PROCEEDINGS OF THE COMMITTEE OF COURSES FOR FORMULATING COURSE CURRICULA FOR THE POST GRADUATE DEGREE PROGRAMME IN ELECTRICAL, ELECTRONIC AND COMMUNICATION ENGINEERING

The committee of courses for formulating the course curricula for the post graduate degree programme in Electrical, Electronic and Communication Engineering to be conducted by Department of Electrical, Electronic and Communication Engineering (EECE), Military Institute of Science and Technology (MIST) published vide Bangladesh University of Professional (BUP) letter number 23.01.902.858.10.786.03.16.07.19 dated 17 July 2019. The undersigned committee has worked out and finalized the detail course outline for the aforementioned post graduate degree programme on _____December 2019.

President: ----------

Brigadier General A K M Nazrul Islam, PhD
Head, EECE Dept. MIST

Members: ----------

1. Commodore S Salahuddin Ahmed (S), NUP, NDU, afwc, psc, BN
   Dean, Office of the Evaluation, Faculty and Curriculum Development (OEFCD)
   (Representative nominated by BUP)

---

2. Brigadier General Md Anwar Shafique, ndc, psc
   Inspector of Colleges
   (Representative nominated by BUP)

---

3. Brigadier General Md Zahidur Rahim, ndc, afwc, psc
   Dean, Faculty of Science and Technology
   (Representative nominated by BUP)

---

4. Dr. Satya Prasad Majumder
   Professor, Dept of EEE, BUET (External member)

---

5. Dr. Abdul Hasib Chowdhury
   Professor, Dept of EEE, BUET (External member)

---

6. Air Commodore Mohammed Hossam-E-Haider, PhD (Retd)
   Professor, EECE Dept, MIST

---

7. Colonel Md Golam Mostafa, PhD
   Senior Instructor, EECE Dept, MIST

---

8. Colonel Molla Md Zubaer, te
   Senior Instructor, EECE Dept, MIST

---

9. Group Captain Md Abdul Halim, psc
   Senior Instructor, EECE Dept, MIST

---

10. Lieutenant Colonel Md Tawfiq Amin, PhD, EME
    Instructor Class A, EECE Dept, MIST

---

11. Major Md Ali Azam Khan, EME
    Instructor Class B, EECE Dept, MIST

CHAPTER 1

INTRODUCTION TO EECE DEPARTMENT

1.1 General Information

The necessity of establishing a technical institute for the Bangladesh Armed Forces was felt in the late eighties. In the absence of such an institution, officers of Bangladesh Armed Forces had been graduating from Bangladesh University of Engineering and Technology (BUET), Bangladesh Institute of Technology (BIT) and other foreign institutions of science and technology. With a view to meet the increasing demand for the development and dissemination of engineering and technological knowledge, Bangladesh Armed Forces established the Military Institute of Science and Technology (MIST) that promises to provide facilities for higher technical education both for the officers of Bangladesh Armed Forces as well as for civil students from home and abroad. The motto of MIST is ―Technology for Advancement. Founded on 19 April 1998, MIST started its journey on 31 January 1999 by offering a four-year bachelor's degree on Civil Engineering. Bachelor degree on Computer Science Engineering course started on 2001. Bachelor courses on Electrical, Electronic & Communication Engineering and Mechanical Engineering started its journey from 2003. Bachelor of Science program on Aeronautical Engineering (AE) and Naval Architecture and Marine Engineering (NAME) program were started from 2008-2009 and 2012-2013 respectively. Besides, four new departments started their academic session from 2014-2015 i.e. Nuclear Science & Engineering (NSE), Biomedical Engineering (BME), Architecture (Arch) and Environmental, Water Resources & Coastal Engineering (EWCE).

1.2 Department of Electrical, Electronic and Communication Engineering (EECE)

1.2.1 Introduction

Electrical, Electronic and Communication Engineering is one of the leading and purposeful fields of engineering technology. Presently, a plenty of students from various public and private universities/institutes successfully complete undergraduate programmes in this field of engineering. But scopes are limited to obtain postgraduate degree since most of the institutions at home do not run postgraduate programme. Since 2003, the department of Electrical, Electronic and Communication Engineering (EECE) of MIST is offering the undergraduate programme in this field. Over the past years, the department has attained sufficient strength to run postgraduate programmes in this field of Engineering. MIST is determined to attain the cutting edge academic and research standard in the contemporary scientific world. The department of EECE, as being

well-facilitated with all the modern and essential research aspects, is willing to launch the post-graduate program to open new dimension in the field of higher studies in Bangladesh.

On 07 February 2013, in the 40th Meeting of Academic Council of MIST, it was decided that a board of officers should study the feasibility of running Post Graduate Programme in EECE from October 2013 semester. According to the positive recommendation of the board and committee of courses (formed with distinguished professors from BUET and in house faculties of MIST) M.Sc/M.Engg programme was started from October 2013 semester and Ph.D programme was started from October 2014 semester. In the designed curricula, maximum courses were included providing wider opportunities for the students in selecting courses. However, considering the advancement of technology, existing curricula need to be updated and new courses are to be included. Courses of following fields are included:

1.2.2 Vision and Mission of EECE Department

Vision: To provide quality education in electrical, electronic and communication engineering and technology, and conduct research to meet the national and global challenges.

Mission:

1. To provide comprehensive education in electrical, electronic and communication engineering and conduct research.

2. To produce technologically advanced graduates and professionals with high moral and ethical values to meet the domestic and global needs in the field of electrical, electronic and communication engineering.

3. To conduct collaboration and research activities with national and international academia and industry.

4. To provide consultancy, advisory and testing services to public and private organizations including personal in the areas of electrical, electronic and communication engineering.

1.2.3 Facilities of the Department

The department endeavors to provide its faculty members and students adequate laboratory, library and other facilities. Departmental graduate courses are laboratory intensive and these requirements are catered by following laboratories:

1. High Voltage Engineering Lab
2. Electrical Circuit Lab
   - i. Electrical Services & Design Lab
   - ii. Control System Lab
   - iii. Measurement & Instrumentation Lab
3. Electronics & Digital Electronics Lab
   - i. Power Electronics Lab
4. Analog and Digital Communication Lab
   - i. Satellite Communication and Microwave Engineering Lab
   - ii. Mobile Cellular Communication System Lab
   - iii. Optical Communication Lab
   - iv. Radio Antenna Lab
5. VLSI Lab
   - i. Simulation Lab
   - ii. Electrical & Electronic Circuit Simulation Lab
   - iii. Numerical Methods Lab
   - iv. Digital Signal Processing Lab
   - v. Microprocessor & Interfacing Lab
   - vi. Data Acquisition Lab
6. Electrical Machines Lab
   - i. Power System Lab
   - ii. Power System Protection & Switchgear Lab

In addition to above laboratories, EECE students will have the access to the laboratories/workshops held in Physics, Chemistry, Mechanical Engineering departments too during their project, thesis and research works.

CHAPTER 2

RULES AND REGULATIONS FOR MASTERS DEGREE

Degrees Offered

The Postgraduate degrees to be offered under the Post-Graduation Ordinance of MIST in EECE Department are as follows:

2.1.1	**Doctor of Philosophy in**		
Electrical, Electronic and Communication Engineering, Abbreviated as			Ph.D. (EECE)
2.1.2	**Master of Science in**		
Electrical, Electronic and Communication Engineering, Abbreviated as			M.Sc. Engg. (EECE)
2.1.3	**Master of Engineering in**		
Electrical, Electronic and Communication Engineering, Abbreviated as			M. Engg. (EECE)

2.1 Program Objectives:

The students will acquire the following attributes on achieving the post-graduation degree:

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.

PO 4: Investigation: Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

PO 5: Modern tool usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.

PO 9: Individual work and teamwork: Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.

PO 10: Communication: Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological challenge.

2.2 Learning Outcome

Learning outcome of each course is provided in the course profile.

2.3 Admission Requirements/ Generic Skills

2.3.1 For admission to the courses leading to a Ph.D. degree an applicant:

(a) Must have a minimum GPA of 4.00 out of 5.00 or a first division or equivalent in S.S.C. and H.S.C. or in equivalent examinations;

(b) Must have at least 60% marks or a minimum GPA of 3.00 out of 4.00 or its equivalent in B. Sc. Engg. or equivalent degree in the relevant field from a recognized University/Institute. The duration of B. Sc. Engg. or equivalent degree program should be of minimum four (04) years;

(c) Should have at least 60% marks or a minimum GPA of 3.00 out of 4.00 in M. Sc. Engg. or equivalent degree in the relevant field from a recognized University/Institute. The duration of M.Sc. Engg. or equivalent degree program should be of minimum one and a half (1.5) years;

(d) In case of different grading system, the GPA of all the above examinations should be evaluated by the MIST Equivalence Committee.

2.3.2 For admission to the courses leading to a Master's degree (M.Sc. Engg. / M. Engg.) an applicant:

(a) Must have a minimum GPA of 4.00 out of 5.00 or a first division or equivalent in S. S. C and H. S. C or in equivalent examinations;

(b) Must have obtained a B.Sc. Engg. Degree or equivalent degree in the relevant field from a recognized University/Institute. The duration of B. Sc. Engg. or

equivalent degree program should be of minimum four (04) years, and the applicant must have at least 55% marks or a minimum GPA of 2.75 out of 4.0 or its equivalent in the under-graduation programme;

(c) In case of different grading system, the GPA of all the above examinations should be evaluated by the MIST Equivalence Committee.

2.3.3 For admission to the courses leading to the degree of M.Sc. Engg. /M.Engg. in any branch, an applicant must have obtained a B.Sc. Engg. Degree in the relevant branch or an equivalent degree from any UGC recognized institution. For the case of non-relevant degree of a department, the candidate may be required to undertake prerequisite courses as determined by the BPGS of EECE department.

2.3.4 For any course requiring any prerequisite knowledge, will be mentioned in that respective course profile.

2.4 Curriculum/ Skill Mapping

Curriculum/ Skill Mapping will be presented for each course in the course profile.

2.5 Curriculum Structure

The courses offered by the Department for both Masters and PhD Programs are generally divided in the following divisions.

a. Navigation and Guidance (N & G) Division.

b. Electrical Energy and Power Systems (EEPS) Division.

c. Communication & Signal Processing (Comm & SP) Division.

d. Electronics (Elec) Division.

e. Interdisciplinary Courses.

The postgraduate theory courses are arranged as: Navigation and Guidance Division (EECE 6001-6006), EEPS Division (EECE 6101-6103, EECE 6201-6210, EECE 6301-6304), Communication & Signal Processing (Comm & SP) Division (EECE 6401-6413, EECE 6501-6506), Electronics Division (EECE 6601-6611, EECE 6701-6705) and Interdisciplinary Courses (EECE 6801-6804, EECE 6901-6910, ME 6251, AE 6108).

a. **Navigation and Guidance (N&G) Division**.

EECE 6001 Advanced Radar Engineering

EECE 6002 Advanced Satellite Navigation Engineering

EECE 6003 Advanced Avionics Engineering
EECE 6004 Advanced Electronic Warfare
EECE 6005 Guided Weapon System
EECE 6006 Sonar and Underwater Communication

b. **Electrical Energy and Power Systems (EEPS) Division**.

EECE 6101 Generalized Machine Theory
EECE 6102 Advanced Control System for Industrial Electrical Machines
EECE 6103 Advanced Topics of Machines Design
EECE 6201 Optimization of Power System Operation
EECE 6202 Computer Methods in Power System Analysis
EECE 6203 Reliability of Power System
EECE 6204 Power System Stability
EECE 6205 Transient Analysis of Electric Power Circuits
EECE 6206 Power System Protection and Communication
EECE 6207 Power System Planning
EECE 6208 Advanced Power System Control
EECE 6209 Energy Conversion and Renewable Energy
EECE 6210 Flexible AC transmission Systems
EECE 6301 Advanced Topics on Nuclear Power Generation Engineering
EECE 6302 Smart Grid System
EECE 6303 Power Quality
EECE 6304 Photovoltaic Energy Conversion

c. **Communication & Signal Processing (Comm & SP) Division.**

EECE 6401 Information Theory and Coding
EECE 6402 Advanced Telecommunication Engineering
EECE 6403 Optical Fiber Communication
EECE 6404 Optical Networks
EECE 6405 Broadband Wireless Communications
EECE 6406 Advanced Multimedia Communications
EECE 6407 Advanced Digital Signal Processing
EECE 6408 Biomedical Signal Processing

EECE 6409 Digital Image Processing
EECE 6410 Digital Video Processing
EECE 6411 Digital Speech Processing
EECE 6412 Genomic Signal Processing
EECE 6413 Wireless Sensor Networks
EECE 6501 Applied EM Theory
EECE 6502 Microwave Theory and Techniques
EECE 6503 Microwave Tubes and Circuits
EECE 6504 Antennas and Propagation
EECE 6505 Microwave Solid State Devices and Circuits
EECE 6506 Optical Waveguide Theory and Photonics

d. **Electronics (Elec) Division.**

EECE 6601 MOS Devices
EECE 6602 Compound Semiconductor Devices
EECE 6603 Quantum Phenomena in Nanostructures
EECE 6604 VLSI Silicon Process Technology
EECE 6605 Semiconductor Device Modeling
EECE 6606 Advanced VLSI Design
EECE 6607 Testing VLSI Circuits
EECE 6608 Carbon Nanotechnology
EECE 6609 Nano Systems
EECE 6610 Thin film Growth and Deposition
EECE 6611 Semiconductor Characterization Technology
EECE 6701 Electric and Magnetic Properties of Materials
EECE 6702 Electronics of Solids
EECE 6703 Laser Theory
EECE 6704 Semiconductor Materials and Heterostructures
EECE 6705 Advanced Analog IC design

e. **Interdisciplinary Courses.**

EECE 6801 Engineering Analysis
EECE 6802 Selected Topics in Electrical and Electronic Engineering

EECE 6803	Nonlinear System Analysis
EECE 6804	Artificial Neural Systems
EECE 6901	Power Semiconductor Circuits
EECE 6902	Design of Power Semiconductor Circuits and drives
EECE 6903	Nonlinear Control Systems
EECE 6904	Sampled Data Control System
EECE 6905	Modern Control Theory
EECE 6906	Ionospheric Prediction and Forecasting
EECE 6907	Advanced Electrical, Electronic and Communication Engineering
EECE 6908	Space Weather Effects on Telecommunication Systems
EECE 6909	Selected Topics on GNSS Remote Sensing Technology
EECE 6910	Ionospheric Precursors of Earthquake
ME 6251	Advanced Automobile Engineering
AE 6108	Advanced Weapon Engineering

2.6 Course Schedule

2.6.1 Admission and Registration Procedures

2.6.1.1 Applications for admission to the above programs shall be invited through regular means of advertisement and shall be received by the Admission officer.

2.6.1.2 Before being finally selected for admission, an applicant may be required to appear at an oral and/or written test by a Selection Committee as constituted by the concerned department. Every selected applicant, unless he/she has already been registered, shall get himself/herself registered with Bangladesh University of Professionals (BUP).

2.6.1.3 After admission each student shall be assigned, by the Head of the department, an Adviser from among the teachers of the Department not below the rank of an Associate Professor/Instructor Class A. In advance of each enrolment and registration, the Adviser shall check and approve his/her student's schedule for subjects, pre-requisites as recommended by the Selection Committee and the total hours. The student is expected to consult his/her Adviser on all academic matters but, it is the responsibility of the individual student to see that his/her schedule conforms to the academic regulations. If no advisor is assigned, then the student will contact with the Postgraduate Program Coordinator or Head of the department for all academic matters.

2.6.1.4 Every registered student shall get himself/herself enrolled on payment of prescribed fees and other dues as per MIST and BUP rules before commencement of each semester.

2.6.1.5 On the recommendation of the Board of Post Graduate Studies (BPGS) and Committee for Advanced Studies and Research (CASR), the rules for admission into the post graduate studies shall be framed from time to time by the Academic Council. CASR on its own may, if it deems fit,

recommend such rules for admission for approval of the Academic Council. The composition of BPGS and CASR is mentioned in MIST post graduate ordinance.

2.6.1.6 No late registration will be allowed after two weeks of designated dates of registration. Late registration after this date may only be accepted for thesis/project if the student submits a written appeal to the Dean, MIST through the concerned Head and can document extenuating circumstances such as medical problems (physically incapacitated and not able to be presented) from the Medical Officer (MO) of the Institute or some other academic commitments which precluded registration prior to the last date of registration. Students will be charged a late registration fee of Tk. 1000.00 (One thousand) only. This extra fee will not be waived whatever be the reason for late registration.

2.6.1.7 If a student is unable to complete the final examination of a semester due to serious illness or serious accident or official commitment he/she may apply to the Dean, MIST in a prescribed form through Head/Director of the Department for total withdrawal from the semester within a week after the end of the semester final examination. The application must be supported by a medical certificate from the MO, or relevant Official documents. The Academic Council will take the final decision about such application on the recommendation of the relevant BPGS.

2.6.2. Supervisor

2.6.2.1 Criteria of supervisor selection

On admission and fulfillment of other requirements as mentioned in this ordinance, the Head or Postgraduate Program Coordinator of the relevant department will suggest a Supervisor for the student after completion of at least 60% theory courses with minimum required CGPA (for MSc: 3.00 and for MEngg: 2.75) following the format as given in Annexure-1. Without taking supervisor a student is not allowed to register credit hours for thesis/project. The criteria of supervisor are as follows:

2.6.2.1.1 He/She must have a PhD degree in a relevant discipline from any reputed university.

2.6.2.1.2 Scrutinize of the PhD degree has to be done through a committee as comprised below before selection as a supervisor:

- Head of the concern department
- One teacher from MIST
- One external member

2.6.2.1.3 For Ph.D. student, he/she should have at least 02 years of postgraduate teaching and supervising experience or 04 years of research experience from any public university or from nationally/internationally renowned research organization. For Masters degree student, he/she should have at least 01 years of postgraduate teaching and supervising experience or 02 years of research experience from any public university or from national/internationally renowned research organization.

2.6.2.1.4 Any person who has online PhD will not be appointed as supervisor/co-supervisor.

2.6.2.1.5 Any person who fulfills above criteria and preferably has at least o4 research publications (Ph.D.) and 02 research publications (masters) in reputed peer reviewed journals as a First/Corresponding author will be appointed as a supervisor.

2.6.2.1.6 The institute may outsource supervisors primarily from public university on fulfillment of above criteria. However, a retired teacher of public university presently serving in any other organization/university may be permitted to supervise on fulfillment of above criteria.

2.6.2.1.7 The BPGS will look into the fulfillment of the above criteria before appointing supervisors. Approval of CASR for appointing supervisor must be taken.

2.6.2.1.8 If supervisor is selected outside of this institute, CASR through BPGS may decide whether a co-supervisor from MIST is required or not.

2.6.2.1.9 If co-supervisor is required for a particular thesis work, the co-supervisor preferably should have a PhD degree from reputed university, however, a faculty member holding MSc (with thesis) degree can work as a co-supervisor.

2.6.2.1.10 For M.Engg projects a faculty member holding MSc (with thesis) degree with at least 02 years of teaching and/or research experience may be permitted to supervise.

2.6.2.1.11 A supervisor/co-supervisor shall not take more than 12 (twelve) students (maximum 6 as supervisor and remaining 6 as co-supervisor) of two programs ie Masters and PhD at a time. However, in any cases he/she will not allow to take more than 2 (two) PhD students at a time.

2.6.2.1.12 Any change of supervisor/co-supervisor shall have to be recommended by the CASR through BPGS. In such case, written consent of both present and proposed supervisor/co-supervisor has to be produced.

2.6.2.2 Charter of Duties of a Supervisor

The supervisor is expected to do the following:

2.6.2.2.1 Supervise the research work of the M. Sc. Engg./M.Engg. researcher.

2.6.2.2.2 Supervise the research for the duration of researcher's candidacy, which may include a period of extension to the researcher's submission deadline and may also include supervision during a period of resubmission.

2.6.2.2.3 Ensure face-to-face meeting with the Researcher's at least once in a month.

2.6.2.2.4 Ensure communication with Researcher at least once in a week by any means (i.e., telephone, email etc.)

2.6.2.2.5 Submit Research Progress Report to the Head of the respective department covering duration of three calendar months as specified in the Academic Calendar.

2.6.2.2.6 Examine the thesis as a member of Board of Examiners.

2.6.2.2.7 Attend the oral examination of the researcher for defense.

2.6.2.2.8 Maintain a comprehensive file of relevant documents, emails, correspondence etc.

relating to supervision of the candidate.

2.6.2.2.9 If under any emergency circumstance such as going abroad for higher studies etc. he/she must inform the Dean/Head of the department at least one month prior to the discontinuation.

2.6.3 Academic Requirements and Regulations

2.6.3.1 The minimum duration of the Ph.D. degree shall be six semesters from the date of admission. A student must complete all requirements for the Ph.D. degree within seven academic years from the date of his first registration with BUP. The minimum duration of the M.Sc.Engg./M.Engg. program shall be three semesters. A student for the Master's degree program must complete all the requirements for the degree within five academic years from the date of the first admission in the respective programme.

2.6.3.2 Academic progress shall be measured in terms of Credit hours earned by a student. One Credit hour subject shall normally require 14 hours of lecture for one semester (14 weeks); while one Credit hour for thesis/project work should normally require 42 hours of research work for one semester. The number of Credit hours for each subject shall be as specified in the syllabus of the respective department.

2.6.3.3 For Ph.D, a student must complete a minimum of 54 credit hours of which 45 credit hours shall be assigned for a thesis and for masters, a student must complete a minimum of **36 credit hours** of which **18 credit hours** shall be assigned for a thesis for M.Sc.Engg. and **6 credit hours** as project work for M.Engg. Students can register thesis/project after completion of at least 12 credit hours theory courses.

2.6.3.3.1 Students are allowed to take more credit courses than minimum requirement for the calculation of GPA. The extra course should help the student to increase his/her CGPA than minimum requirement, and also in case Supervisor wants him/her to take addition courses related to his/her thesis work. However, the students need to take written permission for the extra courses from Supervisor and Head of the concern department. This has to be reported to the Controller of Examination of BUP through Controller of Examination of MIST.

2.6.3.3.2 The best grades among all the completed courses will be considered for CGPA calculation.

2.6.3.4 There shall be two categories of students, namely, full-time students and part-time students.

2.6.3.4.1 A student may enroll as a part-time student. Students, serving in different organizations, may also be admitted as part time students with the written consent of the employer. A part time student may be assigned a maximum of 9 credit hours of course including thesis work in any semester.

2.6.3.4.2 Full-time students must register for a minimum of 09 credit hours and a maximum of 15 credit hours per semester for Ph.D while for masters, minimum of 12 credit hours and a maximum of 15 credit hours per semester. A full-time student shall not be allowed to be in the employment of any organization (even as a part-time employee). However, they may be employed as Teaching/Research Assistant at MIST. If a full time student becomes an employee (full time or part time) of any other organization in the middle of a semester, he/she may, with the approval of the

Head of the Department and his/her Employer, be allowed to continue as a full time student for that semester only.

2.6.3.4.3 A student may be allowed to switch from part-time to full-time or vice versa on the recommendation of the respective BPGS before the commencement of a semester.

2.6.3.5 The subjects of study in the different Departments/Institutes shall be as recommended by the respective BPGS and the Faculty and approved by CASR. The BPGS may review the curriculum from time to time and recommend any changes as may be considered necessary. For Ph.D., at least 60% of the theory courses have to be completed from their major field of study and for masters, at least 50% of the theory courses have to be completed from their major field of study

2.6.3.6 A student on the recommendation of the BPGS and as approved by the CASR may be allowed to transfer a maximum of 6.0 credits of the theory courses (relevant to the field of study) for Ph.D. and 9.0 credits of the courses (relevant to the field of study) for masters completed by the student at a recognized institution provided that the courses were not taken earlier than five calendar years from the date of his/her first enrolment in the respective programme at MIST and that the student obtained a minimum GPA of 3.0 out of 4.0 or its equivalent in such courses and that the courses are equivalent to the approved courses of MIST.

2.6.4 Grading system

2.6.4.1 Final grades for courses shall be recorded as follows:

Grade	Merit description	Grade points
A (Plus)	Excellent	4.00
A	Very good	3.50
B (Plus)	Good	3.00
B	Average	2.50
C	Pass	2.00
F	Fail	0.00
S	Satisfactory	--
U	Unsatisfactory	--
W	Withdrawn	--
X	In Progress (for thesis)	--
I	Incomplete/Discontinued (for thesis)	--

Note: For already enrolled students the previously approved grading system will be followed till his/her completion of the degree.

2.6.4.2 Courses in which the student gets F grades shall not be counted towards credit hour requirements and for the calculation of Grade Point Average (GPA).

2.6.4.2.1 The C grades, up to a maximum of two courses, may be ignored for calculation of GPA at the written request of the student to the Head of the Department on the recommendation of the

supervisor / program coordinator, provided that the student has fulfilled the total course credit hour requirement in the remaining subjects with a minimum CGPA of 3.00 (for Ph.D. and M.Sc. Engg.) and 2.75 (for M.Engg.).

2.6.4.2.2 When a course is repeated for improvement, better grade shall be counted for calculation of GPA.

2.6.4.2.3 Performance in all the subjects excluding all the F grades shall be reflected in the transcript.

2.6.4.3 Grade "I" is given only when a student is unable to sit for the examination of a course at the end of the semester because of circumstances beyond his/her control. He/She must apply to the Head of the Department within one month after the examination to get an "I" grade in that course. It must be completed as soon as possible whenever the course is offered, otherwise, the "I" becomes an "F" grade. He/She may, however, be allowed to register without further payment of tuition fees for that course. If the course is not offered within next one year, the student can complete the course requirement by taking similar alternative course which should be approved by the BPGS.

2.6.4.4 Satisfactory or Unsatisfactory used only as final grades for thesis/project and non-credit courses. An "X" grade shall be recorded for thesis in progress. If, however, thesis is discontinued an "I" grade shall be recorded.

2.6.4.5 Students may enroll for non-credit course(s) termed as audit/research course(s) on recommendation of his/her thesis / project Supervisor and Head of the Department. However, his grades in audit/research course(s) will not be counted for calculating his CGPA.

2.6.4.6 A student shall withdraw officially from a course within two working weeks of the commencement of the semester or else his grade in that course shall be recorded as F unless he/she is eligible to get a grade of "I". A student may be permitted to withdraw and change his/her course within the specified period with the approval of his/her Adviser, Head of the Department and the respective teacher(s) concerned. (In that case his / her grade in the courses registered shall be recorded as 'W' in his Academic Record but shall not be reflected in the transcript.)

2.6.4.7 Numerical markings may be made in answer scripts, tests etc., but all final grading to be reported to the Controller of Examinations (BUP) shall be in the letter grade system as detailed below:

90% and above	:	A (Plus)
80% to below 90%	:	A
70% to below 80%	:	B (Plus)
60% to below 70%	:	B
50% to below 60%	:	C
Below 50%	:	F

2.6.5 Research Proposal

All students must submit a research proposal following the format given in Annexure-3 (for Ph.D. and M.Sc. Engg.) or Annexure-5 (for M.Engg.) to the BPGS of the respective department which shall examine the proposal and recommend it for the approval of the CASR. In special circumstances the BPGS may recommend to CASR for approval of any subsequent changes in the research proposal.

2.6.6 Conduct of Examination

2.6.6.1 In addition to tests, assignments and/ or examinations during the semester as may be given by the teacher(s) concerned, there shall be a written examination and / or other tests for each of the subjects offered in a semester at the end of that semester, the dates of which shall be announced by the Exam Section, MIST as advised by Dean at least two weeks before the commencement of the examination. The final grade in a subject shall be based on the performance in all tests, assignments and examinations.

2.6.6.2 The Exam Section and BUP shall keep up to date record of all the grades obtained by a student in individual Academic Record Card. Grades shall be announced by the Controller of Examinations at the end of each semester. In addition, each student is entitled to one official transcript of the University record at the completion of his academic programme from the office of the Controller of Examinations on production of statement of clearance from all departments' offices.

2.6.6.3 The Head /BPGS of a department shall recommend the names of the paper setters and examiners for the semester examinations at least four weeks before the date of commencement of the examination to the Controller of Exam of MIST for approval.

2.6.7 Qualifying Requirements

The following are the qualifying requirements for the degree of M.Sc. Engg./M. Engg:

2.6.7.1 To qualify for the degree a student must earn a minimum grade point of 3.00 for Ph.D. and M.Sc. Engg and 2.75 for M.Engg based on the weighted average of grade points (GP) in his/her course work.

2.6.7.2 Two courses may be repeated for improvement with the prior approval of the Head of the Department on the recommendation of the Supervisor/Program Coordinator. Such approval shall be reported to the BPGS.

2.6.7.3 A student obtaining "F" grade in a course may be allowed to repeat the course with the prior approval of Head of the Department on the recommendation of the Supervisor / Advisor. Such approval shall be reported to the BPGS.

2.6.7.4 A student is allowed to switch from M.Sc. Engg. to M.Engg. if his/her CGPA falls below the minimum requirement of the M.Sc. Engg. degree. This has to be approved by the respective BPGS on the written request from the student.

2.6.7.5 A student shall not be allowed to continue the programme if he/she obtains a total of three "F" grades in one or more than one subjects, during the whole course of his/her studies.

2.6.7.6 If at the end of the second or any subsequent semester (for full time students) and third or any subsequent semester (for part time students), the cumulative GPA falls below 3.00 for a M.Sc. Engg. student and 2.75 for a M.Engg. student he/she shall not be allowed to continue in the programme.

2.6.8 Thesis

2.6.8.1 A student finally shall submit a thesis on his/her research work fulfilling the other requirements mentioning in this Ordinance.

2.6.8.2 Research work for the thesis shall be carried out under the supervision of a Supervisor and a Co-supervisor (if required).

2.6.8.3 If any change is necessary of the approved thesis (title, content, cost, Supervisor, Co-supervisor etc.), it shall be approved by the CASR on recommendation of the relevant BPGS.

2.6.8.4 The research work must be carried out in MIST or at a place(s) recommended by the BPGS. The work schedule and financial involvement should be mentioned in the research proposal for carrying out the research work.

2.6.8.5 At the end of the student's research work, the student shall submit a thesis which must be an original contribution to engineering/sciences and worthy of publication.

2.6.8.6 The thesis submitted for the fulfillment of the degree of M.Sc. Engg. shall be written in English. The student must follow the Thesis writing guideline attached to this ordinance.

2.6.8.7 The student shall certify that the research work was done by him/her and that this work has not been submitted elsewhere for the award of any other diploma or degree (except for publication).

2.6.9 Examination of Thesis

2.6.9.1 Examination Board

2.6.9.1.1 An Examination Board for every student for thesis and oral examination shall be approved by the CASR through BPGS on recommendation of the thesis Supervisor in consultation with the Head of the Department. The Board shall consist of at least four members including the Supervisor as the Chairman and the Head of the Department as an Ex-officio and following the format as given in Annexure-4. The Board shall also include one or more external examiner(s).

The Examination Board shall be constituted as follows:

(i)	Supervisor	Chairman
(ii)	Co-supervisor (if any)	Member
(iii)	Head of the Department (Ex-officio)	Member

(iv)	One or more members from within the Department/Institute	Member
(v)	Two (Ph.D.)/One or more external member from any other reputed National/International Institutes/Universities/Organizations	Member (External)

If any member holds two portfolios (i.e., Head of a Department becomes Supervisor), then one additional internal member can be included in the board. In any case if Head of a department is unable to act as an Ex-officio, then the Faculty Dean will act as an Ex-officio. In case of non-availability of an internal member in related field, one additional external member can be included in the board from any reputed public university.

2.6.9.1.2 All the members of the Thesis Examination Board should be PhD holder and should have expertise on the same field of study of the student. They should have experience of supervision and/or thesis examination of Masters Candidates.

2.6.9.1.3 If the external examiner is appointed from outside the country a copy of the thesis should be sent for his/her evaluation and his/her written opinions are to be placed before the Examination Board.

2.6.9.1.4 If any examiner is unable to accept the appointment or has to relinquish his/her appointment before the examination, Commandant, MIST shall appoint another examiner in his/her place, on suggestion from the Supervisor in consultation with the Head of the department. This appointment will be reported to the CASR.

2.6.9.2 Thesis Examination

2.6.9.2.1 Every student submitting a thesis in partial fulfillment of the requirements of a degree, shall be required to appear at an oral examination, on a date fixed by the Supervisor in consultation with the Head of the Department and must satisfy the examiners that he/she is capable of intelligently applying the results of this research to the solution of problems, of undertaking independent work, and also afford evidence of satisfactory knowledge related to the theory and technique used in his/her research work.

2.6.9.2.2 Every student shall submit to the Head of the Department, through his/her Supervisor, required number of type written soft bound copies of his/her thesis in the approved format (as given in Annexure-7) on or before a date to be fixed by the Supervisor in consultation with the Head of the Department along with transcript of the course work and copy/copies of published article.

2.6.9.2.3 After necessary scrutiny, the Head will forward the thesis with other documents (transcripts, published articles) to the member of the Examination Board.

2.6.9.2.4 The M.Sc. Engg. Thesis shall be examined by all members of the Examination Board. After examination of the thesis, all members shall send their reports within 2 weeks after receiving the soft bound thesis in a sealed envelope to the Head of the concerned department and a copy to the Controller of Examination of MIST.

2.6.9.2.5 On the basis of positive opinions from majority of the examiners except Supervisor and Co-supervisor that satisfies the thesis is standard and justified for Oral Examination, the Ex-officio of the Thesis Examination Board in consultation with the Supervisor shall arrange an Oral Examination for the M.Sc. Engg. student to defend his/her Thesis.

2.6.9.2.6 If any external examiner is appointed from outside the country, he/she shall be invited for attending the Oral Examination. In case, he/she is unable to attend the oral examination, the oral examination shall be arranged in absence of him/her, provided he/she gives his/her consent to do so.

2.6.9.2.7 On the basis of the negative opinions from majority of the examiners except Supervisor and Co-supervisor that do not satisfy the thesis as standard, the Thesis Examination Board shall decide either to reject the thesis or may recommend to allow the student to resubmit the thesis after necessary revision and modification as suggested by the examiners within 6 (six) months from the date of supply of comments of examiner. In such case, further registration will not be necessary. The Ex-officio of the thesis Examination Board shall report their decision to the Controller of Examinations of this Institute.

2.6.9.2.8 In case equal numbers of examiners are in favour and against, the Ex-officio will propose and get approval from CASR for a third external examiner on the relevant field and take his opinion whether the student will be allowed for Oral examination or reject/resubmit the thesis. For unavoidable circumstances, Commandant may give approval of the third external examiner which has to be post facto approved in the next CASR meeting.

2.6.9.2.9 In case, the student is unable to satisfy the Oral examination even the thesis is adjudged adequate, the Thesis Examination Board may recommend that the M.Sc. Engg. student may be permitted to appear at another oral examination on a date to be fixed by the Supervisor in consultation with the Head of the Department.

2.6.9.2.10 After successful Oral examination and necessary corrections recommended by the thesis Examination Board, every candidate will submit necessary copies of hard bound thesis following the template to the concern persons/department.

2.6.9.2.11 The Thesis Examination Board will forward the results of the student to Controller of Examinations of MIST. The results will be send to the Controller of Examination of BUP for approval and then the degree will be awarded.

2.6.10 Project

2.6.10.1 A M.Engg student finally shall submit a project report on his/her research work fulfilling the other requirements mentioning in this Ordinance.

2.6.10.2 Research work for the report shall be carried out under the supervision of a Supervisor.

2.6.10.3 If any change is necessary of the approved project (title, content, cost, Supervisor etc.), it shall be approved by the CASR on recommendation of the relevant BPGS.

2.6.10.4 The research work must be carried out in MIST or at a place(s) recommended by the BPGS. The work schedule and financial involvement should be mentioned in the research proposal for carrying out research work.

2.6.10.5 At the end of the student's research work, the student shall submit a project report which must be an original contribution to engineering/sciences.

2.6.10.6 The report submitted for the fulfillment of the degree of M.Engg. shall be written in English. The student must follow the writing guideline attached to this ordinance.

2.6.10.7 The student shall certify that the research work was done by him/her and that this work has not been submitted elsewhere for the award of any other diploma or degree (except for publication).

2.6.11 Examination Board-Project

2.6.11.1 An Examination Board for every student for his/her project and oral examination shall be approved by the CASR on recommendation of the thesis Supervisor in consultation with the Head of the Department. The Board shall consist of at least three members including the Supervisor as the Chairman following the format as given in Annexure-6. The Supervisor shall act as the Chairman and propose the other board members.

The Examination Board shall be constituted as follows:

(i)	Supervisor	Chairman
(ii)	One or two member from within the Department/Institute	Member
(iii)	One external member from any other reputed National Institutes/Universities/Organizations	Member (External)

If any member holds two portfolios (i.e., Head of a Department becomes Supervisor), then one additional internal member can be included in the board. In case of non-availability of an internal member in related field, one additional external member can be included in the board from any reputed public university.

2.6.11.2 All the members of the Project Examination Board should be at least Masters degree holder and have expertise on the same field of study of the student. They should have experience of supervision and/or thesis examination of Masters Students.

2.6.11.3 If any examiner is unable to accept the appointment or has to relinquish his/her appointment before the examination the BPGS shall appoint another examiner in his/her place on the recommendation of his/her supervisor. This modification will be reported to the CASR.

2.6.11.4 Every student shall submit to the Head of the Department, through his/her Supervisor, required number of type written soft bound copies of his/her project report in the approved format (as given in Annexure-7) on or before a date to be fixed by the Supervisor concerned in consultation with the Head of the Department along with transcript of the course work and copy/copies of published article (if any).

2.6.11.5 After necessary scrutiny, the Head will forward the project report with other documents to the members of the Examination Board at least 2 weeks before the oral examination. The report shall be examined by all members of the Examination Board.

2.6.11.6 Every student submitting a project report in partial fulfillment of the requirements of a degree, must be required to appear at an oral examination, on a date or dates fixed by the Supervisor concerned in consultation with the Head of the Department and must satisfy the examiners that he/she has gained satisfactory knowledge related to the project work.

2.6.11.7 In case a student fails to satisfy the Examination Board by project report and /or oral examination, the student shall be given one more chance to resubmit the project report and/or appear in another oral examination as recommended by the Board.

2.6.11.8 After successful Oral examination and necessary corrections recommended by the Project Examination Board, every candidate will submit necessary copies of hard bound project report following the template given in Annexure-7.

2.6.11.9 The Project Examination Board will forward the results of the M.Engg student to Controller of Examinations of MIST through Graduate Course Coordinator. The results will be send to the Controller of Examination of BUP for approval and then degree will be awarded.

2.6.12 Striking off and Removal of Names

2.6.12.1 The name of the student shall be struck off and / or removed from the rolls of the

Institute on the following grounds:

(i) Non-payment of dues within prescribed period. Post graduate students residing in the halls of residence shall be subject to the same conditions as allowed in the Policies Relating to the Hall of Residence and Discipline.

(ii) Failing to make satisfactory progress in his/her programme as reported by the supervisor through the BPGS and approved by CASR.

(iii) Forced to discontinue his/her studies under disciplinary rules.

(iv) Withdrawn officially from the Master Degree Programme.

2.6.13 Academic fees

Items of Academic fees shall be as per MIST policy, and these fees shall be reviewed and recommended from time to time by the Governing Body of MIST

ANNEXURE – 1

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY, DHAKA
OFFICE OF THE MEMBER SECRETARY OF THE COMMITTEE FOR ADVANCED STUDIES AND RESEARCH

Application for the **Approval of Supervisor and/or Co-Supervisor** for
Ph.D./ M.Phil./ M.Sc.Engg./ M.Engg. Thesis/Project

(All the items/sub-items of the following list that are applicable to ones must be mentioned and filled in properly)

Date of Application:

1. **Name of the Student:** **Status:** Full Time/ Part Time
   Roll No: **Session:** Apr.20…./Oct.20.....
2. **Present Address:**
   Email: Tel No:
3. **Name of the Department:**
   Program (Ph.D./M.Phil./M.Sc.Engg./M.Engg.): Division (if any):
4. **Session of First Enrolment in the Program:**
5. **Name of the Supervisor:** Affiliation:

Email: Tel No:

6. **Name of the Co-Supervisor** (if any)**:** Affiliation:
7. **List of Courses so far Completed with Course No, Course Title, Credit Hour, Grade, Grade Point and CGPA:***(To be verified and signed by the Program Coordinator)*

Sl. No	Course No	Course Title	Credit	Grade	Grade Point	CGPA

Signature of the Program Coordinator
Date:

8. **Number of Postgraduate Students Working with the Supervisor at Present:**

Ph.D.: M.Phil./ M.Sc.Engg.: M.Engg.:

9. **BPGS Reference**: Date of BPGS Meeting:

Signature of the Student
Date:

Signature of the Supervisor
Date:

Signature of the Co-Supervisor
Date:

Signature of the Head of the Dept.
Date:

ANNEXURE – 2

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY, DHAKA
OFFICE OF THE MEMBER SECRETARY OF THE COMMITTEE FOR ADVANCED STUDIES AND RESEARCH

Application for the **Approval of Doctoral Committee**

(All the items/sub-items of the following list that are applicable to ones must be mentioned and filled in properly)

Date of Application:

1. **Name of the Student:** **Status**: Full Time / Part Time

   Roll No: Session: Apr. 20…. / Oct. 20….

2. **Present Address:**

   Email: Tel No:

3. **Name of the Department:**

   Program (Ph.D./M.Phil./M.Sc.Engg./M.Engg.): Division (if any):

4. **Session of First Enrolment in the PhD Program:**

5. **Appointment of Supervisor & Co-supervisor Approved by CASR** (if any)**:**

   Meeting No: Date:

6. **Name of the Supervisor**: Affiliation:

   Email: Tel No:

7. **Name of the Co-supervisor (if any):** Affiliation:

8. **Tentative Title of Thesis:**

9. BPGS Reference: Date of BPGS Meeting:

Signature of the Student:

Date:

To be filled in by the Head of the Department and Supervisor

10. Proposed Doctoral Committee:

(i)	**Name:** Designation: Affiliation:	(Supervisor)	**Chairman**
(ii)	**Name:** Designation: Affiliation:	(Co-Supervisor, if any)	**Member**
(iii)	**Name** (Head of the Dept.)**:** Designation: Affiliation:	(Ex-Officio)	**Member**
(iv)	**Name:** Designation: Affiliation:		**Member**
(v)	**Name:** Designation: Affiliation:		**Member**
(vi)	**Name:** Designation: Affiliation:		**Member**
(vii)	**Name:** Designation: Affiliation:		**Member**

Signature of the Supervisor:

Date:

Signature of the Head of the Dept.:

Date:

ANNEXURE – 3

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY, DHAKA
OFFICE OF THE MEMBER SECRETARY OF
THE COMMITTEE FOR ADVANCED STUDIES AND RESEARCH

Application for the **Approval of Ph.D. Thesis Proposal**

(All the items/sub-items of the following list that are applicable to ones must be mentioned and filled in properly)

Date of Application:

1. **Name of the Student:** **Status:** Full Time/ Part Time

   Roll No: **Session:** Apr. 20…. / Oct. 20….

2. **Present Address:**

   Email: Tel No:

3. **Name of the Department:**

   Program (Ph.D./M.Phil./M.Sc.Engg./M.Engg.): Division (if any):

4. **Session of First Enrolment in the Program:**

5. **Name of the Supervisor:**

   Affiliation:
   Email: Tel No:

6. **Name of the Co-Supervisor** (if any)**:** Affiliation:
7. **Thesis Title** (IN BLOCK LETTER)**:**

8. **Background and Present State of the Problem:** *(Not more than 150 words)*

Please mention only those activities which have been carried out in different places as reported in publications. Please support your information by citing the relevant references. Keep your description within 150 words.

9. **Objectives with Specific Aims and Possible Outcome:** *(Not more than 150 words)*

Please list the objectives and the possible outcomes using short sentences. If you are writing one or two paragraphs for describing the objectives and the outcomes please limit yourself within 150 words.

10. **Outline of Methodology/Experimental Design:** *(Not more than 200 words)*

Outline the approach and the sequence of activities in not more than 200 works to describe how the work will be carried out.

11. **References:**

Give only the references which you have indicated as number style (i.e., [1] or [1-3] etc.) in the item 8 (background and present state of the problem). While giving the references you must mention clearly the name of author(s), title of the paper/book/dissertation, name of the journal/proceeding/publisher/university, vol. no., year of publication etc. in chronological order.

12. List of Courses so far Completed with Course No, Course Title, Credit Hour, Grade, Grade Point and CGPA: *(To be verified and signed by the Program Coordinator)*

Sl. No.	Course No	Course Title	Credit	Grade	Grade Point	CGPA

Signature of the Program Coordinator:
Date:

13. Cost Estimate: (*Break-ups can be provided in separate sheets, if required*)

Sl. No.	Items	Cost (Tk.)
1	Cost of Material (breakup needed)	
2	Field Works / Cost of Experimental Setup (if applicable)	
3	Conveyance / Data Collection (with breakup)	
4	Typing, Drafting, Binding and Paper etc.	
Total Amount:		

14. Justification of having Co-Supervisor:

Co-Supervisor(s) are acceptable only if the supervisor can justify that the work requires considerable knowledge of a discipline other than his own field of work.

15. Appointment of Supervisor and Co-Supervisor Approved by CASR:

Meeting No: Date: Reference No:

16. Appointment of Doctoral Committee Approved by CASR:

Meeting No: Date: Reference No:

17. Doctoral Committee:

Sl. No.	Name of the Committee members with affiliation
1	Chairman (Supervisor):
2	Member (Co-supervisor, if any):
3	Member-1(Ex-officio): Head,
4	Member-2:
5	Member-3:
6	Member-4:

18. Result of the Candidacy Examination: (*Photocopy of result should be enclosed*)

Satisfactory/ Unsatisfactory Date:

19. BPGS Reference: Date of BPGS Meeting:

	Names and Signatures of the Members of the Doctoral Committee (5 to 7 Members)	
---------- Signature of the Supervisor: Date:	1	
---------- Signature of the Supervisor: Date:	2	
	3	
---------- Signature of the Supervisor: Date:	4	
	5	
---------- Signature of the Head of the Dept: Date:	6	
	7	

ANNEXURE – 4

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY, DHAKA
OFFICE OF THE MEMBER SECRETARY OF
THE COMMITTEE FOR ADVANCED STUDIES AND RESEARCH

Application for the **Approval of Board of Examination for the Ph.D./M.Phil./M.Sc.Engg. Degree**

(All the items/sub-items of the following list that are applicable to ones must be mentioned and filled in properly)

Date of Application:

1. **Name of the Student:** **Status**: Full Time/ Part Time

   Roll No: **Session**: Apr. 20…./ Oct. 20….

2. **Present Address:**

   Email: Tel No:

3. **Name of the Department:**

   Program (Ph.D./M.Phil./M.Sc.Engg.): Division (if any):

4. **Session of First Enrolment in the Program:**

5. **Title of the Thesis as Approved by CASR** (if any)**:**

6. **Thesis Proposal Approved by CASR** (if any)**:**

   Meeting No: Date: Reference No:

7. **Doctoral Committee Approved by CASR:**

   Meeting No: Date: Reference No:

8. **BPGS Reference:** Date of BPGS Meeting:

9. **List of Courses so far Completed with Course No, Course Title, Credit Hour, Grade, Grade Point and GPA:** *(To be verified and signed by the Program Coordinator)*

Sl. No.	Course No	Course Title	Credit	Grade	Grade Point	CGPA

Signature of the Program Coordinator:

Date:

10. Name of the Thesis Supervisor:

11. Name of the Co-Supervisor (if any)**:**

12. Time Extension (if any) **Approved by the CASR:**

Meeting No.: Date: Reference No:

Signature of the Student

Date:

To be Filled in by the Head of the Department/Supervisor

13. Expected Date of Examination:

14. Suggested Board of Examiners:

(i) Name: Designation: Affiliation:		**Chairman**
(ii) Name: Designation: Affiliation:	(Co-Supervisor, if any)	**Member**
(iii) Name (Head of the Dept.)**:** Affiliation:	(Ex-Officio)	**Member**
(iv) Name: Designation: Affiliation:	**Member** (Internal)	
(v) Name: Designation: Affiliation:	**Member** (External)	

Signature of the Supervisor:
Date:

Signature of the Head of the Dept.:
Date:

ANNEXURE – 5

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY, DHAKA
OFFICE OF THE MEMBER SECRETARY OF
THE COMMITTEE FOR ADVANCED STUDIES AND RESEARCH

Application for the **Approval of M.Engg. Project Proposal**

(All the items/sub-items of the following list that are applicable to ones must be mentioned and filled in properly)

Date of Application:

1. **Name of the Student:** **Status:** Full Time/ Part Time

   Roll No: **Session:** Apr. 20…. / Oct. 20….

2. **Present Address:**

   Email: Tel No:

3. **Name of the Department:**

4. **Session of First Enrolment in the Program:**

5. **Name of the Supervisor:**

Affiliation:

Email: Tel No:

6. **Project Title:** (IN BLOCK LETTERS)

7. **Total Cost of the Project:** Tk. (In words)**:**

8. **BPGS Reference**: Date of BPGS Meeting:

9. **Project Proposal:** *(Not more than 200 words)*

Please describe briefly background, specific objective, methodology and possible outcome of the project in not more than 200 words.

Signature of the Student:
Date:

Signature of the Supervisor:
Date:

Signature of the Head of the Dept.:
Date:

ANNEXURE – 6

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY, DHAKA
OFFICE OF THE MEMBER SECRETARY OF
THE COMMITTEE FORADVANCED STUDIES AND RESEARCH

Application for the **Approval of Board of Examination for the M.Engg. Degree**

(All the items/sub-items of the following list that are applicable to ones must be mentioned and filled in properly)

Date of Application:

1. **Name of the Student:** **Status:** Full Time/ Part Time
   Roll No: **Session**: Apr. 20…. / Oct. 20….
2. **Present Address:**
   Email: Tel No:

3. **Name of the Department**:

4. **Session of First Enrolment in the Program**:

5. **Name of the Supervisor**: Affiliation:

6. **Title of the Project**:

7. **Project Proposal Approved by CASR:**

   Meeting No: Date: Reference No:

8. **Approved Time Extension (if any) up to**:

   CASR Meeting No: Date: Reference No:

9. **BPGS Reference**: Date of BPGS Meeting:

10. **List of Courses so far Completed with Course No, Course Title, Credit Hour, Grade, Grade Point and CGPA:** *(To be verified and signed by the Program Coordinator)*

Sl. No	Course No	Course Title	Credit	Grade	Grade Point	CGPA

Signature of the Student:
Date:

Signature of the Program Coordinator:
Date:

To be Filled in by the Head of the Department/Supervisor

11. Expected Date of Examination:

12. Suggested Board of Examiners:

(i)	**Name:** Designation: Affiliation:	(Supervisor)	**Chairman**
(ii)	**Name** (Head of the Dept.)**:** Designation: Affiliation:	(Ex-Officio)	**Member**
(iii)	**Name:** Designation: Affiliation:		**Member**
(iv)	**Name:** Designation: Affiliation:		**Member**

Signature of the Supervisor:

Date:

Signature of the Head of the Dept.:

Date:

ANNEXURE – 7 (Thesis Format)

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY

General Guidelines on Format of Thesis Submitted for Examination or Final Submission

1. General Information

A Master's thesis must make some contribution to knowledge and not be mere collation of existing material. A PhD thesis must make a significant contribution to the knowledge of the subject concerned or provide evidence of originality either by the discovery of new facts or by the exercising of independent critical ability.

Work which has been submitted for another degree, or for which a degree has already been conferred by this Institute or any other university, may not be submitted again as a thesis but you are not precluded from incorporating part of such work provided that, in the thesis, you clearly indicate the part of the work which has been so incorporated.

Furthermore, please note that any work carried out before your enrolment in the University cannot be used for submission in a thesis examination, unless you have obtained approval from your supervisor and the Faculty.

The thesis must be written in English unless otherwise specified. Before submission of the thesis, you should seek consent from copyright owners for the inclusion of any third party proprietary/confidential intellectual property in the thesis.

Politically and commercially-sensitive information; or proprietary/confidential information which is not critical to the thesis and for which consent is not granted, should be excluded from the thesis. If necessary, such information could be included as appendices instead.

Most thesis authors experience major difficulties with tense in their documents. Many theses become a muddled mixture of past, present and future tense. To alleviate this problem, a simple solution is to treat the thesis as a historical document which will be read many years from the date of publication. The following grammatical procedure can then be adopted:

All general discussions and all discussions of experiments, equipment, etc. are written in the past tense (e.g., "*The test-tubes were acquired from a standard batch that was available at the time of experimentation...*").

References to mathematical formulae are written in the present tense (e.g., "*Equation 7.2 highlights the relationship between...*").

References to objects (sections, tables, diagrams, etc.) in the thesis are in the present tense (e.g., "*Section 2.9 contains a discussion on...*").

References to future work are also written in the past tense (e.g., "*It was determined that future developments could lead to an increase in...*").

2. Thesis Title

The title has to be approved from the CASR after having recommendation from BPGS. If the thesis title differs significantly from the original approved title, the candidate must request for a change of title using the prescribed application form and take necessary approval from the CASR.

3. General Formatting

Page Size	Each copy of the thesis must be printed on A4 size (8.27" x 11.69") paper (offset paper with minimum weight should be 80 gm) with white background and black colour font for the text.
Print Quality	Clear, clean and sharp copies are required. In the case of photocopies, no fading, extraneous marks or gray background should appear.
Margins	The top, bottom and right margins should be 25 mm from the edge of the paper and left margin should be 35 mm from the edge of the paper. A right justified margin is acceptable which must be consistent throughout the thesis.
Font	The font size for the main text should be 11 to 12 points. The same font type and size should be used for the entire thesis (with possible exception for figures and appendices). Do not choose a font that is difficult to read. The following fonts are acceptable: Times Roman and Helvetica.
Line Spacing	The text should be double-spaced throughout with the following exceptions: Captions for Figures/Tables: should be single-spaced List of Figures/Tables: should be single-spaced and double-spaced between entries Footnotes: should be single-spaced
Page Numbering	All pages except the title page must be paginated. The page numbers must appear at the bottom centre of the page. The position of the page numbers should not change even on pages with landscape mode illustrations. All material preceding the thesis proper (introductory sections starting from acknowledgements to summary) may have a separate sequence of numbering, preferably in roman numerals beginning with i. Plates, maps, plans, diagrams, tables, etc., should also be given a separate sequence of numbering. The main body of the thesis should be numbered in arabic numerals from 1 onwards. The numbering must be consecutive throughout the thesis and should include all maps, diagrams, photographs, etc. Published material submitted with the thesis whether bound in with the thesis or not, should not be included in the pagination but must maintain the same margins, font type and size. For a thesis which consists of more than one volume, one numbering sequence should be used, for example, if volume I ends at p.200, volume II should begin with p.201.

Footnotes	Footnotes should appear at the bottom of each page for easy reference and not at the end of the chapter.
Printing	The thesis should be printed in single sided format.

4. Sequence of Content

- The content of the thesis should be in the following order:
- Title page
- A blank page
- Approval page Declaration page Summary
- Acknowledgements Table of Contents List of Tables
- List of Figures
- List of Illustrations List of Symbols
- Main body of thesis
- Bibliography or references Appendices
- A blank page

5. Title Page

The title page should contain the following information in BLOCK LETTERS not exceeding 16 points:

- Thesis title
- Candidate's name (with qualification(s) in brackets)
- The words: "**A THESIS SUBMITTED FOR THE DEGREE OF** <NAME OF DEGREE>"
- Department: **DEPARTMENT OF** <NAME OF DEPARTMENT>
- Name of Institute/University: **MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY**
- Year of first submission of thesis: If the thesis is resubmitted in a subsequent year, the year of submission to be indicated on the title page should remain as year of first submission.

Sample of the Title Page:

A MODELING STUDY OF WASTEWATER

TREATMENT PLANT

Rafi Rahman

(*BSc Engg., MIST*)

A THESIS SUBMITTED

FOR THE DEGREE OF MASTER OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY

2019

6. Declaration Page

The words on this page should be of a font size of 12 points. The following should be stated:

"*Declaration*

I hereby declare that this thesis is my original work and it has been written by me in its entirety. I have duly acknowledged all the sources of information which have been used in the thesis. This thesis has also not been submitted for any degree in any university previously."

Candidate should sign at the bottom of the page with the candidate's name and the date indicated.

Sample of the Declaration Page:

DECLARATION

I hereby declare that this thesis is my Original work and it has been written by me in its entirety. I have duly acknowledged all the sources of information which have been used in the thesis.

This thesis has also not been submitted for any degree in any university previously.

_____

Rafi Rahman

1 April 2019

7. Summary

The thesis must contain a summary of not more than 500 words written in the English Language in each copy of the thesis. The summary should be a miniature version of the thesis and should contain summary of the results, conclusions and main arguments presented in the thesis.

8. **Photographs, Illustrations and Other Attachments**

Photographic and other illustrations should be securely mounted using double-faced tape. Photograph album pockets or slits in the page are not adequate. In no circumstances should 'cellophane tape' or a similar material be used for any purpose in a copy of the thesis. All copies of the thesis should contain original photographs.

Subsidiary papers and other loose material should be bound in wherever possible. If this is not possible, an adequately guarded pocket for each material should be provided at the end of the thesis. Any such loose material (and corrigenda sheets, if not bound in) should bear the candidate's name, initials and degree.

9. Approval Page

The approval page has to be included in the hard bound final copy of the thesis.

Sample of the Approval Page:

The thesis titled …… …… Submitted by ……. Roll No: ……. Session: …… has been accepted as satisfactory in partial fulfillment of the requirement for the degree of …….. on……

Board of Examiners

1.	(Signature) Name of the supervisor Designation & Address	Chairman
2.	(Signature) Name of the supervisor Designation & Address	Member
3.	(Signature) Name of the supervisor Designation & Address	**Member**
4.	(Signature) Name of the supervisor Designation & Address	**Member (Ex-officio)**
5.	(Signature) Name of the supervisor Designation & Address	**Member (External)**

10. Main Bodies

1. CHAPTER TITLES SHOULD BE CENTERED BOLD 14 POINT Text in the chapter titles should be in upper case.

1.1 Secondary Headings Should be Flash Left 12 Point Bold

The first letter in each word of the secondary heading should be capitalized.

1.1.1 Third level headings should be flush left 12 point bold

Only the first letter of the first word of the third level heading should be capitalized

In the case of the paragraph starting left justified, there should be a spacing between the paragraphs. Otherwise, the paragraphs may be indented by a consistent amount.

The font, point size, positioning, numbering and referencing of equation:

The typeface for equations will be 12 point Times New Roman and are to be numbered sequentially by chapters (right justified). Reference for equation numbers in the text should be enclosed in parenthesis, such as (5.2).

The layout and numbering of figures and tables and their captions:

Figures should be centered between the left and right margin with their captions centered below the figure in point size 12 Times New Roman single spaced. Figures should be consecutively numbered per chapter. The word Figure may be abbreviated as "Fig". Tables should be centered between the left and right margin with their captions

(12 point Times New Roman) centered above the table. Tables should be consecutively numbered per chapter. Main heading and number of Figures and Tables should be bold.

Part B gives an overview of different chapters of a thesis.

11. References

A numbered list of references must be provided at the end of the thesis, before any appendices. The list should be numbered either in the order of citation in the text, or in alphabetical order, and there should be only one reference per reference number. Each reference number should be enclosed in square brackets. Samples are shown below:

Books:

[1] Brognakke, C. (1984), "Flame Propagation and Heat Transfer Effets in Spark Ignition Engines", In J. C. Hillard and G. S. Springer (eds.), Fuel Economy in Road Vehicles Powered by Spark Ignition Engines, chap 5, pp 183-224, Pienum Press, New York.

[2] Farrelly, D. (1966), "*The book of bamboo*", Thames and Hudson Ltd., London.

Journals/Periodicals:

[3] Benson, R. S., Garg, R. D. and Woolatt, D. (1964), "A Numerical Solution of Unsteady Flow Problems", *Journal of Mechanical Engineering*, vol. 6, pp. 117-144.

Articles from published conference proceedings:

[4] Nichols, M. A., Siegel, H. J. and Nation, W. G. (1990), "Minimizing memory requirements for partitionable SIMD/SPMD machines", *Proceedings of the International conference on Parallel Processing*, pp. 84-91.

Papers presented at conferences (unpublished):

[5] Ebehard, D. and Voges, E. (1984), "Digital single sideband detection for interferometric sensors", *presented at 2nd International conference on Optical Fiber Sensors*, Stuttgart, Germany.

Reports:

[6] GOB (1993), National housing policy 1993. Government of Bangladesh, Ministry of Housing and Public Works, Dhaka, Bangladesh.

Thesis:

[7] Rahman, M. A. (1998), "The structure of Turbulent Mixing Layers", *M. Sc. Engg. Thesis*, Department of Mechanical Engineering, BUET, Bangladesh, pp. 198.

12. Appendices

Appendices should contain supplementary material that the author considers necessary to the interpretation of the text itself. Long tables, essential raw data, detailed reports or computer are generally more appropriately included in an appendix. Appendices should not be longer that the body of the thesis and normally would be considerably shorter. If there is more than one appendix, the appendices should be numbered in sequence using Arabic numerals. Appendices should be numbered as A-1, A-2, … B-1, B-2… etc. for respective appendix.

13. Thesis Cover and Spine

The front cover and spine of the thesis should contain only the following information in BLOCK LETTERS. The font size on the cover should not exceed 16 points:

<table>
<tr>
<td>Thesis Cover:

• Thesis Title
• Candidate’s Name
• Name of Institute
• Year of first submission</td>
<td>Thesis Spine:

Thesis Title (or an abbreviated title)
Candidate’s Name
Year of first submission</td>
</tr>
<tr>
<td>Sample of Thesis Cover:

A MODELING STUDY OF WASTEWATER TREATMENT PLANT

RAFI RAHMAN

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY

2019</td>
<td>Sample of Thesis Spine

A MODELLING STUDY OF RAFI RAHMAN 2019 WASTEWATER TREATMENT PLANT</td>
</tr>
</table>

14. Type of Cover/Binding

For submission of your thesis for examination/re-examination, the thesis should be bound with soft cover (light blue with black lettering not exceeding 16 points) using saddle-stitch or perfect binding (spiral or ring-back binding is not acceptable).
For final submission the thesis/project report should be sewn and bound in strong, waterproof material. Color of the binding material for various degrees will be as follows. The Lettering in all cases will be in golden color.

PhD:	Black
M.Sc./M.Phil:	Dark Blue
M..Engg.:	Blue

Format of the thesis

Chapter 1 - Introduction (Thesis Body)	This is the most crucial chapter in the thesis and the one which requires the most careful consideration. The reader must be introduced, in a step by step fashion, to the purpose of the project, concepts and ideas related to the project and the structure of the following sections of the thesis. This section should endeavour to treat technical issues in a ***qualitative*** manner so that the reader can clearly understand the task at hand, without reference to other texts or periodicals. Formal page numbering for the body of the thesis begins in this section. Pages should preferably be numbered in a simple sequential order and should be chapter independent (ie: page numbers such as 1.2, 2.7 are not appropriate).
Chapters 2..N (Thesis Body)	This is the portion of the thesis in which literature surveys are discussed, research and development techniques are explained, theories, models and systems formulated and results evaluated. In general, the body of the thesis should be free from long, complex calculations, routine mathematical proofs, program code or large volumes of raw data. Page numbering continues on from the introductory chapter.
Chapter N+1 Conclusions and Recommendations for Further Work	This should draw together the main findings of the research program, together with findings of literature surveys carried out at the beginning and the end of the research program. Recommendations should also be made for future research in related areas. Page numbering should be a continuation from the previous section.
References	A listing of all references from which data has been abstracted for the purposes of the thesis. Preferably, the references should be listed in the order in which they are referred to in the body of the thesis. Page numbering is a continuation of previous sections.
Appendices	Appendices are used to store important calculations, proofs, tables or code which would interrupt the flow of qualitative descriptions in the body of the thesis. Each appendix has its own page numbering scheme. For example, Appendix A would have numbers A-1, A-2, etc. Appendix X would have numbers X-1, X-2, etc.
Index	This is generally an optional section in which common words or phrases, occurring in the body of the thesis are referenced to page numbers. Modern word-processors make the task of compiling an index considerably easier and hence authors may wish to include them. Page numbering can be a continuation of the Appendix Format.

Thesis Complexity by Chapter

Complexity	***Chapter***	***Function***
Lay-reader		Abstract
Lay-reader	1	Introduction
	2	Literature Review
Expert	3	Methodology and Implementation
	4	Experimental Procedures for Methodology Assessment
	5	Experimental Results and Observations
	6	Broad Context Discussion of Results and Relevance
Lay-reader	7	Conclusions and Recommendations for Further Work
-	-	References
-	-	Appendices

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY, DHAKA
OFFICE OF THE MEMBER SECRETARY OF
THE COMMITTEE FOR ADVANCED STUDIES AND RESEARCH
Progress Report of a Postgraduate Student for Ph.D./M.Phil./M.Sc.Engg./M.Engg. Degree
(All the items/sub-items of the following list that are applicable to ones must be mentioned and filled in properly)

Part I: To be Completed by the Student:

1. **Name of the Student:** **Status:** Full Tim / Part Time
   Roll No: Session: Apr. 20…. / Oct. 20….
2. **Present Address:**
   Email: Tel No:
3. **Name of the Department:**
   Program (Ph.D./M.Phil./M.Sc.Engg./M.Engg.): Division (if any):

4. **Session of First Enrolment in the Program:**

5. **Name of Supervisor:**

6. **Title of the Thesis** (if approved by CASR)**:**

7. **Expected Date of Completion of Degree**:

8. **List of Courses so far Completed with Course No, Course Title, Credit Hour, Grade, Grade Point and GPA:** *(To be verified and signed by the Program Coordinator)*

Sl. No.	Course No	Course Title	Credit	Grade	Grade Point	GPA

Signature of the Program Coordinator

Date:

9. **Research Activities and Findings** *(within 200 words)***:**

10. **Publications (***List complete citations for all papers published and manuscripts in press or in preparation)***:**

Part II: To be Completed by the Supervisor:

11. **Comments by the Supervisor** *(Please provide a brief evaluation of the student's performance)***:**

12. **Rating of Student's Performance by the Supervisor:** (circle one)

Progress is excellent *Progress is satisfactory* *Progress is unsatisfactory*

Signature of the Supervisor

Date:

Signature of the Head of the Dept.

Date

2.7 Teaching Strategy

In class lecture, Research paper review, Literature review, Case study of different technical problems in relevant areas, Design problems, Economic and Environmental considerations, Effective data management procedure, Individual and Group projects and presentations etc.

The course instructor has the freedom to select any of the above mentioned process to conduct his instruction in class or he may use any justifiable teaching method to conduct his lecture in class.

2.8 Assessment strategy

Assessment Method	Percentage
Continuous assessment via class performance, class test, assignment, presentation, project, term paper, in class discussion etc.	**50%**
Final Exam	**50%**

Grading system followed in MIST is mentioned in section 2.6.4

CHAPTER 3

COURSE PROFILE FOR THE POST GRADUATE DEGREE PROGRAMMES

3.1 Detailed Syllabus of Post Graduate Courses

The detailed syllabus of the courses listed in paragraph 2.5 is enumerated in this section by serial.

Course Title: Thesis

Course Code: EECE 6000

Level: Post-graduate program

Credit Hour: 18 for M.Sc. Engineering and 45 for PhD degree

Contact Hour: As required and specified by the supervisor and concerned committee/board.

Objective: This credit courses will enable the students to be an individual researcher.

Rationale: Compulsory course for M.Sc. Engineering and PhD degree based on advanced level of research in line with theoretical courses undertaken and fields under the guidance of assigned supervisor or doctoral committee to undertake innovation and development in science and technology for the well-being of mankind.

Course Content: As defined and specified by supervisor and concerned board.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Address a physical and scientific problem for in depth study;
2. Utilize mathematical models or experimental means developed for scientific researches;
3. Develop new mathematical models or experimental means for further researches;

Teaching-learning Strategy: Research papers review, Literature review, Laboratory works, Field visits, Industry evaluation etc.

Assessment Strategy: As convenient by supervisor and concerned board/committee.

Linkage of LO with Assessment Methods & their Weights:

As convenient by supervisor and concerned board/committee.

Mapping of Course LO and Program Outcomes (PO):

Will remain flexible for supervisor

Reference Books:

1. As advised by supervisor/co-supervisor/board.

Grading system: As per approved grading scale of MIST

Course Title: Project

Course Code: EECE 6000

Level: Post-graduation program

Credit Hour: 6 for M. Engineering

Contact Hour: As required and specified by the supervisor and concerned committee/board.

Objective: A student will learn to apply his knowledge to create a Electrical/Electronic/Communication system to solve a specific problem.

Rationale: Compulsory course for M. Engineering on advanced level of research in line with theoretical courses undertaken and fields under the guidance of assigned supervisor to undertake innovation and development in science and technology for the well-being of mankind.

Course Content: As defined and specified by supervisor and concerned board.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

4. Address a physical and scientific problem for in depth study;
5. Utilize mathematical models or experimental means developed for scientific researches;
6. Develop new mathematical models or experimental means for further researches;

Teaching-learning Strategy: Research papers review, Literature review, Laboratory works, Field visits, Industry evaluation etc.

Assessment Strategy: As convenient by supervisor and concerned board/committee.

Linkage of LO with Assessment Methods & their Weights:

As convenient by supervisor and concerned board/committee.

Mapping of Course LO and Program Outcomes (PO):

Will remain flexible for supervisor

Reference Books:

2. As advised by supervisor/co-supervisor/board.

Grading system: As per approved grading scale of MIST

Navigation and Guidance (N & G) Division

Course Title: Advanced Radar Engineering

Course Code: EECE 6001

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply radar equation to solve different design problem.

Rationale: Theoretical course based on Radar Engineering to solve different practical problem.

Course Content: Radar – Introduction, functional block diagrams, radar range equation, probability of detection and false alarm, pulse integration, radar cross-section of targets, detection and tracking, clutter and jamming. Doppler effect, simple CW Doppler Radar. Moving target indicator (MTI), MTI Radar Block Diagram, delay line cancellers, Pulse-Doppler radar. Tracking Radar – monopulse tracking, conical scan and sequential lobing, low angle tracking Radar clutter – different type, grazing angle, Radar antenna, – radiation pattern, effective aperture, side lobe radiation, aperture efficiency, polarization, reflector antenna, phase array antenna. Radar transmitter – Magnetron oscillator, klystron amplifier and traveling wave tube amplifier. Radar receivers – Noise figure, displays and duplexers.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Familiarize with the different types of Radar Displays and advanced radar systems.
2. Understand the key factors determining the design of radar systems used in aerospace applications.
3. Apply the radar equation and set up and solve problems involving radar range, noise, and radar cross-section.
4. Design radar systems and to undertake measurements to characterize and verify the performance of radar systems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	

Total	100%	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x										
LO 3		x	x		x							
LO 4			x									

Reference Books:

1. As advised by the course teacher/department.

or

1. Microwave and Radar Engineering- Gottapu Sasi Bhushana Rao
2. Radar and Laser Cross Section Engineering (AIAA Education Series)- David C. Jenn
3. Fundamentals of Radar Signal Processing, Second Edition (McGraw-Hill Professional Engineering) 2nd Edition-M. A. Richards

Grading system: As per approved grading scale of MIST

Course Title: Advanced Satellite Navigation Engineering

Course Code: EECE 6002

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn satellite navigation system.

Rationale: Theoretical course based on GPS, GNSS, DGPS, RAIM and DAB technology.

Course Content: Global Navigation Satellite Systems (GNSS). Global Navigation Systems – GPS, GLONASS, Galileo and Beidou. Global Positioning System (GPS): GPS segment, satellite constellation, navigation technique, GPS signal structure, navigation data, application of GPS, differential GPS (DGPS) and wide area DGPS (WADGPS). Augmentation of GPS – Wide Area Augmentation System (WAAS). GPS Integrity – sources of integrity anomalies, integrity enhancement technique, Receiver Autonomous Integrity Monitoring (RAIM). Global Navigation Satellite System (GLONASS), satellite constellation, service, GLONASS signal.

Galileo - system description, services, Galileo satellites constellation, full operational capability (FOC) satellites. Galileo Signal structure, Digital Audio Broadcasting (DAB), Direct-broadcast satellite (DBS), Satellite Networks.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate a clear understanding of the GPS signal, codes and biases
2. Discuss the practical applications of GPS, GNSS, GLONASS, DGPS and the implications of its modernization
3. Describe the differences between relative and autonomous GPS positioning, code phase carrier phase, DGPS and RTK
4. Demonstrate the understanding of some techniques of GPS observing and data processing

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x					x	x					
LO 3	x											
LO 4	x				x							

Reference Books:

1. As advised by the course teacher/department.

or

1. Engineering Satellite-Based Navigation and Timing: Global Navigation Satellite Systems, Signals, and Receivers- John W. Betz
2. Advanced Galileo and GPS Receiver Techniques- Andreas Schmid

Grading system: As per approved grading scale of MIST
Course Title: Advanced Avionics Engineering

Course Code: EECE 6003

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve well-defined engineering problems used in Aeronautical and Electronic engineering technology program.

Rationale: Theoretical course based on avionics to design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes of an Aeronautical and Electronic engineering system

Course Content: Introduction, VHF and UHF radio, methods of navigation, radio direction finding, automatic direction finder, radio compass, VHF omni directional range, distance measuring equipment (DME), DME beacon, TACAN. Hyperbolic system of navigation: Loran-C, Instrument Landing System (ILS), localizer, glide slope indicator and marker beacon. Microwave Landing System (MLS), GPS Landing System, Doppler Navigation, Inertial Navigation. Global positioning system (GPS): satellite constellation, navigation technique, Differential GPS and augmentation of GPS. Traffic Alert Collision Avoidance System: Introduction, basic operating principle, block diagram and system description, controls and display. Flight Management System: Introduction, basic operating principle, block diagram and system description, controls and display.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Understand the basics of VHF, UHF system, DME, TACAN, ILS, MLS etc
2. Design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes of an electronic/avionic system
3. Apply a deep working knowledge of technical fundamentals to solve engineering problems and address society's needs in aerospace and related areas for the nation and the world.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2			x		x	x						
LO 3						x						

Reference Books:

1. As advised by the course teacher/department.

or

1. Avionics: Fundamentals of Aircraft Electronics--by Scott Kenney
2. Digital Avionics Handbook by Cary Spitzer

Grading system: As per approved grading scale of MIST

Course Title: Advanced Electronic Warfare

Course Code: EECE 6004

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply techniques of electronic jamming to solve different problem.

Rationale: Theoretical course based on electronic warfare to solve different practical problem.

Course Content: Targets of Electronic Warfare operation: A general description of the targets of electronic warfare, Mathematical models of electronic systems as targets of electronic warfare, Mathematical models of automated systems for control of AAD forces as targets of electronic warfare, Mathematical models of automated systems for control of AAD weapons as targets for electronic warfare, Guidance laws and effectiveness indicators for control of AAD missiles. Mathematical Models of Signals, Systems, and Techniques of Electronic Jamming: A general description of the basic elements of electronic jamming, Mathematical

models of jamming signals, Mathematical models for systems and techniques for jamming. Electronic Warfare Effectiveness Criteria: General characteristics of the criteria, Information indicators of the effectiveness of jamming signals, systems and techniques of electronic attack, Energy effectiveness criteria of jamming signals and techniques of electronic jamming, Operational and tactical indicators of electronic warfare effectiveness, Military and economic indicators of electronic warfare effectiveness. Active Jamming: The jamming equation for monostatic Radar using active jamming, Reduction of the jamming equation to canonical form, methods of determining information damage, specifics of the jamming equation using active jamming against various types of Radar, Particulars of jamming Radar using screening jamming with limited information quality indicators, Use of the jamming equation for the analysis of the electronic environment. Passive and Active-Passive Jamming: Types of passive jamming, Chaffs, Formation dynamics and statistical characteristics of chaff clouds, Equation for Radar jamming using passive jamming, Jamming coefficient for non-coherent Radar, Jamming coefficient using passive jamming for coherent pulse-radar. Effectiveness of Radar jamming using passive jamming, Determination of the required quantity of chaff, Active-passive jamming. False radar Targets and Decoys: Types of false Radar targets, decoys, and disposable EW devices, Parameter simulated by false Radar targets and Radar decoys, Methods of increasing the Radar cross-sections false Radar targets and decoys, Thermal decoys, Use of towed and launched decoys, selecting decoys launch time. Methods of Reducing Aircraft Detectability and Changing the Electrical Properties of the Environment: Factors determining the complex nature of the Problem, Possibilities of determining the thermal detectability of an aircraft, Modern technologies for the development of the aircraft with low Radar detectability and problems of EW dynamics, Potential for reducing Radar detectability of aircraft antennas, Optimum gain for jammer antennas, Methods of changing the electrical properties of the environment.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Understand the basics of electronic warfare, mathematical model and electronic jamming.
2. Demonstrate Electronic Warfare Systems Engineering and System of Systems Engineering (SoSE) principles and false radar targets.
3. Apply jamming equation for the analysis of the electronic environment.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	

LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x											
LO 3				x		x						

Reference Books:

1. As advised by the course teacher/department.

or

1. Radar and Electronic Warfare Principles for the Non-Specialist (Electromagnetics and Radar)
by Paul Hannen
2. Electronic Warfare Pocket Guide (Electromagnetics and Radar) by David L. Adamy

Grading system: As per approved grading scale of MIST

Course Title: Guided Weapon System

Course Code: EECE 6005

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply knowledge of weapon to solve different problems.

Rationale: Theoretical course based on weapon theory to solve different practical problems.

Course Content: Introduction to the 'missile' and the system; constituent parts of the missile and how they integrate into the complete system; the threat and how it can be countered. Airframes, Airframe materials and structures; factors affecting aerodynamic lift and drag. Control Polar, Cartesian and roll control; aerodynamic and thrust vector control; actuation systems; instrumentation; accelerometers; rate and position, gyroscopes; acceleration and velocity control; roll rate and position, latex and altitude autopilots. mmW seekers, Introduction to the principles of millimetric wave (mmW) seekers. Electro-optics Introduction to the

principles of infra-red seeker technology. Guidance The need for guidance; types of trajectory; system characteristics and classification; command, homing and navigational guidance coverage diagrams. Propulsion Reaction thrust, propellants, jet propulsion, rocket and air-breathing engines. Radar Introduction to the principles of homing and surveillance radar. Warheads Overview of warheads for guided weapons for attack of armour, airborne targets and ground installations; safety and arming; types of fuze, matching and countermeasures.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on missile, Airframes, Airframe materials and structures; factors affecting aerodynamic lift and drag.
2. Understand the basics of Control Polar, Cartesian and roll control; aerodynamic and thrust vector control; actuation systems; instrumentation; accelerometers; rate and position, gyroscopes; acceleration and velocity control; roll rate and position, latex and altitude autopilots etc
3. Apply the knowledge of millimetric wave (mmW), Propulsion Reaction thrust, propellants, jet propulsion, rocket and air-breathing engines to design a system.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									

Reference Books:

1. As advised by the course teacher/department.

or
1. Guided weapon control systems by P Garnell
2. Guided weapons 3rd ed by J Rouse

Grading system: As per approved grading scale of MIST

Course Title: Sonar and Underwater Communication

Course Code: EECE 6006

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply the knowledge of sonar and transducer to solve different real life problem.

Rationale: Theoretical course based on sensor and transducer related theory to solve different practical problem.

Course Content: The loss-free wave equation. Plane waves, acoustic impedance and intensity, spherical and cylindrical waves. Acoustic radiation, monopole and dipole sources. Radiation from a piston, directivity, radiation impedance. Acoustic scattering and target strength. Absorption. Reflection and refraction. Oceanographic measurements, velocity, temperature and salinity. Ray theory, ray tracing, sound channels and normal modes. Propagation modeling and commercial software. Volume, bottom and surface reverberation. Underwater noise, its characteristics and causes. Electro-acoustic transduction. Transducer modeling, equivalent circuits, and numerical methods. Magneto-strictive, piezo-electric and electro-strictive transducers. Sandwich transducers, quarter-and half-wavelength plates for high-frequency transducers. Hydrophones and noise in hydrophones. Probability of target detection and probability of false alarm. Receiver operating characteristics. Signal integration, pulse compression, matched filters, correlators, range resolution, Doppler effects and ambiguities. Fourier-transform theory. Digital processing, the sampling theorem, dynamic-range problems, realization of correlators. Software and hardware algorithms to compute the discrete Fourier transform. Correlation using frequency-domain techniques. Directional patterns, angular resolution, uniform line arrays and line arrays with phase and amplitude tapers. Planar and cylindrical arrays. The spatial-sampling theorem, near-field effects and focusing. Active and passive sonars, detection, classification and localization. Range-resolution and bandwidth relationships. The active-sonar equation, noise and reverberation limitations and Doppler processing. Side-scan sonars, mechanical scanning and its limitations. The passive-sonar equation. Electronic beam steering by time-delay and phase methods. Digital beam formers. The Fourier transform applied to beam forming and beam steering. Passive-ranging methods.

The application of modern devices and technology to sonar-system design. Typically, this material includes: reverberation, noise, transducers, wide-band systems, applications of Fourier Transforms, applications of correlation, beam forming-in-practice, compact sonar systems, underwater communications, environmental impact and future developments in sonar.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on sonar and transducer for under water communication.
2. Analyze and solve a practical problem using knowledge of transducer modeling.
3. Apply Fourier transform and correlation to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									

Reference Books:

1. As advised by the course teacher/department.

or

1. Introduction to the Theory and Design of Sonar Transducers by Oscar Bryan Wilson
2. Sonar transducer fundamentals by Ralph S Woollett

3. Transducers and Arrays for Underwater Sound (The Underwater Acoustics Series) by Charles H. Sherman

Grading system: As per approved grading scale of MIST

Electrical Energy and Power Systems (EEPS) Division

Course Title: Generalized Machine Theory

Course Code: EECE 6101

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply the advanced knowledge of electrical machines in industry.

Rationale: Theoretical course based on theoretical knowledge of electrical machines.

Course Content: Introduction to generalized machine theory, Kron's primitive machine: moving to fixed-axis transformation; Park's transformation: three-phase to d-q transformation: variable co-efficient transformation: other transformations. Matrix and tensor analysis of machines. Three phase synchronous and induction machines: two-phase servo motor: single phase induction motor. Smooth-air gap two-phase synchronous machine. Two-phase induction machine. The n-m winding symmetrical machine. Diagonalization by charge of variable. Symmetrical three-phase machine and special limiting cases.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

5. Demonstrate advanced knowledge on the electrical machines.
6. Analyze and solve a practical problem using knowledge of park’s transformation.
7. Demonstrate and apply different method to solve electrical machine engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	X		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Advanced Control System for Industrial Electrical Machines

Course Code: EECE 6102

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply advanced control techniques for various industrial problems.

Rationale: Theoretical course based on different control techniques for industrial machine and instruments operation.

Course Content: Advanced topics of electric machines, beginning with dynamic modeling and principles of vector control and evolving into new design and control of electric machines for advanced traction motors and renewable energy generator systems. Industrial

instrumentation: analog and digital devices; studies of industrial control techniques in actual industrial systems to provide competence in the analysis, design, selection and maintenance of industrial control systems; applications to electromechanical, pneumatic and hydraulic systems, permanent magnet machines. Hysteresis machine. Eddy current devices: homopolar machines. PAM motors and reluctance machines.

Learning Outcomes (LO):

On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the industrial control methods.
2. Analyze and solve a practical problem using knowledge of vector control, traction motors and renewable energy generators.
3. Apply different methods to solve industrial control problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	X		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Advanced Machine Design

Course Code: EECE 6103

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply the advanced knowledge of electrical machines design.

Rationale: Theoretical course based on design factors of advanced dc machine and ac machine.

Course Content: General treatment of Electrical Machine Design. Review of standard procedures in design of DC machines. AC machines, transformers and special machines. Optimization and synthesis of design procedures. Applications of material balance and critical path principles in electrical design. Design economics and safety factors. Applications of computers in modern designs including the operation of the machine in the nonlinear ranges: Magnetic flux-plots and heat transfer process etc. Mechanical design of electrical machinery and relation between mechanical and electrical machine design.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on electric machine.
2. Analyze and solve a practical problem using knowledge material balance and critical path principle in electric design.
3. Demonstrate and apply magnetic flux plots to solve machine design problems.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:
1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Optimization of Power System Operation

Course Code: EECE 6201

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply different optimization techniques in power system.

Rationale: Theoretical course based on optimization of power system in application of economic load dispatch, unit commitment and optimal power flow.

Course Content: General principles of optimization. Basics of power system operation - economic load dispatch, transmission system effects, concept of marginal cost, Kuhn-Tucker's conditions of optimum. Unit commitments. Hydro-thermal coordination. Optimal power flow analysis, security constrained optimal power flow. Optimization of interconnected power system.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the power system optimization.
2. Analyze and solve a practical problem using knowledge of optimization theory.
3. Apply complex method to solve optimal power flow and economic load dispatch.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Computer Methods in Power System Analysis
Course Code: EECE 6202

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply computer methods in power system analysis.

Rationale: Theoretical course based on computer techniques to solve power system network.

Course Content: General review of network theory, matrix analysis and computer modeling. Incidence matrices, primitive networks and formation of impedance and admittance network

matrices. Analytical solution methods: linearity, superposition, Thevenin and Norton equivalent circuits, sinusoidal forcing function, phasor representation, Fourier representation, Laplace transform, single-phase equivalent circuit, symmetrical component analysis, per unit method. Load flow studies, short circuit studies, transient stability analysis, harmonic analysis, flicker analysis, insulation coordination, ground grid analysis, lightning surge analysis.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on computer methods in power system.
2. Analyze and solve a practical problem using knowledge of power system theories in computer modeling.
3. Demonstrate and apply circuit solving method to solve power system problems using simulation.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Power System Protection and Communication

Course Code: EECE 6203

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply power system protection and communications techniques.

Rationale: Theoretical course based on different protection and communication schemes used in power system to ensure security.

Course Content: The purpose and application of protective systems in electrical distribution networks. Main elements and techniques for power system protection. Protective equipment: circuit breakers, relay, enclosures, fuses and isolating switches. Protection techniques: protect feeders, transformers, generators and motors. Theoretical and practical aspects of protection schemes. Performance of common measurement transducers, various classes of protective relays and their theory of operation. Protection relay communications: IEC 61850.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the power system protection and communication.
2. Analyze and solve a practical problem using knowledge of faults and protection devices
3. Apply complex method to solve power system security during faulty condition.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Power System Stability

Course Code: EECE 6204

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply different power system stability models for a secure power system.

Rationale: Theoretical course based on power system stability to solve different faulty situation.

Course Content: Definitions of power system stability, synchronous machine modeling, synchronous machine representation in stability studies. Small signal stability: state space representation, linearization, Eigen properties of state matrix, small signal stability of a single machine infinite bus system, effects of excitation system, power system stabilizer, small signal stability of multi machine system. Transient stability: simulation of power system dynamic response. Voltage stability: basic concepts, voltage collapse, voltage stability analysis. Sub-synchronous oscillations, analysis and mitigation of sub-synchronous resonance.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the power system stability.
2. Analyze and solve a practical problem using knowledge of dynamic theory of power system.

3. Apply complex stability method to solve power engineering problems.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Transient Analysis of Electric Power Circuits

Course Code: EECE 6205

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply transient analysis techniques in power system.

Rationale: Theoretical course based different transient analysis method to solve power system problems.

Course Content: Classical approach to transient analysis, transient response of basic circuits. Transient analyses using the Laplace transform techniques, Transient analysis using the Fourier transform. Transient analysis using state variables. Transients in three-phase systems, Transient behavior of transmission lines, Static and dynamic stability of power systems.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the transient analysis in power circuit.
2. Analyze and solve a practical problem using knowledge of Fourier transform and Laplace transform.
3. Apply complex method to solve transient problem in power system stability.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Reliability of Power System

Course Code: EECE 6206

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply probability theories for reliability analysis of power system.

Rationale: Theoretical course based on different probability theory to solve reliability problems in power system.

Course Content: Review of basic probability theory. Basic reliability concepts. Markovian model of generation unit. Development of load models. Probabilistic simulation of generating systems. Reliability indices. Recursive, segmentation and cumulate method to obtain loss of load probability (LOLP). Modeling of forecast uncertainty. Reliability evaluation of energy limited systems. Different techniques of evaluating reliability, reliability indices of interconnected systems. Composite transmission and generating system reliability.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the power system reliability.
2. Analyze and solve a practical problem using knowledge of probability in power system.
3. Apply probabilistic simulation to solve power system reliability problems.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

	Program Outcomes

Learning Outcomes (LOs) of this course	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Power System Planning

Course Code: EECE 6207

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply different methods of power system planning.

Rationale: Theoretical course based on generation planning to solve power system generation problem considering technical and economic aspects.

Course Content: Basic objectives of power system planning. Generation expansion planning process. Electrical demand forecasting; current demand forecasting approaches. Generation planning; economic analysis, expected energy generation, expected fuel cost. Both-Baleriux, cummulant and segmentation methods. Probabilistic simulation of hydro and energy limited units. Expected energy production cost of interconnected systems. Economic aspects of interconnection. Different aspects of load management; effects of load Management on reliability and on production cost. Joint ownership of generation.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the generation planning.
2. Analyze and solve a practical problem using knowledge of load forecasting, fuel cost.
3. Apply probabilistic methods to solve power system planning problems.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	X											
LO 2	X	x		x								
LO 3	X		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Advanced Power System Control

Course Code: EECE 6208

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply advance power system control methods to solve different control problems in power system.

Rationale: Theoretical course based on different advanced control techniques for automatic solution of power system control problems.

Course Content: Overview of requirements and constraints, real time operation and monitoring in power system; supervisory control and data acquisition (SCADA). Energy management system (EMS); on-line application functions; state estimation, short term load forecasting, unit commitment, automatic generation control (AGC), load frequency control (LFC) and security control. Open architecture EMS, on-line algorithm's speed enhancement: sparsity exploitation, fast decoupling, model/system decomposition, parallel processing-hierarchical computer and array processor configuration, application of expert system, pattern recognition, artificial neural network (ANN), fuzzy logic and genetic algorithms. EMS in the context of deregulation of utilities and independent system operator (ISO).

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on control techniques in power system.
2. Analyze and solve a practical problem using knowledge of SCADA and AGC.
3. Apply different control methods to solve power system problems.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	X											
LO 2	X	x		x								
LO 3	X		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Energy Conversion and Renewable Energy

Course Code: EECE 6209

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply energy conversion methods to solve energy problem.

Rationale: Theoretical course based on energy conversion techniques to solve different energy transformation problems.

Course Content: Energy conversion processes; general introduction, energy sources, principles or conservation of energy balance equations. Direct electrical energy conversion: introduction: magnetohydronamic (MHD): fuel cell: thermoelectrostatic: ferro-electric: photo-electric: photovoltaic, electrostatic and piezoelectric energy conversions: characteristics including efficiency, power densities, terminal properties and limitations. Electromechanical energy conversion: general introduction of electrical to mechanical, mechanical to electrical and electrical to electrical conversions. Bulk energy conversion devices. General formulations of equations; co-ordinate transformation and terminal characteristics.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the energy conversion.
2. Analyze and solve a practical problem using knowledge of energy conversion methods.
3. Apply complex method to solve energy conversion related engineering problems.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Flexible AC transmission Systems

Course Code: EECE 6210

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to use FACTS in power transmission system.

Rationale: Theoretical course based on high power electronic devices to solve power transmission problem in grid.

Course Content: Application of state-of-the-art high-power electronics to power transmission and distribution systems. Flexible AC transmission Systems (FACTS). FACTS controllers including: static synchronous compensators (STATCOM), static synchronous series compensators (SSSC), interphase power flow controllers (IPFC) and unified power flow

controllers (UPFC). Custom power devices including: shunt DSTATCOM, series compensating DVR and unified power quality conditioners (UPQC). Operating principles, models, and control and performance of power electronic systems used in these applications.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on FACTS and HVDC.
2. Analyze and solve a practical problem using knowledge of power electronic devices.
3. Demonstrate and apply different method to solve transmission grid problems.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Advanced Topics on Nuclear Power Generation Engineering

Course Code: EECE 6301

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn power generation from nuclear fuels.

Rationale: Theoretical course based on nuclear science theory to solve energy generation problem.

Course Content: Role and importance of nuclear energy in the global context; Nuclear Reaction, Theory of the fission process, Reaction rates, Nuclear cross-sections, Fission products, Prompt and delayed neutrons in fission, Reactivity, Criticality conditions, Temperature and void coefficient of reactivity, Fission product poisoning; History of research and power reactors, Classification and design features of research and power reactors, Layout of nuclear power plants, Power plant's major components; Containment buildings, Primary containment vessels, Control room, Reactor core control & design, Control rods, Primary & secondary neutron sources, steam generator, steam dryer and separator, pressurizer, reheater, heat exchanger, condenser, demineralizer, turbine, generator, cooling tower, Coolant pumps, Primary & Auxiliary cooling systems etc, Heat generation and its transport system between reactor coolant and fuel element interface; Fuel properties, Fuel materials, Fuel cycles, Radiation, measurements and its control, Radioactive waste management systems; Safety characteristics of LWRs and FBRs. Electrical distribution systems to reliable power (Generator, Transformer, switchgear, motor control, etc), Reactor grid interface and load following, Backup power sources, Economic and environmental effect of nuclear and fossil fueled power plants, Future trends in nuclear power cost with respect to advanced reactors, Nuclear power plant simulators based on reactor type (PWR, BWR, VVER etc), Introduction to fast breeder, gas cooled and fusion reactors.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the nuclear power engineering
2. Analyze and solve a practical problem using knowledge of nuclear science.
3. Apply techniques to solve nuclear engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Smart Grid and Advanced Power Systems

Course Code: EECE 6302

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn smart grid concept in modern power system.

Rationale: Theoretical course based on smart grid and it's integration of advanced technologies in conventional grid.

Course Content: Smart Grid: Introduction to smart grid and emerging technologies, Operating principles and models of smart gird components, Definition, Applications, Government and Industry, Standardization, Smart Grid Communications: Two-way Digital Communications Paradigm, Network Architectures, IP-based Systems, Power Line Communications, Advanced Metering Infrastructure, Solar photovoltaic model and grid integration, Wind turbine model and grid integration, Microturbine model and grid integration, Fuel cell model and grid integration, Energy storage and electric vehicle models and grid integration, Distribution line models, Distribution transformer models, Distribution load models, Communication infrastructures for smart grid operation, Advanced metering infrastructure and advanced control methods, Demand response and demand management, Distribution feeder analysis, Impact of smart grid component integration on distribution network operation, Smart grid reliability evaluation, Impacts of Smart Grid on air pollutant emissions reduction.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on smart grid.
2. Analyze and solve a practical problem using knowledge of smart grid technologies.
3. Demonstrate and apply grid integration of new technologies to solve grid problems.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Power Quality

Course Code: EECE 6303

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply power quality theory to solve power system problem.

Rationale: Theoretical course based on power quality method theory to solve different transient problem.

Course Content: Qualitative concepts and comprehensive coverage of Power Quality (PQ) issues- voltage sags, interruptions, transients, flickers, harmonics etc. PQ definitions, limitations, related international standards. Mathematical techniques for PQ analysis of Power Systems. Different identification, localization and classification techniques for PQ. Effects of PQ problems on load/system equipment. Mitigation strategies: passive filtering, active and hybrid power filtering, static VAR compensation, dynamic voltage restorer (DVR), unified power quality conditioners (UPQC). Grounding imperfection as a major cause for PQ. Requirements and impacts of distributed generation (DG) on network power quality.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on power quality.
2. Analyze and solve a practical problem using knowledge of power system.
3. Demonstrate and apply complex method to solve quality problem in power system.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Photovoltaic Energy Conversion

Course Code: EECE 6304

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply photovoltaic energy conversion theory to solve different renewable energy problem.

Rationale: Theoretical course based on photovoltaic energy conversion theory to solve different practical problem.

Course Content: Physical source of solar radiation; direct & diffuse radiations; review of electronic materials; semiconductor concepts; optical absorption; generation and recombination processes in semiconductors; operating principles of photovoltaic devices; homo- and hetero- junction devices; equivalent circuits; quantum efficiency; current-voltage characteristics; Efficiency limits in photovoltaic devices; short circuit current and open circuit voltage losses; temperature effect; material-imposed limits; theoretical and practical limits; Photovoltaic device design and fabrication; silicon-based devices; gallium arsenide devices; thin film devices; device simulation; fabrication technologies; Advanced photovoltaic concepts; nano-structure and organic PV devices; System-level photovoltaics; module structure and design; back-end electronics; stand-alone and grid-interactive systems; photovoltaic hybrid systems Physical source of solar radiation; direct & diffuse radiations; review of electronic materials; semiconductor concepts; optical absorption; generation and recombination processes in semiconductors; operating principles of photovoltaic devices; homo- and hetero- junction devices; equivalent circuits; quantum efficiency; current-voltage characteristics; Efficiency limits in photovoltaic devices; short circuit current and open circuit voltage losses; temperature effect; material-imposed limits; theoretical and practical limits; Photovoltaic device design and fabrication; silicon-based devices; gallium arsenide devices; thin film devices; device simulation; fabrication technologies; Advanced photovoltaic concepts; nano-structure and organic PV devices; System-level photovoltaics; module structure and design; back-end electronics; stand-alone and grid-interactive systems; photovoltaic hybrid systemsv

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the photovoltaic energy conversion.
2. Analyze and solve a practical problem using knowledge of photovoltaic theory.
3. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO-1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Information Theory and Coding

Course Code: EECE 6401

COMMUNICATION & SIGNAL PROCESSING (COMM & SP) DIVISION

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to represent, secure and correct information.

Rationale: Theoretical course based on Information Theory and Coding to solve real life problems.

Course Content: Definition and measure of information, information capacity. Fundamentals of error control coding: forward error correction (FEC) and automatic repeat request. Binary coding: and automatic repeat request. Binary Coding: properties of codes, construction of binary compact codes. Convolutional coding: Viterbi and sequential decoding; algebra of linear block codes; error correction and detection using block codes; transmission line codes-space time block code, space frequency block code and turbo code.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

8. Design the channel performance using Information theory.

9. Comprehend various error control code properties.
10. Apply linear block codes for error detection and correction.
11. Apply convolution codes for performance analysis & cyclic codes for error detection and correction.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x									
LO 2	x	x										
LO 3			x	x								
LO 4		x	x	x								

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Advanced Telecommunication Engineering

Course Code: EECE 6402

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to gain the necessary background and technical knowledge for successful careers in Advanced Telecommunications Engineering.

Rationale: Theoretical course based on Advanced Telecommunication Engineering to solve real life problems.

Course Content: Challenges in modern communications technology, baseband and broadband signal transmission, first and second Nyquists criteria for zero intersymbol interference; robust signal compression and detection techniques, optimum receivers, design of frequency- and time-domain equalizers and echo cancellers; wired and wireless channel characteristics, AWGN channels, time-varying multipath faded channels, channel modeling; advanced source and channel coding techniques, high bit rate digital modulation schemes and MODEMs; SS7 and HDLC protocols, H.323, H.26x, RTP and SCTP; modern high speed communication networks and emerging technologies, access and backbone networks, intelligent networks, NGN; advanced switching and routing principles, complex multiplexing and multiple access techniques, orthogonal signals, OFDM, DWDM; broadband wireless communication, spread spectrum techniques, CDMA2000 and WCDMA, multi-carrier systems; 3G and 3GPP mobile communications and WiMAX technology, UMTS, VoIP, IP TV, HDTV.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Provide an in-depth understanding of different concepts used in a telecommunication system.
2. Explain the tools necessary for the calculation of basic parameters in a telecommunication system.
3. Understand every aspects of telecommunication like link design, budget management and different access system of a network.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x			x							
LO 3									x		x	

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Optical Fiber Communication

Course Code: EECE 6403

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.

Rationale: Theoretical course based on Optical Fiber Communication to solve real life problems.

Course Content: Optical sensors and their applications, Photo detectors and optical receivers. Optical amplifiers: DFA, Raman amplifier, Brillouin amplifier, amplifier nonlinearity, characteristics and application. Optical Multiplexing: OTDM, OFDM, WDM and O-CDMA. Optional modulation and detection schemes. Direct and coherent detection receivers: configuration, operation, noise sources, sensitivity calculation, performance curves. Design of analog and digital receivers. Dispersion Limitations, Dispersion Compensation Scheme, Nonlinear effects in fibers: FWM, SPM, XPM, Soliton, Introduction to optical networks.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.
2. Estimate the losses and analyze the propagation characteristics of an optical signal in different types of fibers
3. Describe the principles of optical sources and power launching-coupling methods.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Optical Networks

Course Code: EECE 6404

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to learn the main elements, components, capabilities and limitations of the all-optical networking solution.

Rationale: Theoretical course based on Optical Networks to solve real life problems.

Course Content: Optical networking: principles and challenges; evolution of optical networks, wavelength routed network, wavelength division multiplexing (WDM) network,

sub-carrier multiplexing optical networks. Enabling technologies: optical transmitter, optical fiber, optical receivers, optical amplifiers, optical switching elements, optical cross-connects (OXC), multiplexers/demultiplexers, wavelength routers, optical wavelength converters, WDM network test beds. Network architecture, IP over WDM. Broadcast optical networks: single and multiple hop networks, channel sharing and multi-casting, shared channel multicasting network-GEMNET, performance evaluation for unicast and multicast traffic, experimental WDM networks. Wavelength routed networks: virtual topology design, routing and wavelength assignment, circuit switched and packet switched approaches, performance evaluation. Optical Burst Switching (OBS), Reconfiguration in WDM network, network control and management, network optimization, design considerations. Multi wavelength star and ring networks. Photonic switching, optical TDM (OTDM) and optical CDMA (O-CDMA) networks, next generation optical networks.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Identify the three generations of optical networking evolution.
2. Underline how these networks fit in the more classical communication networks based on electronic time division.
3. Compare the performance of optical networks via computer discrete-event simulation.
4. Review current optical networking trends like optical packet, burst or label switching from research articles.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

	Program Outcomes

Learning Outcomes (LOs) of this course	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x								
LO 3			x	x								
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Broadband Wireless Communications

Course Code: EECE 6405

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to understand mobile radio communication principles and to study the recent trends adopted in cellular systems and wireless standards.

Rationale: Theoretical course based on Broadband Wireless Communications to solve real life problems.

Course Content: Overview of broadband wireless communications, multiple access techniques - TDMA, FDMA. Spread spectrum communications - direct sequence spread spectrum (DSSS), FHSS, THSS, modulator and demodulator structure, probability of error, jamming margin, decoding, performance in the presence of interference, PN sequence, CDMA, MC-CDMA, UWB transmission. Multi-user detection: multiple access interference, detector performance measure - BER, asymptotic efficiency, near-far resistance; detectors - matched filter detector, de-correlator detector, MMSE detector, SIC, PIC, MAP and MLSE detectors. Propagation in mobile radio channels; channel models, fading - large scale and small-scale fading, flat fading and frequency selective fading channel, fast fading and slow fading channel; delay spread, Doppler spread and angle spread; channel autocorrelation functions, scattering function, correlated and uncorrelated scattering (US), WSS and WSSUS model. Multiple antenna systems, capacity of SISO, SIMO, MISO and MIMO systems, ergodic capacity, outage capacity, STBC, OSTBC, QOSTBC, spatial multiplexing (SM) scheme, SM detection techniques, diversity and diversity combining techniques. Multi-carrier communications; Orthogonal FDM (OFDM), OFDM transceivers. Special issues of OFDM - cyclic prefix,

timing offset, frequency offset, synchronization, peak power problem, Broadband wireless standards.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Discuss the cellular system design and technical challenges.
2. Analyze the design parameters, link design, smart antenna, beam forming and MIMO systems.
3. Analyze Multiuser Systems, CDMA, WCDMA network planning and OFDM Concepts
4. Summarize the principles and applications of wireless systems and standards

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x								
LO 3			x	x								
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Advanced Multimedia Communications

Course Code: EECE 6406

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to understand the multimedia communications systems, application and basic principles.

Rationale: Theoretical course based on Advanced Multimedia Communications to solve real life problems.

Course Content: Review of multimedia communications; asynchronous and synchronous transmission techniques, synchronization issues and challenges, advanced signal compression, error-detection and correction methods; high-speed multimedia communication networks, switched network and enterprise networks; QoS issues of multimedia networks; wireless network for multimedia, mobile IP and mobile Adhoc networking, network security and secured remote access; protocol specification, UDP, TCP/IP and OSI reference models, SS7 and HDLC protocols, FTP, H.26x, RTP, SCTP, MSCTP, ICMP: message formats and transmission; voice over IP and mobile IP protocols, IPv6/IPv4 interoperability; advanced routing mechanisms, broadcast and multicast routing, watermarking and authentication for multimedia documents; NGI and Internet 2, revolutionary applications of Internet, transcoding of Internets multimedia content for universal access; entertainment networks, IP applications, audio and video conferencing, Internet through mobile and WiMAX, emerging technologies of multimedia communication.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Describe technical characteristics and the performance of multimedia system and terminals.
2. Design creative approach in the application of multimedia devices, equipment and systems.
3. Carry out experiments and measurements on the multimedia systems in laboratory conditions on real components and equipment.
4. Interpret and analyze measurement results obtained on the multimedia system and components.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x			x								
LO 2	x	x	x									
LO 3				x							x	x
LO 4	x	x		x								

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Advanced Digital Signal Processing

Course Code: EECE 6407

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will have in depth knowledge of processing digital signals.

Rationale: Theoretical course based on advanced digital signal processing to solve real life problems.

Course Content: Adaptive filtering: Review of the LMS and RLS algorithms, adaptive lattice-ladder filters, frequency-domain adaptive filtering methods, variable step-size adaptive filters, application of adaptive filtering, Power spectrum estimation: Review of parametric techniques for power spectrum estimation, high resolution methods, Multirate signal processing: filter banks: cosine modulated filter banks, paraunitary QMF banks, multidimensional filter banks, emerging applications of multirate signal processing.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Learn the modern digital signal processing algorithms and applications
2. Use digital systems in real time applications
3. Apply the algorithms for wide area of recent applications.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2		x	x		x							
LO 3			x	x								

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Biomedical Signal Processing

Course Code: EECE 6408

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to learn the signal processing methods and analysis of biomedical signals. This course equips the students with skills to analyze biomedical signals.

Rationale: Theoretical course based on Biomedical Signal Processing to solve real life problems.

Course Content: Dynamic medical signals: electrocardiogram, electroencephalogram, electromyogram. Detailed analyses of electromedical signals: waveform, origin, interpretation and significance. Linear and nonlinear parametric modeling: autoregressive (AR), moving average (MA), autoregressive moving average (ARMA), bilinear models. Nonlinear nonparametric modeling: neural network, fractal and chaos-based models. Software based medical signal detection and pattern recognition. Medical image analysis and compression. On-line monitoring and diagnosis.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Understand DFT and its computation.
2. Analyze the design techniques involved for digital filters
3. Identify the bio-signals.
4. Understand special techniques like Heart rate variability Analysis

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x	x								
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Digital Image Processing

Course Code: EECE 6409

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to learn the image fundamentals and mathematical transforms necessary for image processing

Rationale: Theoretical course based on Digital Image Processing to solve real life problems.

Course Content: Fundamentals of image processing: image formation, representation in pixel and transform domains, reconstruction from projections and interpolation, human visual system, stochastic models for images, enhancement and restoration techniques in spatial and frequency domains, image processing in color space, morphological filters, multi-resolution image processing, image compression techniques and standards, segmentation for edge detection and texture analysis, pattern classification, image watermarking, registration and fusion, emerging applications of image processing, Optical signal processing techniques.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Review the fundamental concepts of a digital image processing system.

2. Analyze images in the frequency domain using various transformations.
3. Evaluate the techniques for image enhancement and image restoration.
4. Interpret image segmentation and representation techniques

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x	x								
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Digital Video Processing

Course Code: EECE 6410

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to learn the image fundamentals and mathematical transforms necessary for video processing

Rationale: Theoretical course based on Digital Video Processing to solve real life problems.

Course Content: Formation and representation of video, spatio-temporal video sampling, motion analysis and estimation: real versus apparent motion, optical flow, block- and mesh-based methods for motion estimation and region-based stochastic motion modeling, motion segmentation and layered video representations, video filtering: motion-compensated filtering, noise reduction, signal recovery, deblurring, superresolution, mosaicing, deinterlacing and frame-rate conversion, video compression techniques and standards, content-based video indexing and retrieval, video communication: digital television, streaming over IP and wireless networks, error control and watermarking, stereo and multiview sequence processing.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Understand digital video processing with more emphasis on video coding and its international standards.
2. Gain sufficient understanding regarding video compression and communications technologies and its exploitation on various multimedia applications.
3. Achieve a basic understanding of digital video compression and its relevant processing tasks, such as transport issues, video streaming, error detection, recovery, and/or concealment issues.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x										
LO 3	x		x									

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Digital Speech Processing

Course Code: EECE 6411

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to learn recording speech and other vocal signals, for processing and modifying such recordings, and for synthesizing artificial speech.

Rationale: Theoretical course based on Digital Speech Processing to solve real life problems.

Course Content: Speech production and phonetics: speech organs, articulatory phonetics, acoustic theory of speech production, vocal tract models, speech analysis: time and frequency domain analysis, formant and pitch estimation, speech coding: linear predictive coding (LPC), vocoders, vector quantization, speech enhancement techniques, speech synthesis: formant and LPC synthesizers, effect of different speeches and languages, automatic speech and speaker recognition: feature extraction, hidden Markov models, noise robustness, measures of similarity, language and accent identification.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Record, analyze, characterize, modify, and synthesize speech (and other vocal) signals.
2. Design, execute, interpret, and evaluate simple studies that utilize speech processing methods.
3. Present and discuss research, both orally and in writing, to other students and scientists.
4. Locate, interpret, and synthesize scientific literature.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1		x	x									
LO 2				x	x							
LO 3			x						x	x		x
LO 4	x	x								x		

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Genomic Signal Processing

Course Code: EECE 6412

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to learn recording speech and other vocal signals, for processing and modifying such recordings, and for synthesizing artificial speech.

Rationale: Theoretical course based on fluid kinetics and potential flow theory to solve different practical flow problem.

Course Content: Fundamentals of molecular biology, genomics, and proteomics; DNA and microarray; genome sequencing; microarray technology and data pre-processing; gene feature selection; gene expression analysis; hidden Markov Model-based and time-frequency analysis

of genomics and proteomic sequences, regulatory motif discovery; gene finding; gene clustering and classification; proteomic technologies, protein-protein interactions and protein function prediction, modeling and inference for genetic regulatory networks, emerging applications of genomic signal processing.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Learn about molecular biology, genomics, and proteomics; DNA and microarray; genome sequencing; microarray technology and data pre-processing etc.
2. Design, execute, interpret, and evaluate speech synthesis: formant and LPC synthesizers, effect of different speeches and languages, automatic speech and speaker recognition: feature extraction, hidden Markov models.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2	Class test/Assignment	15%	
LO 1,2	Case study /Presentation/Oral examination	30%	
LO 1,2	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x								

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Wireless Sensor Networks

Course Code: EECE 6413

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to deal with the comprehensive knowledge about wireless sensor networks.

Rationale: Theoretical course based on Wireless Sensor Networks to solve real life problems.

Course Content: Radio communication and propagation; link margin, communication range, and power consumption; theoretical and practical limits; information theory; medium access, ALOHA, CSMA, TDMA; 802.15.4; routing protocols; reliability; network management, diagnostics, quality of service; data management, databases, query processing, and scripting languages; scalability; encryption and security, certification, joining and binding, key management; time synchronization; ranging and localization; operating systems; over the air programming; sensor and actuator interfacing; feedback control; current and future platforms; energy sources and storage; applications and standards, RFID, IR, LAN, Mobile networks, Sensor Network, Adhoc network Protocol.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Analyze modeling and simulation of various communication networks
2. Generate test and estimate parameters
3. Apply this knowledge for detection estimation and simulation of various communication networks.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1		x	x									
LO 2			x	x								
LO 3			x	x								

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Applied EM Theory

Course Code: EECE 6501

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to get a clear idea with with the different concepts of electrostatic, magneto static and time varying electromagnetic systems.

Rationale: Theoretical course based on Applied EM Theory to solve real life problems.

Course Content: Generalized approach to field theory: introduction to reaction concept, wave propagation through isotropic, anisotropic and gyrotropic media. Scattering of EM Waves. Microwave antennas-theory and design. Advanced topics in EM theory.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Define and recognize different co-ordinate systems to describe the spatial variations of the physical quantities dealt in electromagnetic field theory as they are functions of space and time. Apply different techniques of vector calculus to understand different concepts of electromagnetic field theory.
2. Explain fundamental laws governing electromagnetic fields and evaluate the physical quantities of electromagnetic fields (Field intensity, Flux density etc.) in different media using the fundamental laws.

3. Determine the electromagnetic force exerted on charged particles, current elements, working principle of various electric and electromagnetic energy conversion devices are based on this force.
4. Design electromagnetic energy storage devices like capacitor, inductor which are frequently used in electrical systems and choose suitable materials required to assemble such electromagnetic energy storage devices.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2		x	x									
LO 3			x	x								
LO 4			x	x								x

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Microwave Theory and Techniques

Course Code: EECE 6502

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to build up the concept from basics of microwave communications to modern applications

Rationale: Theoretical course based on Microwave Theory and Techniques to solve real life problems.

Course Content: Circuit theory for wave guide systems. N port circuits: impedance matrix, admittance matrix, scattering matrix and transmission matrix, their properties. Periodic structures and filters: wave analysis, impedance matching, wave and group velocities; comb lines and their analysis: introduction to filters, filter design by image parameter and insertion-loss methods; design of different type of filters

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Describe microwave transmission modes and transmission lines.
2. Analyze microwave networks and measure their measurements parameters.
3. Explain the working of various microwave devices
4. Identify the modern-day applications of microwaves.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2		x	x									
LO 3	x		x									

LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Microwave Tubes and Circuits

Course Code: EECE 6503

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to build up the concept of the microwave devices and circuits that are useful in modern microwave radar and communication systems.

Rationale: Theoretical course based on Microwave Tubes and Circuits to solve real life problems.

Course Content: Electron guns and their design; interaction of electron beams and electromagnetic fields. Details of microwave tubes. Masers, parametric amplifiers, microwave circuits. Matrix representation of microwave component design. Analysis of waveguide discontinuations and non-reciprocal microwave circuits, selected topics.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Convert between shunt and series elements using lumped-element equivalent transformations
2. Design microwave switching networks that use PIN diodes
3. Explain the meanings of an amplifier's bandwidth, gain, noise temperature, compression point, and dynamic range.
4. Analyze a transmission line filter structure to determine its frequency response.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1		x	x									
LO 2			x	x								
LO 3	x		x									
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Antennas and Propagation

Course Code: EECE 6504

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to build up the concept of antennas, their principle of operation, antenna analysis and their applications.

Rationale: Theoretical course based on Antennas and Propagation to solve real life problems.

Course Content: Basic Antenna parameters; antenna as an aperture; point sources and their arrays; review of dipoles, loop and thin linear antenna. helical antenna, biconical antennas; horn antennas, internal equation methods; current distribution; arrays: design and synthesis; reflector antennas, complementary antennas, array antennas, broadband and frequency-

independent antennas, micro strip antennas, antenna measurements, antennas for special applications, different wave propagation; scattering and diffraction.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Analyze radiation patterns of antennas
2. Evaluate antennas for given specifications
3. Illustrate techniques for antenna parameter measurements
4. Understand the various applications of antennas

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2		x										
LO 3	x		x									
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Microwave Solid State Devices and Circuits

Course Code: EECE 6505

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will be able to analyze and design a variety of microwave circuits that contain transmission lines, passive multiport devices, and active solid-state devices.

Rationale: Theoretical course based on Microwave Solid State Devices and Circuit to solve real life problems.

Course Content: Introduction to N port network for lossless Junctions. Resonant circuits and different types of resonators. Modern microwave transmission lines and microwave integrated circuits (MICs); TEM, quasi TEM and non TEM type MIC lines, microstrip lines. Microwave passive devices: directional couplers, hybrid junction / magic T, Wilkinson power divider, microstrip line filters, isolators, phase shifters, attenuators. Microwave amplifiers and oscillators.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Understand semiconductor materials behavior under microwave signals.
2. Understand microwave transistor operations.
3. Apply GUNN devices in frequency multipliers and oscillators.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x										
LO 3			x	x								

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Optical Waveguide Theory and Photonics

Course Code: EECE 6506

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will have an in-depth overview of the fundamentals as well as modern techniques of optical waveguides, optical waveguides and photonic devices.

Rationale: Theoretical course based on Optical Waveguide Theory and Photonics to solve real life problems.

Course Content: Types of optical waveguides: optical integrated circuits and guiding structures. Basics of optical waveguide analysis: basic equations for light waves, polarization of light, reflection and refraction, wave equations. Guided and radiation modes in dielectric slab waveguides. Coupled mode theory. Analytical solution for optical waveguides: WKB method, Marcatili's method, effective index method, equivalent network method. Computer aided design of integrated optical waveguide devices. Application of photonics to microwave devices. Nonlinear optical waveguides.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Use the main theoretical methods for modelling and analysing optical waveguides and photonic devices.

2. Understand basic concepts governing optical waveguides and fibres, lasers and optical amplification.
3. Use theoretical techniques for the solution of engineering problems.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1			x	x	x							
LO 2	x	x										
LO 3			x		x							

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

ELECTRONICS (ELEC) DIVISION

Course Title: MOS Devices

Course Code: EECE 6601

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn about MOS structure including with the potential application in electronic devices.

Rationale: Theoretical approach for explaining the operation of MOS structure based electronic devices

Course Content: The two terminal MOS Structure: flat-band voltage, inversion, properties of the regions of inversion and small signal capacitance. The four terminal MOS structure: charge-sheet model, strong inversion, moderate inversion and weak inversion. Threshold voltage-effects of ion implantation, short channel and narrow width. The MOS transistor in dynamic operation, small signal model for low medium and high frequencies, Charge Coupled devices (CCD).

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

12. Understand the advanced knowledge on MOS structure.
13. Demonstrate different models for analyzing the various modes of operation.
14. Analyze and solve a device structure using knowledge on MOS structure.
15. Apply the concept of charge couple devices in advanced electronic devices.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x							x			

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Compound Semiconductor Devices

Course Code: EECE 6602

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn different about different electronic and optoelectronic devices using compound semiconductor.

Rationale: Theoretical course based on compound semiconductor and to design different practical devices and ICs.

Course Content: Introduction to GaAs device technology. GaAs metal-semiconductor field effect transistor (GaAs MESFET): introduction, structure, equivalent circuits, current saturation, effect of source and drain resistances, gate resistance and application of GaAs MESFET. High electron mobility transistor (HEMT): practical HEMT structure, energy band line-up, equivalent circuit, HEMT noise, pseudomorphic HEMT and applications. Opto-electronic integration of compound semiconductor devices: heterojunction phototransistor (HPT) and light amplifying optical switch (LAOS). Low-temperature compound semiconductor electronics. Design consideration of MMICs and power MMICs using compound semiconductor devices.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Familiarize with the GaAs based device technology including with device structure and equivalent circuits.
2. Apply the compound semiconductors in HEMT.
3. Integrate of Opto-electronic with the compound semiconductor.
4. Consider the design parameters of MMICs and power MMICs using compound semiconductor devices.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x							x			

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Quantum Phenomena in Nanostructures

Course Code: EECE 6603

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn different quantum phenomenon in nanostructures.

Rationale: Theoretical course based on the fundamental phenomena occurred in nanostructures and nanostructures devices.

Course Content: Fundamentals of quantum mechanics: effective-mass Schrodinger Equation, matrix representation, Greenis function: Fundamentals of non-equilibrium statistical mechanics: scattering and relaxation. Carrier transport: density of states, current, tunneling and transmission probabilities, introduction to transport in the collective picture. Basic principles

of a few effective devices: resonant tunnel diode, super lattice, quantum wire and dot.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Know about effective-mass Schrodinger Equation, matrix representation and Greenis function.
2. Analyze the fundamentals of non-equilibrium statistical mechanics.
3. Investigate the density of states, current, tunneling and transmission probabilities
4. Know about the basic principles of resonant tunnel diode, super lattice, quantum wire and dot.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: VLSI Silicon Process Technology

Course Code: EECE 6604

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn about VLSI Silicon Process Technology.

Rationale: To achieve advanced knowledge on VLSI Silicon Process technology to build a chip with optimum Performance.

Course Content: Overview of integrated circuit technology. Si crystal growth and wafer preparation, epitaxial growth on Si substrate, Oxidation of Si, lithography, wet processing, cleaning and etching, diffusion: methods and models, ion implantation, metallization, MOS capacitor. Overview and process flow of a CMOS and BiCMOS process, VLSI Si devices. Isolation techniques.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Understand advanced VLSI Design.
2. Express the Layout of different circuit topologies using advanced knowledge.
3. Apply the advanced knowledge for application specific IC design.
4. Differentiate various FPGA architectures.
5. Design an application specific using latest technology tools.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-5	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x										
LO 5									x			

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Semiconductor Device Modeling

Course Code: EECE 6605

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to make device modeling using semiconductors.

Rationale: Theoretical analysis on different models of different semiconductor devices.

Course Content: Device models. Compact models for bipolar devices. Ebers-Moll type model. Gummel-Poon type model and their implementation in SPICE. BJT model in SPICE2. Compact models for MOS transistor and their implementation in SPICE. Level 1,2 and 3 MOS model parameters in SPICE. BSIM models of MOS transistors. RF MOS transistor models. Parameter extraction for bipolar and MOS device models. Geometry, process and temperature dependency of bipolar and MOS model parameters. Parameter optimization, statistics of parameters and statistical modeling.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on Compact models for bipolar devices.
2. Investigate the Level 1,2 and 3 MOS model parameters in SPICE.

3. Analyze RF MOS transistor models and Parameter extraction for bipolar and MOS device models.
4. Make decision on parameter optimization, statistics of parameters and statistical modeling for MOS devices.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x						x			
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST
Course Title: Advanced VLSI Design

Course Code: EECE 6606

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to design advanced VLSI circuits.

Rationale: To achieve advanced knowledge on VLSI IC design and to design a application specific chip with optimum Performance

Course Content: Trends and issues in high performance digital VLSI design: interconnect as key limiting factor, wire modeling, clock distribution of high speed system, power distribution, crosstalk and power distribution noise. High speed circuit design techniques; Low power design issues; High density and high speed memory design; SOI technology and circuits. VLSI circuits in signal processing; VLSI circuits in wireless communication. ASIC design.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Learn the basic VLSI design approach, technology trends and design styles.
2. Understand the basic layout design for CMOS circuits.
3. Consider design parameters for modeling VLSI circuits in signal processing, VLSI circuits in wireless communication.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Testing VLSI Circuits

Course Code: EECE 6607

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn the basic VLSI design approach, technology trends and design style.

Rationale: To learn the concepts of designing VLSI subsystem.

Course Content: Physical defects in VLSI Circuits. Complexity and economics of testing. Fault models: Stuck-at, Stack-on, Stack-open, bridging and delay faults. Testing combinational logic circuits: terminologies, path sensitization, fan-out and reconvergence, fault matrix, fault collapsing. test generation using D-algorithm, Boolean difference and other methods. Testing sequential logic circ its: problems and remedies. Testability of different types of CMOS circuits for various faults. test invalidation. Robustly testable CMOS circuits. Test generation for static and dynamic CMOS. Design for testability: different techniques of enhancing testability scan design techniques, built-in self (BIST) Built-in current sensors (BICS) for IDDQ testing of CMOS circuits. Error detecting codes and self-checking circuits. Testable design of regular array architectures and PLAS: Testable design of regular array architectures and PLAS: the concept of C-testability.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Identify the various IC fabrication methods.
2. Express the Layout of simple MOS circuit using Lambda based design rule.
3. Apply the Lambda based design rules for subsystem design.

4. Differentiate various CMOS architecture and design an application using latest technology tool.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x							x			

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Carbon Nanotechnology

Course Code: EECE 6608

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn the nanotechnology using Carbon and related materials.

Rationale: Theoretical course for Nanomaterials and nanostructures and their fabrication process.

Course Content: Nanomaterials and nanostructures: graphene, carbon nanotubes, fullerenes, molecules and organic nanostructures. Synthesis methods of nanostructures: electric arc, pulsed laser deposition, chemical vapor deposition (CVD); thermal CVD, catalytic CVD, micro wave CVD (MWCVD), plasma enhanced CVD (PECVD), spray pyrolysis. Physical and opto-electronic properties; characterization techniques. Applications: carbon nanotube and graphene based devices, bio-sensors, bio-inspired nanostructures, molecular motors, fuel cells and solar cells.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on Nanomaterials and nanostructures.
2. Know about the synthesis methods of nanostructures.
3. Analyze physical and opto-electronic properties of Nanomaterials and nanostructures.
4. Apply the carbon nanotube and grapheme in bio-sensors, bio-inspired nanostructures molecular motors, fuel cells and solar cells.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									

LO 4	x	x							x			

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Nano Systems

Course Code: EECE 6609

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn about the Nano system.

Rationale: Theoretical course based on Nano systems and Devices including with their processing.

Course Content: Nanosystems and Devices: Introduction- nanomaterials, nanodevices, nanostructures. Nanoscale Lithography: X-ray, Electron-Beam and Ion-Beam; Soft Lithography; Scanning Probe Lithography. Advances in Device Technology: nanoscale silicon devices, process technology, present challenges. Self Assembled Nanocrystals: self assembly, surface defects and passivation, structures, energy levels, transitions, luminescence and lasing. Nano Electro Mechanical Systems (NEMS): stress in thin films, mechanical to electrical transduction, surface engineering techniques, process flow, NEMS actuators, high aspect ratio system technology. Nano Biotechnology: scope and dimensions; detection of biological species on electrical, mechanical and optical criteria; Bio functionality on silicon; Biochip sensors and systems- structures, process technology.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Understand the Nano systems and Devices.
2. Become Advances in Device Technology.
3. Analyze the Nano Electro Mechanical Systems.
4. Demonstrate the bio functionality on silicon.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x							x			

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Thin Film Growth and Deposition

Course Code: EECE 6610

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn about the growth and deposition of thin film.

Rationale: To learn and familiarize the basics of processing and fabrication technology of VLSI as well as the application of this area of electrical engineering.

Course Content: Introduction to Thin Film Technology. Vacuum systems. Kinetic theory of gases. The physics and chemistry of evaporation/deposition mechanism. Physical vapor deposition and related techniques. Theories of epitaxy and nucleation, molecular beam epitaxy.

Chemical vapor deposition techniques: reaction types, growth kinetics. Liquid phase epitaxy and related techniques. Theories of plasma and discharges. Sputtering (DC, RF and ECR). Solution based deposition techniques (Sol-gel), spray pyrolysis.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Become familiarize with statistical modeling and the control of semiconductor fabrication processes and plants.
2. Understand the physical concepts underlying the operation of semiconductor devices.
3. Introduce semiconductor process flow from wafer fabrication to package assembly and final test, and what the semiconductor device failure analysis is and how it is conducted.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x						x			

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Semiconductor Characterization Technology

Course Code: EECE 6611

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to investigate the semiconductor using different characterization technologies.

Rationale: This course is based on the structural characterization of semiconductor materials and semiconductors.

Course Content: Overview of semiconductor technology. Structural characterization: X-ray diffraction (XRD), low energy electron diffraction (LEED), reflection high energy electron diffraction (RHEED), atomic force microscopy (AFM), scanning tunneling microscopy (STM), scanning electron microscopy (SEM), transmission electron microscopy (TEM), Rutherford backscattering spectroscopy (RBS), energy dispersive x-ray analysis (EDX), Auger electron spectroscopy (AES), electron energy loss spectroscopy (EELS), secondary ion mass spectroscopy (SIMS), X-ray photoelectron spectroscopy (XPS), elastic recoil detection (ERD). Electrical characterization: resistivity measurements, Hall measurement, current-voltage (I-V), capacitance-voltage (C-V), deep level transient spectroscopy (DLTS), lifetime measurements. Optical characterization: optical transmittance and reflectance spectroscopy, ellipsometry, photoluminescence (PL), Raman spectroscopy, Fourier transform infrared spectroscopy.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Analyze the semiconductor technology for designing the advanced semiconductor devices.
2. Demonstrate the structural characterization of semiconductor.
3. Decide on the electrical properties of materials for device application.
4. Estimate the optical properties of semiconductor for optical device application.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x							x			

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Electric and Magnetic Properties of Materials
Course Code: EECE 6701

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn the Electric and Magnetic Properties of Materials.

Rationale: To learn and familiarize the basics of Properties of Material as well as the modern and classical theories of material.

Course Content: Electric Properties: Polarization, electrical conductivity and dielectric losses. Pyroelectric phenomena. piezoelectric effect and electrostriction. Domain structure and peculiarities electric properties of ferroelectrics and anti-ferroelectrics. Structure and properties of some ferroelectrics and anti-ferroelectrics. Phase transition in ferroelectrics, fundamentals of spontaneous polarization theory. Magnetic Properties: Disordered magnetics, ordered magnetics. Domain structure of ferromagnetic crystals and magnetization processes.

Anisotropy of ferroelectric crystals. Structure of some magnetically ordered crystals and reorientation transition. Piezomagnetic and magnetoelectric effect.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Analyze Crystal structures, Classical and quantum theory of semiconductor, Modern theory of metals and Magnetic properties of materials.
2. Apply Bravais lattice and Miller indices, Mathiessen's rule, Schrodinger's equation for solving different aspect.
3. Compute lattice and basis, Fermi energy and average energy of electrons, classical and quantum mechanical calculation of specific heat, density of states.
4. Estimate wave nature of electrons, temperature dependency of metal resistivity and behavior of Type I and Type II superconductors.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x							x			

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Electronics of Solids

Course Code: EECE 6702

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn the electronics of solid semiconductor.

Rationale: To understand the physical concepts underlying the operation of semiconductor devices.

Course Content: Crystal Structure: lattice types, basis, defects, reciprocal lattice, Miller indices. Free Electron Theory: Drude model and Sommerfield theory. Band Theory: Blochis theorem and crystal momentum, the nearly free electron model, band structures of Si and III-V semiconductors. Carrier Transport: Boltzmann transport theory, relaxation time approximation, high field transport and hot-carrier effects, Hall effect.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Analyze carrier flow and associated fields due to drift, diffusion, generation, and recombination. Be able to draw and interpret energy band diagrams.
2. Analyze the behavior of a pn junction (diode) field effect transistor (FET), including device physics, device operation, and device characteristics and summarize how device design affects performance.
3. Apply mathematical methods for the analysis of solid state electronics processes and theirs application to the solution of energy problems.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	

LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x						x			

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Laser Theory

Course Code: EECE 6703

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn the theory on different phenomena on Laser.

Rationale: This course illustrates the operation principles of gas, solid state and semiconductor lasers.

Course Content: Black body radiation and the Planck law. Stimulated and spontaneous emission, atomic and spectral line width, 3-level atomic, systems. Laser operation under steady state condition, laser output coupling and power . Q-switching and mode locking. Line broadening mechanisms: homogeneous and inhomogeneous broadening. Open resonator and Gaussian beam, stability criterion for optical resonators. Principles of operation of gas, solid state and semiconductor lasers.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on Stimulated and spontaneous emission, atomic and spectral line width, 3-level atomic, systems.
2. Analyze the Laser operation under steady state condition.
3. Design practical Laser considering issues such as broadening mechanisms, Open resonator and Gaussian beam, stability criterion for optical resonators.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x										

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Semiconductor Materials and Heterostructures

Course Code: EECE 6704

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn about semiconductor materials and their applications in heterostructures.

Rationale: To learn and familiarize with the characteristics of compound semiconductors as well as with different heterojunction devices along with different device models.

Course Content: Residual impurities in silicon wafers, zone refining. Crystal imperfections: structural, optical and electronic properties. Implantation related defects, recovery of crystal structure, solid phase epitaxial regrowth (SPE). Semiconductor alloys: Structural and electronic properties: growth techniques- molecular beam epitaxy (MBE). Chemical vapour deposition (CVD): pseudomorphic and metastable structures, tetragonal distortion. Strain relaxation. Structural and optical properties of double sided heterostructures, quantum wells and superlattices; types of band alignment. Solid state heterostructural LED and LASER. optoelectronic Functionality in silicon chip. Structural and electrical study of heterojunction bipolar transistor (HBT), heterojunction avalanche photodiode, and silicon-germanium MOSFET.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Analyze relevant material, optical and transport properties of compound semiconductors and their facility to form hetero-structures in a flexible manner for fabricating photonic devices.
2. Relate the trends in heterogeneous integration of compound semiconductors on lattice mismatched substrates or non-polar substrates.
3. Design a particular photonic device from judicious choice of compound semiconductor and heterostructures.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-3	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x							x			

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Advanced Analog IC Design

Course Code: EECE 6705

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to design advanced analog ICs.

Rationale: Theoretical course based on the concept of processing CMOS and application of CMOS technology in different device designing.

Course Content: The concept of System on Chip (SOC) and mixed signal design. CMOS process for mixed analog/digital design. Layout design issues, parasitic components, IC components, Introduction to basic analog building blocks in CMOS: Basic gain stage, super MOS transistor, current division, current mirror, current sources, differential amplifiers, transconductance amplifier, linear voltage-to-voltage and current-to- voltage converters, MOS resistive networks, arithmetic functions, voltage and current references, output stages and buffers, Winner-Take-All circuits. CMOS and BI-CMOS operational amplifier design. Filters, data converters, analog integrated sensors. Low noise amplifiers (LNA), mixers, voltage-controlled oscillators (VCO), Neural information processing in silicon: retina, cochlea and vision chips.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on CMOS process for mixed analog/digital design.

2. Design the layout including with parasitic components, IC components.
3. Design CMOS and BI-CMOS operational amplifier.
4. Process neural information in Silicon such as retina, cochlea and vision chips.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x	x		x								
LO 3			x									
LO 4	x	x							x			

Reference Books:
As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

INTERDISCIPLINARY COURSES

Course Title: Engineering Analysis

Course Code: EECE 6801

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply engineering analysis using various theorems, functions and logics.

Rationale: Theoretical course based on problem analysis through the use of genetic logics and numerical theorems and functions.

Course Content: Wavelet transform. Chaos and bifurcation theorems. Walsh function. Green's function. Finite element techniques. Fuzzy logic. Genetic algorithms.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

16. Demonstrate advanced knowledge on Wavelet transform.
17. Convert a practical problem into mathematical model using Chaos and bifurcation theorems, Walsh function and Green's function.
18. Analyze and solve a practical problem using knowledge of Fuzzy logic and Genetic algorithms.
19. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x					x			
LO 3		x	x						x			
LO 4	x	x										

Reference Books:
1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Selected Topics in Electrical and Electronic Engineering

Course Code: EECE 6802

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: *to be set by Board of Postgraduate Studies.*

Rationale: *to be set by Board of Postgraduate Studies.*

Course Content: Course contents to be decided by the course teacher with the approval of the Board of Postgraduate Studies (BPGS) of EECE Dept. (NB: This course can be taken by a student only once in any program. Any student intending to enroll in the subject EECE6002 in a semester will have to declare in the "Remarks" column of his/her Course Registration form that he/she has not taken this course previously irrespective of the topic title under EECE6002).

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. To be set by course teacher.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
	Class participation and observation	5%	set by course teacher
	Class test/Assignment	15%	set by course teacher
	Case study /Presentation/Oral examination	30%	set by course teacher
	Final Examination	50%	set by course teacher
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1												
LO 2												
LO 3												
LO 4												

Reference Books:
1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Nonlinear System Analysis

Course Code: EECE 6803

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply system analysis techniques using numerical and analytical methods.

Rationale: Theoretical course based on problem analysis through the use of numerical theorems and functions along with judgement of stability for nonlinear systems.

Course Content: Numerical methods. Graphical methods. Equations with known exact solution. Analysis of singular points. Analytical methods. Forced oscillation systems. Systems

described by differential difference equations. Linear differential equation with varying coefficient. Stability of nonlinear systems.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on Numerical methods and Graphical methods.
2. Analyze and solve a practical problem using knowledge of Equations with known exact solution, Analysis of singular points, Analytical methods, Forced oscillation systems.
3. Illustrate Systems described by differential difference equations, Linear differential equation with varying coefficient, Stability of nonlinear systems.
4. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x					x			
LO 3		x	x						x			
LO 4	x	x										

Reference Books:
1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Artificial Neural Systems

Course Code: EECE 6804

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn to apply prediction techniques using artificial neural networks.

Rationale: Theoretical course based on problem analysis through the use of perceptrons and adaptive nural networks.

Course Content: Biological nervous system: the bran and neurons. Artificial neural networks. Historical backgrounds. Hebbian associator. Perceptions: learning rule, illustration, proof, failing Adaptive linear (ADALINE) and Multiple Adaptive linear (MADALINE) networks. Multilayer perceptions: generating internal representation Back propagation, cascade correlation and counter propagation networks. Higher order and bidirectional associated memory. Hopfield networks: Lyapunov energy function. attraction basin. Probabilistic updates: simulated annealing, Boltzman machine. Adaptive Resonance Theory (ART) network ART1, ART2, Fuzzy ART mapping (ARTMAP) networks. Kohonen's feature map, learning vector Quantization (LVQ) networks. Applications of neural nets.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on perceptrons: learning rule, illustration, proof, failing Adaptive linear (ADALINE) and Multiple Adaptive linear (MADALINE) networks.
2. Analyze and solve a practical problem using knowledge of Multilayer perceptions: generating internal representation Back propagation, cascade correlation and counter propagation networks. Higher order and bidirectional associated memory. Hopfield networks: Lyapunov energy function. attraction basin.
3. Illustrate Systems described by Boltzman machine. Adaptive Resonance Theory (ART) network ART1, ART2, Fuzzy ART mapping (ARTMAP) networks. Kohonen's feature map, learning vector Quantization (LVQ) networks. Applications of neural nets.
4. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x								
LO 3		x	x									
LO 4	x	x										

Reference Books:
1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Power Semiconductor Circuits

Course Code: EECE 6901

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn implementation of power semiconductor devices and their characteristics.

Rationale: Theoretical course based on analysis and operations of power semiconductor devices.

Course Content: Static switching devices, characteristics of SCR, BJT, MOSFET, IGBT, SIT, GTO, MCT. Classifications of static power converters and their application. Control circuits for static power converters. Pulse width modulation; PWM control of static power

converters. Switch mode DC to DC converters, resonant converters, Fourier analysis of static converter waveforms, HD, THD, pf, ZVS and ZCS of static converters. Hysteresis current of AC drives.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on Static switching devices, characteristics of SCR, BJT, MOSFET, IGBT, SIT, GTO, MCT. Classifications of static power converters and their application.
2. Analyze and solve a practical problem using knowledge Control circuits for static power converters. Pulse width modulation; PWM control of static power converters.
3. Illustrate Systems described by Switch mode DC to DC converters, resonant converters, Fourier analysis of static converter waveforms, HD, THD, pf, ZVS and ZCS of static converters. Hysteresis current of AC drives.
4. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x					x			
LO 3		x	x						x			
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Design of Power Semiconductor Circuits and Drives

Course Code: EECE 6902

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn design of power semiconductor devices circuits.

Rationale: Theoretical course based on practical implementation of power semiconductor devices.

Course Content: Design of SCR communication circuits, base and gate drive circuits of static switching devices, snubber circuits, switching losses and heat sink. Input/output filter design of static power converters. Design of protection circuits for static power converters. Scalar and vector control of AC machines using static power converters. Design of microcomputer controllers for static power converter switching.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on design of SCR communication circuits, base and gate drive circuits of static switching devices, snubber circuits, switching losses and heat sink.
2. Analyze and solve a practical problem using knowledge of Input/output filter design of static power converters. Design of protection circuits for static power converters.
3. Illustrate Scalar and vector control of AC machines using static power converters. Design of microcomputer controllers for static power converter switching Demonstrate and apply complex variable method to solve engineering problems
4. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	

Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x										
LO 3		x	x						x			
LO 4	x	x										

Reference Books:
1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Nonlinear Control Systems

Course Code: EECE 6903

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn design and application of nonlinear control system.

Rationale: Theoretical course based on analysis of nonlinear control circuitry.

Course Content: General introduction, the phase plane: method of isoclines, Linenard's method, Pelts method, common nonlinearities, transient response from phase trajectory, describing function and their applications. Relay servo mechanism. Lyapunov's method.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on the phase plane: method of isoclines, Linenard's method, Pelts method, common nonlinearities.
2. Analyze and solve a practical problem using knowledge of transient response from phase trajectory, describing function and their applications.
3. Illustrate Relay servo mechanism. Lyapunov's method.
4. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x					x			
LO 3		x	x						x			
LO 4	x	x										

Reference Books:
1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Sampled Data Control System

Course Code: EECE 6904

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn design and application of sampled data control system.

Rationale: Theoretical course based on analysis of sampled data control circuitry.

Course Content: Z Transform and modified Z transform: root-locus and frequency method of analysis of sampled data systems. Compensation, discrete and continuous method. Physical

realization of discrete compensations.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on Z Transform and modified Z transform: root-locus and frequency method of analysis of sampled data systems
2. Analyze and solve a practical problem using knowledge of Compensation, discrete and continuous method.
3. Illustrate Physical realization of discrete compensations.
4. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x					x			
LO 3		x	x						x			
LO 4	x	x										

Reference Books:
1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Modern Control Theory

Course Code: EECE 6905

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn design and application of modern control system.

Rationale: Theoretical course based on analysis of modern control circuitry.

Course Content: State space description of dynamic systems: relationship between state equations and transfer function: continuous and discrete time linear system analysis and design using state transition method. Controllability and observability. State feedback and output feedback. Pole assignment using state feedback and output feedback. H control. Optimal control-dynamic programming. Pontryagin's minimum principle. Separation theorem. Stochastic control. Adaptive control.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge on State space description of dynamic systems: relationship between state equations and transfer function: continuous and discrete time linear system analysis and design using state transition method.
1. Analyze and solve a practical problem using knowledge of Controllability and observability. State feedback and output feedback. Pole assignment using state feedback and output feedback. H control.
2. Illustrate Optimal control-dynamic programming. Pontryagin's minimum principle. Separation theorem. Stochastic control. Adaptive control.
2. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12

LO 1	x	x										
LO 2	x	x		x					x			
LO 3		x	x						x			
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Ionospheric Prediction and Forecasting

Course Code: EECE 6906

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn prediction modelling of ionospheric phenomenon.

Rationale: Theoretical course based on forecasting of ionospheric events using satellite data.

Course Content: Introduction: sun and solar interactions, solar wind, geomagnetic field, magnetosphere, solar and geomagnetic indices. Regular ionospheric regions, sporadic ionospheric layer, ionospheric irregularities. Ionospheric sounding: ionosondes, ionograms and their interpretation, ionospheric sounding with GNSS signals. Ionospheric spatial and temporal variations: geographic and geomagnetic variations, high-latitude ionosphere, equatorial ionosphere, daily, seasonal, and solar cycle variations. Ionospheric model for prediction and forecasting: international reference ionosphere (IRI). Total electron content modelling and mapping: TEC evaluation technique from RINEX files, total electron content modelling, total electron content mapping: global and regional, ionospheric tomography. Ionospheric forecasting: ionospheric disturbances, sudden ionospheric disturbance (SID), polar cap absorption, ionospheric storm. Ionospheric forecasting techniques: statistical methods, neural network methods. Prediction and nowcasting for HF applications and radio links: HF ionospheric performance predictions, MUF definition and calculation, calculation of attenuation and LUF, point-to-point HF prediction and nowcasting, HF area prediction and nowcasting. Existing prediction and nowcasting propagation procedures: purpose of ionospheric prediction, nowcasting, and forecasting, IONCAP, VOACAP, and ICECAP, the

IPS advanced stand-alone prediction system. current and future trends in ionospheric prediction and forecasting: radio systems applications, contribution to space weather. Mitigation of disturbances and signal errors in GNSS and other systems: navigation systems, communication systems, surveillance, Conclusions.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge of sun and solar interactions, solar wind, geomagnetic field, magnetosphere, solar and geomagnetic indices. Regular ionospheric regions, sporadic ionospheric layer, ionospheric irregularities. Ionospheric sounding: ionosondes, ionograms and their interpretation, ionospheric sounding with GNSS signals. Ionospheric spatial and temporal variations: geographic and geomagnetic variations, high-latitude ionosphere, equatorial ionosphere, daily, seasonal, and solar cycle variations. Ionospheric model for prediction and forecasting: international reference ionosphere (IRI).
2. Analyze and solve a practical problem using knowledge of Total electron content modelling and mapping: TEC evaluation technique from RINEX files, total electron content modelling, total electron content mapping: global and regional, ionospheric tomography. Ionospheric forecasting: ionospheric disturbances, sudden ionospheric disturbance (SID), polar cap absorption, ionospheric storm.
3. Illustrate Ionospheric forecasting techniques: statistical methods, neural network methods. Prediction and nowcasting for HF applications and radio links: HF ionospheric performance predictions, MUF definition and calculation, calculation of attenuation and LUF, point-to-point HF prediction and nowcasting, HF area prediction and nowcasting. Existing prediction and nowcasting propagation procedures: purpose of ionospheric prediction, nowcasting, and forecasting, IONCAP, VOACAP, and ICECAP, the IPS advanced stand-alone prediction system. current and future trends in ionospheric prediction and forecasting: radio systems applications, contribution to space weather. Mitigation of disturbances and signal errors in GNSS and other systems: navigation systems, communication systems, surveillance.
4. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x					x			
LO 3		x	x						x			
LO 4	x	x										

Reference Books:
1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Advanced Electrical, Electronics and Communication Engineering

Course Code: EECE 6907

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn different electrical and communication technique used in military communications.

Rationale: Theoretical course on advanced electrical and communication technology used in different militaries around the world.

Course Content: Advanced trends in dc and ac motors, dc generator, alternator and transformers. Analog and mixed signal IC design for wireless communications. Electronic vehicle control, drive and diagnoses system, PLC and microprocessor-based control system. Advanced technologies for electro-medical equipment; advanced wired and wireless communication system and trends in Military communications, high data rate analog and digital modulation techniques for Military communication system. Fiber optic and free-space

optical (FSO) communications and their applications in military. Modern battle field surveillance system (IR, TI and LASER technology), control and stabilization technology, Electronic protections, support, countermeasures and counter countermeasures (EP, ESM, ECM and ECCM).

Remark: Both the instructor and students for this course will be from military.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate knowledge on advancement and current state of motor, generator, alternator and generator technology.
2. Demonstrate knowledge on advanced communication system used in militaries around the world
3. Demonstrate knowledge on modern battlefield surveillance equipment
4. Design PLC and microprocessor based control system for military application.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1-2	Class participation and observation	5%	
LO 3	Class test/Assignment	15%	
LO 4	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x											
LO 3	x											
LO 4		x			x							

Reference Books:

1. Advanced Electrical and Electronics Engineering, Vol. 2 – Jian Lee
2. Electronic and Radio Engineeringm - F.E. Terman

3. Introduction to Programmable Logic Controllers - Glen Mazur and William J. Weindorf
4. Microcontroller programming - Julio Sanchez
5. Fiber Optic Communications: Fundamentals and Applications- M. Jamal Deen and Shiva Kumar

Grading system: As per approved grading scale of MIST

Course Title: Space Weather Effects on Telecommunication Systems

Course Code: EECE 6908

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn effects of space weather on telecommunication systems.

Rationale: Theoretical course based on various space weather condition affecting telecommunication.

Course Content: Introduction: definition of space weather, space weather data utilization. The origins of space weather: the sun and its influence, magnetosphere and geomagnetic storms. Telecommunication systems: earth-space telecommunications, integrated propagation effects, differential effects and the Ne distribution, space weather support for systems. Prediction services and systems: elements of the prediction process, organizational approaches, commercial forecasting services, systems for forecasting. Research activities and programs: data assimilation and transfer, international initiatives, scientific and professional organizations, research programs and activities.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge of definition of space weather, space weather data utilization. The origins of space weather: the sun and its influence, magnetosphere and geomagnetic storms. Telecommunication systems: earth-space telecommunications, integrated propagation effects.
2. Analyze and solve a practical problem using knowledge of differential effects and the Ne distribution, space weather support for systems. Prediction services and systems: elements of the prediction process, organizational approaches, commercial forecasting services, systems for forecasting.
3. Illustrate data assimilation and transfer, international initiatives, scientific and professional organizations, research programs and activities.

4. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x					x			
LO 3		x	x						x			
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Selected Topics on GNSS Remote Sensing Technology

Course Code: EECE 6909

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn operations and use of GNSS satellite.

Rationale: Theoretical course based on application and sensing of GNSS.

Course Content: Introduction to GNSS: GNSS systems and signals, GNSS errors, GNSS observations and applications. GNSS atmospheric and multipath delays: atmospheric refractivity, GNSS atmospheric delays, GNSS ionospheric delay, GNSS multipath delay. GNSS atmospheric sensing and applications: ground GNSS atmospheric sensing, theory and methods, ZTD estimate and variations, GNSS precipitable water vapor, 3-D water vapor topography. ground GNSS ionosphere sounding: DCB determination, TEC estimate, 2-D ionospheric mapping and its applications, 3-D GNSS ionospheric mapping, 3-D ionospheric topography, validation of GNSS ionospheric tomography, assessment of IRI using GNSS tomography, ionospheric slab thickness, 3-D ionospheric behaviors to storms. Principle of GNSS radio occultation: atmospheric refraction, geometric optics approximation, symmetric atmosphere assumption, bending angle and refractive index, GNSS radio occultation processing, calibrating and extracting GNSS RO observables, bending angle retrieval, ionosphere retrieval, neutral atmosphere retrieval. Atmospheric sensing using GNSS RO: GNSS RO atmospheric sounding, parameters retrieval from GNSS RO, dry atmosphere retrieval (density, pressure and temperature), moist atmosphere retrieval, 1D-Var (Variational Method), characteristics of GNSS RO observations, spatial resolution (vertical and horizontal resolution), accuracy and precision analysis, dynamic processes studies with GNSS RO, study of tropopause and stratospheric, weather prediction applications, climate applications, future application of radio occultation, future GNSS and GNSS RO missions, airborne and mountain-Top GNSS RO, LEO-to-LEO occultation.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge of definition of GNSS systems and signals, GNSS errors, GNSS observations and applications. GNSS atmospheric and multipath delays: atmospheric refractivity, GNSS atmospheric delays, GNSS ionospheric delay, GNSS multipath delay. GNSS atmospheric sensing and applications: ground GNSS atmospheric sensing, theory and methods, ZTD estimate and variations, GNSS precipitable water vapor, 3-D water vapor topography. ground GNSS ionosphere sounding: DCB determination, TEC estimate, 2-D ionospheric mapping and its applications, 3-D GNSS ionospheric mapping, 3-D ionospheric topography.
2. Analyze and solve a practical problem using knowledge of validation of GNSS ionospheric tomography, assessment of IRI using GNSS tomography, ionospheric slab thickness, 3-D ionospheric behaviors to storms. Principle of GNSS radio occultation: atmospheric refraction, geometric optics approximation, symmetric atmosphere assumption, bending angle and refractive index, GNSS radio occultation processing, calibrating and extracting GNSS RO observables, bending angle retrieval, ionosphere retrieval, neutral atmosphere retrieval. Atmospheric sensing using GNSS RO: GNSS RO atmospheric sounding, parameters retrieval from GNSS RO, dry atmosphere retrieval (density, pressure and temperature).
3. Illustrate 1D-Var (Variational Method), characteristics of GNSS RO observations, spatial resolution (vertical and horizontal resolution), accuracy and precision analysis, dynamic processes studies with GNSS RO, study of tropopause and stratospheric, weather prediction applications, climate applications, future application of radio

occultation, future GNSS and GNSS RO missions, airborne and mountain-Top GNSS RO, LEO-to-LEO occultation.

4. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x					x			
LO 3		x	x						x			
LO 4	x	x										

Reference Books:

1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Ionospheric Precursors of Earthquake

Course Code: EECE 6910

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Students will learn events of ionospheric earthquakes.

Rationale: Theoretical course based on effect of seismic activities of the ionosphere.

Course Content: The basic components of Seismo-ionospheric coupling: physical background of earthquake prediction, radon emanation as precursory phenomenon, other geochemical precursors, anomalous electric field, earthquake preparation zone, radioactive troposphere plasma chemistry, the global electric circuit and atmospheric electricity. Ionospheric precursors of earthquakes as seen from the ground and from space: ionospheric precursors registered by ground based ionosondes, precursory effects in D-layer, E-layer reaction on the earthquake preparation, the F-layer, upper ionosphere and magnetosphere, optical emissions associated with earthquakes. Near ground and troposphere plasma chemistry and electric field: the characteristics of radiative sources, ionized atmosphere models, conception of neutral ion clusters in air, electric field generation. Seismo-ionospheric coupling: wave channel, electric field channel, Seismo-ionospheric coupling model. Main phenomenological features of ionospheric precursors of earthquakes: The ground-based and satellite systems of electromagnetic and ionospheric precursors monitoring, dedicated satellite missions for earthquake precursors registration from space, how to use ionospheric precursors in real prediction.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate advanced knowledge of definition of the basic components of Seismo-ionospheric coupling: physical background of earthquake prediction, radon emanation as precursory phenomenon, other geochemical precursors, anomalous electric field, earthquake preparation zone, radioactive troposphere plasma chemistry, the global electric circuit and atmospheric electricity. Ionospheric precursors of earthquakes as seen from the ground and from space.
2. Analyze and solve a practical problem using knowledge of ionospheric precursors registered by ground based ionosondes, precursory effects in D-layer, E-layer reaction on the earthquake preparation, the F-layer, upper ionosphere and magnetosphere, optical emissions associated with earthquakes. Near ground and troposphere plasma chemistry and electric field.
3. Illustrate the characteristics of radiative sources, ionized atmosphere models, conception of neutral ion clusters in air, electric field generation. Seismo-ionospheric coupling: wave channel, electric field channel, Seismo-ionospheric coupling model. Main phenomenological features of ionospheric precursors of earthquakes: The ground-based and satellite systems of electromagnetic and ionospheric precursors monitoring, dedicated satellite missions for earthquake precursors registration from space, how to use ionospheric precursors in real prediction.
4. Demonstrate and apply complex variable method to solve engineering problems

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 4	Class participation and observation	5%	
LO 1-3	Class test/Assignment	15%	
LO 2-3	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x										
LO 2	x	x		x					x			
LO 3		x	x						x			
LO 4	x	x										

Reference Books:
1. As advised by the course teacher/department.

Grading system: As per approved grading scale of MIST

Course Title: Advanced Automobile Engineering

Course Code: ME 6251

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Objective: Student will learn about different design characteristics of vehicles including military vehicle.

Rationale: Theoretical course on the advanced engineering of military vehicles

Course Content: Vehicle design characteristics including military vehicles; Vehicle material selection including military vehicles; Vehicle aerodynamics; Vehicle propulsion (Engine technology and performance analysis, transmission system); Vehicle dynamics

(Improved automotive fuel system, lubrication and cooling system, braking, suspension, tire/track and steering system) including military vehicles; Emission effects and control; advanced electrical automotive drives and instruments; hybrid technology; Evaluating vehicle performance; Vehicle safety system and Vehicle tracking system including military vehicles. Vehicle electronics, sensors and imaging, signal processing and communications. Electromagnetic shielding of military vehicle.

Remark: Currently this course will be offered for EME officers of BD Army only, and later will be offered for civilian students.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate knowledge on vehicle design including military vehicle (requirements and guidelines)
2. Demonstrate knowledge on vehicle subsystems including military vehicle.
3. Demonstrate advanced tracking and control system used in vehicles including military vehicle.
4. Demonstrate knowledge on inspecting and maintenance of vehicles including military vehicle.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 2-3	Class test/Assignment	15%	
LO 4	Case study /Presentation/Oral examination	30%	
LO 1-4	Final Examination	50%	
Total		**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x											
LO 2	x		x									

LO 3	x											
LO4	x						x			x		

Reference Books:

1. Materials and Process Selection for Engineering Design - Mahmoud M. Farag
2. Automotive Mechatronics: Operational and Practical Issues - Fijalkowski, B. T.
3. Automotive Control Systems - A. Galip Ulsoy, Huei Peng, and Melih Çakmakci
4. Introduction to Hybrid Vehicle System Modeling and Control - Wei Liu
5. Automotive Chassis Systems - James D. Halderman
6. Automotive Brake Systems - James D. Halderman

Grading system: As per approved grading scale of MIST

Course Title: Advanced Weapon Engineering

Course Code: AE-6108

Level: Post-graduation program

Credit Hour: 3

Contact Hour: 3 (per week)

Rationale: Theoretical course on different design and inspection procedure of light weapons.

Course Content: Weapon classification; Light weapons/ small arms design (small arms theory and design, advanced trends in small arm, material selection and surface treatment, ballistics, firing and operating mechanics, sighting system and safety); gun system design (gun design and barrel material and thermodynamics, breech system, recoil system and control system); Weapon inspection/ performance evaluation; Rocket propulsion systems; Guided weapon system (Air frames, control, guidance, propulsion and warheads); Missile guidance phases, techniques; Advanced guidance and sensor systems; Working principle of various types of RADAR used in weapon system; Electronic warfare.

Remark: Both the instructor and students for this course will be from military.

Objective: To learn about small arms design and details of guided weapon system.

Learning Outcomes (LO): On successful completion of this course unit, students should be able to:

1. Demonstrate knowledge about classification of weapon and current trend of small weapon usage by different military of advanced world.
2. Design and modify small arms in terms of material, ballistics, control, safety etc.
3. Demonstrate knowledge on rocket propulsion system.
4. Demonstrate knowledge on guided weapon system, different phases and techniques of

missile guidance, advanced guidance and sensor system.

Teaching-learning Strategy: Class lectures, Case studies, Research papers review, Practical problem solution etc.

Assessment Strategy: Class tests, Assignments, Presentation and Final exam.

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Demonstrate knowledge about weapon classification and current trend of small weapon usage by different military of advanced world.	✓											
2. Design and modify small arms in terms of material, ballistics, control, safety etc.	✓		✓									
3. Demonstrate knowledge on rocket propulsion system.	✓											
4. Demonstrate knowledge on guided weapon system, different phases and techniques of missile guidance, advanced guidance and sensor system.	✓											

Reference Books:

1. Small Arms: General Design - M. A. Toomey
2. Advances in Missile Guidance, Control, and Estimation – B.A. White
3. Guided Weapons - J. F. Rouse
4. Radar technology - Eli Brookner

Grading system: As per approved grading scale of MIST