Sc. (Eng.) (Hons.) (Peradeniya), Ph.D. (Peradeniya)*
Electrical & Electronics Engineering

Lecturer:
Dr. U.S. Liyanaarachchi, *B.Sc. (Hons.) (Wayamba), Ph.D. (Wayamba)*
Nano-Technology, Nano-Materials

DEPARTMENT OF INDUSTRIAL MANAGEMENT

Head of the Department:
Dr. M.M.D.R. Deegahawatura, *B.Sc. Business Administration (Hons.) (Sri J'pura) MBA (Colombo), MBA in MOT (AIT), Ph.D. (HUST)*

Senior Lecturers (Grade I):
Dr. K.D.D.N. Dissanayake, *B.Sc. (Hons.) (Kelaniya), MBA in MOT (AIT), M.Sc. (CERAM), Ph.D. (RMIT) - (On Sabbatical Leave)*
Industrial Management, Management of Technology, Strategic Tourism Management, Business Information Technology

Dr. M.M.D.R. Deegahawatura, *B.Sc. Business Administration (Hons.) (Sri J'pura) MBA (Colombo), MBA in MOT (AIT), Ph.D. (HUST)*
Business Administration, Management of Technology, Innovation Management

Senior Lecturers (Grade II):
Mr. E.A.C.P. Karunarathne, *B.Sc. (Hons.) (Kelaniya), MBA in Marketing (AIT) -*
(On Study Leave)
Industrial Management, Marketing Management

Mr. D.M. Jayasena, *B.Sc. Business Administration (Hons.) (Sri J'pura), MBA (AIT)*
Business Administration, Financial Management

Dr. (Mrs.) R.A.R. Prabodanie, *B.Sc. (Hons.) (Kelaniya), Ph.D. (Canterbury)*
Industrial Management, Operations Research

Dr. (Mrs.) W.G.E.J. Wattegama, *B.Sc. Business Administration (Hons.) (Sri J'pura), M.Sc. Management (Sri J'pura) Ph.D. (HUST)*
Business Administration, Entrepreneurship, Marketing Management

Ms. B.S. Habaragoda, *B.Sc.(Hons.) (Kelaniya), M.Sc. (Moratuwa) -*
(On Study Leave)
Industrial Management, Financial Mathematics

Mrs. P.A.A.U. Jothirathna, *B.Sc. (Hons.) (Kelaniya), M.Sc. (Moratuwa) -*
(On Study Leave)
Industrial Management, Operational Research

Mrs. M.G.S. Dilanthi, *B.Sc. Eng. (Hons.) (Peradeniya), M.Sc. (Moratuwa) -*
(On Study Leave)
Production Engineering, Operational Research

Lecturers:
Mr. R. P. I. R. Senarathne, *B.Sc. (Hons.) (Kelaniya), MBA (Peradeniya) –*
(On Study Leave)
Industrial Management, Business Information Technology

Dr. A. Pallegedara, *B.Eng. (UEC), MA (GRIPS), Ph.D. (GRIPS)*
(On Post Doctorial Studies)
Economics, Finance, Information Technology

Dr. A.D. Dharmawansa, B.*Sc. (Hons.) Wayamba, M.Eng. (NUT), D.Eng. (NUT)*
Industrial Management, Educational Technology, Kansei Engineering

DEPARTMENT OF MATHEMATICAL SCIENCES

Head of the Department:
Dr. P.M.N. Dharmawardane, *B.Sc. (Hons.) (Kelaniya), M.Phil. (Kelaniya), M.Sc. (Kyushu), Ph.D. (Kyushu)*

Associate Professor:
Prof. E.M.P. Ekanayake, *B.Sc. (Hons.) (Kelaniya), M.Sc. (Kyushu), D.Sc. (Kyushu), Fellow (Oxford)*
Mathematics, Atmospheric Dynamics

Senior Lecturers (Grade II):
Dr. (Mrs.) G.S. Francisco, *B.Sc. (Hons.) (Kelaniya), M.Sc. (ECNU), Ph.D. (Keele,UK)*
Mathematics & Mathematical Modelling, Differential Equations

Dr. P.M.N. Dharmawardane, *B.Sc. (Hons.) (Kelaniya), M.Phil. (Kelaniya), M.Sc. (Kyushu), Ph.D. (Kyushu)*
Mathematics & Mathematical Modelling, Differential Equations

Mrs. W.M.P.M. Wickramasinghe, *B.Sc. (Hons.) (Kelaniya), M.Sc. (Colombo)*
Statistics

Mrs. N.A.D.N. Napagoda, *B.Sc. (Hons.) (Kelaniya), M.Sc. (Colombo) - (On Study Leave)*
Statistics

Mrs. P.A.D.A.N. Appuhamy, *B.Sc. (Hons.) (Kelaniya), M.Sc. (Colombo)*
Statistics

Mrs. W.J.M.L.P. Jayasinghe, *B.Sc. (Hons.) (Kelaniya), M.Phil. (Kelaniya)*
Mathematics & Mathematical Modelling

Lecturers:
Mr. G.A.C.M. Karunananda, *B.Sc. (Hons.) (Kelaniya)*
Mathematics & Mathematical Modelling

Mr. D.M.S. Bandara, *B.Sc. (Hons.) (Peradeniya) - (On Study Leave)*
Mathematics

Mr. G.M.L.M. Aponsu, *B.Sc. (Hons.) (Kelaniya)*
Statistics

Ms. S.D. Dahanayaka, *B.Sc. (Hons.) (Kelaniya)*
Mathematics & Mathematical Modelling

Mrs. P.M.O.P. Panahatipola, *B.Sc. (Hons.) (Peradeniya)*
Statistics

DEPARTMENT OF ENGINEERING TECHNOLOGY

Head of the Department:
Dr. (Mrs.) J.M.J.W. Jayasinghe, *B.Sc. (Eng.) (Hons.) (Peradeniya), Ph.D. (Peradeniya)*

Senior Lecturer (Grade I):
Dr. I.P.M. Wickramasinghe, *B.Sc. (Hons.), M.Phil. (Peradeniya), M.Sc., Ph.D. (USA)*
Mechanical Engineering, Control and Automation

Lecturer:
Mr. M.R.H.E. Bandara, *BTech. (Hons.) (Eng.) (OUSL), Reading for M.Phil., AMIESL*
Electronic and Communication Engineering

DEPARTMENT OF NANO SCIENCE TECHNOLOGY

Coordinator:
Prof. C.A.N. Fernando, *B.Sc. (Sri J'pura), PG.Dip. (Sri J'pura), M.Phil. (Ruhuna), Ph.D. (Kanazawa)*

Senior Lecturer (Grade I):
Dr. (Miss.) S.N.T. De Silva, *B.Sc. (Colombo), M.Sc. (Colombo), Ph.D. (Sheffield Hallam, UK)*
Molecular Biology & Biochemistry

LIBRARY:

Librarian:
Mr. W.G.P. Gamlath, *B.A. (Hons.) (Peradeniya), BLIS, MLIS (India)*

Senior Assistant Librarian:
Mrs. W.M. Thusithakumari, *B.A. (Hons.) (Kelaniya), MSSc in LIS (Kelaniya), ASLLA, Charted Librarian*

Assistant Librarian:
Mr. K.G.I. Jayawardana, *B.A. (Hons.) (Kelaniya)*

Assistant Registrar/ Library Services:
Mrs. S. Pathiraja, *B.A. (Kelaniya), ASLLA, Charted Librarian*

Programmer Cum Systems Analyst:
Mr. E.M.C.L. Ekanayake, *B.Sc. (Wayamba), M.Sc. (Peradeniya)*
(On Leave)

INFORMATION COMMUNICATION TECHNOLOGY CENTRE

Director:
Dr. V.G.T.N. Vidanagama, *B.Sc. (Hons.) (Peradeniya), M.Sc., D.Sc. (Waseda)*

Lecturers:
Mr. N.J. Amarasinghe, *B.Sc. (Kelaniya), PG.Dip. (Sri J'pura), M.Sc. (Colombo) –*
(On Study Leave)
Computer Science

Mrs. W.P.E. Priyadarshani, *B.Sc. (Peradeniya), M.Sc. (Peradeniya)*
Applied Science & Computer Science

Mr. A.J. Herath, *B.Sc. (Hons) (Rajarata)*

Instructor:
Mr. A.C.A. Wahab, *B.Sc. (Wayamba)*
Applied Science

System Engineer:
Mr. H.M.A.K. Bogoda, *B.Sc. (Hons.) (Peradeniya)*
Computer Science

ENGLISH LANGUAGE TEACHING UNIT

Coordinator
Mrs. W.S.A. Fernando, *B.A. (Sri J'pura), M.A. (Kelaniya), PG.Dip. (TESL) (Colombo), M.A. in TESL (OUSL)*

Lecturers:
Mr. K.M. Dissanayake, *B.A. (Hons.) (Peradeniya), M.A. (Kelaniya)*

Mr. M.K.S.M. Samaranayake, *B.A. (Kelaniya), M.A. (Kelaniya), M.A. in TESL (OUSL), PG.Dip. (TESL) (Colombo)*

Mr. E.M.H.J. Edirisinghe, *B.A. (Sri J'pura), M.A. (Kelaniya), PG.Dip. (Sri J'pura)*

Mrs. W.S.A. Fernando, *B.A. (Sri J'pura), M.A. (Kelaniya), PG.Dip. (TESL) (Colombo), M.A. in TESL (OUSL)*

§ 4. DEPARTMENTS OF THE FACULTY & COMMON SUPPORT UNITS

Department of Computing & Information Systems

The new information revolution which began in business has gone farthest in every field of life, society and of technology. Information is the foundation for the challenges of knowledge.

The main objective of the Department of Computing & Information Systems is to equip the students with a sound knowledge on IT to face the above challenges at their own work and employment. Therefore, this Department offers course modules in the following areas of the subject, and a project and an industrial training programme, to achieve the above objectives.

- Object-Oriented Programming
- Database Management Systems
- Data Communication & Computer Networks
- Software Engineering
- Web Designing & e-Commerce
- Advanced Operating Systems & Artificial Intelligence

Department of Electronics

Electronics is a fascinating subject that could make your time at the University a challenging, enriching, and rewarding experience. This subject has become so important to the society, that we simply cannot do many things without it. If you have the idea of creating electronics systems which could help millions of people on a day to day basis, like the systems used in phones, or computers, then you may be interested in studying the subject offered by the Department of Electronics.

The Department of Electronics offers course modules for three degree programmes of the Faculty of Applied Sciences, namely B.Sc. (General) Degree, B.Sc. (Joint Major) Degree, and B.Sc. (Special) in Applied Electronics for undergraduate students, and degrees Master of Philosophy (M.Phil.) and Doctor of Philosophy (Ph.D.) for postgraduate students.

Students who need general knowledge of Electronics may follow the Electronics course modules offered under 3-year B.Sc. (General) programme. Those who wish to study Electronics to some depth with another main subject can follow 4-year Joint Major Degree programme. Past graduates who followed Electronics as a Major subject had no difficulty in finding employment opportunities, where most of them started their career as an engineer or assistant engineer in private sector. Recently started special degree in Applied Electronics provides deeper subject knowledge to students those who wish to seek career opportunities in Research & Development or in Academia.

The Department of Electronics consists of well-qualified academic staff committed to provide conceptual knowledge as well as practical skills for undergraduate students in the following areas,

- Fundamentals of Electronics
- Analog Circuits
- Digital Systems
- Communication & Antenna Design
- Microprocessor Technology
- Signal Processing
- Embedded Systems
- Programmable Hardware

With the rapid expansion of the technology sector, the demand for experts in Electronics has been increasing accordingly. Therefore, students who study Electronics will have various career opportunities. The Department of Electronics takes all measures to equip students with sound knowledge and skills to succeed in their career, and meet the demands of socio-economic development of the country.

Department of Industrial Management

The Department of Industrial Management has already realized the future challenges and the importance of socio-economic development of Sri Lanka. Therefore, the Department of Industrial Management has articulated its main objective to produce readily employable graduates to face 21st century management challenges.

To achieve the above objective, the Department offers a number of course modules, not only to gain the conceptual knowledge but also to have hands on experience in all aspects of information system development with exposure to business problem analysis and problem solving through "Design & Development of Computer Based Project" and hands on managerial experience through "Industrial Training" at manufacturing and service organizations. These provide students with the opportunity to relate the academic contents of the modules to practical applications.

A systematic conceptual framework is built for the students in the following areas:

- Production, Operations & Quality Management
- Accounting and Financial Management
- Marketing Management
- Management of Technology
- Human Resource Management
- Operations Research
- Structured System Analysis & Design Methodology
- Management Information System
- Industrial and Business Law
- Strategic Management

Effective and efficient management in the industry is vital for enhancing productivity for the competitiveness of a nation. Therefore, Industrial

Management plays a vital role to face the stringent competition in future in the midst of the rapid globalization.

Department of Mathematical Sciences

The main objective of the Department of Mathematical Sciences is to develop the logical and independent thinking power to face new and independent situations which are directly related to the actual life. Therefore, the Department offers two subject streams in Mathematics & Mathematical Modelling and Statistics in the following areas including most demanding disciplines such as Actuarial Mathematics, Operations Research and Time Series Analysis:

- Linear Algebra
- Analysis
- Computational Mathematics
- Numerical Analysis
- Theory of Interest
- Statistical Inference
- Data Analysis and Designing Experiments
- Sampling Methods
- Regression Analysis
- Stochastic Processes and Simulation
- Statistical Laboratory Works

Learning above subject areas will develop the theoretical knowledge as well as the computer skills which support a deeper understanding of Mathematical and Statistical models and their practical implementations.

Main Library

The Wayamba University Library started its full functions as a University Library after 2000. There are two Libraries at Kuliyapitiya and Makandura. The Library at Kuliyapitiya is functioning as the Main Library and serving for the two faculties of Applied Sciences and Business Studies and Finance.

The Main Library has around 36,400* volumes related to the subjects of two Faculties. The collections of periodicals in print version are about 25 titles and all university scholars as well as researchers and undergraduate students and postgraduate students are provided access to online databases. This all web based information users can freely access within the both premises of Wayamba University. The E-Journals information listed below.

- ➢ Emerald http://www.emeraldinsight.com/
- ➢ SAGE Research http://srmo.sagepub.com/
- ➢ Wiley Online http://onlinelibrary.wiley.com/
- ➢ Cambridge University Press http://journals.cambridge.org/
- ➢ Oxford Journals http://www.oxfordjournals.org/

Further users can ask to download useful articles from bellow sites,

- ➤ Taylor & Francis (http://www.tandfonline.com/)
- ➤ Elsevier (http://www.sciencedirect.com/)

Subject related DVDs and CDs are also available for reference in the computer unit at the Library. The Library also adds 1500 – 2000 to its collection every year.

In addition to the Reference and Lending services, Computer laboratory facilities, Staff Development collection, Special collection related to Social, Economical, Cultural, Political background in Sri Lanka, Paper cuttings, Past papers, Theses & students training reports, User Education programmes such as; Library Orientation and Learning skill Development programme covering Online Public Access Catalogue (OPAC) and online searching facilities, Information retrieving, analyzing organizing and presenting techniques with Citations and Reference styles etc. Inter Library Loan, Current Awareness Services and Referral Services are available at the Library.

COMMON ACADEMIC SUPPORT UNITS:

Information Communication Technology (ICT) Centre

The Wayamba University of Sri Lanka has two ICT Centers, one in the Kuliyapitiya premises and the other in the Makandura premises. The ICT Center Kuliyapitiya provides computing and information technology resources, services, and support to Kuliyapitiya premises of Wayamba University. It provides IT training programmes for students, staff, and external professionals to improve demanding IT skills. It is committed to support academic activities by promoting on-campus information literacy, and by providing a suitable information technology environment. To ensure the smooth proceeding of the educational and research activities, the center also offers comprehensive services using the latest advances in information technology. These services include running many servers such as mail-server, web-server, and Learning Management System, and maintaining the networks that form the University's IT infrastructure.

The University has identified that the literacy in IT is one of the basic skills that makes graduates employable. The literacy in IT is salient in continuing the undergraduate education in Wayamba University of Sri Lanka. The ICT Center provides variety of programs for undergraduates including Diploma and Certificate Courses in Information Technology, Web Designing, Computer Graphics, and Software Programming.

English Language Teaching Unit

A major fact to be emphasized is that the medium of instruction in the Faculty is English. Therefore, a high literacy standard of the language is obviously sought after. The main objective of English Language courses is to develop the proficiency level of English language of the undergraduates to enhance their pursuit of the degree programme successfully and effectively, which would ultimately lead to a better employability.

To achieve the above objective, the English Language Teaching Unit at Kuliyapitiya Premises offers the following courses for the undergraduates of Applied Sciences:

Compulsory Courses:

- Intensive English Course : New entrants to the Faculty
- English Language Proficiency Course I : Level 1 undergraduates
- English Language Proficiency Course II : Level 2 undergraduates

Optional Courses:

- Certificate Course in Business English : Level 3 undergraduates
- Advanced English Proficiency Course : Level 3 undergraduates

STUDENT COUNSELLING

It is understood that students would need the assistance and guidance to sort out many of the problems they would face from time to time during a 3-4 year long stay at the university. Irrespective of the nature of problems or grievances, the Faculty makes arrangements to provide a counselling service for all students of the Faculty.

A team of Student Counsellors/ Mentors is appointed in every academic year from both senior and junior staff of the Faculty, who are willing and prepared to listen to any student matter and provide the utmost guidance and advise to help the students.

The Student Counsellors thus appointed will be notified at the beginning of the academic year and all students are strongly advised to consult them prior to seeking appointments with Heads of Departments or Dean of the Faculty. Any written student request should be addressed to the Assistant Registrar of the Faculty through the Student Counsellor assigned to the student and where necessary through the relevant Head of the Department.

§ 5. SUMMARY OF MODULES OFFERED BY THE DEPARTMENTS OF STUDY

The following convention has been used throughout to describe the significance attached to the modules offered by the Department:

x - Compulsory modules, i.e. the students must offer the module if this symbol appears against it for a particular degree programme and take all examination components of the module. These modules cover the essential subject material for that subject area to be considered as a major subject.

† - If this symbol appears with the code or against a particular module, it will be conducted throughout the academic year.

▼ - Optional modules, i.e. the students can choose such modules at will to fulfil the annual/overall credit requirements.

✱ - Only these modules are available for the students who are not offering the relevant subject as a major subject in the combination.

♣ - One of these modules is offered in the semester

- One of these modules is offered in the semester

5.1 Computing & Information Systems

Level	Module Code & Title	B.Sc. (General)	B.Sc. (Joint Major) Major 1	B.Sc. (Joint Major) Major 2	B.Sc. (Special)
1	**Semester I**				
	CMIS 1113 - Introduction to Computers and Operating Systems	**x**	**x**	**x**	**x**
	CMIS 1123 - Computer Programming I	**x**	**x**	**x**	**x**
	CMIS 1131 - Practical Computing I	**x**	**x**	**x**	**x**
	Semester II				
	CMIS 1212 - Computer Programming II	**x**	**x**	**x**	**x**
	CMIS 1221 - Practical Computing II	**x**	**x**	**x**	**x**
	Credits from Level I (Cumulative credits)	**10 (10)**	**10 (10)**	**10 (10)**	**10 (10)**
2	**Semester I**				
	CMIS 2113 - Object-oriented Programming	**x**	**x**	**x**	**x**
	CMIS 2123 - Database Management Systems	**x**	**x**	**x**	**x**
	Semester II				
	CMIS 2214 - Data Structures & Analysis of Algorithms	**x**	**x**	**x**	**x**
	Credits from Level 2 (Cumulative credits)	**10 (20)**	**10 (20)**	**10 (20)**	**10 (20)**
3	**Semester I**				
	CMIS 3114 - Data Communication & Comp. Networks	**x**	**x**	**x**	**x**
	CMIS 3122 - Rapid Application Development	▼	**x**	▼	**x**
	CMIS 3134 - Computer Architecture & Compiler Design	-	▼	▼	**x**
	CMIS 3142 - Computational Methods	-	-	-	**x**
	Semester II				
	CMIS 3214 - Software Engineering	▼	**x**	**x**	**x**
	CMIS 3224 - Web Designing and e-commerce	▼	**x**	**x**	**x**
	CMIS 3234 - Computer Graphics and Visualization	-	-	-	**x**
	CMIS 3242 - Mobile and Ubiquitous Computing	-	-	-	**x**
	Credits from Level 3 (Cumulative credits)	**4-14 (24-34)**	**14-18 (34-38)**	**12-18 (32-38)**	**26 (46)**
4	**Semester I**				
	CMIS 4114 - Artificial Intelligence		**x**	**x**	**x**
	CMIS 4133 - Advanced Operating Systems		-	-	**x**
	CMIS 4144 - Distributed and Cloud Computing		**x**	**x**	**x**
	CMIS 4152 - Image Processing		▼	▼	**x**
	CMIS 4†18 - Research Project		-	-	**x**
	CMIS 4† 24 - Project		**x**	-	
	Semester II				
	CMIS 4213 - Data Mining		-	-	**x**
	CMIS 4223 - Parallel Computing		-	-	**x**
	CMIS 4233 - Advanced Database Systems		-	-	**x**
	INDT 4218 - Industrial Training		**x** (4)	**x** (4)	-
	Credits from Level 4 (Total credits)		**16-18 (50-56)**	**12-14 (44-52)**	**30 (76)**

5.2 Electronics

Level	Module Code / Title	B.Sc. (General)	B.Sc. (Joint Major) Major I	B.Sc. (Joint Major) Major II	B.Sc. (Special)
1	**Semester I**				
	ELTN 1112 - Fundamentals of Electricity and Magnetism	x	x	x	x
	ELTN 1122 - Introduction to Semiconductors	x	x	x	x
	ELTN 1132 - Basic Digital Electronics	x	x	x	x
	Semester II				
	ELTN 1212 - Basic Electronics - Lab	x	x	x	x
	ELTN 1222 - General Physics	x	x	x	x
	Credits from Level 1 (Cumulative Credits)	**10 (10)**	**10 (10)**	**10 (10)**	**10 (10)**
2	**Semester I**				
	ELTN 2112 - Electricity and Magnetism	x	x	x	x
	ELTN 2121 - Electricity and Magnetism - Lab	x	x	x	x
	Semester II				
	ELTN 2213 - Semiconductor Devices	x	x	x	x
	ELTN 2221 - Semiconductor Devices - Lab	x	x	x	x
	ELTN 2232 - Analogue Electronics	x	x	x	x
	ELTN 2241 - Analogue Electronics - Lab	x	x	x	x
	Credits from Level 2 (Cumulative Credits)	**10 (20)**	**10 (20)**	**10 (20)**	**10 (20)**
3	**Semester I**				
	ELTN 3113 - Digital Electronics	x	x	x	x
	ELTN 3121 - Digital Electronics - Lab	x	x	x	x
	ELTN 3133 - Data Acquisition and Signal Processing	▼	x	x	x
	ELTN 3141 - Data Acquisition and Signal Processing – Lab	▼	x	x	x
	ELTN 3†53 - Applied Electronics Laboratory I				x
	Semester II				
	ELTN 3212 - AC Theory	▼	x	▼	x
	ELTN 3222 - Scientific Writing				x
	ELTN 3233 - Microprocessor and Microcontroller Technology	▼	x	x	x
	ELTN 3241 - Microprocessor and Microcontroller Technology - Lab	▼	x	x	x
	ELTN 3252 - Electromagnetic Theory				x
	ELTN 3262 - Power Electronics		▼		x
	ELTN 3272 - Optimization Techniques and Applications	▼	x	▼	x
	Credits from Level 3 (Cumulative Credits)	**4-16 (24-36)**	**16-18 (36-38)**	**12-16 (32-36)**	**25 (45)**
4	**Semester I**				
	ELTN 4114 - Communication Theory and Systems		x	x	x
	ELTN 4122 - Optoelectronics Devices and Fiber Communication Systems		▼	x	x
	ELTN 4131 - Communication Technology - Lab		▼		x
	ELTN 4143 - Programmable Logic Devices		x	x	x
	ELTN 4151 - Programmable Logic Devices - Lab		x	x	x

Course				
ELTN 4†63 - Applied Electronics Laboratory II				**x**
ELTN 4†78 - Research Project				**x**
ELTN 4†84 - Research Project		**x**		
ELTN 4†92 Seminar in Electronics				**x**
Semester II				
ELTN 4213 - Digital Signal Processing				**x**
ELTN 4222 - Nano-Technology Devices and Nano-Materials				▼
ELTN 4232 - Data Communication Networks				▼
ELTN 4242 - Solid State Theory				▼
ELTN 4252 - Polymer Electronics				▼
ELTN 4262 - Mechatronics				▼
ELTN 4272 - Embedded Systems				▼
ELTN 4282 - Antenna Design				▼
INDT 4218 - Industrial Training		**x** (4)	**x** (4)	
Credits from Level 4 **(Total Credits)**		**16-19** **(52-57)**	**14** **(46-50)**	**27-31** **(72-76)**

5.3 Industrial Management

Level	Module Code/Title	B.Sc. (General)	B.Sc. (Joint Major) Major 1	B.Sc. (Joint Major) Major 2	B.Sc. (Special)
1	**Semester I**				
	IMGT 1112 - Principles of Management *	x	x	x	x
	IMGT 1122 - Business Economics	x	x	x	x
	IMGT 1132 - Entrepreneurial Dynamics *	x	x	x	x
	Semester II				
	IMGT 1212 - Principles of Accounting	x	x	x	x
	IMGT 1222 - Marketing Management *	x	x	x	x
	Credits from Level 1 (Cumulative Credits)	**10 (10)**	**10 (10)**	**10 (10)**	**10 (10)**
2	**Semester I**				
	IMGT 2112 - Operations Management I	x	x	x	x
	IMGT 2122 - Cost & Management Accounting	x	x	x	x
	IMGT 2132 - Service Industry Concepts *	x	x	x	x
	Semester II				
	IMGT 2212 - Human Resource Management *	x	x	x	x
	IMGT 2222 - Operations Research I *	x	x	x	x
	Credits from Level 2 (Cumulative Credits)	**10 (20)**	**10 (20)**	**10 (20)**	**10 (20)**
3	**Semester I**				
	IMGT 3112 - Operations Management II	x	x	x	x
	IMGT 3122 - Organization Development	▼	x	x	x
	IMGT 3†34 - Design & Development of Computer Based Project		x†		x†
	IMGT 3142 - Structured System Analysis & Design Methodologies and Management Information Systems		▼		x
	IMGT 3153 - Environmental Management based on ISO 14001				x
	IMGT 3162 - Business & Industrial Law	x	x	x	x
	Semester II				
	IMGT 3212 - Operations Research II	▼	x	x	x
	IMGT 3222 - Management of Technology	▼	x	x	x
	IMGT 3232 - International Business	▼	x	x	x
	IMGT 3242 - Project Management				x
	IMGT 3252 - Industrial Technology *	▼	▼	▼	x
	Credits from Level 3 (Cumulative Credits)	**4-14 (24-34)**	**16-20 (36-40)**	**12-14 (32-34)**	**25 (45)**
4	**Semester I**				
	IMGT 4†18 - Research Project				x†
	IMGT 4123 - Environmental Management based on ISO 14001		x	x	
	IMGT 4133 - Computer based Modelling & Simulation		x	x	▼
	IMGT 4142 - Supply Chain Management		x	x	x
	IMGT 4152 - Productivity Techniques		x		x
	IMGT 4164 - Strategic Management				x
	IMGT 4172 - Strategic Management		x	x	
	Semester II				
	IMGT 4213 - Advanced Marketing Management				x
	IMGT 4222 - Applied Econometrics				x
	IMGT 4234 - Advanced Operations Research				x
	IMGT 4242 - Financial Management				x
	INDT 4218 - Industrial Training		x(4)	x(4)	
	Credits from Level 4 (Total Credits)		**16 (52-56)**	**14 (46-48)**	**27 (122-125)**

Other Preferables

STAT 3124	Time Series Analysis
STAT 3252	Data Analysis & Preparation of Statistical Reports

N.B. **As the students are selected for the Degree Programme at end of Level 2, they will be offering two more subjects upto Level 2 from among Computing & Information Systems, Electronics, Mathematics & Mathematical Modelling and Statistics conducted by the other Departments that account for 40 credits.**

5.4 Mathematics & Mathematical Modelling and Statistics

Level	Module Code/Title	B.Sc. (General) MATH & MMOD	B.Sc. (General) STAT	B.Sc. (Joint Major) MATH & MMOD and STAT — Major 1	B.Sc. (Joint Major) Major 2	B.Sc. (Special)
1	**Semester I**					
	MATH 1112 - Introduction to Mathematics I	x	x	x	x	x
	STAT 1113 - Introduction to Probability and Statistics I	x	x	x	x	x
	Semester II					
	MATH 1212 - Introduction to Mathematics II	x	x	x	x	x
	MATH 1222 - Differential Equations	x	x	x	x	x
	STAT 1213 - Introduction to Probability and Statistics II	x	x	x	x	x
	Credits from Level 1 (Cumulative Credits)	12 (12)	12 (12)	12 (12)	12 (12)	12 (12)
2	**Semester I**					
	MATH 2114 - Linear Algebra I	x	x	x	x	x
	STAT 2112 - Statistical Inference I	x	x	x	x	x
	Semester II					
	MATH 2213 - Linear Algebra II	x	x	x	x	x
	STAT 2212 - Design of Experiments	x	x	x	x	x
	STAT 2222 - Regression Analysis	x	x	x	x	x
	Credits from Level 2 (Cumulative Credits)	13 (25)	13 (25)	13 (25)	13 (25)	13 (25)
3	**Semester I**	MATH & MMOD	STAT	MATH & MMOD and STAT		
	MATH 3114 - Advanced Calculus			▼	▼	x
	MMOD 3113 - Mathematical Methods	x		x	x	x
	MMOD 3124 - Mathematical Models	x		▼	▼	▼
	STAT 3112 - Statistical Inference II		x	x	▼	x
	STAT 3124 - Time Series Analysis		x	x	x	x
	Semester II					
	MATH 3214 - Discrete Mathematics	▼		▼	▼	▼
	MMOD 3214 - Numerical Methods	x		x	x	x
	MATH 3224 - Applied Number Theory			▼		x
	STAT 3212 - Statistical Techniques		x	▼	▼	x
	STAT 3223 - Operations Research		x	▼	▼	▼
	STAT 3232 - Data Analysis & Preparation of Statistical Reports		x	▼	▼	x
	STAT 3243 - Theory of Interest		▼	▼	▼	▼
	Credits from Level 3 (Cumulative Credits)	11-15 (24-28)	13-16 (25-28)	13-39 (38-64)	11-35 (36-60)	25-39 (50-64)
4	**Semester I**					
	MATH 4114 - Complex Variables					x
	MATH 4124 - Functional Analysis			▼	▼	▼
	MATS 4†14 - Project			x†		
	MATS 4†28 - Research Project					x
	STAT 4114 - Stochastic Processes			x	x	x
	STAT 4124 - Quality Control			▼	▼	▼
	STAT 4134 - Actuarial Mathematics			x	x	x
	Semester II					
	MATH 4214 - Partial Differential Equations					x
	MATH 4224 - Measure Theory					x
	STAT 4214 - Multivariate Analysis					▼
	INDT 4218 - Industrial Training			x(4)	x(4)	
	Credits from Level 4 (Total Credits)			16-24 (54-84)	12-20 (48-80)	28-40 (78-104)

5.5 English

The English Language Teaching Unit (ELTU) at Kuliyapitiya Premises is committed to improve the English language competency of the undergraduates from the very inception as they pursue the degree programme in English medium. The ELTU offers the following courses to achieve the above objective as the successful performance of the students depends on the high standard of literacy in English Language.

Compulsory Courses:

➢ **Intensive English Course:**

- A short Intensive English Course would be conducted for the new entrants before the commencement of the academic programme depending on the availability of time after the students are admitted to the Faculty.

➢ **ELPC 1†10 - English Language Proficiency Course I:**

- conducted throughout the academic year at Level 1.
- in addition to the continuous assessments during the course, the English Language Proficiency Test I (ELPT I) will be held at the end of Semester II at Level 1.
- a partial requirement for all degree programmes, i.e. the degree will not be awarded until the student obtains a minimum of an ordinary pass at ELPT I.

➢ **ELPC 2†20 - English Language Proficiency Course II:**

- conducted throughout the academic year at Level 2.
- in addition to the continuous assessments during the course, the English Language Proficiency Test II (ELPT II) will be held at the end of Semester II at Level 2.
- a partial requirement for all degree programmes, i.e. the degree will not be awarded until the student obtains a minimum of an ordinary pass at ELPT II.

N.B. After following ELPC 1†10 and ELPC 2†20, the students are expected to reach the Band 5 of the University Test of English Language (UTEL – Band 5).

Optional Courses:

➢ **Certificate Course in Business English:**

- a professional course conducted during Semester II of the academic year at Level 3.
- a separate certificate will be issued by the Examination Branch to the students who complete the course successfully.

➢ **Advanced English Proficiency Course:**

- enrollment is limited for only the best performers at ELPT I and ELPT II.
- an optional course conducted during semester I at Level 3.

- the aim is to prepare students to be confident enough in all four major skills of English Language and to perform well at any standard examination both at local and international level such as TOFEL and IELTS.
- at the end of the course the students would be able to follow with confidence any higher degree programme of study conducted in English medium at local or foreign Higher Educational Institutes.
- a separate certificate will be issued by the Examination Branch to the students who complete the course successfully.

N.B. **At the end of Level 3, the students who have followed the above optional courses are expected to reach Band 6 of the University Test of English Language.**

5.6 Enhancement/ Auxiliary Courses/ Non-credit Courses

(a) These modules are indicated by ' ✳' in each subject area and provide the students, who are not offering it as a major subject, the opportunity to obtain basic knowledge and skills in another subject area outside their original combinations. Such modules may be offered by a student if permitted by the semester time table.

Accordingly, the modules with ✳s in the following subject areas will form the auxiliary modules for each combination:

Combination	Auxiliary Subject Area
COMB 1	Industrial Management
COMB 2	Computing & Information Systems
COMB 3	Electronics

N.B. The auxiliary courses will not be taken into account in computing the final GPA of a student. The grades obtained shall be mentioned in the academic transcript.

(b) Career Guidance

There will be a programme to prepare the undergraduates to take on the challenges in looking for a suitable employment upon graduation. The objectives shall include to provide the undergraduates with an insight into the expectations in the corporate world, career opportunities in the respective fields and trends in the job market etc.

This will be offered for all students reading for any degree programme during Semester II at Level 3. **The participation and satisfactory performance upon the end of the course will be a compulsory partial requirement for awarding the degree.**

The Faculty Coordinator for Career Guidance shall design and organize this course annually with inputs from resource persons from the universities and industries.

5.7 Diploma/Advanced Certificate in Information Technology

The ICT Center-Kuliyapitiya recently introduced a Diploma in Information Technology for undergraduates of the Faculty of Applied Sciences. It is a two-year program, which is conducted in parallel to the academic program of the Faculty. The programme is targeted for undergraduates of combination 2 (who do not follow the subject streams offered by the Department of Computing & Information Systems (CMIS)), and it enhances students' basic IT skills that are required to perform academic program of the Faculty. Furthermore, valuable Certificates are offered for those who successfully complete the programme and it would provide students with added qualifications for highly competitive job market.

Note: Students of combination 1 and 3 can also follow the programme to obtain the Diploma Certificate in IT. Interested students may contact the Director/ICT center Kuliyapitiya.

5.7.1 Details of the Programme

The duration of the Diploma programme is four-semesters (2 academic years). During the first two semesters students will learn basic and essential IT skills. These skills are necessary for successfully complete the undergraduate degree programme of the Faulty where students have to write reports, make interactive presentations using PowerPoint, and analyze data using different software in their projects.

During the third and fourth semesters, students those who wish to learn more than just essential IT skills, can explore a wide range of subjects related to the computer science. With the knowledge gained through these modules, student will become more competent among other graduates who have followed IT related subject streams, when they are competing in the job market.

Students have the option to quit the program after successfully completing the first two semesters with the Advanced Certificate in Information Technology. However, students are strongly advised to obtain the Diploma Certificate completing the entire programme successfully.

Details of the four modules offered under the programme are given bellow:

Semester I:
1. ICT 111 IT Fundamentals
   Main Topics: Fundamentals of Computer Technology, Operating Systems: Windows & Linus, MS Office Application Packages (MS Word, MS Exel), Web Applications, Computer Peripheral Devices.

   Evaluation:
   - Continuous assessment 40%
   - End-semester examination 60%

Semester II:

2. ICT 122 IT Essentials
   Main Topics: Introduction to Computer Programming using C, Web Designing Basics, Creation of Interactive presentation slides using MS Powerpoint, Information Management using MS Access, and Introduction to PC Hardware.

   Evaluation:
   - Continuous assessment 40%
   - End-semester examination 60%

Semester III:

3. ICT 211 IT for Advanced Users
   Main Topics: Computer Networks, Computer Security, Web Application Development, E-commerce, and Introduction to DBMS.

   Evaluation:
   - Continuous assessment 40%
   - End-semester examination 60%

Semester IV:

4. ICT 222 IT for Designer & Developers
   Main Topics: Object Oriented Programming using Java, Graphics Design, Projects

   Evaluation:
   - Continuous assessment 20%
   - Project 40%
   - End-semester examination 40%

Grading

Numeric Score	Grade	Performance
80 & Above	A	Distinction Pass
70…79	B	Merit Pass
60…69	C	Credit Pass
50…59	S	Simple Pass
Below 49	F	Fail

Note: A candidate shall be eligible to obtain a Credit, Merit, or Distinction Pass for a course module, only if he/she has taken the examination at the very first attempt.

Repeat Examinations

There will be no repeat examinations for any module. Students, who are absent for an examination, or those who failed a particular module, may sit for the examination of the module in the following year.

Recommendation:

It has been accepted that every graduate should have sufficient IT skills in all sort of employments. Therefore, passing the first two modules of the Diploma/Advanced Certificate in IT is strongly recommended for the students who follow Combination 2 (those who do not take the subject streams offered by the Department of Computing & Information Systems) in this Prospectus.

§ 6. ACADEMIC PROGRAMME

6.1 General

All four Departments of the Faculty offer course modules in the following subject area(s) indicated against their names:

Department	Subject Area(s)	
Computing & Information Systems	Computing & Information Systems	**[CMIS]**
Electronics	Electronics	**[ELTN]**
Industrial Management	Industrial Management	**[IMGT]**
Mathematical Sciences	Mathematics & Mathematical Modelling, Statistics	**[MATH & MMOD, STAT]**

All Departments contribute to the following degree programmes by offering a number of course modules from the above subject area(s):

- **3-year B.Sc. (General) Degree,**
- **4-year B.Sc. (Joint Major) Degree in** *Major 1* **and** *Major 2*
- **4-Year B.Sc. (Special) Degree in** *Subject Area* *

N.B. * 4-Year B.Sc. (Special) Degree Programme in Computing & Information Systems is being planned and it would be offered once approved by the Senate of the Wayamba University.

The four academic years are indicated as Level 1, Level 2, Level 3, and Level 4 and each student shall be selected into one of the following   3-subject combinations based on the criteria described in section §6.2:

> **COMB 1**   -   **MATH & STAT + CMIS + ELTN**
>
> **COMB 2**   -   **MATH & STAT + ELTN + IMGT**
>
> **COMB 3**   -   **MATH & STAT + IMGT + CMIS**

Based on the overall performance as at end of Level 2 (Semester II), the students can apply for the 4-Year B.Sc. (Joint Major) Degree and the available 4-Year B.Sc. (Special) Degree Programmes in the relevant subject areas within the combination. The selection criteria is described in Section §6.2.

6.2 Combinations and Selection Criteria for Combinations/ Degree Programmes

(a) 3-Year B.Sc. (General) Degree

The students, on admission to the Faculty, can apply for the following combinations in priority order:

> **COMB 1**   -   **MATH & STAT + CMIS + ELTN**
>
> **COMB 2**   -   **MATH & STAT + ELTN + IMGT**
>
> **COMB 3**   -   **MATH & STAT + IMGT + CMIS**

If there is a higher demand for a particular combination than the capacity of the Faculty, the maximum number of students will be selected based on the district quota. That is, the number of placements for a combination shall be decided based on the percentage of registration from each district and the Advanced Level Z-Score. The students not selected for their first preference shall be enrolled based on their second or third preference.

The students who fail to apply in time or who register after the initial selection shall be placed in other combinations depending on the availability of vacancies.

The students preferring a 3-Year Degree and those failing to qualify for the 4-year Degrees at Level 2 can proceed within the same combination of subjects by selecting Mathematics and Statistics, as separate major subjects at Level 3, and read for the 3-Year B.Sc. (General) Degree.

Accordingly, the students could proceed towards the 3-Year B.Sc. (General) Degree in one of the following combinations:

COMB 1A	:	MATH	+	CMIS	+	ELTN
COMB 1B	:	STAT	+	CMIS	+	ELTN
COMB 1C	:	MATH	+	STAT	+	CMIS
COMB 2A	:	MATH	+	ELTN	+	IMGT
COMB 2B	:	STAT	+	ELTN	+	IMGT
COMB 2C	:	MATH	+	STAT	+	ELTN
COMB 3A	:	MATH	+	IMGT	+	CMIS
COMB 3B	:	STAT	+	IMGT	+	CMIS
COMB 3C	:	MATH	+	STAT	+	IMGT

Note: MATH includes modules from both Mathematics and Mathematical Modelling at Level 3.

(b) 4-Year B.Sc. (Joint Major) Degree in *Major 1* and *Major 2*

This degree involves continuation in two subject areas called Major 1 and Major 2 from Level 3 and onwards with an outbound 06-month Industrial Training Programme during the last semester at Level 4. A minimum total of 120 credits is required to qualify for the degree over the four year period of which a minimum of 45 credits must be in each of the two subject areas: Major 1 and Major 2 (i.e. a minimum 90 credits in both subject areas)

Combinations

The available combinations are listed below together with the credit distribution between the two major subjects and the third subject that was followed till end of Level 2.

Combination	Major 1 [Max. Credits]		Major 2 [Max. Credits]		Subject 3 [Levels 1&2]	Total Credits
COMB: 1A	CMIS	[52]	ELTN	[46]	[25]	123
1B	CMIS	[52]	MMST	[48]	[20]	120
1C	CMIS	[52]	IMGT	[46]	[25]	123
COMB: 2A	ELTN	[52]	CMIS	[46]	[25]	123
2B	ELTN	[52]	MMST	[48]	[20]	120
2C	ELTN	[52]	IMGT	[46]	[25]	123
COMB: 3A	IMGT	[52]	ELTN	[46]	[25]	123
3B	IMGT	[52]	MMST	[48]	[20]	120
3C	IMGT	[52]	CMIS	[46]	[25]	123
COMB: 4A	MMST	[54]	CMIS	[46]	[20]	120
4B	MMST	[54]	ELTN	[46]	[20]	120
4C	MMST	[54]	IMGT	[46]	[20]	120

Note: MMST indicates Mathematics, Mathematical Modelling and Statistics.

Selection Criteria

The students who wish to follow a 4-Year Joint Major Degree must reach the following threshold level as at end of Level 2 (Semester II) of the academic programme:

(i) obtain a minimum overall grade point average of 2.5 from all the modules registered

and

(ii) minimum of ordinary pass from English Language Proficiency Tests held at the end of Level 1 and Level 2.

The Major 1 subject area provides the students with the full complement of modules than the modules available for students offering the same subject as Major 2.

Due to limited resources, the intake for some Major 1 subject areas may be limited depending on the capacity at the Departments for that academic year. Therefore, if the demand is higher than the available vacancies, the students with the highest Y-Scores, defined below, will be selected into Major 1.

$$Y = 0.6 \times (A) + 0.4 \times (B)$$

where,

A – the average marks of the modules from the subject area chosen by the student for Major 1 at Level 1 and Level 2,

B – the average marks of the other modules offered by the student at Level 1 and Level 2.

The Major 1 and Major 2 subjects for which a student is selected will be notified before the commencement of the academic year at Level 3. The modules to be selected apart from the two major subject areas should be in accordance with the flexibility provided in the respective semester time tables.

Criteria to Accommodate Extra Curricular Activities/ Achievements

Compulsory

Student should have minimum GPA 2.4.

Priority 1:

Student should possess a patent(s) after being enrolled at the University.

Priority 2:

Student should have peer-reviewed Journal/Conference publications after being enrolled at the University.

Priority 3:

Student should be a winner (one of first three places) of relevant subject related international, national or inter-university competitions such as Exhibitions.

Priority 4:

Student should be a winner (one of three places) of international, national or inter-university competitions such as Sports, English Debates, etc.

Changing the Major Subjects

If a student wishes to change the Major 1 subject area to which he/she has been selected by the Faculty, such requests should be submitted to the Assistant Registrar of the Faculty **within three (03) days** from the commencement of the academic year at Level 3.

Although changing the choice of Major 2 subject area would be possible, changing the Major 1 subject area would be possible only if the vacancies are available and the student has reached the required level of competence at Level 1 and Level 2.

If such a request is allowed, the student should submit new registration forms.

Mutual changes will not be allowed under this provision.

Once the major subjects are finalized, the student will be considered as belonging to the Department of Study that offers his/her Major 1 subject area.

(c) 4-Year B.Sc. (Special) Degrees

These degree programmes will be very competitive for the students aspiring to continue their studies into postgraduate level and to become researchers or specialists in one subject area after graduation. Only a very limited number of students who record the best performance in a particular subject area together with other qualifications specified by the Departments would be selected for the special degree programmes, which include a research project in the final year.

The following special degree programmes are available for the students admitted to the academic year 2014/2015:

4-Year B.Sc. (Special) Degree in Applied Electronics
4-Year B.Sc. (Special) Degree in Industrial Management
4-Year B.Sc. (Special) Degree in Mathematics with Statistics
4-Year B.Sc. (Special) Degree in Computer Science

Selection Criteria

Departments of Computing & Information Systems, Industrial Management & Mathematical Sciences

The prospective students should satisfy the following entry qualifications as at end of Level 2:

(i)   obtain grades of **B** or better for at least 16 credits in Level 1 and Level 2 compulsory modules of the subject to be specialized and obtain **C** or better grades in the remaining Level 1 and Level 2 modules,

(ii)   follow Mathematics & Statistics as a subject in the first two years of study,

(iii)   obtain a minimum overall grade point average of 2.70 from all the modules offered,

(iv)   minimum of ordinary passes from both English Language Proficiency Tests held at the end of Level 1 and Level 2,

(v)   pass an interview conducted by the Faculty to assess the student's contribution to academic societies, participation in extracurricular activities, communication skills, and disciplinary conduct etc. and other specific needs of the Department.

Department of Electronics

The prospective students should satisfy the following entry qualifications as at end of Level 2:

(i)   students must earn 2.7 overall GPA and 3.0 subject GPA to obtain the eligibility to apply special degree programme,

(ii)   follow Mathematics & Statistics as a subject in the first two years of study,

(iii) minimum of ordinary passes from both English Language Proficiency Tests held at the end of Level 1 and Level 2 before ending the Level 3,

(iv)   pass an interview conducted by the Faculty to assess the student's contribution to academic societies, participation in extracurricular activities, communication skills, and disciplinary conduct etc. and other specific needs of the Department.

Changing the Area of Specialization

If a student is selected to more than one special degree programme, he/she should inform the preference to the Assistant Registrar of the Faculty within three (03) days from the commencement of the academic year at Level 3. Once the student is registered to a special degree programme, he/she will not be allowed to change it and the relevant registration forms should be submitted.

All students reading for a special degree will be considered as belonging to the Department that conducts the degree programme and should obtain the approval of the Head of Department for the modules he/she wishes to offer, prior to being registered at each Level 3 and level 4.

6.3   Medium of Instruction

The medium of instruction of all degree programmes will be English and therefore it should be noted that all examination work and material will be set in English medium and the answers should also be given in English medium.

6.4   Registration and De-registration of Modules

As soon as the Time Table for semester I is announced, all students can get an idea about the modules for which they can register for the academic year without facing any clashes in their personal time tables.

At the beginning of each academic year, all students should register for the modules they wish to follow during the academic year by submitting a **Course Registration Form** obtainable from the Faculty Office. The Course Registration Form should be channeled through the Student Counsellor assigned to the student to be received by the Assistant Registrar of the Faculty Office within the first two weeks (02) of the academic year.

No student shall be permitted to change his or her choice of modules or cancel a registration after the first two weeks of the academic year.

N.B. Only the registered students shall be permitted to sit for the examination components of the modules.

Any registration for a course module that is not relevant to the combination offered by the Faculty will automatically be cancelled.

6.5 Validation of Students Registration

6.5.1 Repeat Examination

Renewal of Registration shall be compulsory to sit for repeat examinations.

6.5.2 Deferment

Students shall continue their registration to be eligible to request deferment.

6.6 Annual & Total Minimum/Maximum Credit Requirements

The minimum and maximum number of credits a student can take in an academic year are 30 and 33 respectively. These are excluding the course units to be repeated and the enhancement/auxiliary modules. It is the responsibility of the students to ensure that they are registered for the modules that account for the minimum annual credit requirement.

These annual credit requirements shall ensure that the student fulfills the following minimum/ maximum total credits for the respective following degree programmes:

		Minimum	Maximum
3-Year B.Sc. (General) Degree	-	90 credits	99 credits
4-Year B.Sc. (Joint Major) Degree	-	120 credits	132 credits
4-Year B.Sc. (Special) Degree	-	120 credits	132 credits

6.7 Attendance

As all degree programmes are offered full-time, the students are expected to attend all academic activities regularly and be active participants during their stay at the university. There is obvious correlation between the attendance and examination results. The payment of Mahapola/ Bursaries are determined based on satisfactory attendance and performance of the students. Therefore, a minimum of 80% attendance should be registered by the students for all academic activities such as lectures, tutorial classes, practical classes etc.

However, the students representing the Faculty or the Wayamba University in sports or taking part in other extracurricular activities with prior approval from the Heads of Departments/Dean could be excused from the scheduled academic activities upon producing evidence of participation at such events to the Faculty Office.

§ 7. EVALUATION CRITERIA

7.1 Credit

A credit is a time based quantitative measure assigned to a module and indicates the rating of the module in working towards a degree.

A credit is defined as follows for modules with lectures, practicals, and both lectures & practicals:

15 hours	for modules consisting of	lectures only,
30-45 hours	for modules consisting of	laboratory only,
10 lecture hours & 15 laboratory hours	for modules consisting of	both lectures and laboratory

7.2 Testing of Modules – Method of Evaluation

7.2.1 General

The performance of a student for a module is normally evaluated by a semester-end examination and continuous assessments which may consist of assignments, reports, presentations, mid-semester tests etc. as appropriate to the module.

The exact method of evaluation will be announced by the relevant lecturer at the commencement of the module.

7.2.2 Structure of Modules & Papers

Some modules may consist of a practical component and a theory component of appropriate credit values, which shall be evaluated separately.

Example: The course on Electricity and Magnetism consists of two modules namely,
ELTN 2113 – Electricity and Magnetism
ELTN 2121 - Electricity and Magnetism – Laboratory

A student selecting a theory module should necessarily offer the corresponding practical module as well.

Example: A student selecting the module ELTN 2113 must offer ELTN 2121 as well.

The duration of a semester-end examination paper is determined on the basis of the credit value of the module and is usually distributed as follows:

- 2 credit theory paper – 2 hours,
- 3 credit theory paper – 2 ½ hours,
- 4 credit theory paper – 3 hours, and
- a practical examination – 2-3 hours.

7.2.3 Evaluation of Modules

Though a greater weighting is given to the semester-end examination, the performance at continuous assessments is equally important because it determines the eligibility for sitting the semester-end examination and also accounts for a better overall grade for the module.

The overall mark is usually based on the following allocation:

Overall mark (100) = 70% (semester-end examination) + 30% (continuous assessments)

However, there may be exceptions to the above formula depending on the nature of course module.

7.2.4 Absence for Continuous Assessments

Medical certificates will not be considered for continuous assessments and a student will not receive any marks for the components he/she fails to attend. The absence at continuous assessments will automatically deny the eligibility for sitting the semester-end examination of that module and such a student will belong to the "Not Eligible" category. A student who becomes Not Eligible must redo the continuous assessments at the next available opportunity to be eligible to repeat the module.

7.3 Eligibility for Sitting the Examinations

Proper Students:

The eligibility for sitting the semester-end examination of a module depends heavily on the active participation of the student in the academic activities arranged by the Department throughout the semester. A regular participant is expected to perform reasonably well at the continuous assessments held during a course.

It is compulsory that a student obtains a minimum weighted mean score of 30% from all continuous assessment components of a module, to be eligible to sit for the semester-end examination of a module. A student, who fails to get a minimum weighted mean score of 30% for continuous assessments, will fall into the 'Not Eligible' category and shall not be issued with admission in respect of the module concerned.

Such students must resubmit continuous assessments and earn eligibility from the relevant Department for obtaining admission to sit the next immediately available examination.

Repeat Students:

All students who earned eligibility by submitting continuous assessments but failed to reach the normal pass mark at the overall evaluation after the end-semester examination, will be considered as repeat students.

Such students need not resubmit continuous assessment assignments to obtain admission for subsequent attempt(s) but must resit the next immediately available end-semester examination.

The marks obtained for continuous assessment at the proper attempt will be carried forward to be combined with the marks at the end of semester examination(s) of subsequent resitting(s).

N.B. (1) The highest grade awarded to a student repeating an examination of any module will be C. In the event a student obtains a lower grade while attempting to better the grade, he/she will be entitled to the previous grade.

(2) Students who sit for repeat examinations after the compulsory 3/4 year period of registration for a given degree programme should re-register for the particular academic year in order to maintain their studentship and they will be required to pay a nominal fee for such registration.

7.4 Procedure for Submitting Medical Certificates
(As approved by the Senate of the Wayamba University of Sri Lanka)

1. If a student fails to attend academic activities due to a medical reason, he/she should produce a medical certificate issued by one of the following:

   - the University Medical Officer,
   - a government hospital,
   - a private medical certificate issued by

     (i) a consultant or
     (ii) an MBBS qualified doctor or
     (iii) Ayurvedic physician registered in the Ayurvedic Medical Council which is recommended by the University Medical Officer.

2. **However the medical certificate submitted in respect of an examination matter, should be obtained from a government hospital or by the University Medical Officer.**

3. Every medical certificate should have a date stamp from the Dean's Office and should be entered in the students' medical leave register maintained by the Dean's office and should be sent through proper channel.

4. The student concerned should inform of his/her absence immediately, he/she should tell the illness and should submit a medical certificate within 4 days of his/her return to the Faculty. The medical certificate submitted thereafter will be considered as late and no arrangements

will be made to send them for revising the attendance for lectures, tutorials, practicals, and any other academic activities.

5.   If a student takes medical leave in excess of 10 days per month, he/she should bring a Government Medical Certificate or should inform the University Medical Officer with valid clinical documents. In such situation, student is liable to be summoned before the University Medical Officer to furnish the reasons for leave. If such student fails to provide the evidence for genuineness of medical leave, his/her medical leave period is subject to revision by the University Medical Officer.

N.B.   Under exceptional circumstances, if a student was not able to meet the deadline mentioned above, he/she could send his/her appeal to the Dean to be considered by the Faculty Board and the Senate with the observation of the University Medical Officer. The respective Faculty should obtain the observation of the University Medical Officer before reporting the matter to the Faculty Board and the Senate.

7.5 Number of Attempts for Sitting the Examination

A student shall not be permitted more than three (03) consecutive sittings for the examination of modules conducted at the last academic year without a valid reason substantiated by documentary evidence acceptable to the Faculty Board.

B.Sc. (General) Degree

The students shall not be permitted to re-sit for an examination if he/she has completed a period of five (05) academic years from the date of admission to the University under any circumstances (i.e. even with medical certificates).

All B.Sc. (Joint Major) Degrees and All B.Sc. (Special) Degrees

The students shall not be permitted to re-sit for an examination if he/she has completed a period of six (06) academic years from the date of admission to the University under any circumstances (i.e. even with medical certificates).

7.6 Provision for Re-scrutinizing of Marks and Grades of Undergraduates

Policy Guidelines

➢   All marks and grades obtained by a student at any examination (i.e. in-course assessment, assignment, semester examination, final examination, etc.) must be free of any errors of addition, computation and transcription.

- Provisions shall be made for undergraduate students to submit request for verification of their examination marks and grades, if they wish to do so, particularly for the end-semester examinations and Final Examination.

- **However, the examiners' discretion to allocate marks for the answers presented in the answer scripts for the question(s) presented in the question paper, based on the pre-determined criteria and/or model answer expected shall not to be undermined and hence the verification process will be limited only to check for accuracy of addition, computation and transcription (ACT Verification) and not for re-marking of scripts.**

- The provision for requesting re - scrutinization of marks and grades shall be limited only during the 2 weeks immediately following the release of results of an examination. As the cost of re-scrutinization process must be borne by the student, a non-refundable fee, calculated on the basis of actual cost of re-scrutiny process shall be levied on the student.

- The Dean of the Faculty in consultation with the Chief Examiner of the examination shall convene Results Verification Board, constituted as prescribed by these by-laws and verification of results must be conducted in accordance with the guidelines prescribed herein.

- If the marks and grades are not changed, the candidate shall be notified by the Dean through SAR/AR of the Faculty after the meeting of the Results Verification Board. However, if the marks and grades are changed, the outcome of the verification shall be notified to the candidate (s) only after the ratification of results by the Special Result Board of the Faculty in the case of end-semester examination. Whereas in the case of Final Examination, amended results should only be released after obtaining the approval of the Senate and Council of the University.

- The results issued to the student (s) following the re-scrutiny of marks and grades shall be the final and no more requests shall be entertained thereafter.

Procedures

- SAR /AR of the Faculty should notify the students of the relevant examination the period during which the requests for verification of results are entertained by displaying a notice in the Notice Board of the Deans' Office.

- A payment of Rs. 500/= (subject to revision) per course/subject of an end – semester examination shall be charged for verification of the marks and grades and the issue of application forms (Annexure 1) must be done only upon submission of receipt for the prescribed payment.

- The Dean shall convene the Results Verification Board meeting for verification of marks/ grade within 3 working days upon closure of the applications.

- The Results Verification Board shall consist of the following persons:
    1. Dean of the faculty (convener)
    2. Head of Department (s)
    3. Chief Examiner (if applicable)
    4. Examiners in-charge of each subject/paper

- When the Head is a Chief Examiner/Examiner in charge of each examination / subject/paper, another member from the same Department can be called for the Results Verification Board.

- The Head of Department in-charge of the relevant course (s) / subject(s) shall present the individual marks /grades sheets for different components of the examination (s) (i.e. written, oral, laboratory, continuous assessment, etc.) and the answer scripts for scrutiny of the Results Verification Board.

- The Results Verification Board should proceed to check the accuracy of addition, computation and transcription of results (ACT Verification).

- If the number of applications received is too large the Dean of the Faculty in consultation with the Chief Examiner can appoint relevant Sub-Committees for verification of marks and grades. In such instances verified results should be tabled at the Results Verification Board For ratification.

- If there is no change of grades, the Dean of the Faculty through the SAR/AR of the Faculty should inform the candidate (s) soon after the Results Verification Board meeting.

- A Special Results Board should be held within five working days to ratify the results if a revision of marks /grades is necessary and the decision of the Special Results Board shall be the final.

- If the marks and grades are changed, in the case of end-semester examination the outcome of the verification shall be notified to the candidate (s) following the ratification of amended results by the Special Results Board of the Faculty whereas in the case of final examination, amended results ratified by the Special Results Board further be approved by the Senate and Council of the University before it is released to the candidate (s).

- SAR/AR of the Faculty should maintain a record of all verification applications and the outcome of all applications and should submit a report to the Faculty Board after completion of re-scrutiny process.

Wayamba University of Sri Lanka

Application Form for Verification of Examination Marks & Grades.

Faculty of ……………………………………………

1. **Details of the Candidate**

Name of the Candidate	
Registration No	
Year	Semester	

2. **Assessment (s) to be verified**

End Semester/Final Examination	Course/Subject	Marks Received (If applicable)	Grade Received

Total amount paid: Rs…………..(at the rate of Rs. 500/-per course/ Subject/ Examination):
(Original receipt should be attached)

Date: ……………..   Signature of the Candidate: ..…………………

FOR OFFICE USE :

Results after Verification

End Semester/Final Examination	Course/Subject	Marks Received	Grade received	Changed/Not Changed

Verification Board Members :   **Date of Verification: ……………**

Name	Designation	Signature

Note : In the case of final examination relevant minutes of the Special Result Board and the Senate must be attached.

§ 8. CRITERIA FOR THE AWARD OF DEGREES & HONOURS

8.1 Grading System

Letter grades based on the grade point system and corresponding percentage marks, as illustrated in the Table below will be used to express the performance of a student at each module.

Range of Marks	Grade	Grade Point Value	Description
85 - 100	A+	4.0	Superior Performance [a]
70 - 84	A	4.0	Excellent
65 - 69	A-	3.7	Very Good
60 - 64	B+	3.3	Good, clearly above average
55 - 59	B	3.0	Above average
50 - 54	B-	2.7	Average performance
45 - 49	C+	2.3	Quite Satisfactory
40 - 44	C	2.0	Pass and possesses basic understanding of the subject matter [b]
35 - 39	C-	1.7	Satisfactory
30 - 34	D+	1.3	Weak
25 - 29	D	1.0	Quite Weak
00 - 24	E	0.0	Very weak
	I	0.0	Incomplete [c]

(a) Grade, A+, represents superior performance, showing comprehensive understanding of the subject matter.

(b) A student satisfying continuous assessment requirements and failing to sit the semester-end examination receives an incomplete grade "I". By repeating only the semester-end examination, the grade can be improved to a maximum of "C" grade.

A student registered for a module but failing to sit for continuous assessments or unable to obtain examination eligibility will also be given the grade I.

(c) A student who fails to sit for either the Semester-End Practical Examination or the Semester-End Theory Examination of a course module in CMIS will receive a Grade of I, and the student is required to sit only for the missed component in the next attempt. The maximum grade given for the course module when the student has sat for the missed component in the next attempt is C, unless the reason for absence is accepted by the Faculty Board.

8.2 Grade Point Average

Grade Point Average (GPA) is the credit-weighted arithmetic mean of the Grade Point Values, which is determined by dividing the total credit-weighted Grade Point Value by the total number of credits. GPA shall be computed to the second decimal place.

Example: A student who has completed one course unit with 2-credits, three course units each of 3-credits and two course units each of 1-credit with grades, A, C, B, D, B- and A+ respectively would have the GPA of 2.52 as calculated below.

$$= \frac{(2 \times 4.0) + (3 \times 2.0) + (3 \times 3.0) + (3 \times 1.0) + (1 \times 2.7) + (1 \times 4.0)}{2 + 3 + 3 + 3 + 1 + 1} = \frac{32.7}{13} = 2.5153$$

Grade Point Average = 2.52

Grade point values and credit values of all registered course units excluding the general studies course units, in a study programme of a student shall be taken into account in calculating the final GPA.

N.B. **All credits accumulated by a student shall be taken into account when computing the final GPA in respect of all the degree programmes offered by the Faculty.**

Students should complete all modules registered and if they fail to complete a particular module, it will be indicated in the transcript as "Incomplete" and a zero (0.0) grade point value will be assigned to it.

8.3 MINIMUM REQUIREMENTS FOR OBTAINING A DEGREE

(a) 3-Year B.Sc. (General) Degree:

A student who has completed the first three academic years at Level 1, Level 2, and Level 3 as a full-time student can apply for the B.Sc. (General) Degree upon fulfilling the following credit requirements and the other partial requirements as prescribed in this Prospectus.

Obtain grades of "D+" or better in modules aggregating to a minimum of 90 credits with at least 30 credits at each level.

Furthermore, a student should

(i) **obtain grades of "C" or better for compulsory and/or optional modules worth of 24 credits from each subject area, aggregating to 72 credits from any subject area,**
(ii) **have a minimum overall GPA of 2.00,**
(iii) **obtain minimum ordinary passes at both English Language Proficiency Test I and II, and**
(iv) **complete other relevant requirements within a period of five (05) academic years.**

(b) 4-Year B.Sc. (Joint Major) Degree in *Major 1* and *Major 2*:

A student who has completed all four academic years at Level 1, Level 2, Level 3, and Level 4, as a full-time student can apply for the B.Sc. (Joint Major) Degree upon fulfilling the following credit requirements and the other partial requirements as prescribed in this Prospectus.

Obtain grades of "D+" or better in modules aggregating to a minimum of 120 credits with at least 30 credits at each level.

Furthermore, a student should

(i) obtain grades of "C" or better for compulsory and/or optional modules worth of 45 credits from each major subject area (i.e. "C" or better grades for 90 credits from both Major 1 and Major 2), aggregating to 102 credits from any subject area,

(ii) have a minimum overall GPA 2.00,

(iii) obtain minimum ordinary passes at both English Language Proficiency Test I and II, and

(iv) complete other relevant requirements within a period of six (6) academic years.

(c) 4-Year B.Sc. (Special) Degree in [*Subject Area*]:

Obtain grades of "D+" or better in modules aggregating to a minimum of 120 credits with at least 30 credits at each level.

Furthermore, a student should

(i) obtain grades of "C" or better for at least 72 credits worth of compulsory modules from the subject of specialization aggregating to 110 credits from any subject area,

(ii) have a minimum overall GPA of 2.00,

(iii) obtain minimum ordinary passes at both English Language Proficiency Test I and II, and

(iv) complete other relevant requirements within a period of six (6) academic years.

8.4 Reverting to the B.Sc. (General) Degree

The students reading for the 4-year B.Sc. (Joint Major) Degrees or the 4-Year B.Sc. (Special) Degrees at Level 4 may request the award of the B.Sc. (General) Degree foregoing the B.Sc. (Joint Major/Special) Degrees upon satisfying the requirements for the B.Sc. (General) Degree. This request should be made within two (02) weeks after the release of results of Semester II modules at Level 3 of the degree programme. In these cases, the results of the B.Sc. (General) Degree shall be determined solely on the basis of modules offered at the first three Levels of the degree programme.

N.B.

1. A particular subject area shall be prescribed as a main subject for the B.Sc. (General) Degree in the academic transcript <u>only if</u> the student has offered a minimum 24 credits from that area.

Therefore, the students following the 4-year degrees from Level 3 onwards are strongly advised to offer a minimum of 4 more credits from the subject area to be dropped at Level 3.

2. The students who opt for the 3-year B.Sc. (General) Degree while being registered for Level 4, will be required to pay back all Mahapola or Bursary payments received from the University during Level 4 of the degree programme.

8.5   AWARD OF HONOURS

The students should apply for the award of the degree on satisfying the necessary requirements. On completion of the B.Sc. (General/Joint Major/ or Special) Degree a student is entitled to a transcript giving the grades obtained the respective modules.

The students who have fulfilled the minimum requirements for obtaining a degree may be awarded honours (classes) if they further satisfy the following requirements.

(a) B.Sc. (General) Degree:

First Class Honours

A student who is eligible for the B.Sc. (General) Degree under §8.3(a) may be awarded First Class Honours provided if he/she

(i)   obtains grades of "C" or better in compulsory and/or optional modules worth of 24 credits from each subject area aggregating to at least 90 credits, and grades of at least "C" in the remaining course modules registered (i.e. for all the modules registered except Auxiliary Courses),

(ii)   obtain grades of A or better in modules aggregating to at least half the minimum overall credit requirement (i.e. A grades for at least 45 credits from any subject area,

(iii)   obtains a minimum GPA of 3.70, and

(iv)   completes the relevant requirements within three academic years.

Second Class (Upper Division) Honours

A student who is eligible for the B.Sc. (General) Degree under §8.3(a) may be awarded Second Class (Upper Division) Honours provided if he/she

(i)   obtains grades of "C" or better in compulsory and/or optional modules worth of 24 credits from each subject area aggregating to at least 84 credits and grades of at least "C-" in the remaining course modules registered except Auxiliary Courses,

(ii)   obtains grades of B or better in modules aggregating to at least half the minimum overall credit requirement (i.e. B grades for at least 45 credits from any subject area,

(iii)   obtains a minimum GPA of 3.30, and

(iv) completes the relevant requirements within three academic years.

Second Class (Lower Division) Honours

A student who is eligible for the B.Sc. (General) Degree under §8.3(a) may be awarded Second Class (Lower Division) Honours provided if he/she

(i) obtains grades of "C" or better in compulsory and/or optional modules worth of 24 credits from each subject area aggregating to at least 80 credits and grades of at least "C-" in the remaining course modules registered except Auxiliary Courses,

(ii) obtains grades of B or better in modules aggregating to at least half the minimum overall credit requirement (i.e. B grades for at least 45 credits from any subject area,

(iii) obtains a minimum GPA of 3.00, and

(iv) completes the relevant requirements within three academic years.

(b) B.Sc. (Joint Major) Degree in *Major 1 & Major 2*:

First Class Honours

A student who is eligible for the B.Sc. (Joint Major) Degree under §8.3(b) may be awarded First Class Honours provided if he/she

(i) obtains grades of "C" or better in compulsory/optional modules worth of 45 credits from each major subject area (i.e. Major 1 and Major 2) aggregating to at least 120 credits, and grades of at least "C" in the remaining course modules registered (i.e. for all the modules registered except Auxiliary Courses),

(ii) obtains grades of A or better in modules aggregating to at least half the minimum overall credit requirement (i.e. A grades for at least 60 credits from any subject area)

(iii) obtains a minimum GPA of 3.70, and

(iv) completes the relevant requirements within four academic years.

Second Class (Upper Division) Honours

A student who is eligible for the B.Sc. (Joint Major) Degree under §8.3(b) may be awarded Second Class (Upper Division) Honours provided if he/she

(i) obtains grades of "C" or better in compulsory/optional modules worth of 45 credits from each major subject area (i.e. Major 1 and Major 2) aggregating to at least 112 credits and grades of at least "C-" in the remaining modules registered except Auxiliary Courses,

    (ii)   **obtains grades of B or better in modules aggregating to at least half the minimum overall credit requirement (i.e. B grades for at least 60 credits from any subject area)**

    (iii) **obtains a minimum GPA of 3.30, and**

    (iv) **completes the relevant requirements within four academic years.**

Second Class (Lower Division) Honours

A student who is eligible for the B.Sc. (Joint Major) Degree under §8.3(b) may be awarded Second Class (Lower Division) Honours provided if he/she

    (i)   **obtains grades of "C" or better in compulsory/optional modules worth of 45 credits from each major subject area (i.e. Major 1 and Major 2) aggregating to at least 104 credits and grades of at least "C-" in the remaining modules registered except Auxiliary Courses,**

    (ii)   **obtains grades of B or better in modules aggregating to at least half the minimum overall credit requirement (i.e. B grades for at least 60 credits from any subject area)**

    (iii) **obtains a minimum GPA of 3.00, and**

    (iv) **completes the relevant requirements within four academic years.**

(c) B.Sc. (Special) Degree in *Subject Area:*

First Class Honours

A student who is eligible for the B.Sc. (Special) Degree under §8.3(c) may be awarded First Class Honours if he/she

    (i)   **obtains grades of "C" or better for all the modules offered except Auxiliary Courses,**

    (ii)   **obtains grades of A or better in modules aggregating to at least half the minimum overall credit requirement (i.e. A or better grades for at least 60 credits),**

    (iii) **obtains grades of A or better in modules aggregating to at least half the number of credits accumulated at Level 3 and Level 4 from the subject of specialization,**

    (iv) **obtains a minimum GPA of 3.70, and**

    (v)   **completes the relevant requirements within four academic years.**

Second Class (Upper Division) Honours

A student who is eligible for the B.Sc. (Special) Degree under §8.3(c) may be awarded Second Class (Upper Division) if he/she

    (i)   **obtains grades of "C" or better aggregating to at least 112 credits including all the modules from the subject area of specialization**

and grades of at least "C-" in the remaining modules offered except Auxiliary Courses,

(ii) obtains grades of B or better in modules aggregating to at least half the minimum overall credit requirement (i.e. B or better grades for at least 60 credits),

(iii) obtains grades of B or better in modules aggregating to at least half the number of credits accumulated at Level 3 and Level 4 from the subject of specialization,

(iv) obtains a minimum GPA of 3.30, and

(v) completes the relevant requirements within four academic years.

Second Class (Lower Division) Honours

A student who is eligible for the B.Sc. (Special) Degree under §8.3(c) may be awarded Second Class (Lower Division) if he/she

(i) obtains grades of "C" or better aggregating to at least 104 credits including all the modules from the subject area of specialization and grades of at least "C-" in the remaining modules offered except Auxiliary Courses,

(ii) obtains grades of B or better in modules aggregating to at least half the minimum overall credit requirement (i.e. B or better grades for at least 60 credits),

(iii) obtains grades of B or better in modules aggregating to at least half the number of credits accumulated at Level 3 and Level 4 from the subject of specialization,

(iv) obtains a minimum GPA of 3.00, and

(v) completes the relevant requirements within four academic years.

8.6 Dean's List

Introduction

Undergraduates who achieve an outstanding overall result in the course of an academic year can have their names included in the Deans' List. This is an award for academic excellence, promoted by the Deans of a University, and an honor which will also appear on a student's University transcript.

The Faculty of Applied Sciences encourages excellence in scholarship and gives official recognition to undergraduate students whose academic achievements are outstanding in any given academic year. Any student who meets all the following conditions and obtains a credit-weighted annual grade point average of 3.70 or above for the academic year will be recorded on the Deans' List. The award will be made annually and the Dean's List citation will appear on the transcript.

Criteria

To qualify and be placed on the Dean's List, students must meet the following minimum requirements:

- Be enrolled as a full time undergraduate for an approved Degree program at the Faculty of Applied Sciences.

- Be enrolled for course modules amounting to at least 30 credits (*the minimum prescribed for an academic year*) during the academic year.

- Earn a minimum of 30 letter-grade credits with
  No grade lower than C"
  No failure grades or Incompletes in the qualifying academic year.

- Reach a minimum annual GPA of 3.70 in the qualifying academic year.

- Be not on academic warning or probation or subject to any disciplinary action.

The following shall also be applicable in respect of the selection criteria.

➢ Calculation of Annual GPA:
  All the course modules, excluding the non-credit modules, a student is registered for in an academic year shall be taken into account in calculating the annual GPA.

➢ Failure grades:
  Non-eligibility for a module shall be considered as a failure grade.

➢ Incompletes:
  Students with incomplete grades due to medical reasons or other reasons acceptable to the Faculty board will be evaluated after the incomplete grades are upgraded.

- ➢ Disciplinary action:
  A student who is found to have violated the Code of Student Conduct, Laws, by-laws or regulations of the University or who has received a suspension or greater punishment for a violation of the Code of Conduct will not be eligible for Dean's List in any academic year.

  If the finding occurs after selections have been made, the student's name will be removed from all the Dean's Lists, the Dean's List citation will be removed from the transcript and any letters /certificates issued will be withdrawn.

- ➢ Leave of absence:
  Students who have to take a period of leave of absence for medical or personal reasons will retain their eligibility provided they satisfy the above criteria within the completion time stipulated by the Faculty for the academic year that has been interrupted.

- ➢ Graduate students:
  Graduate students are not eligible for Dean's List.

Selection Process & the Award

- Calculation of grades and selection of students for the Dean's list will take place over the following academic year, once the second semester results are released.
- On the recommendation of the Dean/ Faculty of Applied Sciences and on the approval by the Faculty Board, any student who is eligible under above criteria will be placed on the Deans' List.
- On graduation, students who were in the Dean's List will be issued with a certificate from the Dean.
- Notation of Dean's List standing will be made on the grade report and on the official transcript.
- Further recognition may be granted at graduation/convocation for students who were in the Dean's List for more than one academic year.

§ 9. DETAILED SYLLABII OF MODULES

9.1 Computing and Information Systems (25 modules)

Code/Title of the Module: CMIS 1113 – Introduction to Computers and Operating Systems

Aims:
- To introduce students to theoretical Computer Science and to provide a good foundation to follow Computer Science modules found later in the course.

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- explain the evolution of computers, the components of a computer and the use of computers.
- explain the basics of operating systems and operating environment.

Content:
Evolution of computers: computer generations, classification of computer systems.
Computer organization: basic components, data representation and storage, logic gates, software and introduction to computer architecture.
Introduction to Operating Systems: Fundamentals of process management, memory management, deadlocks, file system managements, comparison of major operating systems.
Single user, multi-user, and distributed systems, embedded systems;
Introduction to Networks: data transmission, transmission technologies (wireless, wired, optical.), network topologies, classification of networks (LANs, WANs, Mans,…), protocols (ISO/OSI, TCP/IP) Internet and email

Assessment:

Continuous Assessments	30%	
Semester-End Theory Examination	70%	

References:
- C.S.French, Computer Science, 5th edition, DP Publication Ltd, 1996.
- Ray Bradley, Understanding Computer Science for Advanced Level, Nelson Thornes, 2001.
- Glenn Brookshear, Computer Science – An overview, 11th edition, Addison Wesley, 2011.
- Abraham Silberschatz, Operating Systems Concepts, 8th edition , Wiley, 2008.
- Andrew S. Tanenbaum, Modern Operating Systems, 4th edition, Pearson, 2014.

Time Allocation: Lectures 3hrs (per week)

Code / Title of the module: CMIS 1123 – Computer Programming -I

Aims:
- To provide knowledge and understanding on programming techniques of procedural programming languages.

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- describe the importance of programming languages,
- explain the basics and the facilities available in C language,
- solve simple problems through algorithms,
- implement algorithms in C programming language.

Content:
Introduction to programming: A brief history and type of programming languages, Structured Programming approach, software development strategy and simple problem solving.
C programming: Data types, constants, identifiers, I/O operations, operators, control structures, Functions & parameter passing, arrays and pointers, structured data types, programmer defined data types and File Handling.

Assessment:

Continuous Assessments	30%	
Semester-End Theory exam	70%	

Reference:
- Gotfield B.S, Theory and problems of programming in C , Schaum's Outline Series, 1996
- Rajaraman V., Computer Programming in C , 2006.
- Kelly A.L, & Pohl I, A book on C : Programming in C., 1997.

Time Allocation : Lectures 3hrs (per week)

Code / Title of the module: CMIS 1131 – Practical Computing I

Aims:

- To provide practical knowledge and understanding on Linux environment and C programming.

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- work on Linux environment,
- describe the basics and the facilities available in C programming language,
- solve simple problems using C.

Co-requisites: CMIS 1113 and CMIS 1123.

Content:
Introduction to Linux operating system and its applications, Linux commands, Shell scripting;

C programming practical: Introduction to C compiler, I/O operations, access specifiers, operators, control structures, Functions & parameter passing, arrays and pointers and file handling.

Assessment:
Continuous Assessments	30%
Semester-End Practical exam	70%

Reference:
- Gotfield B.S., Theory and problems of programming in C , Schaum's Outline Series, 1996
- Rajaraman V, Computer Programming in C , 2006.
- Kelly A.L, & Pohl I, A book on C : Programming in C., 1997

Time Allocation: Practicals 2 hrs (per week)

Code / Title of the module: **CMIS 1212 – Computer Programming II**

Aims:
- To provide knowledge and understanding on programming techniques of object oriented programming languages.

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- describe the basics and the facilities available in Java programming language,
- use object oriented languages to develop simple algorithms,
- solve problems using Java

Content:
Data types, operators in Java, keywords and imports in Java, access modifiers, control structures, functions, arrays, string functions, recursion, classes, interfaces, packages, input/output, exception, file handling, Applet.

Assessment:
Continuous Assessments	30%
Semester-End Theory exam	70%

References:
- Advanced Java 2 how to Program, Paul J.Deitel, et al. 2001.
- Object-Oriented Software Construction, B.Meyer, 1997.

Time Allocation: Lectures 2hrs (per week)

Code / Title of the module: CMIS 1221 – Practical Computing II

Aims:
- To provide knowledge and hands on experience in object oriented programming languages.

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- demonstrate the basics and the facilities available in Java,
- use Java programming language to design and implement programs
- get hands on practical experience and skills in Java programming,

Content:
Hands-on applications in design and implementation of programs using Java.

Assessment:
Continuous Assessments	30%
Semester-End practical exam	70%

Reference:
- Advanced Java 2 how to Program, Paul J.Deitel, et al.2001.
- Object-Oriented Software Construction, B.Meyer, 1997.

Time Allocation: Practical 2 hrs (per week)

Code / Title of the module: CMIS 2113 – Object Oriented Programming

Aims:
- To introduce a new way of thinking about problems using models organized around real world concepts.
- To introduce the principles and concepts of object oriented analysis and design.

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- describe object-oriented concepts,
- analyse given real world problems and design solutions using object oriented concepts,
- implement object oriented concepts in an object oriented language.
- design and implement object oriented programs using Java programming language

Content:
Background and motivation of object oriented methods, concepts and principles of object oriented programming, inheritance, polymorphism, etc., implementation of object oriented programming concepts using an object oriented language.

Practical: Hands-on applications in design and implementation of object oriented programs using Java.

Assessment:
Continuous Assessments	20%
Semester-End practical exam	30%
Semester-End Theory exam	50%

Reference:
- Object-Oriented Software Construction, B.Meyer, 1997
- Object-Oriented Modelling and Design, J.Rumblaugh, et al
- Object-Oriented Analysis and Design with Applications, G.Booch
- Advanced Java 2 how to Program, Paul J.Deitel, et al., 2001

Time Allocation: Lectures 2 hrs + Practicals 2hr (per week)

Code / Title of the module: CMIS 2123 – Database Management Systems

Aims:
- To provide knowledge and specialized skills in database management including the ability to analyze, design & develop and manipulate electronic databases and manage & maintain electronic database systems.

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- describe the concepts of Database Management,
- identify database management systems
- analyse the real world and design databases to store real world data,
- formulate queries to retrieve information from a database,
- address common concurrency issues,
- design physical relational databases.

Content:
Introduction to DBMS, advantages of DBMS approach, DBMS Architecture, Relational Model and Entity Relationship(ER) Modelling, Relational Database Design, Sequential Query Language (SQL), Normalization, Query Optimization and Relational Algebra, Database Security and Integrity, Concurrency Control Techniques, Recovery, Physical organization of databases, Hashing Techniques and Introduction to Distributed Databases.

Assessment:

Continuous Assessments	10%
Semester-End Practical Examination	30%
Semester-End Theory Examination	60%

References:
- Fundamentals of Database Systems, 7th Ed., Ramez Elmasri and Shamkant B. Navathe, 2017.
- Database Management Systems, 3rd Ed., Raghu Ramakrishnan and Johannes Gehrke, 2003.

Time Allocation: Lectures 3 hrs + Practical 2 hrs (per week)

Code / Title of the Module: CMIS 2214 - Data Structures & Analysis of Algorithms

Aims:
- To provide a sound knowledge on abstract data types in a programming language and to implement and analyze known sorting and searching algorithms written in the same programming language.

Intended Learning Outcomes: On completion of the module, students should be able to
- design and analyze a given algorithm
- apply linear and non-linear data structures to design efficient applications

Pre-requisites: CMIS 2113

Content:
Introduction to Data structures: A general introduction to data structures, The need for data structures in programming, Data types, Data structures and abstract data types, Homogeneous and heterogeneous structures, Static and dynamic structures.
Introduction to Analysis of Algorithms: A brief introduction and analysis of simple algorithms, Efficiency of various sorting algorithms and the need for external sorting.
Data Structured: Arrays, Strings, Sets, Structures, Lists, Stacks, Queues.
Searching Techniques: Linear Search and Binary Search
Sorting Techniques: Exchange (Bubble) Sort, Insertion Sort, Selection Sort, Shell Sort, Quick Sort, Heap Sort, Merge Sort etc.
Hands-on practical using data structures and algorithms

Assessment:

Continuous Assessments	10%
Semester-End Practical Examination	30%
Semester-End Theory Examination	60%

References:
- Data Structures and Problem Solving Using Java by M. A. Weiss, Addision-Wesley (latest edit.)
- Introduction to Data Structures and Algorithms with Java by G. W. Rome, Prentice-Hall, Europe.
- Introduction to Algorithms, 2nd edition, T.H. Cormen et al., 2001
- Analysis of Algorithms by M. A. Weiss, Addision-Wesley (latest edition)
- Data Structures in Java by Thomas A. Standish, Addison-Wesley (latest edition)

Time Allocation: Lectures 3 hrs + Practical 2hrs (per week)

Code/ Title of the Module: CMIS 3114 - Data Communication & Computer Networks

Aims:
- To examine the use of computer networks and to identify the forces behind their development.
- To design and implement various network topologies, architectures, protocols and algorithms.

Intended Learning Outcomes: On completion of the module, the students should be able to
- define layered architecture of networks, network operating systems, distributed systems.
- set up a communication link using modems
- set up a TCP/IP Ethernet LAN
- monitor the operation of a network.

Pre-requisites: CMIS 2234

Content:
Introduction**:** Network structures and protocol hierarchies.
The physical layer**:** transmission media, and analog and digital transmission.
The medium access sub-layer: CSMA/CD, token bus, token ring, GSM, CDMA.
The data link layer : framing, error detection and correction , error control and flow control and data link protocols.
The network layer: routing algorithms and internetworking, IP address.
The transport layer: transport protocols, ATM, connection management, TCP ports, socket programming
The application layer: protocols, data compression, data security and encryption
Hands-on practical in network design and programming

Assessment:

Continuous Assessments	10%
Mini-Project / Presentation	30%
Semester-End Theory Examination	60%

References:
- Tanenbaum A.S., 'Computer Networks '5th Edition, Prentice-Hall 2011.
- Halsall F., 'Data communications, Computer Networks and OSI ', 4th Ed., Addison-Wesley, 1995.
- Shay W. A., 'Understanding Data communication and Networks', PWS Publishing Comp., 1994.
- Introduction to Data Communications and Networking, W. Tomasi, 2011.

Time Allocation: Lectures 3 hrs + Practical 2hrs (per week)

Code/ Title of the Module: CMIS 3122 - Rapid Application Development

Aims:
- To introduce current techniques in Rapid Application Development
- To provide opportunity for planning, designing, scheduling, controlling, and implementing a new application as a member of a team

Intended Learning Outcomes: On completion of the module, students should be able to
- explain the role of 4GL languages in Rapid Application Development
- implement a simple appropriate system in the exemplar 4GL chosen
- explain the characteristics of fourth generation languages and to describe their opportunities and limitations
- combine software development methods, tools, and management techniques to implement software solution to real world problems.

Pre-requisites: CMIS 1123, CMIS 1212, CMIS 2113, CMIS 2213

Content:

The module is built around practical sessions throughout the semester during which the students will be introduced to RAD concepts and the capabilities of the fourth generation programming languages. The module also trains students in depths of combining software development methods, tools, and management techniques to achieve rapid application development.

The module is assessed based on a software development project of six months duration.
The software development project is a two member group project. Preference is given for a client project. The students will prepare a log book of their laboratory sessions individually to record the progress and individual contribution to the project. This log book will contribute to Continuous Assessments.

Assessment:

Continuous Assessment (Log book, Interim presentations)	40%
Software Development Project (Final Software Product, Presentation, Viva)	60%

References: Use of electronic sources is highly recommended

Time Allocation: Practicals 4 hrs (per week)

Code/ Title of the Module: CMIS 3134 - Computer Architecture & Compiler Design

Aims:
To provide knowledge on
- internal structure of a computer and the functionality of a computer.
- performance based architecture.
- principles and practices of the design and implementation of compilers and interpreters.

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- describe the computer organization,
- explain the memory organization and the Input / Output operations,
- describe internal functionality of hardware in different processing environments,
- explain issues and features in programming language design and implementation,
- identify how compilation and linking work together to make large systems possible.

Pre-requisites: CMIS 1123, CMIS 1131, CMIS 1212, CMIS 1221, CMIS 2113

Content:
Computer Architecture
Basic hardware, Instruction set architecture and design, Processing unit design, Memory system design, Input / Output design and organization, Pipelining design technique, Reduced instruction set computers.

Compiler Design
Stages of the compilation and execution process: lexical analysis; parsing; symbol tables; type systems; scope; semantic analysis; intermediate representations; run-time environments and interpreters; code generation; program analysis and optimization; and garbage collection.

Assessment:

Continuous Assessments	10%
Project / Presentation	30%
Semester-End Theory Examination	60%

References:
- Logic and Computer Design Fundamentals, M.Morris Mano, Charles R. Kime.
- Computer Architecture & Logic Design, Tomas C. Bartee.
- An Introduction to Assembly Language Programming for 8086 Family, Tomas P. Skinner.
- Modern Compiler Implementation in Java, Andrew Appel, 2nd Edition, Cambridge, 2002.
- Basics in Compiler Design, Torben Mogensen, 2007.

Time Allocation: Lectures 3hrs + Practical 2hr (per week)

Code/ Title of the Module: CMIS 3142 - Computational Methods

Aims:
- To provide knowledge on numerical methods for Computational science and program design to solve real world problems using numerical methods.

Intended Learning Outcomes:
On successful completion of this course module, students should be able to:
- Interpret data representation and computational errors,
- Identify basics and methods to solve systems of linear equations,
- Solve given real world problems using numerical methods:
  - i.   Analyze different ways of solving problems using numerical methods
  - ii. Compile all possible alternative solutions
  - iii. Program design from each solution
  - iv. Compare all the alternative solutions and recommend the best solution

Content:
- *Data Representation and Computational Error:*
  - o Floating-point numbers, rounding rules, machine precision, floating-point arithmetic; well-posed problems, problems vs. algorithms, data error vs. computational error, forward error vs. backward error, conditioning of a problem, stability of an algorithm.
- *System of Linear Equations:*
  - o Programming aspects for different types of matrices such as full matrix, symmetric matrix, sparse matrix, symmetric sparse matrix, row vector, column vector.
  - o Program Design for matrices and other relevant Operations, SOR (Successive over relaxation Method), Cholesky Method, ICCG (Incomplete Choleski Conjugate Gradient method).
  - o Program design for different problems using matrices.
    Implementation using an Object Oriented Programming Language.
- *Fixed point iteration, Jacobian Matrix, Finite Difference Method*

Assessment:

Continuous Assessments	30%
Semester-End Theory Examination	70%

References:
- Jennings, A., Matrix computation for engineers and scientists, John Willey, London, 1977.
- E. Kreyszig, Advanced Engineering Mathematics, John Willey & Sons, Inc., Singapore, 1999.
- Hoole, S.R.H., *Computer Aided Analysis and Design of Electromagnetic Devices*, Elsevier, 1989.

Time Allocation: Lectures 2hrs (Per week)

Code/ Title of the Module: CMIS 3214 - Software Engineering

Aims:
- To introduce the principles of Software Engineering as an engineering discipline with insight into the processes of software development.
- To provide comprehensive knowledge on software engineering analysis & techniques and application using an object-oriented approach.

Intended Learning Outcomes: On successful completion of this module, students should be able to
- describe Software Engineering principles.
- use appropriate systems analysis and design methods and techniques for a given systems development scenario.

Pre-requisites: CMIS 2113

Content:
Systems development Life-cycle Model:
Requirement Engineering: requirements elicitation and analysis, requirements specifications;
Software Design: Design Issues, Architectural Design, Prototyping, Abstract Specifications;
Object Oriented Analysis and Design using Unified Modeling Language (UML);
Verification and Validation: Testing Process, Testing Strategies, Defect Testing;

Operation and Maintenance: Maintenance Operation, Maintenance process;
Configuration Management: Configuration Identification, Configuration Control;
Support Processes and Software Quality

Assessment:

Continuous assessment	10%
Project / Presentation	30%
Semester-End Theory Examination	60%

References:
- Rambaugh J., Jacobson I. and Booch G., The Unified Modeling Language Reference Manual Addison-Wesley, 2005
- Sommerville, I., Software Engineering, 8th edition, Addison Wesley, 2006
- Pressman R. S. and Ince D., Software Engineering: A Practitioner's Approach, McGraw-Hill, 2007
- Kruchten P., The Rational Unified Process - An Introduction, Addison Wesley

Time Allocation: Lectures 3 hrs + Practical 2hrs (per week)

Code/ Title of the Module: CMIS 3224 - Web Designing & e-Commerce

Aims:
- To provide a comprehensive understanding & the technology available for web-based application design and e-commerce applications.
- To explore the opportunity and potential impact of deploying electronic commerce strategies in business and consumer-related activities, including development and delivery of products and services in commercial markets.

Intended Learning Outcomes:
On completion of this module, the student will be able to
- use multimedia for web design
- identify web development tools
- describe the Legal   and regulatory aspects of e-commerce
- design e-enabled dynamic web sites.

Pre-requisites: CMIS 1113, CMIS 1123, CMIS 1212

Content:
Principles of multimedia document management, Hypertext, Hypermedia, distributed multimedia, web designing tools, HTML, creation of web sites, Adding multimedia features, Aspects of maintaining websites, security features, Dynamic Web documents, Scripting languages, Databases connectivity.
E-commerce; Overview of e-commerce applications, web enabled systems, Legal   and regulatory aspects of e-commerce, new trends and implications of e-commerce applications.

Assessment:

Continuous Assessments	10%
Mini-Project / Presentation	30%
Semester-End Theory Examination	60%

References:
Due to the rapid changes in the subject area, references will be recommended at the beginning of the course.

Time Allocation: Lectures 3 hrs + Practical 2hrs (per week)

Code/ Title of the Module: CMIS 3234 – Computer Graphics and Visualization

Aims:
- Enable the student to understand the computer generation and manipulation of images
- Provide an understanding of how humans use vision to perceive information.
- Provide knowledge on stages of computer visualization

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- explain how humans perceive graphical information effectively,
- explain the principles of computer vision and how to it can be used in practical applications,

- perform mathematical representation of shapes and forms accurately,
- animate computer generated images accurately,
- effectively visualize computer generated images for human understanding.

Pre-requisites: CMIS 3142

Content:
Basics of Human visual perception, Shader-based OpenGL programming, Coordinate systems and transformations, Quaternions and the Arcball interface, Camera modeling and projection, OpenGL fixed functionality including rasterization, Material simulation, Basic and advanced use of textures including shadow mapping, Image sampling including alpha matting, Image resampling including mip-maps, Physical simulation in animation, Ray tracing

Computer Vision: Human color perception, Discrete geometry and quantization, length estimations, automated visual inspection, object recognition and matching, depth perception problems, stereo geometry and correspondence, motion analysis, optical flow, applications of Computer Vision, remote sensing, biomedical imaging, document processing, target tracking.

Assessment:

Continuous Assessments	10%	
Project /Presentation	30%	
Semester-End Theory Examination	60%	

References:
- Wright R. S. Jr., Sweet M. R.; OpenGL SuperBible, Waite Group, 1997
- Neider J. et al ; Open GL Programming Guide, Addison Wesley, 1993
- S. J. Gortler, Foundations of 3D Computer Graphics, (Latest Ed.)

Time Allocation: Lectures 3hrs + Practical 2hr (per week)

Code/ Title of the Module: CMIS 3242 – Mobile and Ubiquitous Computing

Aims:
- To Enable the student to understand the wireless networks and their operation
- To Provide an understanding of the functions of wireless networking.
- To Provide knowledge on usage of wireless networks and future trends

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- describe the operations and types of wireless networks effectively,
- explain the functions and limitations of wireless networks in practice,
- identify potential usage of wireless networks and their future implementations and research.

Pre-requisites: CMIS 3114

Content:
Overview of use of intelligence in mobile systems: Power management, replication, adaptation, Power management issues, Green communications etc.
Properties of wireless Networks: Basic structure and operation, broadcast, transcoding, Ad-hoc and infrastructure networks. Physical constraints (transmission & reception). Network structures and architectures, hand-off and mobility support.
File systems, Mobile infrastructure support: Mobile middleware. Resource/neighbor discovery including peer-to-peer and gossip protocols.
Wireless technologies: Bluetooth. LANs – IEEE 802.11, Next generation wireless (3G/4G/5G), LTE, UMTS, IMT-2000 and W-CDMA.
Mobile IP: Mobile IPv4 and Mobile IPv6. Routing issues, QoS.
Adaptive and reconfigurable systems, Mobile multimedia, Proxying, Overlay networks and vertical hand-offs, Programmable networking, Applications for mobile systems, Code mobility and control/signaling, Pervasive computing, Ambient networking, Smart cities, Smart Grid, Internet of Things, Internet of Everything.

Assessment:

Continuous Assessments	10%	
Project /Presentation	30%	
Semester-End Theory Examination	60%	

References:
- Handbook on Mobile and Ubiquitous Computing: Status and Perspective, Laurence T. Yang, Evi Syukur, Seng W. Loke, CRC Press, 2012 .
- Ubiquitous Computing Fundamentals 1st Edition , John Krumm, Chapman and Hall/CRC, 2009.

Time Allocation: Lectures 2hrs (per week)

Code/ Title of the Module: CMIS 4114 - Artificial Intelligence

Aims:
- To provide basic knowledge on theory and practice of Artificial Intelligence as a discipline about intelligent agents.

Intended Learning Outcomes:
On successful completion of this module, students should be able to
- describe the use of Artificial Intelligence (AI), its techniques and its main subfields, with emphasis on computational aspects.
- define basic concepts and techniques of neural networks
- use basic Fuzzy Logic concepts in intelligent systems applications.

Pre-requisites: CMIS 1113, CMIS 1123, CMIS 2113, CMIS 2214, CMIS 2234

Content:
Artificial intelligence: Intelligent Agents, Search Techniques, Knowledge and Reasoning, First Order Logic, Logical Reasoning Systems, Uncertainty, Probabilistic Reasoning.
Neural Networks: Parallel and Distributed Processing, Neuron, Connectivity, Activation Function, Propagation Rule, Learning Rules, Pattern Preparation, Perception, Multilayer Perception.
Fuzzy Logic: Fuzzy Set Theory, Fuzzy Arithmetic, Fuzzy Relations, Possibility Theory, Fuzzy Inference, Approximate Reasoning.

Assessment:
Continuous assessments	10%
Mini Projects / Presentations	30%
Semester-End Theory Examination	60%

References:
- Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, (3rd nd Edition), 2010.
- E Rich and K Wright – Artificial Intelligence , (2nd edition), 1991.
- Dean, Allen, and Aldimonos - Artificial Intelligence Theory and Practice, 1995.
- G F Luger and W Stubblefield – AI and Design of Expert Systems (2nd edition), 1989.

Time Allocation : Lecture 3 hrs + Practical 2 hrs (per week)

Code/ Title of the Module: CMIS 4133 - Advanced Operating Systems

Aims:
To enable students:
- To understand the support offered by the architecture to the operating system.
- To explore the relationship between architecture and program execution.
- To investigate the influence on software design of the techniques used for improving the performance of a computer system.
- To investigate the implementation of software features in hardware and the changes that have made this possible.
- To reflect on the different architectures in use and the rationale behind them.

Intended Learning Outcomes:
On successful completion of this module, students will be able to
- identify modern and classical operating systems
- explain the design and use of modern, process oriented operating systems.

Pre-requisites: CMIS 1113, CMIS 2234

Content:
History of Operating Systems, Operating System concepts.

Process management: IPC (inter process communication), process scheduling.
Memory management: Normal memory management, Swapping, virtual memory, paging and replacement algorithms, segmentation.
File management: Files, directories.
Input/out put
Deadlocks.

Assessment:

Continuous Assessments	10%
Project/ Presentation	20%
Semester-End Theory Examination	70%

References:
- Operating System Concepts, 6th Edition, Abraham Silberschatz, et al.
- Modern Operating Systems, 2nd Edition, Andrew S. Tanenbaum.

Time Allocation: Lectures 3 hrs (per week)

Code/ Title of the Module: CMIS 4144 – Distributed and Cloud Computing

Aims:
- To provide knowledge and understanding on Distributed and Cloud computing technologies and concepts

Intended Learning Outcomes:
On successful completion of this course module, students should be able to

- describe the theory and practice of distributed computing,
- critically compare and contrast cloud models and their associated enabling technologies,
- identify and categorize platforms and software environments for cloud computing.

Pre-requisites: CMIS 1212, CMIS 1221, CMIS 3114

Content:
Introduction to distributed computing; principles of distributed computing: communication, processes, naming, synchronization, Introduction to the cloud computing paradigm:, key features and challenges; Cloud system models such (IaaS), (Paas), (SaaS), Virtual Machines and Virtualization; Design of Cloud Computing Platforms and Scalable Computing, Cloud Case studies such as OpenStack, Hadoop; Personal Cloud

Assessment:

Continuous Assessments	10%
Project	30%
Semester-End Theory Examination	60%

References:
- Cloud Computing: Concepts, Technology & Architecture, 1st Ed., Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Prentice Hall, ISBN 13: 9780133387520

- Distributed Systems: Concepts and Design, 5th Ed, George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair, Addison Wesley, ISBN 0-13-214301-1

Time Allocation: Lectures 3hrs + Practical 2hrs (per week)

Code/ Title of the Module: CMIS 4152 - Image Processing

Aims:
- Provide essential knowledge about digital representation of images, image processing techniques, and their applications.
- Provide Basic knowledge of digital video and motion estimation.

Objectives:
At the end of the course, students should be able to
- Describe the human image perception mode effectively,

- Describe and apply image quality enhancement techniques,
- Define basic concepts of image compression techniques,
- Apply mathematical techniques and related algorithms for image understanding.

Content:
Introduction to digital images: why digital images, the digital camera, data types and 2D, 3D and higher dimensional representations, fundamental steps in digital image processing, elements of visual perception, light and electro-magnetic spectrum, image sensing and acquisition, sampling and quantization, relationships between pixels, **Image transformations**: histogram processing, spatial filtering, fuzzy techniques, **Filtering in the frequency domain**: Fourier transform, DFT, filtering, **Morphological image processing**: erosion, dilation, opening, closing, hit-or-miss transform, gray scale morphology, **Image segmentation**: point, line and edge detection, threshold, region based segmentation, watersheds, **Representation and description**: boundary descriptors, regional descriptors, **Object recognition**: patterns, pattern classes, classification, **Color image processing**: color models, image segmentation based on color. Performance evaluation and ROC analysis
Image Processing (practice): Digital image representations, reading, displaying and writing images, data classes, image types, histogram processing, filtering, morphological processing, image segmentation, classification

Assessment :

Continuous Assessments	10%
Project /Presentation	30%
Semester-End Theory Examination	60%

References :
- Digital Image Processing (2nd Edition), Rafael C. Gonzalez, Richard E. Woods
- Computer Vision: Algorithms and Applications, Richard Szeliski.

Time Allocation: Lectures 2 hrs (per week)

Code/ Title of the Module: CMIS 4†18 - Research Project

Aims:
- To enable the students to apply fundamental concepts, tools and techniques in Computer Science into real world applications.

Intended Learning Outcomes:
On completion of this module, a student should be able to
- analyze a practical case and provide a practical computing solution.
- communicate scientific matters and findings effectively in both written and oral form

Pre-requisites: CMIS 1123, CMIS 1212**,** CMIS 2113, CMIS 2214, CMIS 3214

Content:
The supervised and guided research project, carried out throughout the academic year,   will be based on strong theoretical aspects of Computer Science. Students are required to present their work orally and prepare a comprehensive research report.

Assessment:

Continuous Assessments	20%
Oral Presentation	30%
Reports	50%

Time Allocation: 4hrs per week, throughout the academic year

Code/ Title of the Module : CMIS 4†24 - Project

Aims:
- To enable the student to apply what was studied in the classroom into real world problems.

Intended Learning Outcomes:
- On completion of this module, a student should be able to analyze a practical case and provide a practical software solution.

Pre-requisites: CMIS 1123, CMIS 1212**,** CMIS 2113, CMIS 2123, CMIS 3214

Syllabus:
The project / research project will be based on selected areas of the modules/subjects followed.

Assessment:

Presentation	30%
Report	70%

Code/ Title of the Module: CMIS 4213 - Data Mining

Aims:
- To provide knowledge and understanding about Data mining concepts and techniques

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- define basic concepts and techniques of Data Mining effectively,
- use recent data mining software for solving practical problems,
- conduct independent study and research.

Pre-requisites: CMIS 2234, CMIS 2213

Content:
Introduction to Data Mining, Data preprocessing, Data mining knowledge representation, Attribute-oriented analysis, Data mining algorithms: Association rules, Data mining algorithms: Classification, Data mining algorithms: Prediction, Mining real data, Clustering, Advanced techniques, Data Mining software and applications.

Assessment:

Continuous Assessments	10%
Semester-End Practical Examination	30%
Semester-End Theory Examination	60%

References:
- Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Ian H. Witten and Eibe Frank, Morgan Kaufmann 2005,.

Time Allocation: Lectures 2hrs + Practical 2hr (per week)

Code/ Title of the Module: CMIS 4223 - Parallel Computing

Aims:
- Provide knowledge of the fundamentals of parallel computing
- Provide an understanding on usage of parallel computing in current and future technologies

Intended Learning Outcomes:
On successful completion of this course module, students should be able to
- Explain fundamentals of parallel computing effectively,
- Define the functions and limitations of parallel computing,
- Identify potential usage of parallel computing and their future implementations.

Pre-requisites: CMIS 3114, CMIS 4144

Content:
Fundamentals of parallel computing: currency and parallel execution, consistency in state/memory manipulation, latency, communication and coordination among processes, message-passing, shared-memory models of computing, atomicity, consensus, and conditional waiting.
Parallel algorithms: Classification, strategies for problem decomposition, system architecture, implementation strategies, performance analysis and tuning. Algorithms for synchronous/ asynchronous parallel computers.

Assessment:

Continuous Assessments	10%
Mini Project/ presentation	30%
Semester-End Theory Examination	60%

References:
- Computer Architecture and Parallel Processing; Hwang, K., Briggs, F., McGraw-Hill; 1984

Time Allocation: Lectures 3hrs (per week)

Code/ Title of the Module: CMIS 4233 – Advanced Database Systems

Aims: To provide comprehensive knowledge in advanced concepts of database management in order to be able to,
- Critically compare and contrast emerging architectures for database management systems
- Understand the manner in which object relational database systems are implemented and the implications of the techniques of implementation for database performance
- Appreciate the impact of emerging database standards on the facilities which future database management systems will provide

Intended Learning Outcomes:
On successful completion of this course module, students should be able to,
- Critically analyze and improve relational database systems,
- Critically assess new developments in database technology,
- Design and develop and/or improve advanced database management systems such as object relational database systems and distributed databases,
- Apply Data warehousing and On-line Analytic Processing techniques in various data management contexts.

Pre-requisites: CMIS 2123

Content:
Advanced Indexing and Query Processing, Database views, triggers and stored procedures, Simple and multi-dimensional Index Structures, Advanced disk management, Query optimization, Design and development of Object-oriented/object-relational databases, Data warehousing, On-line Analytic Processing (OLAP), Heterogeneous databases and data integration, other database systems: Distributed databases

Assessment:
Continuous Assessments	10%
Practical Examination/Mini Project	30%
Semester-End Theory Examination	60%

References:
- Database System Concepts, Abraham Silberschatz, Henry F. Korth and S. Sudarshan, 2011
- Database Management Systems - 3rd Ed., R. Ramakrishnan, J. Gehrke , 2003.
- An Introduction to Database Systems- 8th Ed., C.J. Date, 2003.

Time Allocation: Lectures 2 hrs + Practical 02 hrs (per week)

Detailed Breakdown of Continuous Assessments

Course Code	Title	Continuous Assessment Components		
		Mid-Semester Exam %	Assignments / Tutorials / Quizzes / Presentations (#) %	Total %
CMIS 1113	Introduction to Computers and Operating Systems	15%	(5-8) 15%	30%
CMIS 1123	Computer Programming I	15%	(5-8) 15%	30%
CMIS 1131	Practical Computing I	-	(5-10) 30%	30%
CMIS 1212	Computer Programming II	15%	(5-8) 15%	30%
CMIS 1221	Practical Computing II	-	(5-10) 30%	30%
CMIS 2113	Object-oriented Programming	10%	(2-5) 10%	20%
CMIS 2123	Database Management Systems	6%	(2-4) 4%	10%
CMIS 2214	Data Structures & Analysis of Algorithms	5%	(2-5) 5%	10%
CMIS 3114	Data Communication & Comp. Networks	6%	(2-4) 4%	10%
CMIS 3122	Rapid Application Development	-	(2-4) 40%	40%
CMIS 3134	Computer Architecture & Compiler Design	5%	(2-5-) 5%	10%
CMIS 3214	Software Engineering	6%	(2-4) 4%	10%
CMIS 3224	Web Designing and e-commerce	6%	(2-4) 4%	10%
CMIS 4114	Artificial Intelligence	6%	(2-4) 4%	10%
CMIS 4133	Advanced Operating Systems	6%	(2-4) 4%	10%

Code/Title of the Module : ELTN 1112 - Fundamentals of Electricity and Magnetism

Intended learning outcomes:
After completing this course students will be able to
- calculate electric and magnetic fields in different charge configurations.
- solve basics problems in Electricity and Magnetism.

Syllabus:
Charge, Laws of electrostatics, Electric field, Electrostatic induction, Electric flux density, Electric field intensity, Electric field on point charge, Electric Field for a group charges, A point Charge in an Electric Field, Electrical potential energy, Electric Potential, Potential at a point, Electrical Potential difference, Alternating Current, Conductance, Resistivity, Conductivity, Effect of Temperature on Conductors, Classification of Dielectrics, Properties of Dielectrics, Permittivity, Dielectric Constant, Introduction to magnetism and types magnetic materials, Magnets, Fundamental Law of Magnetism, Magnetic Field, Important points on Magnets and Magnetic Lines of Force, Direction of the Magnetic Field, Magnetic Flux and Flux Density, Relationship between Magnetic field and Lines of the magnetic force, Magnetic Force on a Charge Particle, Motion of a charged particle in a uniform magnetic field, Magnetic force on a current carrying conductor placed in an uniform magnetic field, Lenz's Law, Faraday's Law of Induction, Applications of Faraday's Law, Fleming's Right Hand Rule.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Fundamentals of Physics, Halliday and Resnick, John Wiley (2008)
- Basic Electronics, B. Grob, Mc Graw Hill (1997)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 1122 - Introduction to Semiconductors

Intended learning outcomes:
After completing the module students will be able to
- explain the operations of different kind of diodes and transistors.
- use diodes and bipolar transistors in simple electronics circuits.

Syllabus:
Band Theory, Energy Bands in Solids, Distribution of Sub Orbits, valance band, conduction band, semiconductor materials, Semi Conductor Types, Intrinsic Semi-Conductors, Formation of a p-n junction, Reverse Biasing a p-n Junction Diode, Forward Biasing a Diode, Applications of Diodes; Clipping Circuits, Clamping Circuits, Rectification: Half Wave Rectifier, Full-wave Rectifier, The Bridge Rectifier, Filters, Introduction to bipolar junction transistors, Schematic diagram / symbol for a bipolar transistor, Action of a Transistor, Rules for Bias Connections, Transistor Connections; Common Base Connection, Common- Emitter Connection, Common Collector Configuration, Load Line, Transistor Biasing, Methods of Transistor biasing, Circuit Analysis with Load line – AC/DC

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Introductory Electronic Devices and Circuits, Robert T. Paynter, Pearson Prentice Hall(2006)
- Electronic Devices, T.L. Floyd, Pearson Prentice Hall(2008)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 1132 - Basic Digital Electronics

Intended learning outcomes:
After completing this module students will be able to,

- explain operations of different logic gates.
- use Boolean algebra and Karnugh maps to design combinational logic circuits.
- analyze combinational logic circuits.

Syllabus:
Digital concepts, Number Systems (Binary, Decimal, Octal, Hexagonal), Binary operations and codes, Basic Logic gates, universal NAND and universal NOR, rules of Boolean algebra, Boolean analysis of logic circuits, DeMorgan's theorems, simplification of logic expressions, truth tables, Karnaugh map, Design and analysis of Combinational circuits.

Assessment:
Continuous Assessment	30%
Semester-End Examination	70%

References:
- Digital Fundamentals, T.L. Floyd, Prentice Hall (2008)
- Digital Systems, R.J.Tocci, N.S. Widmer, G.L. Moss, Pearson(2007)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN - 1212 Basic Electronics (Laboratory)

Intended learning outcomes:
After completing this module students will be able to,
- use efficiently measuring instruments such as multimeters.
- construct simple electronics circuits using basics logic gates.
- simulate operations of electronic circuits.

Syllabus:
Laboratory sessions will be carried out covering the material taught in modules ELTN 1112, ELTN 1122, and ELTN 1132

Assessment:
Continuous Assessment	50%
Semester-End Examination	50%

Time Allocation: Practical - 4 hours (per week)

Code/Title of the Module : ELTN 1222 – General Physics

Intended learning outcomes:
After completing this module, students will be able to,
- explain basic concepts of mechanics, waves & vibrations, and modern physics.
- identify applications of physical concepts in real-world.
- analyze and solve simple problems using basic concepts of physics.

Syllabus:
Coordinate systems, Vector and scalar quantities, Some properties of vectors, Components of a vector and unit vectors, Displacement, velocity and acceleration vectors, Two dimensional motion with constant acceleration, Projectile and uniform circular motion, Tangential and radial acceleration, Concepts of force, Newton's laws and inertial frame, Applications of Newton's laws, Forces of friction, Work and kinetic energy, Potential energy and conservation of energy, Basic variables of wave motion, One-dimensional traveling waves, Superposition and interference, Speeds of waves on a string, Reflection and transmission, Sinusoidal waves, Rate of energy transfer by sinusoidal waves, Introduction to atom, Atomic Models , orbital frequency of an electron, quantum numbers, Valence Electrons, absorption line spectrum, emission line spectrum, Elementary theory of laser action, Laser Operation, Amplification of light, Energizing the amplifying medium, Laser oscillator, active medium, population, population inversion, pumping methods, Laser Beam Characteristics, application, practical laser types

Assessment:
Continuous Assessment	30%
Semester-End Examination	70%

References:
- Fundamentals of Physics, Halliday and Resnick, John Wiley(2008)
- Concepts of Modern Physics, A.Beiser, Tata McGraw Hill(2002)

Time Allocation: Lectures – 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 2112 - Electricity and Magnetism

Intended learning outcomes:
After completing this module, students will be able to,
- explain various properties of Electricity and Magnetism.
- solve wide range of problems using the basic concepts in Electricity and Magnetism.

Syllabus:
Properties of electric charges, Network Theorems, Electric Forces and Vector Fields, Gauss's Law and its Applications, Electric Dipole, Parallel Plate Capacitors, Dielectrics, High Voltage Breakdown, Magnetic Field, Hall effect, Ampere's Law and its Applications, Biot-Savart Law, Magnetic Force on a Current, Lorentz Force, Magnetic Fields of Toroids and Solenoids, Self and Mutual inductance, Circuits containing inductors, capacitors and resistors. AC and DC L-C-R Circuit Analysis; Differential Equation Method, Amplitude-Phase Diagrams, Complex Number Method, Resonance, Quality Factor, Power Dissipation and Power Factor in AC Circuits, Generators and motors, Transformers.

Assessment:
Continuous Assessment	30%
Semester-End Examination	70%

References:
- Electromagnetism, I.S. Grant and W.R. Phillips, John Wiley(1990)
- Electromagnetism, Paul Lorrain and Dale R. Corson, W.H. Freeman(1990)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 2121 –Electricity and Magnetism (Laboratory)

Intended learning outcomes:
By completing this module, students will able to
- measure some properties of Electricity and Magnetism.
- use basic electric and magnetic measuring instruments

Syllabus:
Laboratory sessions will be carried out covering the subject matter in ELTN 2112

Assessment:
Continuous Assessment	50%
Semester-End Examination	50%

Time Allocation: Practical - 3 hours (per week)

Code / Title of the Module : ELTN 2213 - Semiconductor Devices

Intended learning outcomes:
After completing this module, students will be able to,
- construct simple electronics circuits using different types of diodes and transistors.
- analyze transistor amplifier circuits.
- design multistage transistor amplifier circuits.

Syllabus:
Basic Introduction of a PN junction diode, Diode types, Introduction of BJT transistors, States of transistors, Their characteristic curves, Application of transistors for switching and amplification, Faithful Amplification, Stabilization and Stability Factor, Design a biased circuit, h parameter modeling, Single stage amplification and Multi stage amplifiers, Power amplifiers, Oscillators, Amplifiers with negative feedback, Field Effect Transistors (FET) – Structure, Working principle, Important parameters, Biasing, Metal Oxide semiconductor Field Effect Transistors (MOSFET) – Structure, D and E modes, Biasing, Application of FETs and MOSFETs.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- An introduction to Semiconductor Devices, Donald Neamen, McGraw Hill(2006)
- Introductory Electronic Devices and Circuits, Robert T. Paynter, Pearson Prentice Hall(2006),
- Electronic Device and Circuits, J.J Cathey, Tata McGraw Hill(2006),
- Electronic Devices, T.L. Floyd, Pearson Prentice Hall(2008)

Time Allocation: Lectures - 3 hours. Tutorials - 1 hour (per week)

Code / Title of the Module : ELTN 2221 - Semiconductor Devices (Laboratory)

Intended learning outcomes:
After completing this module, students will be able to,
- measure various properties of diodes and transistors
- build and analyze circuits containing diodes and transistors.
- analyze circuits operating under switching conditions.
- analyze circuits operating under dc bias conditions

Syllabus:
Lab sessions will be carried out covering the subject matters taught in ELTN 2213

Assessment:

Continuous Assessment	50%
Semester-End Examination	50%

Time Allocation: Practical - 3 hours (per week)

Code / Title of the Module : ELTN 2232 - Analogue Electronics

Intended learning outcomes:
After completing this module, students will be able to,
- analyze op-amp circuits.
- construct op-amp circuits for different applications.
- analyze frequency response of linear amplifiers
- analyze amplifier feedback systems and their stability

Syllabus:
Operational-amplifier characteristics. Typical performance of selected op-amp types. Non-ideal behavior, saturation, frequency response, slew rate. Basic uses of op-amp: inverter, adder, integrator, differentiator, scalar changer, phase shifter, follower, filter, VC and CV converter, function generators and signal conditioners. Other uses of op-amp: comparator, zero-crossing detector, Clipping, clamping, waveform generators and wave-shaping circuits, Precision rectifier, schmitt triggers and multivibrator. Electronic analogue computation: solution of differential equation, time scaling and amplitude scaling of differential equation, simulation of transfer function. Switching and amplifying circuits. Regulators: basic series and shunt regulators, series regulator with transistor feedback and with op-amp, current limiting circuit

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Microelectronics, 2nd Edition, J. Millman and A. Grabel, McGraw-Hill(1999)
- Electronic Devices and Circuits, J.Milman, C.C. Halldas, Intl Ed, McGraw-Hill(1987)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 2241 - Analogue Electronics (Laboratory)

Intended learning outcomes:
After completing this module, students will be able to,

- measure various properties of operational amplifiers.
- build different op-amp circuits.

Syllabus:
Laboratory sessions will be carried out covering the subject matters taught in ELTN2232

Assessment:

Continuous Assessment	50%
Semester-End Examination	50%

Time Allocation: Practical - 3 hours (per week)

Code/Title of the Module : ELTN 3113 - Digital Electronics

Intended learning outcomes:
After completing this course, students will be able to,
- use latches and flip-flops in basic applications.
- analyze and design synchronous sequential circuits.
- analyze and design asynchronous sequential circuits.

Pre-requisites: ELTN 1132

Syllabus:
Functions of Combinational logic: Basic adders, comparators, Decoders, Encoders, Multiplexers, De-multiplexers, Parity Generator/checkers, Latches, Flip-flops, Flip-flop operating characteristics and their applications, sequential circuit analysis and design, the 555 timer, Counters, Shift registers, Memory storage: Basics of semiconductor memory, Memory Classification, EPROM, Flash Memory, EEPROM, Asynchronous SRAM, Asynchronous DRAM, Serial vs Parallel Communication, The UART, RS-232, RS-422, Integrated circuit technology: CMOS circuits, TTL circuits, practical consideration in the use of TTL, Emitter-Coupled logic circuits.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Digital System, R.J.Tocci, N.S. Widmer, G.L.Moss, Pearson Publication(2007)
- Digital Principal and Design, Donald, Tata McGraw Hills (2007), Digital Electronics, A.K. Maini, Khanna Publishers (2004)
- Digital Fundamentals, Floyd and Jain, Pearson Education (2005)

Time Allocation: Lectures - 3 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 3121 - Digital Electronics (Laboratory)

Intended learning outcomes:
After completing this module, students will be able to,
- select suitable components for digital circuits and determine their operating characteristics.
- build basic digital circuits using discreet components.
- debug digital circuits for fault funding.

Pre-requisites: ELTN 1132

Syllabus:
Laboratory sessions will be carried out covering the subject maters taught in the ELTN 3113.

Assessment:

Continuous Assessment	50%
Semester-End Examination	50%

Time Allocation: Practical - 3 hours (per week)

Code/Title of the Module : ELTN 3133 - Data Acquisition and Signal Processing

Intended learning outcomes:
After completing the module, students will be able to,
- explain various methods of A-to-D and D-to-A converters.
- use different types of sensors and transducers in applications.
- interface hardware circuits to computers

Syllabus:
Signals and Signal processing, Sample-and-Hold system, Interfacing between logic families, Driving Digital logic from comparators and op-amps, Sensors and Measurements, Transducers, Pulse shaping methods, Trigger techniques, Discriminators, Digital to Analogue Converters (DACs), Scaled current sources, Generating voltages from current output DACs, Tune-domain (averaging) DACs, Multiplying DACs, Analogue to Digital Converters (ADCs), Parallel Encoder, Successive-approximation ADC Voltage-to-Frequency Conversion, Internal system interfacing. Digital equipment interfacing, Single-slope Integration, Charge-balancing technique, Dual-Slop Integration, Delta-Sigma converters, Switched-Capacitor ADC, Some A/D Conversion examples, Decoders and Encoders, Multiplexing, Bandwidth-Narrowing Techniques, Signal-to-noise computation, Signal averaging, Spectrum Analysis and Fourier Transforms, PC parallel port

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Digital Fundamentals, Floyd and Jain, Pearson Education (2005)
- Microelectronics, 2nd Edition, J. Millman and A. Grabel, McGraw-Hill (1999)

Time Allocation: Lectures-3 hours Tutorials - 1 hour (per week)

Code / Title of the Module : ELTN 3141 - Data Acquisition and Signal Processing (Laboratory)

Intended learning outcomes:
After completing this module, students will be able to,
- use different sensors/transducers in circuits.
- read and send data from a computer to a digital circuit.
- apply different signal processing operations on acquired signals

Syllabus:
Practical assignments will be given covering subject maters taught in ELTN 3233.

Assessment:

Continuous Assessment	50%
Semester-End Examination	50%

Time Allocation: Practical - 3 hours (per week)

Code/Title of the Module: ELTN 3†53 - Applied Electronics Laboratory I

Intended learning outcomes:
After completing this module, students will be able to,
- apply knowledge of Electronics to solve problems.
- design and implement Electronics circuits.
- write comprehensive project reports.

Syllabus:
Mini-project type practical assignments in the areas such as Analog electronics, Digital Systems etc.

Assessment:

Continuous Assessments	30%
Comprehensive Laboratory Reports	70%

Time Allocation: Practical 6 hours (per week)

Code/Title of the Module : ELTN 3212 - AC Theory

Intended learning outcomes:
After completing this module, students will be able to,
- manipulate complex numbers and develop the euqations for AC circuits using phasors.
- determine the transfer characteristics of common AC filter circuits.
- analyze AC circuits using polar form of the phasor notation
- use circuit theorems to analyze AC circuits.

Syllabus:
Phasor notation in polar form, AC bridges, power in AC circuits; Application of circuit theorems to analysis of AC networks; Coupled circuits: coupled impedances, mutual inductance, coefficient of coupling, tuned circuits; Transformers: Transformers on-load, referred resistance and reactance; Wye/ Delta connected generators and loads, Phase voltages and phase currents, line voltages and line currents, Power in three-phase systems, Power factor, power factor correction, Power measurement, Power factor determination, Maximum power transfer in AC circuits, AC generators and motors, Induction motors, AC measuring instruments

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Electric Circuits, 6th Ed., David A. Bell, Prentice Hall(2008)
- Circuits, Devices and Systems, 5th Ed., R.J. Smith and R. C. Dorf, John Wiley(1991)

Time Allocation: Lectures-2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 3222 - Scientific Writing

Intended learning outcomes:
After completing this module, students will be able to,
- describe the scientific writing process and its key stages.
- identify what constitutes a research problem to be addressed in a scientific paper.
- analysis and review scientific papers in terms of key messages, scientific quality, consistency, justification, and relevance.
- Gather information based on literature survey and/or research work to write up scientific documents

Assessment:

Continuous Assessments	70%
Final Report	30%

References:
- Guide to Scientific and Technical Writing, P.G. Cooray(1992)
- The Mayfield Handbook of Technical and Scientific Writing, L.C. Perelman, J. Paradis, McGraw Hill(2008)

Time Allocation: Lectures-2 hours (per week)

Code / Title of the Module : ELTN 3233 - Microprocessor and Microcontroller Technology

Intended learning outcomes:
After completing this module, students will be able to,
- identify the elements of modern instruction sets and explain their impact on processor design.
- identify and explain the function of basic elements of a modern processor.
- identify and compare different methods for computer I/O.
- design simple computer architectures

Pre-requisites: ELTN 3113, ELTN 3121

Syllabus:
Microprocessor families, Intel Microcontroller family, Microchip PIC microcontroller family, Cache structures, Caches in practice, Virtual memory and MMU, pipelined and scalar architectures, I/O Operations and interrupts, Synchronous DRAMS, DDR and QDR SRAMS, Content addressable memory, Microcontroller Programming: Assembly language/C, Microcontroller peripheral interfacing, RISC architecture, System design using

microprocessors and microcontrollers, Case Studies- Traffic light controller, Washing machine controller, DC & Stepper Motor controller,

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Microcomputer Systems; The 8088/8086 Family; Architecture, Programming and Design, Yu Chang Liu, Glenn A.Gibson (2006),
- Microcontrollers (Features and Applications), D.S.Yadav, A.K.Sing, New Age International Pub.(2006)
- The Intel Microprocessors; Architecture, Programming and Interfacing, Barry B. Brey

Time Allocation: Lectures-3 hours. Tutorials - 1 hour (per week)

Code / Title of the Module : ELTN 3241 - Microprocessor and Microcontroller Technology (Laboratory)

Intended learning outcomes:
After completing this module, students will be able to,
- program micro-processors to implement simple operations.
- select suitable micro-processors specific applications.

Pre-requisites: ELTN 3113, ELTN 3121

Syllabus:
Practical assignments will be given covering the subject materials taught in ELTN 3233.

Assessment:

Continuous Assessment	50%
Semester-End Examination	50%

Time Allocation: Practical - 3 hours (per week)

Code/Title of the Module : ELTN 3252 - Electromagnetic Theory

Intended learning outcomes:
 After completing this module, students will be able to,
- use conceptual understanding of the electromagnetic laws in order to qualitatively describe behavior of the solution to a problem.
- calculate the electric field from the stationary charge distributions and magnetic fields from steady current distributions.
- solve simple electrostatic boundary value problems.

Syllabus:
Review of vector analysis, Divergence theorem, Stokes theorem, Principle of Linear superposition of forces, Charge distributions, Electric potential, Conservative nature of electrostatic field, Gauss's law, Electrical flux density, Calculation Electric field from V, Potential and field due to an electric dipole and quadrapole, Electric potential energy of a system of charges, Electric polarization Vector, Three electric Vectors, Divergence of electric displacement vector, Uniform and non-uniform polarization, Potential and Field due to a Polarized Dielectric, Point charge near a conducting surface and a conducting sphere, In Cartesian , Spherical and Cylindrical Coordinates, Divergence of B, Vector potential, Amphere's circuit law, Amphere's law in Curl form and Stoke's theorem , Vector potentials of known currents, Vector potential of a small current loop, The flux rule, Faraday's laws of electromagnetic induction, Generation of induced e.m.f., Induced Electric Filed and Vector Potential, Inductance, Mutual Inductance, Mutual Inductance between two arbitrary circuits, A dipole in an electric field, Maxwell's Equations in free space, Maxwell's Equations in a dielectric media, Vacuum displacement current, Electromagnetic Waves in a free space

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Electromagnetism, Paul Lorrain and Dale R. Corson, W.H. Freeman(1990)

Time Allocation: Lectures – 2 hours, Tutorials – 1 hour (per week)

Code/Title of the Module : ELTN 3262 – Power Electronics

Intended learning outcomes:
After completing this module, students will be able to,
- design and analyze AC-DC, DC-DC, DC-AC converters.
- design and analyze resonance converters.
- design and analyze DC power suppliers.

Syllabus:
Overview of electric and magnetic circuits concepts, power semiconductor switches, diode rectifier, inductive rectifier, controlled rectifier, effects of line inductance, DC-DC conversion, DC-AC conversion, Resonance conversion, DC power supplies, Power conditioning and UPS, Motor drive applications, Residential/industrial/utility Applications.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Introduction to modern power electronics, A.M. Trzynadlowski, Wiley-Interscience, 1998

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 3272 –Optimization Techniques and applications

Intended learning outcomes:
After completing this module, students will be able to,
- recognize and formulate problems that arise in technology in terms of optimization problems.
- use existing tools to solve simple optimization problems.

Syllabus:
Introduction to optimization techniques: requirement, advantages, disadvantages Classification of optimization techniques: global, local Evolution of genetic algorithms (GA): Charles Darwin, Mendal, J Holland, Introduction to GA optimization: advantages, disadvantages, vocabulary, Phases of GA optimization process: initiation, reproduction, replacement, Parameter encoding and fitness, GA operations: cross over, mutation, selection ,Introduction to particle swamp optimization: advantages, disadvantages, vocabulary, PSO process: initiation, update, replacement, Different convergence criterion, Applications of optimization techniques, Writing codes using Matlab/ VB, Student cantered problem solving using Matlab/VB: Decoding a secret message, Travelling salesman problem, Mathematical problems, Use of optimization techniques in antenna engineering applications.

References:
- Engineering Optimization Methods and Applications, A. Ravindran, K.M. Ragsdell, G.V. Reklaitis, Willey (2006)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 4114 - Communication Theory and Systems

Intended learning outcomes:
After completing this module, students will be able to,
- explain basic concepts related to communication systems
- explain different signal propagation methods and their relevance in communications
- describe the key types of communication systems.
- discuss current trends in the telecommunication sector

Syllabus:
Types of Antennas; Radiation Mechanism; Fundamental parameters of antennas; Antenna radiation efficiency, Antenna Vector Effective length and Equivalent areas. Maximum Directivity and Maximum Effective area, Friis Transmission Equation and Radar range equation, Antenna Arrays and their characteristics, Radio Wave propagation; Electromagnetic waves. Free-space propagation, Ground Wave propagation, Ionospheric Propagation, Line-of-Sight Propagation, Propagation in a Mobile/Portable Environment, Repeaters and Cellular Systems, The cellular concept, Signal modulation, Multiple access Technologies; FDMA, TDMA, CDMA, Analog Cellular Systems; The AMPS System, The TACS System, The NMT System, The NTT System. Digital Cellular mobile Systems; GSM Standardization and Service Aspects, GSM Reference Architecture and Function Partitioning, Numerical Techniques of Electromagnetic Radiation.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Constantine A. Balanis, Antenna Theory, John Wiley & Sons, Inc., New York (2001), Roy Blake, Electronic Communication Systems, Niagara College of Applied Arts & Technology, Canada., Raj - Pandya, Mobile and Personal Communication Systems and Services, IEEE Press-New York.

Time Allocation: Lectures - 4 hours, Tutorials - 2 hour (per week)

Code/Title of the Module : ELTN   4122 – Optoelectronic Devices and Fiber Communication Systems

Intended learning outcomes:
After completing this module, students should be able to,
- identify basic devices/components of optical fiber communication systems.
- explain features of optical fiber communication systems.

Syllabus:
Introduction to Optoelectronics: Fiber Based Communication Systems, Geometrical Optics; Ray theory of light transmission, Total internal reflection, Acceptance angle, Numerical aperture, Physical Optics; Dispersions; Intra and inter Model dispersion; Material: Polarization based dispersions in Cylindrical Wave Guides (CWG), Maxwell's equations for CWD,   Electromagnetic mode theory and optical propagation, EM Waves-modes in planar guide, phase and group velocity, SM/MM/Modified Fibers, Attenuation- material absorption losses in silica glass fibers, Linear and nonlinear losses, Monochromatic and Coherent Optoelectronic Sources, LED structures-surface and edge emitters, mono and hetero structures, Laser formation and Laser Diode, Optical detectors-PIN photo detectors, Avalanche photo diodes, Detector response time and Dark Currents.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Optical Fiber Communications: Principles and Practice, J M Senior, Prentice Hall (1992)
- Fiber-Optic Communication Systems - 2nd Ed., G P Agrawal, John Wiley & Sons (1997)
- Fiber-Optic Communications Technology, D. Mynbaev, L. Scheiner, Prentice Hall, (2001)
- Fundamentals of Optical Fiber Communications, M.S. Kumar, Prentice Hall, (2005)
- An Introduction to Fiber Optics, R.A. Shotwell, Prentice Hall, (2003)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 4131 - Communication Technology (Laboratory)

Intended learning outcomes:
After completing this module, students will be able to,
- demonstrate a working comprehension the technical and procedural aspects of communication technology
- measure the field-strengths from various transmitting antennas
- measure the performance of basic communication systems.

Syllabus:
Practical assignments will be conducted covering the subject matters taught in the ELTN 4113.

Time Allocation: Practical - 3 hours (per week)

Code/Title of the Module : ELTN 4143 - Programmable Logic Devices

Intended learning outcomes:
After completing this module students will be able to,
- design a simple digital system using Verilog HDL.
- perform simulations to check functional and timing accuracy of digital circuits.

Prerequisites: ELTN 2233, ELTN 3113

Syllabus:
Full Custom Integrated Circuits, ASICs, ASIC techniques (Full Custom ASIC, Standard Cell, Gate Arrays), Programmable Logic Devices (PLDs) families (SPLD, CPLD, FPGA), PLD Design Flow, PLD experimental boards, Hardware Description Languages, Verilog HDL for logic design, Language construct of Verilog, Verilog description of Combinational circuits, Verilog description of sequential circuits, Implementation of RAM/ROM, Verilog simulation of digital circuits, Test bench Design, Behavioral and hierarchical Design, Register Transfer Level Design with Verilog: Control/Data partitioning, Finite State Machine(FSM), FSM with data path, Algorithmic State Machine.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Contemporary Logic Design, Randy Katz, Prentice Hall(2005)
- Digital Systems Design with Programmable Logic, Martin Bolton, Addison Wesley Longman Pub.(1990)
- Digital Logic and Computer Design, Morris Mano, Prentice Hall(2008)

Time Allocation: Lectures – 3 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 4151 - Programmable Logic Devices (Laboratory)

Intended learning outcomes:
After completing this module students will be able to,
- design and simulate digital systems using Hardware Description Languages.
- implement digital systems on FPGAs.

Syllabus :
Practical assignments will be conducted covering the subject materials taught in 4143.

Assessment:

Continuous Assessment	50%
Semester-End Examination	50%

Time Allocation: Practical - 3 hours (per week)

Code/Title of the Module: ELTN 4†63 - Applied Electronics Laboratory II

Intended learning outcomes:
After completing this module, students will be able to,
- apply knowledge of Electronics to solve problems.
- design and implement Electronics circuits.
- write comprehensive project reports.

Syllabus:
Mini-project type practical assignments in the areas such as Analog electronics, Digital Systems, Configurable Hardware, Microprocessor systems, Nano Electronics, etc.

Assessment:

Continuous assessments	30%
Comprehensive Laboratory Reports	70%

Time Allocation: Practical - 12 hours (per week)

Code/Title of the Module : ELTN 4†78 - Research Project

Intended learning outcomes:
After completing this module, students will be able to,
- manage research project under minimum supervision.
- device and carryout tests where necessary.
- apply Electronics knowledge to solve important problems.
- communicate results effectively in writing and oral presentations.

Syllabus:
A project is assigned under the supervision of a senior staff member/s and the results should be presented at a seminar. A detailed report should be submitted.

Assessment:

Continuous Evaluation	30%
Project Report	30%
Presentation	**4**0%

Time Allocation: Throughout the year

Code/Title of the Module : ELTN   4†84 - Research Project

Intended learning outcomes:
After completing this module, students will be able to,
- apply Electronics knowledge to solve real-world problems.
- device and carryout tests where necessary.
- communicate results effectively in writing and oral presentations.

Syllabus:
A project is assigned under the supervision of a senior staff member/s and the results should be presented at a seminar. A detailed report should be submitted.

Assessment:

Continuous Evaluation	20%
Project Report	50%
Presentation	30%

Time Allocation: Throughout the year

Code/Title of the Module : ELTN   4†92 – Seminar in Electronics

Intended learning outcomes:
After completing this module, students will be able to,
- critically think and evaluate the work done by other scholars.
- use different sources to find relevant information to logically communicate technical issues.
- make presentations effectively and respond to questions confidently.

Syllabus:
This course is meant to give students to explore topics of their own choosing in detail and practice speaking in front of an audience. Students will research topics and organize presentations for faculty and other students. The topics may be any aspect of Electronics and must be approved by the lecturer in-charge. Each student will give 20-minute presentation every week and submit an abstract of the presentation.

Assessment:

Abstracts	40%
Presentation	60%

Time Allocation: Three hours (per week)

Code / Title of the Module : ELTN 4213 - Digital Signal Processing

Intended learning outcomes:
After completing this module, students will be able to,
- use MATLAB to implement digital signal processing operations.
- design and use most common FIR filtering and discrete-time Fourier transform to process digital signals.

Pre requisites: ELTN 3133

Syllabus:
Statistics, probability and Noise, Digital Noise Generation, Precision and Accuracy, Linear Systems, Static Linearity and Sinusoidal fidelity, Special properties of Linearity, Superposition, Common Decompositions,

Convolution, Delta function and impulse response, The Input side algorithm and Output side algorithm, Sum of weighted inputs, Common impulse responses, Correlation, Time-frequency representation of Continuous signals, Fourier series, Discrete time signals and periodic signals, the discrete time Fourier transform(DFT), Notation and format of the real DFT, Frequency domain's independent variable, Calculate the inverse DFT, Application of DFT, Spectral Analysis of signals, Frequency response of systems, Convolution via the Frequency domain, the Fast Fourier Transform (FFT), the Z-transformation, analyze linear systems, Digital filter design - Finite Impulse Response (FIR) filters, Infinite Impulse Response (IIR) filters,, Filter design from discrete spectral specification, DSP applications - Speech DSP: spectrum and pitch, DSP in communication.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Digital Signal Processing, Sanjit K. Mitra, McGraw-Hill
- Discrete-Time Signal Processing, Alan V. Oppenheim & Ronald W. Schafer, Prentice-Hall

Time Allocation: Lectures 3 hours, Tutorials 1 hour (per week)

Code/Title of the Module: ELTN 4222 - Nano–Technology Devices and Nano-Materials

Intended learning outcomes:
After completing this module, students will be able to,
- discuss the concepts and context of nanotechnology.
- explain procedures and process of nano-scale manufacturing.

Syllabus:
Fabrication and characterization of nano-materials. Fabrication and characterization of Solar cells, supercapasitors, nano-electronic devices, fuel cells, charcoal purification methods, graphene from graphite, AFM, SEM, FTIR, XRD, Chemical vapour deposition methods.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Semiconductor Devices, J. Singh, John Wiley-India(2007)
- Physics of Semiconductor Devices, M. Shur, Prentice Hall(1990)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 4232 – Data Communication Networks

Intended learning outcomes:
After completing this module, students will be able to,
- explain how communication works in data networks and internet.
- recognize different networking devices and their functions.
- explain the role of protocols in networking.
- analyze the services and features of various layers of data networks.
- Design, calculate, and apply subnet masks and addresses to fulfill networking requirements.

Syllabus:
Concepts and terminology, Transmission impairments, Guided transmission media and wireless transmission, Data encoding, Data communication interfaces: Asynchronous and synchronous transmission, Line configuration and interfaces, Data link control, Multiplexing, Circuit switching, Packet switching, Frame relay.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Bertsekas, Dimitri, and Robert Gallager. *Data Networks (2nd Edition)*. Upper Saddle River, NJ: Prentice Hall, 1991.

Time Allocation: Lectures – 2 hours, Tutorials – 1 hour (per week)

Code/Title of the Module : ELTN 4242 - Solid State Theory

Intended learning outcomes:
After completing this module, students will be able to,
- demonstrate skills in describing concepts in solid state physics.
- describe applications of Schrodinger's Equation
- describe the applications of solid state properties in modern Electronics

Syllabus:
Energy Quanta, Wave-Particle Duality, Schrodinger's Wave Equation, Physical Meaning of the wave Equation, Boundary Conditions, Electron in free space, The Infinite Potential Well, The Step Potential Function, The Potential Barrier, One-Electron Atom, The Periodic table, Formation of Energy Bands in Metals, Insulators and Semiconductors, k-Space Diagram, The Energy Band and the Band Model, Drift Current, Electron Effective Mass, Concept of the Hole, Density of Quantum States, Extension to Semiconductors, Fermi-dirac Distribution Function and the Fermi energy, Types of Solids: Amorphous, Polycrystalline and Single Crystal Materials, The Diamond Structure, Atomic bonding, Lattice vibrations, Equilibrium Distribution of Electrons and Holes, The $n_o p_o$ Product, The Fermi-Dirac Integral, Degenerate and Non-degenerate Semiconductors, Statistics of Donors and Acceptors: Probability Function, Complete Ionization

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Introduction to Solid State Physics, C.Kittel, John Wiley(2003)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 4252 – Polymer Electronics

Intended learning outcomes:
After completing this module, students will be able to,
- explain what polymers are made up of, their properties, applications in Electronics.
- identify different polymerization and polymer analytical techniques.
- discuss suitable polymeric materials for applications in Electronics.

Syllabus:
Overview of electronically operated polymers and oligomers with reference to the origin of their semiconductor properties, synthesis methods, characterization techniques, Applications – sensors, optical devices, organic integrated circuits.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Electronic Processors in organic crystals and polymers, Martin Pope, Charles E. Swenberg, Oxford Uni. Press (1999).
- Introduction to Molecular Electronics, M.C Petty, M.R Bryce, D. Bloor, Edward Arnold, John Wiley (2007).

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 4262 – Mechatronics

Intended learning outcomes:
After completing this module, students will be able to,
- demonstrate skills in both hardware and software aspects of mechatronics system design.

Syllabus:
Introduction, Examples of Mechatronics systems, Analog circuit elements and mechanical switches, Solenoids and Relays, Control Software, Sensor static characteristics and dynamics characteristics, Displacement measurements, Proximity Measurements, speed measurements, Strain Measurements, Force and Torque measurements, Vibration measurements, Signal conditioning, Actuators, Feedback controllers.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Fundamentals of Mechatronics, M. Jouaneh, Global Engineering (2013)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 4272 – Embedded Systems

Intended learning outcomes:
After completing this module, students will be able to,
- build a simple embedded system.

Syllabus:
Introduction to Embedded systems, Embedded systems in home and work environment, Hardware and software co-design model, Cross platform Development, Software storage and upgradeability, Real-time embedded systems, On-chip debugging, LCD, and Sensor Interfacing, Motor Control: Relay, PWM, DC and Stepper Motors

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- PIC Mictrocontroller and Embedded Systems: Using Assembly and C, Muhammad A. Mazidi, Rolin D. McKinglay, Danny Causey, Prentice Hall (2008)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : ELTN 4282 – Antenna Design

Intended learning outcomes:
After completing this module, students will be able to,
- identify performance parameters and their quantification for antennas.
- explain the process of antenna measurements
- use numerical analysis principles to analyze antennas
- select the appropriate antenna type for specified operating frequencies and radiation characteristics.

Syllabus:
Introduction, Review of basics antenna types: wire antenna, dipole antenna, biconical antenna, bowtie antenna, aperture antenna, reflector antenna, micro-strip antenna, Antenna array, Radiation pattern, gain, and polarization, Equivalent circuits and radiation efficiency, smart antennas, introduction to microstrip patch antennas (MPAs), cavity model, transmission line model, calculation of patch dimensions, resonant frequency, current distribution, radiation patterns, coaxial feeding, line feeding, group project to design an MPA, influence of substrate height & dielectric constant, review performance improvement techniques (stacking, shorting, fractals, modified shapes, optimization techniques), antenna arrays.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Antenna theory: Analysis and Design, Constantine A. Balanis, Willey (2005)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Detailed Breakdown of Continuous Assessments

Module Code	Module Title	Mid-Semester Exam	Tutorial	Quizzes	Assignment/ Reports	Total
ELTN 1112	Fundamentals of Electricity and Magnetism	20%	05%(8-10)	05%(3-5)		30%
ELTN 1122	Introduction to Semiconductors	20%	05%(8-10)	05%(3-5)		30%
ELTN 1132	Basic Digital Electronics	20%	05%(8-10)	05%(3-5)		30%
ELTN 1212	Basic Electronics – Lab				50%(8-12)	50%
ELTN 1222	General Physics	20%	05%(6-8)	05%(3-5)		30%
ELTN 2112	Electricity and Magnetism	20%	05%(8-10)	05%(3-5)		30%
ELTN 2121	Electricity and Magnetism - Lab				50%(8-12)	50%
ELTN 2213	Semiconductor Devices	20%	05%(8-10)	05%(3-5)		30%
ELTN 2221	Semiconductor Devices – Lab				50%(8-12)	50%
ELTN 2232	Analogue Electronics	20%	05%(8-10)		05%	30%
ELTN 2241	Analogue Electronics – Lab				50%(8-12)	50%
ELTN 3113	Digital Electronics	20%	05%(8-10)	05%(3-5)		30%
ELTN 3121	Digital Electronics - Lab				50%(8-12)	50%
ELTN 3133	Data Acquisition and Signal Processing	20%	05%(8-10)	05%(3-5)		
ELTN 3141	Data Acquisition and Signal Processing - Lab				50%(8-12)	50%
ELTN 3†53	Applied Electronics Laboratory I				100%	100%
ELTN 3212	AC Theory	20%	05%(8-10)		05%	30%
ELTN 3222	Scientific Writing	Continuous Assessment 70%; Final Report 30%				
ELTN 3233	Microprocessor and Microcontroller Technology	20%	05%(8-10)	05%(3-5)		30%
ELTN 3241	Microprocessor and Microcontroller Technology – Lab				50%(8-12)	50%
ELTN 3252	Electromagnetic Theory	20%	05%(8-10)	05%(3-5)		30%
ELTN 3262	Power Electronics	20%	05%(8-10)	05%(3-5)		30%
ELTN 3272	Optimization Techniques and applications	20%	05%(8-10)	05%(3-5)		30%
ELTN 4114	Communication Theory and Systems	20%	05%(8-10)		05%	30%
ELTN 4122	Optoelectronic Devices and Fiber Communication Systems	20%	05%(8-10)	05%(3-5)		30%
ELTN 4131	Communication Technology – Lab				50%(8-12)	50%
ELTN 4143	Programmable Logic Devices	20%	05%(8-10)	05%(3-5)		30%
ELTN 4151	Programmable Logic Devices - Lab				50%(8-12)	50%
ELTN 4†63	Applied Electronics Laboratory II				100%	100%
ELTN 4†78	Research Projects	CA 20% Presentation 30% Report 50%				
ELTN 4†84	Research Projects	CA 20% Presentation 30% Report 50%				
ELTN 4†92	Seminar in Electronics	Abstracts 40% Presentation 60%				
ELTN 4213	Digital Signal Processing	20%	05%(6-8)	05%(3-5)		30%
ELTN 4222	Nano - Technology Devices and Materials	20%	05%(6-8)		05%	30%
ELTN 4232	Data Communication Networks	20%	05%(6-8)	05%(3-5)		30%
ELTN 4242	Solid State Theory	20%	05%(6-8)	05%(3-5)		30%
ELTN 4252	Polymer Electronics#	20%	05%(6-8)	05%(3-5)		30%
ELTN 4262	Mechatronics#	20%	05%(6-8)	05%(3-5)		30%
ELTN 4272	Embedded Systems	20%	05%(6-8)	05%(3-5)		30%
ELTN 4282	Antenna Design	20%	05%(6-8)	05%(3-5)		30%

Code/ Title of the Module : IMGT 1112 - Principles of Management

Aim:

- To provide comprehension of the management concept, issues and challenges faced by managers in an organization and a guidance to built-up correct attitudes to face dynamic environmental changes with the skill of rational decision-making.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:

- Define basic concept of management

- Describe the evolution of management.

- Recognize the organizational environmental behaviour in making decisions effectively.

- Identify the core management functions and related theory models which are required to establish and operate an organization effectively and efficiently.

- Explain the modern trends in management.

- Discuss the possible recommendations to solve the basic managerial problems in organizations.

Pre-requisite(s): None

Syllabus:
Introduction to Management, Environmental Context of Management; internal & external, The Evolution of Management Theories, Management Functions; planning, organizing, leading & controlling, Modern Trends in Management.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Cole, A.G., (2000). *Management-Theory and Practice*, 5th edition, DP Publication Ltd, London.

- Gene Burton & Manab Thakur, (1995). *Management Today*, 1st Edition, Tata Mc Graw Hill Publishing Company Ltd.

- Heing Weihrich & Harold Koontz, (1994). *Management: Global Perspective*, 10th edition, McGraw-Hill Education (Asia).

- James A.F. Stoner, R. Edward Freeman., & Daniel R. Glibert, (2007). *Management*, 6th edition, Prentice-Hall of India Pvt. Ltd.

- Ricky W. Griffin, (2005). *Management,* 8th edition, Houghton Mifflin Company Publishers.

- Robert N. Lussier, (2006). *Management Fundamentals; Concepts, Applications, and Skill Development,* 3rd edition, South Western College Publishers.

(Note: Participants are allowed to refer any Management related Journal Articles and Magazines other than the list mentioned above)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 1122 – Business Economics

Aim:

- To familiarize participants with basic economic tools for analyzing different business environments and to enhance skills on rational decision-making to sharpen the analytical framework that a manager must bring to bear on managerial decisions.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:

- Define the concepts and theories to deal with microeconomic problems of a manufacturing or a service sector organization.
- Improve the knowledge on fundamentals of macroeconomics to apply economics for managerial decision making.
- Develop the skill of adapting economics knowledge for analyzing the trends in a business firm.

Co-requisite(s): IMGT 1112 - Principles of Management

Syllabus:
Introduction Economics & Managerial Decision Making; nature, scope, definitions, microeconomics & macroeconomics, scarcity, opportunity cost, resource allocation &, basic economic problems, types of economic systems & production possibility curves, Demand, Supply & Equilibrium; theory & analysis, Elasticity of Demand & Supply, Consumer Equilibrium; utility, indifference curve & budget line, Producer Equilibrium; factors of production, theory of production & production function, optimum factor combinations, iso-cost & iso-quant curves, Cost, Revenue & Profit Analysis; total, average & marginal, Market Structures & Profit Maximization; perfect competition, monopoly, monopolistic completion & oligopoly, Fundamentals & Models of Macroeconomics for Business Analysis; calculation of national income using production, expenditure & revenue approaches, inflation, unemployment, money & interest rates, labour market & labour productivity.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:
- Ahuja, H.L., (2000), *Business Economics – Micro*, 2nd Edition, S. Chand & Company Ltd, New Delhi
- Keat Paul G. & Young Philip K. Y., (2005), *Managerial Economics; Economic Tools for Today's Decision Makers,* 5th Edition, Prentice Hall of India.
- Lipsey Richard G. & Harbury Colin H., (1993), *First Principles of Economics,* 2nd Edition, Oxford University Press.
- Maheshwari Yogesh, (2007), *Managerial Economics,* 2nd Edition, Prentice Hall of India
- Petersen H. Craig, Lewis W. Cris, (2009), *Managerial Economics*, 3rd Edition, Prentice Hall of India.

(Note: Participants are allowed to refer any Micro, Macro or Managerial Economics related Journal Articles and Magazines other than the list mentioned above)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/Title of the Module : IMGT 1132 – Entrepreneurial Dynamics

Aim:
- To provide essential knowledge for owning and operating a small/entrepreneurial businesses including identification of business opportunities.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Identify the entrepreneurial process.
- Differentiate the entrepreneurs from business men.
- Evaluate the basic business knowledge applicable for managing small businesses.
- Support small businesses

Co-requisite(s): IMGT 1112- Principles of Management

Syllabus:
Entrepreneur; theories of entrepreneurship, characteristics and behavior attributes of entrepreneurs, skills required by entrepreneurs, Types of Entrepreneurs, Entrepreneurship; innovation and entrepreneurship, national importance of entrepreneurship, rewards of entrepreneurship, Small Business; definitions of small business, advantages and disadvantages of a small business, why do small firms fail?, Different Forms of Ownership of a Small Business, Small Business Environment, Motivations for Starting a Business, Formation

of a Business, Family owned Business, Business Plan, The Entrepreneur as a Strategist, Competitive Advantages, E-Commerce and Entrepreneurship, Global Opportunities for Entrepreneurs, Sources of Financing, Managing Human Resources, Legal Acts relating to Entrepreneurship, Management Concept relating to Small Business, Government and Non-governmental Organizations that Support Entrepreneurs, Success Cases of Entrepreneurship.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- David H. Holt, (1998). *Entrepreneurship: New Venture Creation* , Prentice - Hall of India (Pvt.) Ltd Publications.

- Donald F. Kuratko, & Richaed M.Hodgetts, (2007). *Entrepreneurship* (Theory, Process, Practice), 7th Edition, South – Western Thomson Learning.

- Justin G. Longenecker, Carlos W. Moore, & J. William Petty, (2006). *Small Business Management An Entrepreneurial Emphasis,* South – Western Thomson Learning

- Robert D. Hisrich, & Michael P. Peters, (2002). *Entrepreneurship,* 5th Edition, McGraw-Hill- Irwin Publication.

- Thomas W. Zimmerer, & Norman M. Scarborough, (2008). *Essentials of Entrepreneurship & Small Business Management*, 5th Edition, Pearson Education International

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 1212 - Principles of Accounting

Aim:

- To provide knowledge of basic accounting methods, techniques, and principles that would be useful and effective in working environment.

Intended Learning Outcomes:

On successful completion of this course module, the participants will be able to:

- Discuss the basic principles of accounting and theory of double entry and its usage in accounting.
- Observe the process of book keeping and preparing the primary books and ledgers.
- Examine the .financial performance of an organization for better decision making

Pre-requisite(s): None

Syllabus:

Introduction; accounting concepts, double entry system, Assets, Liabilities, Income and Expenditure; Preparation of Cash Books, Petty Cash Book, Preparing Bank Reconciliation Statement, Preparation of Final Accounts of Sole Trader; Introduction to Sri Lankan Accounting Standards; SLAS 03 and SLAS 09, Preparation of Financial Statements for the Publication Purpose; Analyze and Understand the financial Statements.

Assessment:

Method	Marks(%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Frank Wood, (1999). *Business Accounting one*, 8th Edition, Financial Times/Prentice Hall.

- Frank Wood & Sheila Robinson, (1981). *Book Keeping and Accounting*, 6th Edition, Prentice Hall Publication.

- Ronald Maxwell, Peter Onus, & Peter Fox, (1996). *Introductory Accounting*, 3rd Edition, Prentice Hall Publishing.

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 1222 - Marketing Management

Aim:
- To provide a comprehensive and innovative managerial introduction of industrial and consumer marketing with rich depth of practical examples showing the role of marketing manager in their efforts to balance the organization's objectives resources against the market needs and opportunities.

Intended Learning Outcomes:

On successful completion of this course module, the participants will be able to:
- Identify the importance of basic marketing concepts, marketing management related issues and the variables which work at specific marketing situation.
- Identify and customize product, pricing, promotional, and place strategies for a given marketing situation.
- Examine marketing mix strategies and its' impact on society.

Prerequisite(s): IMGT 1112- Principles of Management

Syllabus:
Introduction to Basic Concepts of Marketing, Marketing Strategies to Fill Strategic Planning Gap, Identifying Market Segments, Selecting Target Markets, Positioning, Analyzing Consumer Buying Behavior, New Product Development, Product Life Cycle, Influence of Price, Distribution & Promotional Strategies for a Business Firm.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:
- Philips Kotler, (2007). *Marketing Management,* 12th Edition, Prentice Hall.
- Philips Kotler & Gray Armstrong, (2008). *Principles of Marketing*, 12th Edition, Prentice Hall Publication
- Boyd & Walker, (1995). *Marketing Management.*
- Philp Kotler, Kevin Lane Keller, Swee Hoon Ang, Siew Meng Leong & Chin Tiong Tan, (2006). *Marketing Management: An Asian Perspective*, 4th Edition, Prentice Hall Publication.
- Adrian Palmer, (2004). *Introduction to Marketing:Theory & Practice*, New York: Oxford University Press.
- William D. Perreault & McCarthy, E.J., (2005). *Basic Marketing: A Global-Managerial Approach*, 15th Edition, Boston: McGraw Hill.
- Any articles published by both academic & professional journals in Marketing Management.

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 2112 - Operations Management I

Aim:
- To provide basic knowledge of concepts, models and managerial competencies of the operations management functions and practical aspect of operations management.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Recognize the historical evolution of production and operations management.
- Discuss production control tools and other relevant techniques.
- Identify manufacturing systems, evaluating and selecting appropriate alternatives.

Pre-requisite(s): None

Syllabus:
Introduction and Historical Evolution of Production and Operations Management, Development of Production Management Systems, Types of Production, Product Design, Process Selection, Strategic Capacity

Planning, Aggregate Planning, Operations Scheduling, Plant Location, Facility Layout Types of Production, Line Balancing and Inventory Management.

Assessment:

Method	Marks (%)
Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:

- James B Dilworth, *Production & Operations Management*, 5th Edition, McGraw Hill, ISBN 0-07-112593-0
- OD Khanna, *Industrial Engineering & Management*, 2nd Edition, Dhanpat Rai & Sons
- Chase Aquilano Jacobs, Operations Management, 9th Edition, McGraw Hill, ISBN 0071180303
- Davis-Heineke, Operations Management, 5th Edition, McGraw Hill, ISBN 0072963603
- Richard B. Chase, F. Robert Jacobs & Nicholas J. Aquilano, Operations Management, 10th Edition, McGraw Hill

Time Allocation: Lectures - 2 hours, Tutorial Discussions - 1 hour (per week)

Code/ Title of the Module : IMGT 2122 – Cost & Management Accounting

Aim:

- To provide knowledge of theories on financial management of a firm and expose participants to practical aspects of basic financial management

Intended Learning Outcomes:

On successful completion of this course module, the participants will be able to:

- Analyze the cost structure of an organization and provide useful financial information for decision making
- Recognize the role of financial management in modern organization setting and financial environment
- Practice the concept of time value of money in real world scenarios

Syllabus:

Introduction to Cost Accounting, Marginal Costing and Break –even analysis, Budgeting, Costs for Decision Making; Standard Costing and Variance Analysis; Time Value of Money; Capital Budgeting Decisions.

Prerequisite(s): IMGT 1212 - Principles of Accounting

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Eugene F.Brigham & Joel F.Houston, (2007).*Fundamentals of Financial Management 10/e*, South-Western Thomson Learning Inc.
- Ashish K. Bhattacharya. A.H. (2005).*Principles and Practices of cost Accounting 3/e*, Wheeter Publisher
- Khan & Jain, (2006).*Management Accounting 4/e*, Tata McGraw-Hill Education
- Pauline Weetman, (2010).*Management Accounting 2/e,*, Prentice Hall Ltd

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 2132 - Service Industry Concepts

Aim:

- To provide knowledge on management techniques and practices in service industry in order to enhance the awareness about the operations of service centered organizations.

Intended Learning Outcomes:

On successful completion of this course module, the participants will be able to:
- Evaluate the growth, trends and patterns of the service industry.
- Distinguish the operations of manufacturing and service industry organizations.
- Practice the managerial strategies of the service centered organizations.

Prerequisite(s): None

Syllabus:
Introduction to Service Industry; definitions, nature & classifications, theoretical background and conceptualization, Environmental Analysis; actors and factors affecting service industry, Assessing and Managing Risks and Benefits, Service Strategies and Competitiveness; cost – volume - profit (CVP) analysis, understanding customer needs & targeting, service positioning process, and the service concept for core & peripheral services, Service Quality and Global Competitiveness, Present Situation of Service Industry; trends & patterns, government support & legal issues, use of technology and its future.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:
- <u>Fitzsimmons, James A.</u>, (2007). *Service Management: Operations, Strategy and Information Technology*, McGraw-Hill, Irwin, 6th Edition
- Metters, Richard, (2007). *Successful Service Operation management*, Thomson Learning, Australia, 2nd Edition
- Kunst, Paul, (1996). *Managing Service Quality*, Paul Chapman Publishing, London
- Abromovitz, Hedy, (1998). *Insuring quality; how to improve quality, compliance, customer service, and ethics in the insurance industry*, St. Luie press ; Florida
- Kotler Philip, Makens, James C., Bowen, John T., (2009). *Marketing for Hospitality and Tourism*, Prentice Hall
- Pender, Lesley, (1999). *Marketing Management for Travel and Tourism*, Stanley Thornes; Cheltenham
- Koch, Timothy W., MacDonald, S. Scott (2010). *Bank Management*, South Western, London, 7th Edition
- Lovelock, Christopher and Wirtz, Jochen, (2008). *Services Marketing. People. Technology and Strategy*, Pearson Education, 6th Edition
- Lovelock, Christopher and Wirtz, Jochen, Chew, Patricia, (2009). *Essentials of Services Marketing*, Prentice Hall

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 2212 - Human Resource Management

Aim:
- To provide a systematic and rational approach to participants to handle issues/problems in Human Resource Management (HRM) regardless of participants' interest in functional specialty in a manufacturing or service organization.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Explain the theoretical aspects of performing functions of HRM and its implications for effective management in an organization.
- Improve the ability to implement HRM functions in a practicing organization for handling matters relevant to people at work.
- Recognize the value of human resource in managing and developing them in order to enhance their performance towards the achievement of organizational goals effectively & efficiently.

Pre-requisite(s): IMGT 1112 - Principles of Management

Syllabus:

Introduction; definitions, evolution, goals, objectives & functions of HRM, Job Designing, Job Analysis; identify & prepare job description & job specification, Human Resource Planning, Recruitment, Selection, Hiring & Induction, Performance Evaluation, Training & Development, Discipline Administration, Health & Safety Administration, Pay Administration, Welfare Administration, Grievance Handling, Managing Industrial Relations; trade unions, industrial disputes & settlement procedures.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Gray Dessler, (2008). *Human Resource Management*, 11th Edition, Prentice Hall of India (Pvt.) Ltd.
- H. John Bernardin, & Royce E.A. Russell, (2002). *Human Resource Management: Experimental Approach*, 3rd Edition, McGraw-Hill Inc.
- Graham, H.T., & Roger Bennett, (1998). *Human Resource Management*, 9th Edition, Person Education Ltd.
- James A.F. Stoner, Edward Freeman R., & Daniel R. Gilbert, (2007). *Management,* 6th Edition, Prentice Hall of India (Pvt.) Ltd.
- John M. Ivancevich, (2009). *Human Resource Management*, 11th Edition, McGraw-Hill Inc.

(Note: Participants are allowed to refer any Human Resource Management related Journal Articles and Magazines other than the list mentioned above)

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 2222 - Operations Research I

Aim:

- To provide knowledge of scientific methods those are used for rational decision-making and ability to use those in appropriate practical situations.

Intended Learning Outcomes:

On successful completion of this course module, the participants will be able to:

- Define Operations Research.
- Describe the evolution of operations research.
- Identify the linear nature of decision problems.
- Check the possible areas where the Operations Research Techniques can be applied.
- Develop Operations Research problems for diverse decision situations with appropriate solution procedures.

Pre-requisite(s): None

Syllabus:

Introduction to Linear Programming, Linear Optimization Models, Generalized Linear Programming, LP Model and its Assumptions, Additional Scenarios and Formulations, Algebraic Representation, Graphical Method of Solving Linear Problems, Simplex Procedure, Revise Simplex Procedure, Duality and Economic Interpretation, Dual Simplex, Sensitivity Analysis, Use of Computers in Solving Linear Programming Applications and Case Studies, Transportation and Assignment Model; variation on classical transportation model, linear assignment model, transportation algorithm, alternative transportation algorithm and special consideration in solving transportation model.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Burley, T. A., & Sullivan, G.**,** (1986). ***Operational Research,*** The Macmillan Press Ltd. Publishers.

- Frederick S. Hillier, (2008). *Introduction to Operations Research*, 8th Edition, McGraw-Hill, Inc Publisher.
- Gupta, P.K., & Hira, D.S., **(**1995**)**. ***Introduction to Operations Research,*** S Chand & Company Ltd**.**
- Richard Bronson, (1997). *SCHAUM'S Outline of Theory and Problems of Operations Research*, 2nd Edition, McGraw Hill Book Company.
- Lucy, T., (2002). *Quantitative Techniques*, 6th Edition, Thompson, Australia.

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code / Title of the Module : IMGT 3112 - Operations Management II

Aim:

- To provide knowledge on using concepts, models and practical tools of the operations management function in building organizational competitiveness and improving work efficiency.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Evaluate how operations management can provide direction for strategic growth and competitiveness of an organization.
- Identify and apply operations management tools and techniques in organizations for their better performance.

Pre-requisite(s): IMGT 2112-Operations Management I

Syllabus:
Operations Strategy and Competitiveness, Material Requirements Planning (MRP), Manufacturing Resource Planning (MRP II), Enterprise Resource Planning (ERP), Capacity Planning, Supply Chain Management, Total Quality Management (TQM), International Standards on Quality, Statistical Process Control (SPC) and Process Capability, Job Design, Work Study; method study and work measurement, Just-in-Time Systems, Maintenance Management

Assessment:

Method	Marks (%)
Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:
- Chase, Aquilano & Jacobs, (2004). *Operations Management for competitive Advantage*, 10th Edition, McGraw Hill – Irwin.
- William J. Stevenson, (2009). *Operations Management*, 10th Edition, McGraw Hill – Irwin.
- Norman Gaither, (1999). *Production and Operations Management*, 9th Edition, Wardsworth Publishing Company.

Time Allocation: Lectures - 2 hours, Presentations & Tutorial Discussions - 1 hour (per week)

Code/Title of the Module : IMGT 3122 – Organization Development

Aim:

- To provide insights on theories and empirical evidences relating to organizational development processes and their practices by analyzing micro and macro organizational issues.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Develop a theoretical basis for analyzing organizational development processes.
- Improve skills to convert theory into practice through application of personal experience and/or case studies.
- Change the individual attitudes towards improving interpersonal skills to develop an organization and managing its changes.

Pre-requisite(s): IMGT 1112- Principles of Management

Syllabus:
Introduction; scope, definitions, models, its profession & nature of a planned change, Process of Organization Development; entering & contracting, diagnosing organizations & problems, collecting & analyzing diagnostic information, feeding back the diagnostic information, designing interventions, managing change, evaluating & institutionalizing interventions, Human Process Interventions; interpersonal & group process approaches, Strategic Change Interventions; restructuring organizations & culture changes, organization transformation, Future of Organization Development.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Luthans, F*., (2008). *Organizational Behaviour*, 11th Edition, McGraw Hill Publishing.
- Gray N. McLean, (2009), *Organization Development: Principles, Processes, Performance*, Berett – Kochler Publishers Inc.
- Robbins, S.P., (2002). *Organizational Behaviour*, Prentice - hall of India.

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 3†34 - Design & Development of Computer Based Project

Aim:

- To develop skills in problem solving techniques, program implementation, testing, documentation and, applying methodical and professional approaches by providing an opportunity to develop a computer package for a selected industrial problem utilizing concepts of Systems Analysis and Design giving due recognition to Information Systems' Management needs of the organization concerned.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Analyze industrial problems utilizing concepts of Management, Management Information Systems and Computer Science.
- Design an Information System as a solution for identified industrial problems which apply sound principles and advanced techniques to the design and implementation & Implement reasonably complex programs using Visual Programming.
- Recognize the importance of the application of Management and Information Technology theories and concepts to real world problems and difficulties and associated problems in applying them.

Co-requisite(s): IMGT 3142- Structured System Analysis & Design Methodologies and Management Information Systems

Syllabus:
Students must propose application oriented computer project topics of their own devising, subject to the approval of suitability. Project starts with the submission of a project proposal by the student. Once approved, the student in consultation with the supervisor carries out a formal System Study, Design, and Development work. Three oral project presentations will be held during the academic year & students have to present two progress reports and final report for project assessment and monitoring. Assessment would be on work content, oral presentation and written project report. Projects will normally aim at the creation of a specific end product and will involve substantial practical work. Students submit a comprehensive report at the end of the project. Project presentation and final reports will be assessed by the supervisor together with a panel from the teaching staff.

Assessment:

Method	Marks (%)
Project Proposal, Presentations & Progress Reports	40%
Final Presentation	35%
Final Report	25%

Time Allocation:
As this course module spanning throughout third year of study, Students must complete System Analyzing & Designing part in the First semester. To get industry information, faculty or department will not allocate any time. In Semester II, students have to carry out System Development part and for this purpose; four hours of Computer Practical **(Per Week)** will be allocated.

Code/ Title of the Module : IMGT 3142 – Structured System Analysis & Design Methodologies and Management Information Systems

Aim:

- To provide students with an in depth knowledge on human and technical factors involved in systems analysis and design and the need for a structured approached to the development process of Information Systems within the organizational setting while discussing the different methods and frameworks for managing these information systems.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:

- Identify different types of issues related to Management Information Systems in an organizational setting and analyze these issues using Structured System Analysis and Design Techniques.

- Design an Information System using Structured System Analysis and Design Techniques to answer these identified issued in a cost effective way.

- Recognize the strategic importance of different Information Systems in an organizational setting and explain how they serve the various needs of organizations and how different types of information systems can support decision-making process.

Prerequisite(s): IMGT 1112- Principles of Management

Syllabus:
Basically this course module consist two parts;

(i) Structured System Analysis & Design Methodologies
Introduction; systems and system analysis & design, Historical Evolution of System Analysis & Design, System Development Life Cycle (SDLC), Introduction to structured method, Structured System Analysis & Design Methodology (SSADM) version 4+; modules, stages, steps & tasks of SSADM, Data Flow Modeling & Tools used, Logical Data Modeling & Tools used.

(ii) Management Information Systems
Organizational Setting; systems, data & information, and organization models, The Challenge of Information Systems, Major types of Information Systems & Information Systems Management; executive support systems (ESS), management information systems (MIS), decision support systems (DSS), knowledge work systems (KWS), office automation systems (OAS) & transaction processing systems (TPS), Interrelationships among Systems, Introduction to Strategic Information Systems, Redesigning the Organization with Information System, System Success and Failure.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Philip L. Weaver, Nicholas Lambrou, & Matthew Walkley,(2002). *Practical SSADM version 4+*, 3rd Edition, Prentice Hall.

- Jeffrey L. Whitten, Lonnie D. Bentley, & Kevin C. Dittman, (2000). *System Analysis & Design Methods*, 5th Edition, Tata McGraw Hill, New Delhi.

- David Hargrave, (1996). *SSADM 4+ for Rapid System Development*, McGraw Hill

- Kenneth C. Laudon, & Jane P. Laudon, (2000). *Management Information Systems: Organization and Technology,* 4th Edition, Prentice Hall Publication

- James A. O'Brien, (1996). *Management Information Systems: Managing Information Technology in the Internet-worked Enterprise*, 4th Edition, Irwin/ McGraw-Hill Publication

- David Kroenke, & Richard Hatch, (1994). *Management Information System*, 4th Edition, McGraw-Hill Publication

Time Allocation: Lectures - 2 hours, Presentations & Tutorial Discussions - 1 hour (per week)

Code/ Title of the Module : IMGT 3153/IMGT 4123 - Environmental Management System Based on ISO 14001

Aim:
- To make the future managers to be appreciative of Environmental and Social aspects of production/ services and prepare them to respond to globalized market restrictions through certification.

Intended Learning Outcomes:

On successful completion of this course module, the participants will be able to:
- Explain principles of proactive environmental management and methodologies used.
- Recognize the relationship between industrial production, resource depletion and environmental pollution.
- Improve the Knowledge on global market pressures and restriction on suppliers through need for certification and appropriate environmental management related standards.

Co/pre-requisite(s): IMGT 3112-Operations Management II

Syllabus:
Population Growth, Industrial Development and Outcomes of Environmental Pollution, Evolution of Modern Environmental Protection Movement, Development of Cleaner Production Methodology as a Base Line Approach for Resource Conservation and Pollution Prevention, ISO 14000 Family of Standards Deming's Cycle in Adopting the Standards, ISO 14001 Environmental Management Systems, its elements and the approach by an enterprise to obtain ISO 14001 certification, ISO 9000 Family of Standards, ISO 9001 Quality Management Systems and its relationship with ISO 14001, Working towards Obtaining ISO 9001/14001 Integrated System Certification, Principles of Auditing; different types of audits and conducting audits to obtain accreditation on selected standard, Introduction to Life Cycle Analysis, Eco Design, Dematerialization, Other Elements of ISO 14000 Standard for Environmental/ Eco Labeling, Market base Strategies, Other Related Standards and their Relationship with ISO 14000/ISO 9000 Standards.

Assessment:

Method	Marks (%)
Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:
- CP Library CD provided.
- ISO 14001, 14004 and 9001, 9004 Standards.

Time Allocation: Lectures - 3 hours, Tutorials/ Presentation - 1 hour (per week)

Code/ Title of the Module : IMGT 3162 - Business and Industrial Law

Aim:
- To expose students to the legal environment which is vital in the industrial and business context of Sri Lanka

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Describe the general content and principles of the law relating to business setup
- Identify and recognize the basic legal issues arising in organizations
- Practice the industrial law and its usage in the industry

Pre-requisite(s): IMGT 1112 Principles of Management; IMGT 1132 Entrepreneurial Dynamics

Syllabus:
Law of contract: Formation of contract, Validity of contract, Capacity to contract, Contents of contract, Termination of contract; Law of Delict: Aquilian action, Products liability; Forms of Business Organizations in Sri Lanka: Introduction to companies, partnership and agency; Intellectual Property Law: Copyrights, Patents, Trademarks (Including industrial designs); Banking Law: Negotiable instruments (Bills of exchange, Cheques, Other plastic cards), Banker and customer relationship; Industrial Law: Contract of employment, Types of employment, Settlement of industrial disputes, Relevant statutes; Law of Scale of Goods: Formation of sale of goods contracts, Contents of sale of goods contracts (Conditions, Warranties), Remedies of the seller and the buyer; Consumer Protection: Restrictive trade practices, Monopolies, Merges.

Assessment:

Method	Marks (%)
Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:

- Kimarli Wickramasinghe, (2004). Wickramasinghe's *Company Law of Sri Lanka,* 2nd Edition, Colombo: Kimarli Wickramasinghe.
- Aswattappa, K.., (1991). *Principles of Business Law*, Himalaya Publishing House.
- Abbott, K.R., & Pendlebury, N., (1999). *Business Law*, 6th Edition, ELBS with DP Publications.

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 3212 - Operations Research II

Aim:

- To provide competence to transform managerial situations into OR models, and apply the techniques learned under certain, probabilistic, and uncertain situations.

Intended Learning Outcomes:

On successful completion of this course module, the participants will be able to:

- Identify the different mathematical models and mathematical techniques used in Operations Research.
- Analyze the problems in Operations Research context.
- Apply system approach for any Operations Research applications in the real world.

Pre-requisite(s): IMGT 2222 - Operations Research I

Syllabus:
Network Models; modeling with network, general network and the cyclic problems, shortest path method, minimum spanning tree, maximum flow problems, specialized network algorithm, introduction to PERT and CPM, construction of networks, determining the critical path, project scheduling with uncertain activity times, crashing activity times, planning and scheduling with project costs, Decision Analysis; prior analysis, posterior analysis, pre posterior analysis, structuring the decision situations, decision making under uncertainty, decision trees and utility theory, Queuing Theory; structure of a waiting line system, queuing systems, queuing system input characteristics, queuing system operating characteristics, single-channel waiting line model with Poisson arrivals and exponential service times.

Assessment:

Method	Marks (%)
Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:

- Burley, T. A., & O'Sullivan, G., (1986). *Operational Research* , The Macmillan Press Ltd. Publishers.
- Frederick S. Hillier, (2008). *Introduction to Operations Research*, 8th Edition, McGraw-Hill, Inc Publisher.
- Gupta, P.K., & Hira D.S., (1995). *Introduction to Operations Research*, S Chand & Company Ltd.
- Richard Bronson, (1997). *SCHAUM'S Outline of Theory and Problems of Operations Research*, 2nd Edition, McGraw Hill Book Company.
- Lucy, T., (2002). *Quantitative Techniques*, 6th Edition, Thompson, Australia.

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 3222 - Management of Technology

Aim:
- To develop an awareness of the scope and complexity of issues related to the Management of Technology and develop skills for critical technology judgment and provide the student with principles and tools for technology evaluation and management.

Intended Learning outcomes:
On successful completion of this course module, the participants will be able to:
- Identify the interaction between technological competition and market competition
- Identify firms technological components
- Determine the ways of developing the technological capabilities
- Determine the mode of technological acquisition to a business organization and operations of technology
- Evaluate technology requirements of an organization

Prerequisite(s): IMGT 1112- Principles of Management

Syllabus:
Unique Characteristics of Technology for Socio-Economic Development; Different Embodiment Forms of Technology Used by Productive Enterprises; available degrees of sophistication of various technology components, Introduction to Technological Capabilities; Appropriateness of Technology; Managing Technological Transfer; technology transfer mechanisms, conflict/difficulties in both international and local technology transfer mechanisms, Research and Development as a Core of the Technological Innovation Process; Technology strategy Progression Path in Developing Country Conditions.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:
- Robert A. Burgelman, Modesto A. Maidique, & Steven C. Wheelwright, (1995). *Strategic Management of Technology & Innovation*, 3rd Edition, McGraw Hill Publication.
- David Ford, & Michael Saren, (2001). *Managing & Marketing Technology* The Thomson Learning publication, UK.
- Robert Szakonyi, *Hand Book of Technology Management.*

Time Allocation: Lectures - 2 hours, Presentations & Tutorial Discussions - 1 hour (per week)

Code / Title of the Module : IMGT 3232 - International Business

Aim:

- To provide knowledge and skills in international trade theories & concepts and application of marketing theories & concepts in the global context.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Evaluate the growth, trends and patterns of international trade
- Evaluate the role of international organizations
- Develop knowledge on major decisions in international marketing and designing global market offerings
- Identify and evaluate market entry strategies.

Pre-requisite(s): IMGT 1222 – Marketing Management

Syllabus:
Definitions, Theories and Concepts of International Trade and Marketing; absolute/comparative advantage, product life cycle, Heckscher-Ohlin theory, diamond theory, Trends and Patterns of International Trade, International Environment, Globalization, Regional Economic Integration, Free Trade and Trade Barriers, World Trade Organization (WTO) & International Monetary Fund (IMF), Market Entry Strategies, Foreign Direct Investment (FDI), Foreign Exchange Rates, International Marketing Management, Risks and Benefits of International Marketing, Analysis of Economic, Political, Legal and Socio-cultural Environment, Global Marketing Strategy; international product policy, distribution strategy, international promotion and pricing, Future of International Marketing, Sri Lankan Export Activities; export policy and regulations, export development institutions.

Assessment:

Method	Marks (%)
Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:

- Francis Cherunilam, (2004). *International Business:Text & Cases*, 3rd Edition, Prentice Hall of India.
- Roger Bennett, (2003). *International Business*, 2nd Edition, Pearson Education.
- Donald A. Ball, Wendel A. McCulloch, Paul L. Pantz, J. Michael Geringer & Michael S. Minor, (2006). *International Business: The Challenge of Global Competition*, 10th Edition, Irin, Boston.
- Michael R. Czinkota, Likka A. Ronkainen & Michael H. Moffett, (2006). *International Business*, 7th Edition, Thomson – South Western.
- Phillip Kotler, (2007). *Marketing Management*, 12th Edition, Prentice Hall.
- Michael R. Czinkota & Ilkka A. Ronkainen, (2004). *International Marketing*, 7th Edition, Thomson – South Western

Time Allocation: Lectures - 2 hours, Presentations & Tutorial Discussions - 1 hour (per week)

Code/ Title of the Module : IMGT 3242 - Project Management

Aim:

- To provide knowledge on project management issues and requirements from project definition to completion

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:

- Describe the basic principles and practices of project management
- Improve the skills of problem solving and persuasive presentation of solutions
- Adapt to work in a team for reaching specific objectives

Syllabus:
Introduction, Overview of Project Management; projects in business and development sectors, project life cycle and characteristics, project management - success and failure factors, project logical framework, project organization and stakeholder management, Issues in the Initiation Phase; project definition, feasibility study and proposal, project cost estimates, budgeting and financing, project appraisal and selection, risk analysis and management, Project Planning and Scheduling; basic planning approaches and techniques, time-cost trade-off and project crash scheduling, resource planning and allocation, computer applications in planning and scheduling, Project Monitoring and Control; project control and earned value project management, quality management for projects, computer applications in project control, Special Topics in Project Management; special issues and techniques in managing public and development projects, public-private partnership and BOT projects, Case Studies

Pre-requisite(s): None

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- C. F. Gray & E.W. Larson,(2008). *Project Management, the managerial process*, 4th edition, McGraw Hill Irwin.
- *A Guide to the Project Management Body of Knowledge (BMBOK Guide)*, 3rd. ed., Project Management Institute
- C.S. Chatfield & T. Johnson, (2002). *MS Project 2002 Step by Step*, Microsoft
- L.H.P. Lang,(1998) .*Project Financing in Asia*, North-Holland
- K. Heldman,(2002).*Project Management Professional – Study Guide*, Sybex
- Gido, Jack & James P. Clements,(1999) *Successful Project Management*, International Thompson Publishing
- Beenet P. Lientz & Kathyn Prea,(1995). *Project Management – for 21st Century,* Academic Press
- David, I. Cleland, (1999). *Project management*. McGraw Hill International Edition
- Mantel, Meredith, Shafer & Sutton,(2005).*Core Concepts: Project Management in Practice*, 2e, Wiley and Sons, Inc.
- Field, M. & Keller, L. (2005).*Project Management*, Thomson Learning

Time Allocation : Lectures - 2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module: IMGT 3252– Industrial Technology

Aim:

- To develop student's knowledge and understanding of the technologies used in industry with an emphasis on improving the quality and productivity of industrial operations

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:

- Identify the current technologies of industry, business and society as a whole
- Explain the general content and the principles of manufacturing and machining processes in industry
- Improve the skills in communication and information processing within the industrial context
- Adapt to the safe and healthy work practices, methods and techniques in an industrial environment

Pre-requisite(s): None

Syllabus:
Introduction; introduction to industrial technology, e-commerce, Presentation of Engineering Information; technical drawings, technical report writing, presentation aids, Operations Technology; CAD/CAM, CNC, CIM, FMS, robotics, industrial automation, MIS, Introduction to Different Manufacturing Materials and Their Applications, Steel based Manufacturing Techniques; casting, machining, forming/forging, powder metallurgy, Industrial Health and Safety; general health and safety requirements and procedures, appropriate health and safety materials, tools, equipment and accessories, safe and health working environment, 5S, ergonomics, and cleaner production.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Lawrence J. Kamm, (2000). *Understanding Electro Mechanical Engineering,* 1st Edition, IEEE Press.
- Parker, M. A., & Pickup F., (1981). *Engineering Drawing,* 3rd Edition, Stanley Thornes, London.
- Shan, H. S., (2001). *Work Study and Ergonomics*, Dhanpat Rai & Sons, Delhi.
- Sharma, P. C., (1993). *A Text Book of Production Engineering*, 4th Edition, Chand (S.) Co Ltd, India.
- Chase, Aquilano & Jacobs, (2004). *Operations Management for competitive Advantage,* 10th Edition, McGraw Hill.

Time Allocation: Lectures - 2 hours, Presentations & Tutorial Discussions - 1 hour (per week)

Code/ Title of the Module : IMGT 4†18 - Research Project

Aim:
- To enable the students to conduct research project in investigating real industrial issue(s) following academically and scientifically recognized procedures to identify root cause(s).

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Identify and formulate a suitable research problem in management
- Analyze industrial issues and apply theories into practice
- Recognize issues arisen during the theory implementation process, and identify strategies to overcome the issues.
- Practice systematically, scientifically and academically accepted investigative techniques in carrying out research: design and development data collection tool and technique, data collection and analysis
- Validate research finding and interpret the finding to in real
- Adapt the results obtained and write a research paper

Syllabus:
Each special degree student is assigned to a research project by the department in areas such as finance, operations, marketing, information systems etc. The projects assigned are directly relevant to a typical industry issue and the students are expected to apply the knowledge gained throughout the programme.

The outcome of the research project is reporting root cause(s) of the issues identified based on an academically and scientifically accepted methodical investigation(s) and strategies to overcome the issues, and to make the organization more effective in terms of its achievement of set goals.

Pre-requisite(s):   None

Assessment:

Types of Assessment	Marks	Total
i. Interim Reports, Diary and Monthly Briefing;		
(a) Submission of Interim reports fortnightly	5%	
(b) Monthly Report & Details of Research Project Completed	5%	
(c) Submission of Diary monthly and at the end of the program	5%	
(d) Monthly briefing & attendance to seminars	5%	
		20%
ii. Oral Examination		30%
iii. Report on Research Project		
(a) First version of the Final report [soft binding 1 copy]	30%	
(b) The Final report [hard binding 3 copies]	20%	
		50%
		100%

The Gradings and Grade Point Values shall be the same as for the other course units.

A minimum of 25% marks allocated for each components (i and ii) and two subcomponents [a and b of (ii)] must be separately and individually obtained to pass this module.
Any student who fail to acquire 25% minimum marks from each of the above two main components (i and ii) and two sub components of (ii) is considered as a unsuccessful student and, maximum marks can be obtained is **34.**

N.B.: The grade (**I**) [**incomplete**] will be given unless all the above two main components (i and ii) and all sub components of (ii) are completed by a student by the specified deadlines.

If a student is unsuccessful at the assessment, then he/she should resubmit the report and conduct an oral presentation. Please refer the Research project Guide for further details.

Reference Recommended:

- Colin Robson, **(**2006). *How to do a research project – A guide for undergraduate students*, Blackwell Publishing,

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Code/ Title of the Module: IMGT 4133 - Computer based Modeling and Simulation

Aim:

- To provide an understanding of how manufacturing and service industries can be helped by mathematical modelling and computer simulation.

Intended Learning Outcomes:

On successful completion of this course module, the participants will be able to:

- Identify the structure and the components of a queuing process and queue disciplines.
- Practice Monte-Carlo simulation process (Hand Simulation).
- Improve skills in computer based modelling and simulation using simulation software
- Develop a real industrial model giving rise to a queuing system.

Pre-requisite(s): STAT 1223- Introduction to Probability & Statistics II, IMGT 3212- Operations Research II

Syllabus:

Queuing Systems; multiple-service models & applications, and application of queuing theory to computer systems, Simulation; Monte-Carlo simulation techniques & different applications, and simulation steps & life cycle, Introduction to Computer based Simulation; input data analysis & random variant generation, verification & validation of simulation models, intermediate concepts, output analysis & statistical issues, advanced concepts, measurement of performance indicators such as throughput times, work-in-progress and waiting times, etc.

Assessment:

Method	Marks (%)
Continuous Assessment	30%
Semester-End Theory Examination	40%
Semester-End Practical Examination	30%

Reference Recommended:

- Frederick S. Hiller & Gerald J. Lieberman, (2008). *Introduction to Operations Research,* 8th Edition, Tata McGraw Hill, New Delhi.
- Fishman G. S., *Principles of Discrete Event Simulation*, (2001). Springer, USA.
- Humdy A. Taha, (2009). *Operations Research: An introduction*, 8th Edition, Dorling Kindersley, New Delhi.
- David Kelton W., Randall P. Sadowski, & David T. Sturrck, (2004). *Simulation with Arena,* 3rd Edition, McGraw Hill.
- Ravindran, Phillips & Solberg, (2000). *Operations Research Principles and Practice,* 2nd Edition, John Wiley & Sons, New York.

Time Allocation: 60 Hours (For Lectures and Practical)

Code/ Title of the Module : IMGT 4142 – Supply Chain Management

Aim:

- To enhance knowledge of logistics, both in theory and in practice and equip undergraduates with the skills to identify and analyze the essential principles in business logistics.

Intended Learning Outcomes:

On successful completion of this course module, the participants will be able to:

- Demonstrate conceptual thinking about logistics management and its relationship with the supply chain concept.
- Outline the characteristic elements of integrated business logistics and the importance of logistics in assisting other functional areas of any business organization.

- Develop the governance capacities of intergovernmental and international nongovernmental organizations.
- Originate systematic analysis of the fundamental processes involved in logistics.
- Improve critically think of logistics issues to debate contemporary global risk and governance issues at a high level of theoretical abstraction.
- Practice logistics internal integration operations capabilities, distribution practice capabilities and critical analysis problem setting and solving capabilities to apply practical and conceptual principles in manufacturing and service companies.
- Customize the role and application of logistics principles to supply/demand/value chain management, the application of a selection of inventory management / analytical tools in solving logistics problems, aspects of strategic integrated logistics management and benchmarking and global integrated logistics activities.

Pre-requisite(s): IMGT 3112 - Operations Management II

Syllabus:
Overview of Logistics and Supply Chain Management [SCM]; the logistics and SCM concept, Dimensions of Logistics, Customer Service & Demand Management, Procurement and Supply Management, Integrated Logistics Management and Activities, Service Response Logistics, Processes in Logistics; warehousing, materials handling equipment and packaging, and transportation, Strategic issues for logistics; reverse logistics, third party logistics services, global logistics and relationship management, logistics and information technology, and performance management.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:
- Coyle, J.J., Bardi, E.J., & Langley, E.J., (2003). *Supply Chain Management: A Logistic Perspective*, 7th Edition, Thomson South-Western.
- Bloomberg, LeMay, & Hanna (2002). *Logistics*, Prentice Hall.
- Ballou, R.H., (2007). *Business Logistics / Supply Chain Management*, 5th Edition, Pearson Prentice Hall.

Time Allocation: Lectures - 2 hours, Presentations & Tutorial Discussions - 1 hour (per week)

Code/ Title of the Module : IMGT 4152 - Productivity Techniques

Aim:
- To make aware students the role of productivity in achieving organizational objectives and provides the knowledge in modern concepts, tools and practices in the area of productivity developments.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Identify modern productivity development techniques and their usage
- Explain the importance of productivity in improving the performance
- Adapt the productivity movements and trends in national and international level.
- Develop the productivity development program

Pre-requisite(s): IMGT 3112 - Operations Management II

Syllabus:
Introduction; introduction to productivity, productivity measurement, productivity growth, and factors of productivity improvement, Quality Life through Quality Work, Productivity Concepts, Productivity at International, National and Company Level, Modern Tools and Techniques used in Productivity Improvement; just in time, 5S system, bench marking, green productivity and, ergonomics, Productivity Gain Sharing Techniques.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- John S. Oakland, (2000). *Total Quality Management Text with Cases,* 3rd Edition, BH Publishers, ISBN 0-7506-5740-5.
- Masaaki Imai, (1996). *Kaizen: The Key to Competitive Success*, McGraw Hill, New York, ISBN 0-07-112647-3.
- Suresh Dalela Saurabh, (1999). *Text Book of Work Study & Ergonomics*, New Chand Jain, Delhi.

Time Allocation: Lectures - 2 hours, Tutorials -1 hour (per week)

Code/ Title of the Module : IMGT 4164 - Strategic Management

Aim:

- To provide knowledge about concepts, models and competency in strategic management focusing strategic positioning, strategic choice, strategy implementation and strategy development in a dynamic and volatile business environment by proving practical exposure.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:

- Define the corporate strategy, its characteristics, basic elements of strategic management
- Describe the basic concepts, models of strategic management
- Choose appropriate strategies for different levels of a business
- Link the strategies in different levels and key resources of a business
- Design an organizational climate which is conducive to strategy implementation
- Develop a strategic plan for a strategic business unit.

Pre-requisites: IMGT 1122-Business Economics, IMGT 1222-Marketing Management, IMGT 2212-Human Resource Management, IMGT 3112- Operations Management II

Syllabus:
An Over View of Strategic Management Process; defining the company's vision, mission, objectives etc and social responsibility, The External Environmental/ Industry & Competitive Environment Analysis, The Internal Environmental Analysis, SWOT Analysis, Strategy and Competitive Advantages, Strategic Choice; corporate level strategy, business level strategy, functional level strategy, Strategy Implementation, Managing Strategic Change, Understanding Strategy Development,

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- John A Pearce II and Richard B Robinson Jr. , *Strategic Management* – Formulation Implementation and Control, All India traveler Book seller, ISBN 0-07-116712-9
- Arthus A Thompson Jr. and AJ Strickland III, *Strategic Management, Concepts and Cases*, Tata McGraw Hill publishing Corporations Ltd., ISBN 0-07-044778-0
- Gerry Johnson, Kevan Scholes, and Richard Whittington, *Exploring Corporate Strategy*, Prentice Hall, 0-273-71017-6

Time Allocation: Lectures - 4 hours, Tutorials - 2 hour (per week)

Code/ Title of the Module : IMGT 4172 - Strategic Management

Aim:
- To provide knowledge about concepts, models and competency in strategic management and strategic planning in a dynamic and volatile organizational setting.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Identify the strategic climate of a business and its importance
- Describe the basic concepts, models of strategic management
- Design vision and mission statements, goals and objectives of a strategic business unit.
- Develop a strategic plan for a strategic business unit.

Pre-requisites: IMGT 1122-Business Economics, IMGT 1222-Marketing Management, IMGT 2212-Human Resource Management, IMGT 3112- Operations Management II

Syllabus:
An Over View of Strategic Management Process; defining the company's vision, mission, objectives etc and social responsibility, The External Environmental/ Industry & Competitive Analysis, The Internal Environmental Analysis, SWOT Analysis, Formulating Long Term Objectives & Grand Strategies, Strategy & Competitive Advantage.

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:
- John A. Pearce II & Richard B. Robinson Jr., (1997). *Strategic Management – Formulation Implementation and Control*, 3rd Edition, AITBS Publishers, New Delhi.
- Arthus A. Thompson & Strickland, A.J., (1993), *Strategic Management: Concepts and Cases*, 7th Edition, Irin, Australia.

Time Allocation: Lectures -2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 4213 - Advanced Marketing Management

Aim:
- To provide a comprehensive knowledge in learning concepts of marketing management, brand management and customer relationship management and its' importance in changing business world

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Evaluate the competitive position of a company, latest marketing trends in today's business world, the necessity of market research and the ways to differentiate from its' competitors.
- Design product, price, place and promotion strategies for a given marketing situation utilize business environment analysis and brand positioning strategy to nurture positive perception of an organization or individual.
- Improve decisions on whether to brand or not to brand in a certain situation by identifying a desired or current identity/image of a company or an individual.

Prerequisite(s): IMGT 3232-International Business

Syllabus:
Marketing for Today's Business world, Significance of the Corporate Marketing Functions, Marketing Research and Environment Scanning, Business Marketing, Consumer Behavior, Dealing with Competition, Marketing Planning Process, Marketing Mix Strategies, Branding; introduction to the branding, value of branding, managing brands and brand expansion, Customer Relationship Management (CRM).

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Philip Kotler, Kevin Lane Keller, Swee Hoon Ang, Siew Meng Leong, Chin Tiong Tan, (2006). *Marketing Management: An Asian Perspective*, 4th Edition, Prentice Hall Publication

- Adrian Palmer, (2005). *Introduction to Marketing*, Oxford University Press

- Philips Kotler, *Marketing Management*, Millennium or 12th Edition, Prentice Hall Publication

- Philips Kotler & Gray Armstrong, *Principles of Marketing*, Prentice Hall Publication

- Boyd & Walker, (2007). *Marketing Management*, 3rd Edition, McGraw Hill Publications

- William D., Perreault, McCarthy & E., J., *Basic Marketing*

Time Allocation: Lectures -3 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 4222 - Applied Econometrics

Aim:

- To provide knowledge for using economics to handle industrial issues and making managerial decisions on utilization of scare resources effectively and efficiently

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:

- Analyze the data applicable to economic problems

- Practice computer software packages for data analyze and build background for rational decisions making

- Develop empirical economic models

Syllabus:
Nature of Regression Analysis, Two-Variable Regression Analysis, Classical Normal Linear Regression Model (CNLRM), Multiple Regression Analysis, Dummy Variable Regression Model, Multicollinearity, Heteroscedasticity, Autocorrelation, Identifying Casual Relationship, Instrumental Variable Regressions, Natural Experiment and the Matching Approach, Regression Discontinuity, Panel Data Models

Pre-requisite(s): IMGT 1122- Business Economics, STAT 2212- Design of Experiments, STAT 2222- Regression Analysis

Assessments:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Petersen, H. Craig & Lewis, W. Cris., *Managerial Economics*, Prentice Hall of India

- Gujarati Damodar N, Sangeetha, *Basic Econometrics*, Tata McGraw – Hill Publishing Company Ltd

- Brooks C, *Introductory Econometrics for Finance*, 2nd Edition, Cambridge Press

Time Allocation: Lectures - 2 hours, Tutorials/ Presentation- 1 hour (per week)

Code/ Title of the Module : IMGT 4234 - Advanced Operations Research

Aim:

- To provide a comprehensive knowledge in management science which can be applied in the managerial decision making process.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:

- Evaluate real world situations where quantitative approaches are appropriate.

- Analyze and formulate business problems as mathematical formulas.

- Judge the best quantitative technique according to a given situation.

- Use the right software to solve problems.

- Evaluate the results correctly, to assist management decision process.

Syllabus:
Integer Linear Programming; types of integer linear programming models, cutting plane method, branch and bound method, 0-1 programming, Waiting Line Models; structure of a waiting line system, single and multiple waiting line models, economic analysis of waiting line models, waiting line models with finite populations, Game Theory; two-person game, pure strategy, mixed strategy, n-person game, Replacement and Maintenance Analysis, Non Linear Programming, Dynamic Programming, Parametric Programming; changes in the objective function coefficients and right hand side values, Goal Programming, Stochastic Process.

Prerequisite(s): IMGT 3212- Operation Research II

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:
- Frederick S. Hillier, Gerald J. Lieberman, (2005). *Introduction to Operations Research*, 6th Edition, Tata McGraw Hill , New Delhi

- Hamdy A Taha, (2007). *Operations Research – an Introduction*, 8th Edition, Prentice –Hall, New Delhi

- Harvey M. Wagner, (2001). *Principles of Operations Research- with applications to Managerial Decisions*, 2nd Edition, Prentice –Hall, New Delhi

- Frederick S. Hillier, Mark S. Hiller, (2003). *Introduction to Management Science –a modeling and case studies approach with spreadsheets*, 2nd Edition, McGraw Hill, New York

- P.K Guptha, D.S Hira, (1997). *Operations Research*, S.Chand & Company

- David R. Anderson, *An Introduction to Management Science Quantitative Approaches to Decision Making*, 11th Edition, Thomson Australi**a**

Time Allocation: Lectures -2 hours, Tutorials - 1 hour (per week)

Code/ Title of the Module : IMGT 4242 - Financial Management

Aim:
- To provide knowledge of theories on financial management of a firm and expose participants to practical aspects of advance financial management

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Apply relevant techniques to manage long-term and intermediate-term financing

- Analyze the capital structure and how to determine it

- Design correct mitigation strategies for foreign exchange risk

- Practice appropriate dividend policy for an organization

Syllabus:
Nature and Scope of Financial Management, Money & Capital Market, Security Valuation, Risk and Return, Portfolio Theory, Portfolio Diversification & Optimization, Cost-of Capital, Capital Structure Decisions, Dividend Decisions, Working Capital Management, Forex Management.

Prerequisite(s): IMGT 2122-Cost & Management Accounting

Assessment:

Method	Marks (%)
Continuous Assessment	40%
Semester-End Examination	60%

Reference Recommended:

- Pandey I .M,(2005) *Financial Management 9th*, Vikas Publishing House
- Geoffrey Knott, (2005).Financial management 4/e, Palgrave MacMillan
- Lawrence D Schall and Charles W Haley, *(1991). Introduction to Financial Management 6th*, McGraw-Hill, Inc.
- Eugene F.Brigham & Joel F.Houston, (2007).*Fundamentals of Financial Management 10 th*, South-Western Thomson Learning Inc.
- James C VanHorne & John M. Wachowicz, Jr.,(2001) *Fundamentals of Financial Management 11 th*, Pearson Education Asia

Time Allocation: Lectures - 2 hours, Tutorials - 1 hour (per week)

DETAIL BREAKDOWN OF CONTINUOUS ASSESSMENTS

New Course Code	Subject Name	Mid-Semester Exam	Spot Test	Presentation + Report	Assignments	Tutorials	Quizzes	Case Study + Discussion	Total
		M%	(#) M%	(#) M%	(#) M%	(#) M%	(#) M%	(#) M%	(#) M%
IMGT 1112	Principles of Management	10%	(2-5) 05%	(1) 05%	(2-5) 10%	(2-4) 05%		(1-2) 05%	40%
IMGT 1122	Business Economics	10%	(2-5) 03%	(1) 05%	(1-2) 10%	(8-10) 10%	(2-5) 02%		40%
IMGT 1132	Entrepreneurial Dynamics	10%	(1-2) 03%	(1-2) 08%	(2-3) 10%	(6-8) 05%		(5-6) 04%	40%
IMGT 1212	Principles of Accounting	20%	(2-3) 05%		(2-4) 05%	(3-5) 05%	(2-3) 05%		40%
IMGT 1222	Marketing Management	10%		(1) 15%		(4-6) 08%		(2-4) 07%	40%
IMGT 2112	Operations Management I	15%	(1-2) 03%			(6-8) 10%	(1-3) 02%		30%
IMGT 2122	Cost & Management Accounting	20%	(2-5) 05%			(2-4) 05%		(1-2) 10%	40%
IMGT 2132	Service Industry Concepts	10%		(1-2) 10%	(2-5) 10%	(3-5) 05%		(8-10) 05%	40%
IMGT 2212	Human Resource Management	05%	(2-4) 05%	(1-2) 05%	(2-3) 10%	(5-7) 05%		(8-10) 10%	40%
IMGT 2222	Operations Research I	15%	(3-5) 05%			(5-7) 15%		(1-2) 05%	40%
IMGT 3112	Operations Management II	10%	(1-2) 05%	(1) 02%	(1-2) 5%	(4-6) 05%	(2-4) 03%		30%
IMGT 3122	Organization Development	10%		(2-3) 05%	(2-3) 10%	(5-7) 05%		(8-10) 10%	40%
IMGT 3†34	Design & Development of Computer based Project	[Presentations(2), Progress Reports(3)] 40%							40%
IMGT 3142	Structured System Analysis & Design Methodologies and Management Information Systems	10%		(1-2) 15%		(4-6) 10%		(1-2) 5%	40%
IMGT 3153	Environmental Management based on ISO 14001	10%		(1-2) 10%	(2-3) 5%	(2-3) 5%			30%
IMGT 3162	Business & Industrial Law	10%	(2-5) 05%			(3-5) 15%			30%
IMGT 3212	Operations Research II	15%			(2-4) 05%	(6-8) 10%			30%
IMGT 3222	Management of Technology	15%	(1) 05%	(1) 08%		(3-4) 03%	(3-4) 04%	(1) 05%	40%
IMGT 3232	International Business	10%		(1-2) 05%	(2-5) 05%	(4-6) 05%		(4-6) 05%	30%
IMGT 3242	Project Management	10%		(1-2) 15%	(2-3) 05%			(1-2) 10%	40%
IMGT 3252	Industrial Technology	10%	(3-5) 05%	(1) 05%	(5-8) 15%	(1-2) 05%			40%

New Course Code	Subject Name	Mid-Semester Exam	Spot Test	Presentation + Report	Assignments	Tutorials	Quizzes	Case Study + Discussion	Total
		M%	(#) M%	(#) M%	(#) M%	(#) M%	(#) M%	(#) M%	(#) M%
IMGT 4†18	Research Project	Diary(1), Fortnight Reports(6), Monthly Reports(3), Presentation (2), Report on Completion(1), Monthly Briefing(2-3)							20%
IMGT 4123	Environmental Management based on ISO 14001	10%		(1-2) 10%	(2-3) 5%	(2-3) 5%			30%
IMGT 4133	Computer based Modeling & Simulation	10%	(2-3) 05%	(1) 05%	(2-3) 05%	(5-8) 05%			30%
IMGT 4142	Supply Chain Management	10%		(2-3) 10%	(2-3) 10%			(2-3) 10%	40%
IMGT 4152	Productivity Techniques	15%		(2-4) 05%	(1-2) 05%	(1-2) 05%		(2-4) 10%	40%
IMGT 4164	Strategic Management	10%	(3-5) 05%	(1-2) 10%	(1-2) 10%	(1-2) 05%			40%
IMGT 4172	Strategic Management	10%	(3-5) 05%	(1-2) 10%		(1-2) 05%		(1-2) 10%	40%
IMGT 4213	Advanced Marketing Management	10%		(2-3) 15%		(2-4) 05%		(2-4) 10%	40%
IMGT 4222	Applied Econometrics	10%			(2-3) 10%	(2-3) 05%		(2-3) 15%	40%
IMGT 4234	Advanced Operations Research	10%	(2-3) 05%	(1-2) 10%	(1-2) 05%	(6-8) 05%		(1-2) 05%	40%
IMGT 4242	Financial Management	15%	(2-4) 05%		(2-3) 10%			(1-2) 10%	40%
INDT 4218	Industrial Training	Daily Diary(1), Fortnight Reports(12), Monthly Reports(6), Report on Completion(1), Monthly Briefing(4-6)							20%

"#"   indicates the number of assessments.

"M"   indicates the percentage of marks.

"†"   indicates 'throughout the academic year'

"*"   indicates optional modules for those not offering Industrial Management as major subject

Code/Title of the Module : MATH 1112 – Introduction to Mathematics I

Aims:
- To provide the knowledge in the concepts of Set theory, functions and Mathematical logic;
- To provide an opportunity for the students to understand the rule of logic which forms the basis of mathematical reasoning;
- To assist the students in developing the core skills necessary for successful pursuance of modules in Mathematics, Statistics and Computer Science;
- To ensure a good foundation for further studying of various mathematical courses.

Intended Learning Outcomes:
On successful completion of the course, the students should be able to:
- acquire an understanding of the operations defined on sets and the basic laws in the algebra of sets;
- demonstrate the existence of different type of functions;
- acquire an understanding of the rules of logic;
- apply knowledge of the logical connectives and notational convention of propositional logic by symbolizing compound statements given in natural language;
- understand and use a variety of techniques to construct simple formal proofs of theorems;
- demonstrate knowledge of various styles of mathematical proofs.

Pre Requisite : A/L Combined Mathematics

Syllabus:
Sets relations and functions: finite and infinite sets, equality, algebra of sets ,venn diagrams, ordered pairs, cartesian product, products , n – tuples, relations, equivalence relation, partitions, partial order. Domain, co-domain, range of a function; injective, surjective and bijective functions; countable sets, denumerable sets, uncountable sets, composite functions, inverse functions, application and use of inverse functions.

Language of Mathematics: logic, logical connectives, disjunction, conjunction, conditional , biconditional, negation, logical equivalence, converse, contra positive, tautology, contradiction, schemes of inference, quantifiers, proofs, existence proofs, Proof by case, If and only if proofs, proof by contradiction, indirect proof, uniqueness proofs, counter examples, proofs by induction.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Seymour Lepschultz, Set Theory, McGrawhill, ISBN 0-07-0799013-3
- Richard Johnsonbaugh, Discrete Mathematics, Addition Wesley Longman (Singapore) Pte. Ltd ISBN 81 – 7808 – 279 – 9

Time Allocation : Lectures (2 hours), Tutorials (1 hour) (per week)

Code/Title of the Module : MATH 1212 – Introduction to Mathematics II

Aims:
- To present a self-contained logical development of elementary Number Theory.
- To introduce the essential concepts of Number Theory, both ancient and very modern, using relevant applications as motivating examples.
- To provide the knowledge in the concepts of Limits, Continuity and Differentiation.

Intended Learning Outcomes:

On successful completion of the course, the students should be able to:

- demonstrate basic insight in number theory;
- document insight in important ideas and techniques in number theory;
- understand the concepts of Limits ,Continuity and Differentiation;
- do basic applications related to Limits ,Continuity and Differentiation.

Pre Requisite : MATH 1112

Syllabus:

Introduction to number theory: Integers, gcd, lcm, primes, co-primes, division, Euclidean algorithm, fundamental theorem of arithmetic, congruences, modular arithmetic, structure of Z_n, solving linear congruences, Chinese remainder theorem,. Fermat's theorem, Euler generalization,

Limits and continuity: limit of a function, theorems on limit, concept of continuity, continuous functions and algebra of continuous functions.

Differentiability: concept of differential functions, basic properties of the derivative, L'Hospital rule, Mclaurin's theorem.

Group Theory: Group Tables, Subgroups, Elementary properties of Cyclic groups, Dihedral group of order 2n and its properties, Symmetric and Alternating group: Direct product of two groups, Identification of non-isomorphic groups of order up to 10.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:

- David M. Button, Elementary Number Theory, Wm C Brown, ISBN 0-697-13330-3
- Kenneth A. Ross, Elementary Anaysis: The Theory of Calculus, Springer Verlag
- Benjamin Baumslang, Bruce Chandler, Schaum's Outline of Theory and Problems of Group Theory

Time Allocation : Lectures (2 hours), Tutorials (1 hour) (per week)

Code/Title of the Module : MATH 1222 – Differential Equations

Aims:

- To introduce the fundamental concepts, techniques and theories of differential equations and their applications

Intended Learning Outcomes:

On successful completion of the course, the students should be able to:

- Understand the basic theories and methods of differential equations, and to apply the fundamental techniques of differential equations to perform analysis and computation of solutions to various differential equations..

Pre Requisite : A/L Combined Mathematics

Syllabus:

Ordinary Differential Equations : Burnoulli and Riccarti equations with constant coefficients. operator method, Laplace transformation, Euler's equation, system of linear equations with constant coefficient, application to plane curves, use of Taylor series method,

Autonomous systems for differential equations: First order equations – Cauchy problem for the quasi- linear equations, general first order equation for a function of two variables and the solution, Second order equations – Hyperbolic functions for the functions of two variables, characteristics for linear and quasi linear equations.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Schaum's Differential Equations, Theory and problems of differential equations, Richard Bronson.
- Harry W.Reddick and Donald E.Kibbey, Differential Equation

Time Allocation : Lectures (2 hours), Tutorials (1hour) (per week)

Code/Title of the Module : MATH 2114 – Linear Algebra I

Aims:
- To provide the knowledge in the concepts of Matrices

Intended Learning Outcomes:
On successful completion of the course, the students should be able to:
- cover a succession of topics from modern mathematics using matrices.
- understand the underlying theory of eigenvalues and eigenvectors and their role in the solution of problems in 3-D analytical geometry.
- understand the properties of systems of linear equations and their solutions.

Pre Requisite : MATH 1112

Syllabus:
Special types of matrices: triangular, diagonal, singular, non-singular, invertible, elementary matrices of types 1,2 and 3 and their inverses, row equivalent,, partition matrices, block multiplication, determinants, permutation, definition of a determinant, minor cofactor, properties of determinants, row operation1,2 and 3, characterization of singular matrices, determinant of a product, adjoint, row space, column space, rank, orthogonal subspaces of R^n , matrix norms, least square problem, QR factorization, eigen values and vectors, complex eigen values, diagonalization,

Solving linear equations: existence of solution, solvability, rank
Linear Programming : slack variables, simplex method, and duality
System of linear equations : examples, 2x2 systems, type of systems and number of solutions. equivalent systems, nxnsystems, triangular form, elementary row operations, pivot, augmented matrix, back substitution, Gaussian elimination, Row echelon form, over-determined systems, under-determined systems, reduced row echelon form, homogeneous system, Cramer's rule.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Lancaster &Tismenetsky, The theory of Matrices, Academic Press, 1985, ISBN:0-12-435560-9
- Minc.Wiley, Non-negative Matrices, Intersciences, 1988
- Gilbut String, Linear Algebra and its Application, Academic Press, 1980

Time Allocation : Lectures (4 hours), Tutorials (2 hours) (per week)

Code/Title of the Module : MATH 2213 –Linear Algebra II

Aims:
- To introduce students to the solutions of systems of linear equations using operations on matrices and determinants.
- To develop competence in some basic techniques of linear algebra and to encourage confidence in their application to problem-solving

Intended Learning Outcomes:
On successful completion of the course, the students should be able to:
- understand the concepts of vector spaces, linear transformations.
- represent linear transformations as matrices
- apply skills and concepts to theoretical or practical problems

Pre Requisite: MATH 2114

Syllabus:
Vector space: linear independence , linear dependence, basis, dimension, matrices, column and row spaces , rank, length, norm , inner products, orthogonal projections and least squares,

Linear transformation and matrices: linear transformation, image space, null space, matrix Representation, Eigen values and eigen vectors: invariant subspaces, eigen systems and characteristic polynomials, eigen vectors, Applications: forced oscillation, Cayley Hamilton theorem.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- C.H.Edwards& D E Penney, Elemetary Linear Algebra, Prentice Hall International,1988 ISBN:0-13-258-286-4
- A.O.Morris , Linear Algebra and Introduction (2nd Edition)
- GilbutStrang, Linear Algebra and Its Application, Academic Press 1980

Time Allocation : Lectures (3 hours), Tutorials (1 hour) (per week)

Code/Title of the Module : MATH 3114 – Advanced Calculus

Aims:
- To instill an appreciation of the need for rigor in analysis.
- To provide a clear understanding of concepts of convergence, continuity, differentiation and integration.

Intended Learning Outcomes:
On successful completion of the course, the students should be able to:
- understand the concepts of convergence, continuity, differentiation and integration.
- Devise elementary proofs and understand how they relate to intuitive concepts.

Pre Requisite: MATH 1112 & MATH 1212

Syllabus:
The real numbers: algebraic properties, order properties, absolute value, the completeness property; Topological properties: intervals cluster points, open and closed sets, compact sets, connected sets.

Sequences: limits,boundedness, monotone sequences, subsequences, Bolzano Weierstrass theorem, cauchy criterion, divergent sequences,limsup and liminf.

Series: Series of positive terms, convergence, divergence, the standard series like p-series,Comparison test, Ratio test, Root test, Cauchy's integral test, general theory of infinite series, absolute convergence, conditional convergence, the product of two series.

Differentiation: Role's theorem, the mean value theorem,Mclaurin's theorem, Taylor's theorem, application of Mclaurin's theorem and Taylor's theorem.

Riemann integral: integrability, properties of Riemann integral, the fundamental theorem of calculus, the integral as a limit, approximate integrals.

Sequence of functions: point wise and uniform convergence, interchange of limits, the exponential and logarithm functions, the trigonometric functions, series of functions.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:

- Malcolm W. Pownall , Real Analysis – A First course with Foundations, , Wim. C. Brown Publishers ISBN 0-697-12908-X
- Robert G. Bartle, Donald R. Sherbert, Introduction to Real Analysis, John Wiley & Sons . Inc. ISBN 0-471-86481-1
- Kenneth A. Ross, Elementary Anaysis: The Theory of Calculus, Springer Verlag

Time Allocation : Lectures (4 hours), Tutorials (2 hours) (per week)

Code/Title of the Module : MMOD 3113 – Mathematical Methods

Aims:

- To teach a practical ability to work with functions of two or three variables and vector fields;

- To present the theorems of Gauss and Stokes as generalizations of the fundamental theorem of calculus to higher dimensions;

Intended Learning Outcomes:
On successful completion of the course, the students should be able to:
- understand and apply the concepts of Vector Algebra and to gain a sound knowledge of fundamentals of vector field theory and will be able to formulate differential equation to describe simple situations and use various techniques to solve the equations and recognize the relevance of differential equations in any subject areas.
- calculate line, surface and volume integrals in general curvilinear coordinates;
- familiar with and use in a variety of contexts the fundamental results of vector calculus, namely, the divergence theorem and Stokes' theorem;.

Pre Requisite: MATH 1222

Syllabus:
Vector algebra: vector equations of lines and planes in 3D, vector triple products (both scalar and vector),

Vector Differentiation : scalar and vector fields, ordinary derivatives of vectors, differentiation formulae, partial derivatives of vectors,

Differential geometry: twisted curves, tangent, normal, binormal, Serret-Frenet formula, the helix,vector differential operator 'Δ', Gradient, Divergence and Curl, identities involving 'Δ',

Coordinate Systems: orthogonal curvilinear, polar, cylindrical and spherical,

Vector Integration: line integrals, surface integrals, volume integrals, Divergence theorem, Stoke's theorem and related integral theorems,

Application to Mechanics: rotating coordinate systems, velocity and acceleration in moving systems, angular velocities, motion of a particle relative to the earth.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Murray R. Spiegel, Theory and Problems of Vector Analysis. McGraw – Hill Book Company ISBN 0 – 07 – 099009 – 3
- Harry F. Davis and Arthur David Snider, Introduction to vector Analysis. William C Brown Publication.

Time Allocation : Lectures (3 hours), Tutorials (1 hour) (per week)

Code/Title of the Module : MMOD 3124 – Mathematical Models

Aims:
- To introduce the practice of mathematical modeling techniques.
- To help students build the confidence in their ability to do model analysis.
- To provide students with specific guidelines to follow when attacking new problems.
- To give each student an opportunity to practice the first several steps of the modeling process.

Intended Learning Outcomes:
On completion of the unit the student should be able to:
- apply mathematical & Statistical concepts to solve real world problems.
- develop mathematical models for practical problems, identify relevant variables, collect data, perform using data using statistical software and communicate the outcome to the general public.

Pre Requisite: MATH 1222, MATH 2114

Syllabus:
Introduction to Mathematical Models : technique of mathematical modeling, characteristics of models,

The models describe to demonstrate the principles of formulation and solution will be selected from three main areas,

Industry and commerce : roll up problem, investment, break even, hire or own, project distribution, resource allocation, project selection, water supply,

Science and engineering : motion in a straight line, motion under gravity projectiles, heat conduction and radiation, current flow in electric circuits with resistance, capacitance, inductance, modeling of gases and liquids, cell growth decay, radioactive decay, technology innovation model, models related to non linear ordinary differential equations,

Domestic and social : population growth decay, life expectancy, home finance, seasonal temperature variations, atmospheric solutions, spread of infection deceases.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- J.N. Kapur, Mathematical Modelling, Wiley Eastern Ltd., New Delhi, 1994
- J. Bery, K. Housten, Edward Arnold, Mathematical Modeling, London, 1995

Time Allocation : Lectures (4 hours), Tutorials (2 hours) (per week)

Code/Title of the Module : MATH 3214 – Discrete Mathematics

Aims
- To provide the clear understanding of concepts of relation and function, polynomial generating functions & switching functions

Intended Learning Outcomes:
On successful completion of the course, the students should be able to:

- Acquire knowledge in several basic areas of Discrete Mathematics & the efficient use of these as Mathematical tool

- Enhance knowledge in some commonly use discrete an algebraic structures and will use their properties to develop advance techniques in problem solving.

Pre Requisite: MATH 2114, MATH 3114

Syllabus:
Relation and Function: cartesian products and relations, one to one & onto functions, stirling numbers of second kind, special functions, the pigeon hole principle composition and inverse of functions, computational complexity, analysis of algorithms, first and second levels of reachability,k-equivalent relation, reflexive symmetric transitive relation, partial order, zero-one matrices, relation matrices,

Language: the set theory of strings, concatenation, alphabet , finite state machines, internal status, input alphabet, output alphabet, next state function, state table, transition table, equivalent of finite state machines, delay machine, transfer sequence, minimization of state machine, refinement ,principle of inclusion and exclusion and its generalization, Rook polynomial, generating functions, partition of integers, exponential generating functions recurrent relation, switching functions,
boolean algebra.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Ralph P. Grimaldi, Discrete and combinatorial Mathematics, Addison-wesley, ISBN 0-201-54983-2
- Wayne M. Dymacek, Henry Sharp Jr. , *Introduction to discrete mathematics,* McGraw hill, ISBN 0-07-115688-7

Time Allocation : Lectures (4 hours), Tutorials (2 hours) (per week)

Code/Title of the Module : MATH 3224 – Applied Number Theory

Aims:
- Introduce simple number theory techniques that are powerful tools in computer programming.

Intended Learning Outcomes:
- This will introduce simple number theory techniques that are powerful tools in computer programming. This will prepare students to study towards cryptography.

Pre Requisite: MATH 1212, MATH 2114

Syllabus:
Principle of Finite induction: division algorithm, gcd, Euclidean algorithm, Diophantine equation, Fundamental theorem of arithmetic, Euclid's theorem on primes, congruences, divisibility tests, linear congruences, Structure of Z_n, solving Chinese remainder theorem,. Fermat's theorem, Wilson's theorem, Euler generalization, Euler's phi function, cryptography applications, Primitive roots and indices, composite numbers with primitive roots, application to random number generation, exponential congruence solving, Quadratic congrunces with composite moduli, special types of primes, continued fractions.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- David M. Burton, Elementary Number Theory, Wm.C.Brown, ISBN 0-697-13330-3
- RBJT Allenby & EJ Rolfern, Introduction to number theory, Arnold, ISBN 0-7131- 3661-8

Code/Title of the Module : MMOD 3214 – Numerical Methods

Aims :
- To enable the student to understand the numerical solution related to applied models.
- To enable the student to design appropriate numerical solutions related to applied models.
- To enable the student to distinguish between theoretical and practical answers of a given applied models.

Intended Learning Outcomes:

On completion of the unit the student should be able to:
- Explain what a numerical solution and can be discussed the accuracy of the numerical solution.
- Find numerical solutions of linear equations, non-linear equations and ordinary differential equations.
- Fit curves for given set of data point in two-dimensional space.

Pre Requisite: MATH 2114

Syllabus:

The representation of numbers : decimal and binary.
Algorithms and errors: algorithms, computer accuracy, floating point numbers, significant digits, error, absolute error, relative error, truncation error, round-off error, propagated error.

Solving non-linear equations: method of halving the interval, method of linear interpolation, Newton's method, Secant method, Muller's method, using of x=g(x) method, convergence of Newton's method, method of polynomials, Bairstow's method for quadratic factors, other methods for polynomials.

Solving sets of equations: Gaussian elimination method, matrix inversion method, triangular factorization, iterative methods, determinants.

Curve fitting and approximation of a function: least-squares approximations, fitting non-linear curves by least squares, Chebyshev polynomials, approximation of a function with economized power series.
Interpolating polynomials: Lagrange polynomials, divided differences, evenly spaced data, other interpolating polynomials, error terms and error interpolations, inverse interpolation, interpolating with a cubic splines and other splines.

Numerical differentiation and numerical integration: first derivative from interpolating polynomials, formulae for higher derivatives, extrapolation techniques, composite trapezoidal and Simpson's rule, Newton coates integration formulae, recursive rules and Romberg integration, other ways to derive integration formulae, Gaussian quadrature.

Numerical solution of ordinary differential equations: Taylor series method, Euler and modified Euler methods, Runga-Kutta methods, multistep methods, predictor-corrector methods, system of differential equations and higher order equations, boundary value problems, finite difference method.

Eigen values and eigenvectors: homogeneous systems, the eigen value problem, the power method, Jacobi's method, eigen values of Square matrices, characteristic polynomials and eigen vectors.

Assessment:

Continuous Assessment	30%
Semester-End Theory & Practical Examination	70%

References:
- John H. Mathews, NumericalMethods for Mathematics, Science and Engineering, Prentice – Hall of India (Pvt.) Ltd., New Delhi, 2001.
- Won Y. Yang, Wenwn Cao, Tae-Sang chung, John Morris, *Applied Numerical Methods* using MATLAB, Johns Wiley & Sons.

Time Allocation : Lectures (2 hours) Practical (2 hours), Tutorials (2 hours) (per week)

Code/Title of the Module : MATH 4114 – Complex Variables

Aims:
- To provide the clear understanding of basic concepts of complex variables

Intended Learning Outcomes

On successful completion of the module, the students should be able to
- Understand the functions of the complex variables.
- Understand the theories of residues with applications to the evaluation of complex integrals and conformal mapping with applications drown from various field.

Pre Requisites: MATH 3114

Syllabus:

Functions of complex variables: multivalued functions, examples of w-z plane , polynomials, rational functions, bilinear functions, exponential functions, trigonometric functions, hyperbolic functions, branch points and lines, logarithm and exponents.

Analytic functions: limit, continuity, differentiability, Cauchy –Riemann Equations, Harmonic conjugates, analytic functions, entire functions, singular points, kinds of singularities, poles.

Complex integral: path dependence, contour, Cauchy's theorem, region, Taylors's theorem, Laurent's theorem, improper integrals, principle value , changes to the contour.

Conformal mapping: definition and examples, orientation, critical points, applications.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- J.H. Cartigs, *Introduction to functions of a complex variable,* Marcel-Diikker, ISBN 0-8348-6501 –x
- Mari O. Gonzalez, *Complex Analysis*, Maecel Dekker, ISBN 0-8247-8416-2

Time Allocation : Lectures (4 hours), Tutorials (2 hours) (per week)

Code/Title of the Module: MATH 4124 - Functional Analysis

Aims:
- To provide a clear understanding of concepts of metric, normed, Banach and Hilbert spaces.

Intended Learning Outcomes:

On successful completion of the course, the students should be able to:
- understand the concept of normed, Banach and Hilbert spaces;
- appreciate the notion and consequences of completeness;
- work with operators on normed spaces.

Pre Requisites: MATH 2213, MATH 3114

Syllabus:

Metric Spaces: metric space, completion of metric spaces, Baire's category theorem.

Normed and Banach Spaces: normed space, Banach space, some concrete normed and Banach spaces, subspaces, completion of normed spaces.

Bounded Linear Operators: basic properties of bounded linear operators, spaces of bounded linear operators, finite dimensional normed spaces, open mapping theorem, closed graph theorem, uniform boundedness theorem.

Bounded Linear Functionals: basic properties of bounded linear functionals, dual spaces, weak convergence, Hahn- Banach theorem (without proof).

Inner product spaces: inner products and properties, orthogonal complements, direct sums, orthogonal sets and sequences.

Hilbert spaces: properties of Hilbert space, bounded linear operators and bounded linear functionals on Hilbert spaces.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- P.K. Jain, O.P. Ahuja and K. Ahmed (1997), Functional Analysis, New Age International (Pvt) Ltd.
- E. Kreyszig (1978), Introductory Functional Analysis With Applications, John Wiley
- B. V. Limaye (1996), Functional Analysis, Revised Second Edition, New Age International (Pvt) Ltd.
- W. Rudin (1997), Functional Analysis, Tata McGraw – Hill Publishing Company Ltd.

Time Allocation : Lectures (4 hours), Tutorials (2 hours) (per week)

Code/Title of the Module : MATH 4214 – Partial Differential Equations

Aims
- To unable the students to understand the fundamental techniques and theories of Partial Differential Equations & their applications.

Intended Learning Outcomes:
On completion of the unit the student should be able to:
- Formulate Partial Differential Equations to describe simple situations & use various techniques to solve the equations
- Recognize the relevance of Partial Differential Equations in many subject areas.
- Ability to use Fourier Transform Methods for solution of some Partial Differential Equations.

Pre Requisite: MATH 1222 &MMOD 3113

Syllabus :
Partial Differential Equations: Introduction to first order partial differential equations, theory of second order partial differential equations,
Integral Transforms: Laplace Transforms, Fourier Transforms, Hankel Transforms, Fourier method for partial differential equations,

Partial Differential Equations in two variables: linear second-order equations in two independent variables, normal forms, hyperbolic, parabolic and elliptic equations, boundary value problems in rectangular and cylindrical coordinates, applications to heat flow, vibrations and waves, Laplace and Poisson equations in two dimensions, Bessel functions.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:
- Raisinghania, M.D, Advance Differential Equations, S.Chands& Co. Ltd. (1991) ,
- Pinsky, M., Partial Differential Equations &Boundry value problems with Applications

Time Allocation : Lectures (4 hours), Tutorials (2 hours) (per week)

Code/Title of the Module : MATH 4224 – Measure Theory

Aims:

To give the student the knowledge of theLebesgue measure and Lebesgue integrals

Intended Learning Outcomes:

On completion of the unit the student should be able to:

- understand the concepts associated with Lebesgue measure and Lebesgue integrals
- Riemann theory of integration with its applications.

Pre Requisite: MATH 3114

Syllabus:

Lebesgue Measure on the real line, σ-algebras, Measurable functions, Measure spaces, Lebesgue integral, Fatou's Lemma, Monotone Convergence Theorem, Dominated Convergence Theorems,spaces, Modes of Convergence, Product measures, Fubini's Theorem. Relation of Riemann and   Lebesgue integrals.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

References:

- G. De Barra (1974), Introduction to Measure Theory, Van Nostrand Reinhold Company
- H.L. Royden (1988), Real Analysis, Macmillan

Time Allocation : Lectures (4 hours), Tutorials (2 hours) (per week)

Code/Title of the Module : MATS 4†14 – Project

Aims :

- To enable the student to get hands on experience on applying the mathematical methods learned in other Mathematics course units to a real world problem.
- To enable the student to improve written and oral communication skills in a real practical setting.
- To enable the student to gain experiences to be a successful team player.
- To enable the student to develop contacts with the public sector and private sector agencies to increase the employment opportunities after his or her graduation.

Intended Learning Outcomes:

On completion of the unit the student should be able to:

- Apply mathematical concepts to solve real world problems.
- Develop mathematical models for practical problems, identify relevant variables, collect data, perform data analysis using statistical software, and communicate the outcome to the general public.

Pre-requisites: All compulsory modules in Mathematics & Mathematical Modelling

Syllabus:

Students will be provided with a list of suitable project topics from which a selection may be made. Students will also have the opportunity to propose project topics of their own devising, subject to the approval of suitability.

Project is started with submission of a project proposal by the student. Once approved, the student in consultation with the supervisor carries out a formal System study , Design and Development work. Three oral project presentations will be held during the academic year for project assessment and monitoring and a comprehensive project report should be submitted at the end of the project.

Assessment:

There is no final examination for this course unit. The evaluation is completely based on the quality of the overall project, the effectiveness of the presentation of the results orally and by a written report.

Project Proposal, Presentations	- 25%
Final presentations	- 25%
Project report	- 50%

Code/Title of the Module : MATS 4†28 Research Project

Aims :
- To enable the student to get hands on experience on applying the Mathematical an Statistical methods learned in other Mathematics and statistics course units to a real world problem.
- To enable the student to improve written and oral communication skills in a real practical setting.
- To enable the student to gain experiences to be a successful team player.

Intended Learning Outcome:
On completion of the unit the student should be able to:
- Apply Mathematical and statistical concepts to solve real world problems.
- Develop an understanding in planning and carrying out a research project
- Express themselves both in verbal and written forms

Pre-requisites : All compulsory modules in Mathematics & Mathematical Modelling and Statistics

Syllabus:
A research project related to major sub disciplines of Mathematics and / or Statistics supported by seminars, presentations and dissertation is assigned to each student under the supervision of a senior staff member at the beginning of the forth year. The dissertation should be submitted and the results should be presented at a seminar of one hour duration before the end of the academic year.

Assessment:
There is no final examination for this course unit. The evaluation is completely based on the quality of the overall research project, the effectiveness of the presentation of the results orally, and by the dissertation.

Seminars and oral presentation   - 40%
Dissertation   - 60%

Time Allocation : Throughout the year.

DETAIL BREAKDOWN OF CONTINUOUS ASSESSMENTS

Course Code	Subject Name	Continuous Assessment			
		Mid-Semester Test	Tutorials	Quizzes/ Mini Project	Total
		M%	(#) M%	(#) M%	(#) M%
MATH 1112	Introduction to Mathematics I	15%	(4-8) 10%	(1-3) 5%	30%
MATH 1212	Introduction to Mathematics II	15%	(4-8) 10%	(1-3) 5%	30%
MATH 1222	Differential Equations	15%	(4-8) 10%	(1-3) 5%	30%
MATH 2114	Linear Algebra I	15%	(6-12) 10%	(1-3) 5%	30%
MATH 2213	Linear Algebra II	15%	(6-10) 7%	(1-3) 8%	30%
MATH 3114	Advanced Calculus	15%	(6-12) 7%	(1-3) 8%	30%
MMOD 3113	Mathematical Methods	15%	(6-10) 10%	(1-3) 5%	30%
MMOD 3124	Mathematical Models	15%	(6-12) 10%	(1-3) 5%	30%
MATH 3214	Discrete Mathematics	15%	(6-12) 10%	(1-3) 5%	30%
MATH 3224	Applied Number Theory	15%	(6-12) 10%	(1-3) 5%	30%
MMOD 3214	Numerical Methods	15%	(6-12) 5%	(1-3) 5%	30%
MATH 4114	Complex Variables	15%	(6-12) 10%	(1-3) 5%	30%
MATH 4124	Functional Analysis	15%	(6-12) 10%	(1-3) 5%	30%
MATH 4214	Partial Differential Equations	15%	(6-12) 10%	(1-3) 5%	30%
MATH 4224	Measure Theory	15%	(6-12) 10%	(1-3) 5%	30%

Course Code	Subject Name	Proposal, Preliminary Report	Final Report	Oral Presentation	Total
MATS 4†14	Project	25%	50%	25%	100%
MATS 4†28	Research Project	25%	50%	25%	100%

(#) – No. of. Assessments   M% - Percentage of marks

Code/Title of the Module : STAT 1113 - Introduction to Probability and Statistics I

Aims:
- To enable the student to appreciate the basic concept of statistics
- To enable the student to understand the concepts of probability, random variables and their distributions.
- To provide prerequisites for other statistics course.

Intended Learning Outcome:
On the completion of the unit the student should be able to:
- Assign probabilities to simple events and use probability rules to calculate probabilities of more complicated events.
- Understand the properties of typical probability models used in mathematical modeling and apply them in problem solving setting.
- Understand the concept of a random variable and its distribution.

Pre-requisites: A/L Mathematics

Syllabus:
Introduction to Probability: Random Experiments, Sample Space, Events, Equally Likely Events, Probability of an Event, Axioms of Probability. Counting Techniques and their applications to Probability Calculations, Conditional Probability, Multiplication Rule for Probability, Independent events, Bayes' Theorem.
Random Variables and their Distributions: Mathematical Expectation, Moments and Moment Generating Functions.
Discrete Probability Distributions: Discrete Uniform, Bernoulli, Binomial, Geometric, Negative Binomial, Hyper geometric, Poisson distribution.
Continuous Probability Distributions: Uniform, Exponential, Gamma, and Normal.
Approximations: Binomial to Hyper geometric, Poisson to Binomial, Normal to Binomial, Normal to Poisson.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:
- Introduction to Probability Theory, Paul G. Hoel, Sydney C. Port, and Charls J. Stone, Haughton Mifflin, Boston, 1971

- Introductory Statistics (Perm S. Mann)
- Concise Course in A-Level Statistics (J. Crawshaw, J. Chambers)
- Statistics for Business and Economics (Joseph G. Van Matre, Glenn H. Gillreath)

Time Allocation: Lectures (3 hours), Tutorials (1 hour) **(**Per Week**)**

Code/Title of the Module : STAT 1213 - Introduction to Probability and Statistics II

Aims:
- To enable the student to understand the concepts of more than two random variables and their distributions, sampling theory.
- To provide prerequisites for other statistics course.

Intended Learning Outcome:
On the completion of the unit the student should be able to :
- Possess the knowledge to apply the principles of Probability and Statistic to any real life problem.
- Understand the concept of designing a random experiment for a given investigation, and possess the knowledge of how to perform such an experiment.
- Design and carry out sample surveys and randomize comparative studies to solve real world problems

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Pre-requisites: STAT 1113

Syllabus:

Multivariate Distributions: Joint Distributions of two or more Random Variables, Marginal and Conditional Distributions, Independent Random Variables, Expectation of Functions of many Random Variables, Conditional Expectation, Covariance and Correlation, Bivariate Normal Distribution.

Distributions of Functions of random variables: Distribution Function Techniques, Moment Generating Function Techniques, The Jacobin Method.

Central Limit Theorem

Order statistics

Special Distributions: χ^2 ,t, and F Distributions

Sampling Theory: Planning of a Survey, Questionnaire Designing, Problems Arising in the Execution of a Survey, Sampling and Non-sampling Errors Probability Sampling and its Importance

Types of Sampling Plans: Simple Random, Stratified, Systematic, Cluster, and Multi Stage

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:

- Introduction to Probability Theory, Paul G. Hoel, Sydney C. Port, and Charls J. Stone, Haughton Mifflin, Boston, 1971

- Exploratory Data Analysis, John Tukey, Addison – Wesley, Reading , Massachustts, 1977
- Sampling Techniques, Third Edition, W. G. Cochran, Wiley, New York,1977

Time Allocation: Lectures (3 hours), Tutorials (1 hour)**(Per Week)**

Code/Title of the Module : STAT 2112 - Statistical Inference I

Aim :
- To enable the students to appreciate the theoretical and practical aspect of statistical inference.
- To enable the student to understand the basic foundation of statistical inference.
- To enable the student to project the finding from a sample to the population and communicating the results to the general public.

Intended Learning Outcome:
On completion of the unit the student should be able to:
- Estimate population parameters based on sample data and asses the reliability of the estimate.
- Formulate relevant statistical hypothesis to solve practical problem, test them, draw appropriate conclusion, and communicate the finding effectively.

Pre-requisites: STAT 1213

Syllabus:

*Point Estimation:*Methods of Point Estimation: method of moments, maximum likelihood method, estimating functions of parameters.

Interval Estimation: confidence level, confidence interval, margin of error, confidence intervals for the population mean and the difference between two population means, the population variance, the population proportion, and the difference between two proportion,

Testing Statistical Hypothesis: theory; simple and compositive hypotheses, the null hypothesis, regions of acceptance and rejection, two types of error, the level of significance and the power of a statistical test, using the p-value to test a statistical hypothesis.

Application: hypothesis tests concerning the population mean, variance, the difference between two population means, the population proportion, the difference between two proportions, paired sample t-test, issue of sample size determination.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:

- Introduction to Probability Theory, Paul G. Hoel, Sydney C. Port, and Charls J. Stone, Haughton Mifflin, Boston, 1971.
- Theoretical Statistics, D.R. Cox, Chapman and Hall, London, 1974

Time Allocation : Lectures (2 hours), Tutorials (1 hour)**(Per Week)**

Code/Title of the Module : STAT 2212 - Design of Experiments

Aims:

- To enable the students to understand the concepts of mathematical model building
- To enable the students to understand the fundamental aspects of multiple comparison methods

Intended Learning Outcome:

On the completion of the unit the student should be able to:

- Apply the knowledge they gained to mathematical model building and to applications of various types of models.
- Design appropriate tests to check the adequacy of proposed models on the basis of available facts

Pre-requisites: STAT 2112

Syllabus:

Analysis of Variance: One Way and Two Way Classifications, Assumptions, Normal theory, F-tests Analysis of Variance by Ranks (Kruskals-Wallis test)
Design of Experiments: Three Basic Principles; Randomization, Replication, and Blocking,
Standard Design: Completely Randomized Design, Randomized Blocks, Handling missing observations and Latin Squares.
Multiple Comparison Methods: LSD method, Tuckey's method, Scheffe's method, Duncan's multiple range method, Bon - ferroni method.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:

- Design and Analysis of experiments, Douglas C. Montgomery, Wiley, 1997
- Analysis of Variance, H. Scheffe, Wiley, New York, 1959.
- Linear Statistical Inference and its applications, C. RadhakrishnaRao, Wiley, New York, 1965.

Time Allocation: Lectures (2 hours), Tutorials (1 hour) **(Per Week)**

Code/Title of the Module : STAT 2222 - Regression Analysis

Aims:

- To facilitate understanding, interpretation and implementation of regression models.

Intended Learning Outcome:

On the completion of the unit the student should be able to:

- Use regression techniques to develop mathematical methods and assess their validity.
- Emphasize the importance of expressing the results of an experiment quantitatively.

Pre-requisites: STAT 2112, MATH 2114

Syllabus:

Simple Linear Regression: simple linear regression model, least squares estimation of parameters, hypothesis testing of parameters, inferences about the model parameters, analysis of variance approach, matrix approach to simple linear regression.

Multiple Linear Regression: multiple linear regression models, estimation of model parameters, hypothesis testing, and analysis of variance approach, confidence intervals, multicollinearity.

Model Adequacy Checking: residual analysis, outliers, Testing lack of fit of the regression model, Indicator Variables: use of indicator variables in regression models.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:

- Applied Regression Analysis ,Norman R. Draper, H. Smith , 3rd Edition (1998), Wiley
- Applied linear statistical models,John Neter, Michel H.Kutner, ChristoperJ.Nachtsheim, William Wasserman, 4th Edition, (1996), Mc-Graw Hill

Time Allocation: Lectures (2 hours), Tutorials (1 hour) **(**Per Week**)**

Code/Title of the Module : STAT 3112 - Statistical Inference II

Aims:

- To enable the students to understand theoretical aspects of advanced statistical inference.

Intended Learning Outcome:

On completion of the unit the student should be able to:

- Determine various criteria of estimation and lay down appropriate procedures for obtaining estimates.
- Determine criteria for estimation in large samples.

Pre-requisites: STAT 2112

Syllabus:

*Properties of Estimators:*Unbiasedness, Mean Square Error of an Estimator, Consistency, Efficiency, Sufficiency,Uniformly Minimum Variance Unbiased Estimators(UMVUE) Cramer-Rao lower bound, , Factorization Theorem, Rao-Blackwell Theorem, Lehmann-Scheffe Theorem.

Testing Statistical Hypothesis: Power function of a test, Most powerful test, Neyman-Pearson Lemma, Uniformly Most Powerful Test, Likelihood Ratio Test.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:

- Introduction to Probability Theory, Paul G. Hoel, Sydney C. Port, and Charls J. Stone, Haughton Mifflin, Boston, 1971.
- Theoretical Statistics, D.R. Cox, Chapman and Hall, London, 1974

Time Allocation: Lectures (2 hours), Tutorials (1 hour) **(**Per Week**)**

Code/Title of the Module : STAT 3124 -Time Series Analysis

Aims:

- To enable the student to analyze time series data using regression, ARIMA(Box-Jenkins), and Exponential smoothing methods.

Intended Learning Outcome:

On completion of the unit the student should be able to:

- Use the concept of the autocorrelation function of a stochastic process to test the process for stationary.

- Fit a Box-Jenkins Model for a Time Series.
- Generate a forecast using a general SARIMA model and develop confidence intervals for the forecast.
- For a Box-Jenkins Model, estimate the model parameters, and perform appropriate diagnostic checks of the model.

Pre-requisites: STAT 2112

Syllabus:

Introduction: definition, objectives of time series, components of a time series, autocorrelation, autocovariance, partial autocorrelation, correlogram.

Traditional methods of Time Series Analysis: estimate trend and seasonal effect, simple forecasting techniques, moving averages, exponential smoothing.

Probability Models for Time series: stationary time series, strictly and second-order stationary, purely random processes, random walk, moving average processes, autoregressive process,

mixed models, autoregressive integrated moving average processes, seasonal models,Box-Jenkins Procedure to Analysis of Time Series: identification, parameter estimation, model checking, forecasting.

Analyzing Time series data using a statistical Package: seasonal factors, trend, decomposition, smoothing data, transform non stationary series in to a stationary series , fitting a model by using Box-Jenkins Methodology, residual analysis.

Assessment:

Continuous Assessment	10-15%
Semester-End Examination -Theory	50%
Practical	30%
Project	5-10%

Reference Recommended:
- Forecasting and Time Series: An applied approach, Third Edition, Bruce L. Bowerman, and Richard T. O'Connell, Duxbury Press, Belmont, CA 1993.
- Time Series Analysis: Forecasting and Control, Third Edition, George E. P. Box, G. M. Jenkins, and G. C. Reinsel, Prentice-Hall, New Jersey, 1994.
- The Analysis of Time Series: An Introduction, Fifth Edition, Christopher Chatfield, Chapman & Hall, London, 1996.
- Statistical Vision in Time: A History of Time Series Analysis, J. L. Klein, Cambridge University Press, 1997.
- Econometric Models and Economic Forecasts, Fourth Edition, R. Pindyck, and D. Rubenfield, McGraw-Hill, New York, 1998.

Time Allocation: Lectures (3 hours), Practical(2 Hours) Tutorials (1 hour)**(Per Week)**

Code/Title of the Module : STAT 3212 - Statistical Techniques

Aims:
- To study the two factor factorial design.
- To unable to students to understand the concept of non-parametric tests.

Intended Learning Outcome:

On completion of the unit the student should be able to:
- Use goodness of fit tests to find appropriate probability models to descried the population from which the sample data are generated, and to check the independence of variables.
- Study the methods where the application is independent of the distribution of the random variable on which observations have been obtained.

Pre-requisites: STAT 2222, MATH 2114

Syllabus:

Collecting and interpreting data from a factorial experiment, Main effects and interactions, 2^2 factorial experiments, 2^3 factorial experiments, 2^k factorial experiments, Yates Algorithm, Introduction to Analysis of covariance.

Non Parametric Tests: Sign Test, Rank Sum Test, Mann- Whitney Test, Wilcoxon Sign Rank Test, Wald-Wolfowitz Run Test, Kolmonogorov-Smirnov Test.

Categorical Data Analysis: Multinomial distribution, goodness of fit tests, contingency tables.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:
- Linear Statistical Inference and its applications, C. RadhakrishnaRao, Wiley, 1965.
- Design and Analysis of experiments, Douglas C. Montgomery, Wiley, 1997.

Time Allocation: Lectures (2hours), Tutorials (1 hour) **(**Per Week**)**

Code/Title of the Module : STAT 3223 - Operations Research

Aims:
- Formulate problems using deterministic mathematical models
- Learn a variety of algorithms for solving such models
- Learn how these ideas are used in industrial engineering, management and science applications

Intended Learning Outcome:

On the completion of the unit the student should be able to:
- Understand how to solve problems pertaining to efficient allocation of scarce resources, build mathematical models to represent such situations in real life

Pre-requisites: MATH 2114

Syllabus:

Linear Programming: Maximization Problem, Graphical and Simplex Procedures, Minimization problem, Big M method, Dual method.

Sensitivity Analysis: Dual Simplex Method.

Queuing Theory: Queuing systems, Queue characteristics, Poisson Process, and M/M/1 system, other systems (M/M/s, M/M/1/k, and M/M/s/k).

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:
- Introduction to Operations Research, Fredrick S. Hiller, Gerald J. Lieberman, 8th edition,Mc-Graw Hill (2005),
- Operations Research ,Hamdy A. Taha, 8th edition, , Tara Mc-Graw Hill

Time Allocation: Lectures (3 hours), Tutorials (1 hour) **(**Per Week**)**

Code/Title of the Module : STAT 3232 - Data Analysis & Preparation of Statistical Reports

Aims:
- Familiarize students with the use of statistical packages and/or programming languages in analyzing data for decision making and statistical modeling.

Intended Learning Outcome:

On the completion of the unit the student should be able to:

- Use statistical software to calculate the estimate of the population parameters, construct confidence intervals, and test statistical hypotheses.
- Use regression techniques to develop mathematical methods and assess their
- Use statistical software to do the calculations and construct appropriates graphical displays necessary for statistical analysis.
- Effectively communicate the findings to the general public through well-written reports and well-organized oral presentations.

Pre-requisites: STAT 2212, STAT 2222

Syllabus:
Introduce concepts and techniques required to carry out an advanced statistical analysis by applying suitable statistical techniques, which you have already learnt:
Statistical Inference
Regression Analysis (Computational Techniques for Variable Selection): all possible regressions, stepwise regression methods, other procedures. Model Building: comparing regression models using R², forward selection, backward elimination.
Design of Experiments
Non Parametric Methods
Introduce concepts and techniques required to write a statistical report based on findings of the statistical data analysis

Assessment:

Continuous Assessment	20%
Semester-End Examination	60%
Project	20%

Reference Recommended:
Relevant Statistical software manuals.

Time Allocation: Lectures (Practical)(4 hours), Tutorials (1 hour)**(Per Week)**

Code/Title of the Module : STAT 3243 Theory of Interest

Aims:
- To enable the student to gain a practical knowledge of theory of interest.
- To enable the student to use annuity functions in a broad finance context.
- To enable the student to prepare for the interest theory part of the society of actuaries course-two examination.

Intended Learning Outcome:
On completion of the unit the student should be able to:
- Use theory of interest in the various annuity functions.
- Apply the concepts of present and accumulated value for various streams of cash flows as a basis for future use in: reserving, valuation, pricing, duration, asset / liability management, investment income, capital budgeting, and contingencies.
- Able to perform present and accumulated value calculations using non-level interest rates.
- Understand the following principles and applications:
- Accumulation function and special cases of simple and compound interest.

- Nominal and effective interest and discount rates, and the force of interest- constant and varying.
- Valuation of discrete and continuous streams of payments, including the case in which the interest conversion period differs from the payment period.
- Determination of yield rates on investments and the time required to accumulate a given amount or repay a given loan amount.
- Application of interest theory to amortization of lump sums, fixed income securities, depreciation, and mortgages.

Pre-requisites: MATH 1112, MATH 1222

Syllabus:

Measurement of Interest: The Accumulation and Amount Functions, The Effective Rate of Interest, Simple Interest, Compound Interest, Present Value, The Effective Rate of Discount, Nominal Rate of Interest and Discount, Forces of Interest and Discount, Varying Interest.

Solution of Problems in Interest: Obtaining Numerical Results, Determining the Time Periods, The Basic Problem, Equations of Value, Unknown Time and Rate of Interest.

Basic Annuities: Annuity-Immediate, Annuity-Due, Annuity Value on Any Date, Perpetuities, Unknown Rate of Interest, Varying Interest

More General Annuities: Annuities Payable at a Different Frequency than Interest is Convertible, Further Analysis of Annuities Payable Less Frequently and More Frequently than Interest is Convertible, Continuous Annuities, Basic Varying Annuities, More General Varying Annuities, and Continuous Varying Annuities.

Yield Rates: Discounted Cash Flow Analysis, Uniqueness of the Yield Rate, Reinvestment Rates: Interest Measurement of a Fund, Time-Weighted Rates of Interest, Capital Budgeting

Amortization Schedules and Sinking Funds: Finding the Outstanding Loan Balance, Amortization Schedules, Sinking Funds, Differing Payment Periods and Interest Conversion Periods, Varying Series of Payments.

Assessment:	Continuous Assessment	30%
	Semester-End Examination	70%

Reference Recommended:
- The Theory of Interest, Second Edition, Stephen G. Kellison, McGraw-Hill, New York, 1991.
- Theory of Interest and Life Contingencies, with Pension Applications: A problem Solving Approach, Third Edition, Michael M. Parmenter, ACTEX Publications, Winsted, Connecticut, 1999.

Time Allocation: Lectures (3 hours), Tutorials (1 hour)**(Per Week)**

Code/Title of the Module : STAT 4114 - Stochastic processes

Aims:
- To enable the student to analyze the survival data.
- To enable the student to simulate probability distributions related to actuarial problems.
- To enable the student to understand the stochastic processes related to life contingencies.
- To enable the student to prepare for the examinations for course-3 and course-4 of the society of actuaries.

Intended Learning Outcome:

On completion of the unit the student should be able to:
- Obtain nonparametric estimates for a failure time or loss distribution using the empirical distribution, the Kaplan-Meler estimator and the Nelson-Aalen estimator.
- Construct the likelihood model needed to estimate the parameters of a parametric failure time or loss distribution regression model.
- Construct the partial likelihood model needed to estimate the regression coefficients in semi-parametric failure time or loss distribution regression model.
- Distinguish between a continuous time and discrete time stochastic processes.
- Characterize a discrete-time Morkov chain in terms of transition probability matrix.
- Characterize a Poisson process in various ways.
- Understand a non-homogeneous and compound Poisson processes.
- Understand a Brownian motion, a discrete-time surplus process, and continuous-time surplus process.
- Construct an algorithm to appropriately simulate outcomes under a stochastic model.

Pre-requisites: STAT 2112, MATH 2114

Syllabus:

Introduction to Stochastic Processes, Random walk model, Transition Probability distribution, Markov dependence, Chapman- Kolmogorov equations, Stationary of the process. Two state Markov chain, Finite Markov chain, Limiting probabilities, The gambler ruin problem, Infinite Markov chain. Counting process,

Poisson process, Inter-arrival waiting time distribution, Renewal process. Continuous- Time Markov chains, Birth and Death Processes, Brownian motion. Introduction to Simulation.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:
- Introduction to Probability Models, Sheldon M. Ross, Sixth Edition, Academic Press, New York, 1997.
- Simulation, Second Edition, Sheldon M. Ross, Academic Press, New York, 1997.
- Survival analysis, J. P. Klein, and M. L. Moeschberger, Springer Verlag, New York, 1997.

Time Allocation: Lectures (4 hours), Tutorials (2 hours)**(Per Week)**

Code/Title of the Module : STAT 4124 - Quality Control

Aims:
- Understanding of the principles and the basis for applying quality control techniques in a variety of situations.

Intended Learning Outcome:
- Define and discuss quality and quality improvement
- Discuss the role that variability and statistical methods play in controlling and improving quality
- Understand the importance of the normality assumption for individual control charts and know how to check this assumption

Pre-requisites: STAT 1113, STAT 2112

Syllabus:
Introduction Eight Diemention of Quality, Management Aspects of Quality, Quality Costs, Statistical Methods for Quality Control and Improvement, Statistical process control, Design of experiments, Acceptance sampling, Magnificent seven in statistical process control, Process control, Central chart (Sensitizing Rules for Shewhart Control Charts), $\overline{X}$ Charts, R-Chart, $\overline{X}$ & R Charts, $\overline{X}$ & S, Sampling inspection and Acceptance sampling.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:
- Introduction to Statistical Quality Control ,5th Edition, Douglas C. Montgomery, Wiley, 2005

Time Allocation: Lectures (4 hours), Tutorials (2 hours)**(Per Week)**

Code/Title of the Module : STAT 4134 - Actuarial Mathematics

Aims:
- To enable the student to learn about actuarial models of life contingencies that is the financial random variables dependent on human life such as life insurance payments, life annuity payments, pension payments, etc.
- To enable the student to prepare for the life contingencies part of examination for course-3 of the society of actuaries.

Intended Learning Outcome:
On completion of the unit the student should be able to:
- Explain what an actuarial model can be and discuss the value of building models.
- Understand the differences between a stochastic and a deterministic model and identify the advantages and disadvantages of each.

- Formulate a model for the present value, with respect to an assumed interest rate structure, of a set of future contingent cash flows, and determine the characteristics of the components and the effects of changes of these components.
- Understand a counting distribution, a loss distribution, and a compound distribution.
- Analyze the impact of reinsurance on the probability of ruin and the expected maximum aggregate loss of a surplus process.

Pre-requisites: STAT 1113, STAT 1213

Syllabus:
Theory of Interest: Simple and compound interest, Principles of Compound interest: Nominal and effective rates of interest and discount, Force of interest and discount, Accumulation factor of continuous compounding.
Survival Distribution for a Single Life: Introduction to survival distributions, Basic ideas and notation, The survival function, Future lifetime distributions, Curtate-future lifetimes, Force of Mortality, expected value, Lifetime Table.
Life table and its relation with survival function, assumptions of fractional ages, Selected life table.
Multiple Life Functions: Joint distributions of future lifetimes, The joint-life statuses, The last- survivor status.
Life Insurance Models: Different types of insurance   Models on benefits payable at the moment of death and end of the year of death. Insurance models with varying benefits, Notations of the insurance models, Recurrence relations of discrete and continuous life insurance models. Multiple lives and multiple decrements, Summary of formulas.
Life Annuities: Discrete and continuous annuity certain models, Discrete and continuous varying annuity models, Introduction of the notations of annuity models and terminology, Multiple lives.
Benefit Premiums: The loss variable at issue, Notation for the benefit premium, Benefit premium calculation, Percentile premium, Variance of the loss variable.
Benefit reserves: Continuous and discrete net single reserves, The loss variable, Reserves formulas and differential equations for reserves, Basic notation and formulas

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:
- Actuarial Mathematics, Second Edition, N. L. Bowers, H. U. Gerber, J. C. Hickman, D. A. Jones, and C. J. Nasbitt, Society of Actuaries, 1997.

Time Allocation: Lectures (4 hours), Tutorials (2 hours)**(Per Week)**

Code/Title of the Module : STAT 4214 - Multivariate Analysis

Aim:
- To enable the students to understand how to analyze two sets of data
- To enable the students to determine the linear combination of data.
- To enable the students to visualize the multidimensional data

Intended Learning Outcome:
On completion of the unit the student should be able to:
- Understand set of techniques dedicated to the analysis of data sets with more than one variable such as choosing of the most useful variables, visualization of multidimensional data,etc.
- Able to decide when to use a given statistical technique for a given type of data or statistical question.

Pre-requisites: MATH 2213 , STAT 2112

Syllabus:
Descriptive Statistics, Sample Variance - Covariance matrix, Sample Correlation Coefficient,Mean vectors and Covariance matrix.
Partitioning the Covariance matrix, Mean vector and Covariance matrix for combinations of Random Variables.Partitioning the Sample mean vector and Covariance matrix.
Random samples, Expected values of the sample mean and Covariance matrix.

The multivariate Normal distribution and Applications.

Sampling from a multivariate Normal distribution and maximum likelihood estimation, Sufficient statistics, The sampling distribution of $\overline{X} \text{ and } S$, Central limit theorem, Inferences about a mean vector and Covariance matrix, Hotelling's T^2 and likelihood ratio tests. Comparison of several multivariate Mean(Paired comparison), Comparing mean vectors of two independent populations, The two sample situation when $\varepsilon_1 \neq \varepsilon_2$. Principal Component Analysis. Derivation of principal Components.

Assessment:

Continuous Assessment	30%
Semester-End Examination	70%

Reference Recommended:
- Applied Multivariate Statistical Analysis , Johnson R.A. &WichemD.W. Upper Saddle River (NJ) Prentice – Hall (2002).
- Multivariate Analysis of Data in Sensory Science, Naes T. &Risvik E (Eds) New York Elsevier (1996)
- Multivariable Calculus, William G. McCallum, Deborah Hughes – Hallett, Andrew M. Gleason et.al , John Wiley & Sons, New York (1998)

Time Allocation: Lectures (4 hours), Tutorials (2 hours)**(Per Week)**

Code/Title of the Module : MATS 4†14 Project

Aims:
- To enable the student to get hands on experience on applying the statistical methods   learned in other statistics course units to a real world problem.
- To enable the student to improve written and oral communication skills in a real practical setting.
- To enable the student to gain experiences to be a successful team player.
- To enable the student to develop contacts with the public sector and private sector agencies to increase the employment opportunities after his or her graduation.

Intended Learning Outcome:
On completion of the unit the student should be able to:
- Apply statistical concepts to solve real world problems.
- Develop mathematical models for practical problems, identify relevant variables, collect data, perform data analysis using statistical software, and communicate the outcome to the general public.

Pre-requisites: All compulsory modules in Statistics

Syllabus:
Students will be provided with a list of suitable project topics from which a selection may be made. Students will also have the opportunity to propose project topics of their own devising, subject to the approval of suitability.

Project start with submission of a project proposal by the student.Once approved, the student in consultation with the supervisor carries out a formal System study , Design and Development work. Three oral project presentations will be held during the academic year for project assessment and monitoring and a comprehensive project report should be submitted at the end of the project.

Assessment:
There is no final examination for this course unit. The evaluation is completely based on the quality of the overall project, the effectiveness of the presentation of the results orally and by a written report.

Project Proposal, Presentations	- 25%
Final presentations	- 25%
Project report	- 50%

Time Allocation: Throughout the year.

DETAILED BREAKDOWN OF CONTINUOUS ASSESSMENTS

Course Code	Subject Name	Continuous Assessment					
		Mid-Semester test	Assignments	Tutorials	Quizzes	Group Project	Total
		M%	(#) M%	(#) M%	(#) M%	(#) M%	(#) M%
STAT 1113	Introduction to Probability and Statistics I	15%	-	(6-12) 10%	(1-3) 5%	-	30%
STAT 1213	Introduction to Probability and Statistics II	15%	(3-6) 5%	(6-12) 5%	-	5%	30%
STAT 2112	Statistical Inference I	15%	(1-3) 5%	(4-8) 10%	-	-	30%
STAT 2212	Design of Experiments	15%	(1-3) 5%	(4-8) 10%	-	-	30%
STAT 2222	Regression Analysis	15%	(1-3) 5%	(4-8) 10%	-	-	30%
STAT 3112	Statistical Inference II	15%	(1-3) 5%	(4-8) 10%	-	-	30%
STAT 3124	Time Series Analysis	15%	(1-3) 5%	(6-12) 5%	-	(1) 5%	30%
STAT 3212	Statistical Techniques	15%	(1-3) 5%	(6-12) 5%	-	-	30%
STAT 3223	Operations Research	15%	(1-3) 5%	(6-12) 10%	-	-	30%
STAT 3232	Data Analysis & Preparation of Statistical Reports	15%	(1-3) 5%	-	-	(1) 10%	30%
STAT 3243	Theory of Interest	15%	(1-3) 5%	(6-12) 10%	-	-	30%
STAT 4114	Stochastic Processes	15%	(1-3) 5%	(6-12) 10%	-	-	30%
STAT 4124	Quality Control	15%	(1-3) 5%	(6-12) 10%	-	-	30%
STAT 4134	Actuarial Mathematics	15%	(1-3) 5%	(6-12) 10%	-	-	30%
STAT 4214	Multivariate Analysis	15%	(1-3) 5%	(6-12) 10%	-	-	30%

(#) – No. of Assessments   M% - Percentage of Marks

Course Code	Subject Name	Proposal, Preliminary Report	Final Report	Oral Presentation	Total
MATS 4†14	Project	25%	50%	25%	100%

Code/Title of the Module: INDT 4218 - Industrial Training Programme (Six Months)

Aim:
- To enable the students to interfere with industry to promote their theoretical knowledge into practice and understand issues arisen during the implementation process, and identify strategies to overcome the issues.

Intended Learning Outcomes:
On successful completion of this course module, the participants will be able to:
- Identify issues that a firm confronts in applying the concepts and theories in a business process(es) in achieving set target(s).
- Investigate the internal operations in a scientific manner to predict the future development of a selected industry with a minimum supervision.
- Apply gained experience in fact finding and problem solving.
- Outline how concepts and theories learned in the class are applied in an organizational setting/real world.
- Originate closely supervised quality management training programme.
- Develop formal and informal relationships in an industrial organization so as to promote favorable human relations and teamwork.
- Improve links between the industry and the university to introduce an attraction towards university students for employments.

Syllabus:

Each joint major degree student is assigned to a department/area [such as operations, technical and management etc] of a reputed organization for an industrial training by the coordinator. The training assigned is directly relevant to the subjects followed. The students are expected to select a typical industry issue and apply the knowledge gained throughout the programme to identify root cause(s).

The final outcome of the training is reporting root cause(s) of the issues identified based on a methodical investigation(s) and strategies to overcome the issues, and to make the organization more effective in terms of its achievement of set goals.

Industrial training guide line would be provided with comprehensive detail of tasked to be performed with the time line.

Pre-requisite(s):   None

Assessment:

	Types of Assessment	Marks	Total
i.	Interim Reports, Daily Diary and Monthly Briefing;		
	(a) Submission of Interim reports fortnightly	5%	
	(b) Monthly Report & Details of Industrial Training Completed	5%	
	(c) Submission of Daily Diary monthly and at the end of the program	5%	
	(d) Monthly briefings & attendance to seminars	5%	
			20%
ii.	Oral Examination		30%
iii.	Report on Industrial Training		
	(a) First version of the Final report [soft binding 1 copy]	30%	
	(b) The Final report [hard binding 3 copies]	20%	
			50%
			100%

The Gradings and Grade Point Values shall be the same as for the other course units.

A minimum of 25% marks allocated for each component [three main components (i, ii, and iii), four sub components (a, b, c, and d) of (i) and two sub components (a and b) of (iii)] must be separately and individually obtained to pass this module.

Any student who fail to acquire 25% minimum marks from each of the above three main components (i, ii, and iii), four sub components of (i) and two sub components of (iii) is considered as a unsuccessful student and, maximum marks can be obtained is **34.**

N.B.: The grade (**I**) [**incomplete**] will be given unless all the above three main components (i, ii, and iii) and all sub components of (i) and (iii) are completed by a student by the specified deadlines.

If a trainee is unsuccessful at the assessment, then he/she should resubmit the report and conduct an oral presentation. However, there will be no repetition of the industrial training itself.

Please refer the Industrial Training Guide for further details.