الجامعـــة الإسلاميـــة للتكنولوجيا

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

COURSE STRUCTURE
AND
COURSE CONTENTS

Department
of
Electrical and Electronic Engineering (EEE)

January 2004

Electrical and

Electronic

Engineering

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General Information

The department of Electrical and Electronic Engineering is making major contributions toward the achievement of the cherished goal of IUT in developing human resources of the Member States of the Organisation of the Islamic Conference (OIC), especially in the fields of Engineering, Science and Technology. Several integrated programmes, designed particularly to prepare students with diversified aims to place themselves in a highly competitive world of modern Technology, are offered to realize the desired objectives.

The Programmes are:

- **Master of Science in Electrical and Electronic Engineering**
- **Master of Electrical and Electronic Engineering**
- **Postgraduate Diploma in Electrical and Electronic Engineering**
- **Bachelor of Science in Electrical and Electronic Engineering**
- **Higher Diploma in Electrical & Electronic Engineering**

The Master of Science in Electrical and Electronic Engineering, Master of Engineering and Postgraduate Diploma in Electrical and Electronic Engineering involve varying hours of research, projects, course works requiring 36, 36, 24 credit hours and will normally require 3, 3 and 2 semesters respectively.

The B.Sc. Engineering Course in Electrical and Electronic Engineering comprises of four years of study consisting of eight consecutive semesters of sixteen weeks duration each. However, there is a provision for award of Higher Diploma in Electrical and Electronic Engineering with specializations in Power System Technology and Computer Science & Engineering, after successful completion of three years (six semesters) of study. Higher Diploma in Engineering graduates may also continue further for completion of B.Sc. Engineering programme. The admission requirements are Higher /Upper Secondary School Certificate level with science background i.e., university entry requirements. The total contact hours in classes, laboratories and workshops are 25-30 hours per week. The course curricula contain engineering science of high level as well as include components for hands-on-experience, to produce engineers of international standard having relevance to the development needs of the Member States.

Besides the above long regular programmes special training programmes are designed and offered on short-term basis as per request from Member States of OIC. The course curricula are under constant scrutiny and review and continuously updated to meet the needs and requirements of the member States. The levels and contents are kept at international standard.

The department also takes research works in the field of Electrical and Electronic Engineering. Seminars and Workshops on national and international levels are also organized by the department to disseminate information on current progress in Technology and Technical know-how among the personnel of the OIC Member States who are involved in the promotion, development and application of Electrical and Electronic Engineering Science and Technology.

Faculty

Head of the Department and Professors

Fazli Qayyum Yousaf-Zai, B.Sc.Engg (Elect), Peshawar, M.Sc.Engg. (Elect.), Colorado State Univ. USA, Ph.D., Bradford, UK.
Formerly Professor & Head, NWFP University of Engineering & Technology, Peshawar, Pakistan.
Formerly Visiting Professor, EEE Department, Universiti Tenega Nasional, Malaysia. (on Leave)

Kazi Khairul Islam, B.Sc. Engg. (Elect.), Rajshahi University, M. Tech. Ph.D (IIT Kanpur, India), Research Fellow (UCF, USA).
Professor & formerly Head of the Deptt, EEE, BIT Rajshahi

Dr. K. Siddique-e-Rabbani
Visiting Professor
Ph.D. (Microelectronics, UK), M.Sc. (Physics, Islamabad Univ., Pakistan), B.Sc. Hons. (Physics, Dhaka University, Bangladesh)

Dr. Md. Ashraful Hoque
Visiting Professor
Ph.D. (MUN, Canada), M.Engg. (MUN, Canada), B.Sc. Engg. (BUET)

Assistant Professors

Mr. Kazi Obaidul Awal**,** B.Sc.Engg (Elect) (BUET), M.Sc Nuclear Technology, Islamabad University, Pakistan.
Formerly Director, Nuclear Safety & Radiation Control Division, BAEC.

Md. Syed Iftekhar Ali, B.Sc.Engg. (Electrical & Electronic), (BUET), M.Sc. in EEE, BUET, MASC (Master of Applied Science) in Electrical & Computer Engg.(ECE), University of Waterloo, Canada.

Md. Rakibul Islam, B.Sc.Engg. (Electrical & Electronic), (BUET), M.Sc. Engg. (Telecommunication) (BUET). (on Leave)

Mr. Nabil Shovon Ashraf, B.Tech (Elect), IIT Kanpur. M.Sc. (Elect.), UCF, USA. (on Leave)
Mr. Rishad Ahmed Shafik, B.Sc.Engg. (Electrical & Electronic), (IUT). (on Leave)

Faculty Member

Mr. N.S. Md. Yunus, B.Sc.Engg (Elect) (BUET),

Lecturers

Mr. Shafiqur Rahaman, B.Sc.Engg. (Electrical & Electronic), (IUT).

Mr. Gazi Saurav Islam, B.Sc.Engg. (Electrical & Electronic), (IUT).

Mr. Riaz Raihan Haque, B.Sc.Engg. (Electrical & Electronic), (IUT).

Mr. Golam Sarowar B.Sc.Engg. (Electrical & Electronic), (IUT).

Mr. Md. Mossarrof Hossain Sarker, B.Sc.Engg. (Electrical & Electronic), (RUET)

Mr. Md. Shahriar Rahman B.Sc.Engg. (Electrical & Electronic), (IUT).

Mr. Naseeb Ahmed Adnan B.Sc.Engg. (Electrical & Electronic), (IUT).

Mr. A.S.M. Shihavuddin B.Sc.Engg. (Electrical & Electronic), (IUT).

Mr. Muhammad B.Sc.Engg. (Electrical & Electronic), (IUT).

Mr.Ashik Ahmed**,** B.Sc.Engg. (Electrical & Electronic), (IUT). (on Leave)

Mr. Imrul Hasan B.Sc.Engg. (Electrical & Electronic), (IUT). (on Leave)
Mr. Khondokar Habibul Kabir B.Sc.Engg. (Electrical & Electronic), (IUT). (on Leave)

Mr. Tawfique Hasan B.Sc.Engg. (Electrical & Electronic), (IUT). (on Leave)

Md. Tawhid Kawser, B.Sc.Engg. (Electrical & Electronic), (BUET).
(on Leave)

Mr. Muhammad Hasan-uz-Zaman, B.Sc.Engg. (Electrical & Electronic), (IUT). (on Leave)

Mr. Toufique Hasan, B.Sc.Engg. (Electrical & Electronic), (IUT). (on Leave)

Mr. A.H.M. Razibul Islam, B.Sc.Engg (Electrical & Electronic) IUT, (on Leave)

Mr. Nayeem Ahmed Ninad, B.Sc.Engg (Electrical & Electronic) IUT.(on Leave)

Mr. Jarir Muhammad Fadlullah, B.Sc.Engg (Electrical & Electronic) , BUET. (on Leave)

Part Time

M. Shahidullah, B. Sc. Engg. (Elect.) (BUET),
M.Sc. Engg.(Elect.) (BUET), Ph. D.(IIT, Kharagpur, India)
Head, CSE Department , DUET, Gazipur.

Shaihidul Islam Khan, B.Sc.Engg (Elect) (BUET), M.Sc.Engg. (Elect) (BUET), Ph.D. (CANADA)
Professor & Dean, EEE Department, BUET.

Dr. Md. Shaheen Hasan Chowdhry
M. Sc. (TSTU), Ph. D. (TSTU)
Head, EEE Department , DUET, Gazipur

Md. Abdul Mannan
B. Sc. Engg. (BUET)
Assistant Professor, DUET.

Md. Saifur Rahman, B.Sc. Engg. M.Sc.Engg (Elect.), Ph.D.
Professor, EEE Department, BUET.

Muhammad Hamidur Rahman, B. Sc. Engg. (Elect.) (Dhaka University),
Formerly Assistant Professor, EEE Department, BUET.

Nazrul Islam, B.Sc.Engg. (Elect.) (BUET), M.Sc.Engg. (Elect.) (BUET), Ph. D. (JAPAN).
Asstt. Professor, EEE Department, BUET.

Md. Abdur Rahman, M. Sc. Mathematics, University of Dhaka
Professor of Mathematics, University of Dhaka.

Mominul Huq, M. Sc., Ph. D.,
Professor of Physics, BUET.

A.K.M. Motiur Rahman, M.Sc. Ph.D,
Professor & Formerly Head of Chemistry Deptt. BUET.

Md. Manwarul Islam, M.Sc, Ph.D
Professor of Chemistry, BUET.

Firoz Alam Khan, M.Sc., Ph. D.
Associate Professor, Deptt. of Physics, BUET.

Nazrul Islam, M.Sc., Ph. D.
Associate Professor, Deptt. of Physics, BUET.

Hasan Imtiaz Chowdhury, , B.Sc.Engg, M.Sc.Engg.
Ph.D.

American International University –Bangladesh, Dhaka

Abdul Awal, B.Sc. Engg. M.Sc.Engg (Elect.), Ph.D.
Professor & Head,
North South University, Dhaka

Nur Mahbubul Alam Chowdhury, B.Sc. Engg. M.Sc.Engg (Elect.), Ph.D.
Professor, EEE Department, DUET.

Md. Abdul Quddus Mian
Associate Professor, Department of Mathematics, BUET.

Md. Obayed Ullah
Assistant Professor, Department of Mathematics, BUET.

Dr. Md. Kamrul Hasan
Professor, EEE Department, BUET.

Dr, Md. Quamrul Huda
Professor, EEE Department, BUET.

Hamidur Rahaman
Assistant Professor, EEE Department, BUET.

Mahbub Alam
Lecturer, EEE Department, BUET

Mr. Golam Mostafa,
BSc. Engg (EEE), BUET, MSc. Engg. (CSE),BUET
Associate Professor, AUST.

Mr. Rafiul Hossain,
B.Sc. Engg. (EEE), BUET, M.S. (Comp. Engg.), U.C. Florida
Assistant Professor, AUST.

Mr. A.K.M. Jahangir Alam Majumder,
B.Sc. Engg. (EEE), AUST
Assistant Professor, AUST.

Dr. A. K. M. Akther Hossain
Associate Professor, Department of Physics, BUET.

Wng. Cmdr. Dr. Md. Hossam-E Haider
Instructor,
EEE Dept., MIST
B.Sc. Engg. (EEE), M.Sc. (EEE), Ph.D.

Mr. Masoodur Rahman,
Assistant Professor, AUST B.Sc. Engg(EEE), BUET,
M.S.(EE), U.C. Florida

Course Structure For Undergraduate programmes

L = Lecture, P = Practical, Lab = Laboratory

First Semester

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
ITS 0102	Spoken Arabic I	0 - 2	1.00
OR			
ITS 0104	Spoken English I	0 - 2	1.00
OR			
ITS 0106	Spoken French I	0 - 2	1.00
ITS 0107	Islamiat	2 - 0	2.00
ITS 4149	Technology, Environment and Society	3 - 0	3.00
Math 4101	Mathematics I	3 - 0	3.00
Phy 4101	Engineering Physics I	3 - 0	3.00
Phy 4102	Engineering Physics I Lab	0 - 3/2	0.75
Chem 4101	Engineering Chemistry	3 – 0	3.00
Chem 4102	Engineering Chemistry Lab.	0 - 3/2	0.75
EEE 4101	Elect. & Electronic Engineering Fundamentals	3 – 0	3.00
EEE 4102	Elect. & Electronic Engg Fund. Lab.	0 - 3/2	0.75
MCE 4190	Workshop Practice	0 – 2	1.00
MCE 4198	Engineering Drawing	0 - 3/2	0.75
CIT 4150	Office Automation Lab.	0 – 3	1.50
	Total L- P	17 - 13	
	Total Hours	**30.00**	**23.50**

Second Semester

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
ITS 0202	Spoken Arabic II	0 - 2	1.00
OR			
ITS 0204	Spoken English II	0 - 2	1.00
OR			
ITS 0206	Spoken French II	0 - 2	1.00
ITS 0207	Islamic History & Culture	2 - 0	2.00
Math 4201	Mathematics II	3 - 0	3.00
Phy 4201	Engineering Physics II	3 - 0	3.00
Phy 4202	Engineering Physics II Lab.	0 - 3/2	0.75
EEE 4201	Electrical Circuits	3 - 0	3.00
EEE 4202	Electrical Circuits Lab.	0 - 3/2	0.75
EEE 4203	Electronics I	3 - 0	3.00
EEE 4204	Electronics I Lab.	0 - 3/2	0.75
EEE 4205	Computer Programming	3 - 0	3.00
EEE 4206	Computer Programming Lab.	0 - 3/2	0.75
EEE 4210	Electrical Workshop Practice	0 - 3/2	0.75
EEE 4220	Electrical Drawing & Drafting	0 - 2	1.00
	Total L- P	17 - 11.5	
	Total Hours	**28.50**	**22.75**

Third Semester

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
Math 4301	Mathematics III	3 - 0	3.00
EEE 4301	Signals and Systems	3 - 0	3.00
EEE 4302	Signals and Systems Lab.	0 - 3/2	0.75
EEE 4303	Electronics II	3 - 0	3.00
EEE 4304	Electronics II Lab.	0 - 3/2	0.75
EEE 4305	Electrical Machines I	3 - 0	3.00
EEE 4306	Electrical Machines I Lab.	0 - 3/2	0.75
EEE 4307	Digital Electronics	4 - 0	4.00
EEE 4308	Digital Electronics Lab.	0 - 2	1.00
EEE 4309	Electrical Engg. Materials	2 - 0	2.00
CIT 4350	Database Concepts & Programming Lab.	0 - 3	1.50
	Total L- P	18 - 9.50	
	Total Hours	**27.50**	**22.75**

Fourth Semester

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
Math 4401	Mathematics IV	3 - 0	3.00
EEE 4403	Measurement & Instrumentation	3 - 0	3.00
EEE 4404	Measurement & Instrumentation Lab.	0 - 3/2	0.75
EEE 4405	Electrical Machines II	3 - 0	3.00
EEE 4406	Electrical Machines II Lab.	0 - 3/2	0.75
EEE 4407	Transmission & Distribution of Electrical Power.	3 - 0	3.00
EEE 4408	Transmission & Distribution of Electrical Power Lab.	0 - 3/2	0.75
MCE 4495	Thermofluid Mechanics	3 - 0	3.00
MCE 4496	Thermofluid Mechanics Lab.	0 - 3/2	0.75
ITS 4449	Social Studies & Accounting	3 - 0	3.0
	Total L- P	18 – 6.00	
	Total Hours	**24.00**	**21.00**

Fifth Semester

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
EEE 4501	Power System I	3 - 0	3.00
EEE 4505	Industrial Electronics I	3 - 0	3.00
EEE 4506	Industrial Electronics I Lab.	0 - 3/2	0.75
CIT 4550	Computer Aided Circuit Analysis and Design Lab.	0 - 3	1.50
CIT 4551	Microprocessor & Assembly Language Programming	3 - 0	3.00
CIT 4552	Microprocessor & Assembly Lang. Programming Lab.	0 - 3/2	0.75
EEE 4590	Industrial training *	-	1.00
EEE 4409	Telecommunication Principles	3 - 0	3.00
EEE 4410	Telecommunication Prin. Lab.	0 - 3/2	0.75
	Elective I **	3 - 3/2	3.75
	Elective II **	3 - 3/2	3.75
	Total L- P	18 - 10.50	
	Total Hours	**28.50**	**24.25/23.25**

* Industrial training programme will be organized by IUT during the session break in between 4th and 5th semester compulsory for all the students of HDEE. Duration of the training programme will be about four weeks.

** Student will be required to select two specialization/elective courses, with Lab. if any, from specialization/elective Group 'A' on the approval of the Head of the Department.

Sixth Semester

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
EEE 4600	Project & Design*	0 - 6	3.00
EEE 4601	Power System II	3 - 0	3.00
EEE 4603	Industrial Electronics II	3 - 0	3.00
EEE 4604	Industrial Electronics II Lab.	0 - 3/2	0.75
EEE 4605	Electromagnetic Fields & Waves	3 - 0	3.00
MCE 4629	Engineering Management	3 - 0	3.00
	Elective I **	3 - 3/2	3.75
	Elective II **	3 - 3/2	3.75
	Total L- P	18 - 10.50	
	Total Hours	**28.50**	**23.25**

* Students who have opted for HDEE shall have to take course EEE 4600.

** Student will be required to select two specialization/elective courses, with Lab. if any, from specialization/elective Group 'B' on the approval of the Head of the Department.

Seventh Semester

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
EEE 4700	Project & Thesis	0 - 6	3.00
EEE 4705	Control System Engineering	3 - 0	3.00
EEE 4706	Control System Engg. Lab.	0 - 3/2	0.75
EEE 4741	Digital Signal Processing	3 - 0	3.00
EEE 4742	Digital Signal Processing Lab.	0 - 3/2	0.75
EEE 4790	Industrial Training *	-	1.00
MCE 4791	Engineering Economics	2 - 0	2.00
HUM 4705	Business Communication	3 - 0	3.00
	Elective I **	3 - 3/2	3.75
	Elective II **	3 - 3/2	3.75
	Total L- P	17 - 12.00	
	Total Hours	**29.00**	**24.00**

* Industrial training programme will be organized by IUT during the session break in between 6th and 7th semester compulsory for all the students of B.Sc. Engg.(EEE). Duration of the training programme will be about four weeks.

** Student will be required to select two elective courses, with Lab. if any, from 7th semester Elective Courses (Elective Group 'C') on the approval of the Head of the Department.

Eighth Semester

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
EEE 4800	Project & Thesis	0 - 6	3.00
EEE 4803	Power Station	3 - 0	3.00
EEE 4805	Telecommunication Engg.	3 - 0	3.00
EEE 4806	Telecom. Engineering Lab.	0 - 3/2	0.75
EEE 4813	Energy Conversion	3 - 0	3.00
EEE 4831	Semiconductor Devices	3 - 0	3.00
	Elective I *	3 - 3/2	3.75
	Elective II *	3 - 3/2	3.75
	Total L- P	18 - 10.50	
	Total Hours	**28.50**	**23.25**

* Student will be required to select two elective courses, with Lab. if any, from 8th semester Elective Courses (Elective Group 'D') on the approval of the Head of the Department.

Specialization / Elective Courses

Courses to be offered in the 5th, 6th, 7th and 8th Semesters. On the advice of the Head of the Department, students will be allowed to take two courses from Groups 'A', 'B', 'C' and 'D', as listed below:

Group – 'A'

Fifth Semester

Specialization/Elective Courses

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
EEE 4507	Illumination Engineering	2 - 0	2.00
EEE 4508	Illumination Engineering Lab.	0 - 3/2	0.75
EEE 4509	Switchgear & Control Equip. I	3 - 0	3.00
EEE 4510	Switchgear & Control Equipment I Lab.	0 - 3/2	0.75
EEE 4511	Protective Relays I	3 - 0	3.00
EEE 4512	Protective Relays I Lab.	0 - 3/2	0.75
EEE 4515	Television Engineering	3 - 0	3.00
EEE 4516	Television Engineering Lab.	0 - 3/2	0.75
EEE 4517	Instrumentation Engineering I	3 - 0	3.00
EEE 4518	Instrumentation Engg. I Lab.	0 - 3/2	0.75
EEE 4523	Utilization of Electrical Energy	3 - 0	3.00
EEE 4524	Utilization of Elect. Energy Lab.	0 - 3/2	0.75
EEE 4553	Random Signals and Processes	3 - 0	3.00
CIT 4553	Data Structure & Algorithms	3 - 0	3.00
CIT 4554	Data Structure & Algorithms Lab	0 - 3/2	0.75
CIT 4555	Operating Systems & System Programming	3 - 0	3.00
CIT 4556	Operating Systems & System Programming Lab.	0 - 2	1.00

Group – 'B'

Sixth Semester

Specialization/Elective Courses

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
EEE 4607	Switchgear & Control Equipment II	3 - 0	3.00
EEE 4608	Switchgear & Control Equipment II Lab.	0 - 3/2	0.75
EEE 4609	Protective Relays II	3 - 0	3.00
EEE 4610	Protective Relays II Lab.	0 - 3/2	0.75
EEE 4613	Radio Frequency Engineering	3 - 0	3.00
EEE 4614	Radio Frequency Engineering Lab	0 - 3/2	0.75
EEE 4617	Instrumentation Engineering II	3 - 0	3.00
EEE 4618	Instrumentation Engineering II Lab.	0 - 3/2	0.75
EEE 4619	Peripherals & Micro-processor Based Design	3 - 0	3.00
EEE 4620	Perip. & Micro-processor Based Design Lab.	0 - 3/2	0.75
EEE 4625	Electrical Installations	3 - 0	3.00
EEE 4626	Electrical Installations Lab.	0 - 3/2	0.75
CIT 4651	Computer Networks	3 - 0	3.00
CIT 4652	Computer Networks Lab.	0 - 3/2	0.75

Group – 'C'

Seventh Semester
Elective Courses

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
EEE 4711	Power System Protection I	3 - 0	3.00
EEE 4712	Power System Protection I Lab	0 - 3/2	0.75
EEE 4715	High Voltage Engineering	3 - 0	3.00
EEE 4717	Power System Stability	3 - 0	3.00
EEE 4723	Data Communication I	3 - 0	3.00
EEE 4725	Optical Communication	3 - 0	3.00
EEE 4729	Discrete Mathematics & Numerical Analysis	3 - 0	3.00
EEE 4733	Advanced Electronics I	3 - 0	3.00
EEE 4734	Advanced Electronics I Lab.	0 - 3/2	0.75
EEE 4735	Linear Circiuts and Systems	3 - 0	3.00
EEE 4739	Microwave Engineering	3 - 0	3.00
EEE 4740	Microwave Engineering Lab.	0 - 3/2	0.75
CIT 4751	Database Management & Information System	3 - 0	3.00
CIT 4752	Database Mang. & Inform. System Lab.	0 - 3/2	0.75

Group – 'D'

Eighth Semester
Elective Courses

Course Number	Course Title	Contact Hours	Credit Hours
		L - P	
EEE 4811	Power System Protection II	3 - 0	3.00
EEE 4812	Power System Protec. II Lab.	0 - 3/2	0.75
EEE 4815	Protective Relay Design	3 - 0	3.00
EEE 4816	Protective Relay Design Lab	0 - 3/2	0.75
EEE 4823	Data Communication II	3 - 0	3.00
EEE 4833	Advanced Electronics II	3 - 0	3.00
EEE 4834	Advanced Electronics II Lab.	0 - 3/2	0.75
EEE 4835	Medical Electronics	2 - 0	2.00
EEE 4836	Medical Electronics Lab.	0 - 3/2	0.75
EEE 4839	Electrical Design	3 - 0	3.00
EEE 4841	Energy Conversion & Special Machines	3 - 0	3.00
EEE 4843	Semiconductor Physics	3 - 0	3.00
EEE 4845	Renewable Energy System	3 - 0	3.00
EEE 4847	Advanced Elect. Machines	3 - 0	3.00
EEE 4848	Advanced Elect. Machines Lab.	0 - 3/2	0.75
EEE 4849	VLSI Circuits	2 - 0	2.00
EEE 4850	VLSI Circuits Lab.	0 - 3/2	0.75
EEE 4851	Advanced Communication Techniques	3 - 0	3.00
CIT 4851	Software Development	3 - 0	3.00
CIT 4852	Software Development Lab.	0 - 3/2	0.75
CIT 4855	System Analysis and Design	3 - 0	3.00
CIT 4856	System Ana. and Design Lab.	0 - 3/2	0.75

Post Graduate Prgrammes

For the Post Graduate Programmes of the Department of Electrical & Electronic Engineering the list of the courses is given below.

All students of the Post Graduate Programmes will have to take one compulsory course, EEE 6101, and the remaining from the list of the courses.

LIST OF COURSES

EEE 6000	Thesis
EEE 6002	Project
EEE 6101	Engineering Analysis
EEE 6201	Advanced Analog Electronics
EEE 6203	Advanced Solid State Devices
EEE 6205	VLSI Design
EEE 6207	IC Processing and Fabrication Technology
EEE 6301	Power System Reliability
EEE 6303	Power System Planning
EEE 6305	Transients in Power System
EEE 6307	Power System Modeling
EEE 6401	Optical Fiber Communication
EEE 6403	Wireless Communication
EEE 6405	Advanced Digital Signal Processing
EEE 6407	Digital Communication
EEE 6501	Switching Theory
EEE 6503	Advanced Computer Architecture
EEE 6505	Analysis and Design of Digital Integrated Circuits
EEE 6507	CISC Microprocessor System Design
EEE 6601	Antennas and Propagation
EEE 6603	Microwave Devices and Circuits
EEE 6605	Semiconductor Lasers
EEE 6701	Nonlinear Control System
EEE 6703	Modern Control
EEE 6801	Power Electronics

Course Contents for Undergraduate Programmes

Math 4101 Mathematics I (3 - 0) Credit 3.00

Differential calculus: Limit, continuity and differentiability of function. Successive differentiation. Leibnitz theorem. Taylor and Maclaurin theorem, expansion of functions in series. Indeterminate forms. Partial differentiation, tangent, normal, curvature, asymptotes, envelopes, curve tracing. Determination of maximum and minimum of functions with applications. Integral Calculus: Integration by the method of substitution. Integration by parts. Integration by successive reduction. Standard integrals. Definite integrals, its properties and use in summing series. Determination of area under a plane curve and area of a region enclosed by two curves in Cartesian and polar co-ordinates. Trapezoidal and Simpson's rule. Arc length of a curve in Cartesian and polar co-ordinates. Volumes and surface areas of solids of revolution. Two-dimensional co-ordinate geometry: Change of axes. Transformation of co-ordinates. Simplifications of equation of curves.

Phy 4101 Engineering Physics I (3 - 0) Credit 3.00

Electrostatics: Electric force, Coulomb's law Electric field for different charge Configurations. Electric flux, Gauss' law and its application. Electric potential & potential difference, Equipotential surfaces. Polar & non-polar materials, dielectric constant. Capacitors: Parallel plate, Cylindrical, Spherical, capacitors with dielectric. Energy stored in capacitors.
Electromagnetics: Magnetic field, Magnetic induction; Permeability. Magnetic field of a solenoid. Faraday's law of electromagnetic induction, Lenz's law. Inductance, Energy stored in inductors. Self & Mutual inductance.
Optics: Interference. Young's double slit experiment, fringe width, determination of wavelength of light and thickness of a transparent sheet. Interference due to reflection. Newton's ring. Determination of refractive index of a liquid. Fresnel & Fraunhoffer diffraction through single slit. Intensity of diffracted beam.
Polarization: Polarized & Non-polarized light. Light polarization by reflection. Double refraction, Malus law, Intensity of polarized light.

Phy 4102 Engineering Physics I Lab. (0 - 3/2) Credit 0.75

Experiments based on Phy 4101.

Chem 4101 Engineering Chemistry (3 - 0) Credit 3.00

Atomic structure, quantum numbers, electronic configuration, periodic table. Properties and uses of noble gases. Different types of chemical bonds and their properties. Molecular structures of compounds. Selective organic reactions.
Different types of solution and their compositions. Phase rule, phase diagram of nanocomponent system. Properties of dilute solutions. Thermochemistry; chemical kinetics, chemical equilibria. Ionization of water and pH concept. Electrical properties of solution.

Chem 4102 Engineering Chemistry Lab. (0 - 3/2) Credit 0.75

Experiments based on Chem 4101.

EEE 4101 Electrical & Electronic Fundamentals (3 - 0) Credit 3.00

S.I. Units, Basic concepts of electric charge, current, potential difference, electromotive-force, electrical and mechanical energy. Ohm's law, resistivity, temperature
co-efficient of resistance. D.C. Circuits, Kirchhoff's laws. Series-parallel Circuits, Voltage divider, current divider rules. Delta-star transformation, Maximum power transfer.
Electrical network analysis: branch-current method and loop current method. Concept of current-source and voltage source. Network theorems: Superposition, Thevenin's and Norton. Magnetic circuit concepts: Electromagnetics, magnetic flux density, magnetic field strength, magnetomotive force, reluctance, permeability, hysteresis and eddy currents. Self-

inductance and mutual inductance. Magnetic circuit calculations.
Production of alternating e.m.f. instantaneous, maximum and average values. Root-mean-square and effective value. Representation of A.C.: Wave diagram, phasor, diagram, polar notation. Effect of A.C. on resistance, inductance, capacitance and different combinations.
Review of atomic structure, conductors, semiconductors and insulators. Concept of energy band, holes and electrons. P-type and N-type semiconductors. P-N junction diodes and their characteristics.

EEE 4102 Elect. & Electronic Fundamentals Lab. (0 - 3/2) Credit 0.75

Experiment based on EEE 4101

CIT 4150 Programming Package I (3 - 0) Credit 1.50

Introduction to and application of word processing, spreadsheet systems & Windows. Introduction to and application of Database Management Systems.

MCE 4198 Engineering Drawing (0 – 3/2) Credit 0.75

Introduction to Engineering Drawings, drawing instruments and their uses. Alphabet of lines and their uses, scales of drawing and dimensioning. Drawing geometrical figures including exercises on tangents. Orthographic views, arrangements of views in first angle and third angle. Exercises on orthographic views of straight and taper-surfaced simple blocks. Isometric and oblique drawing of simple blocks. Full sectioning. Practice on lettering and numerals, lettering exercises on a composition.

ITS 4149 Technology, Environment & Society (3 – 0) Credit 3.0

Definition of terminology – technology, environment, society and development. Interdependence of technology, environment, society and development. Growth of technologies and their contribution to human development. Current state of technology and its future use as an instrument of change in the twenty-first century. Impact of technology upon the environment, impact of the environment upon humans, changes in global climates. Environment-friendly technology, technology and development. Renewable energy and environments. Technology and environmental hazards and their remedies. Major hazards of industry. Improvement of working conditions in industry.

ITS 0102 Spoken Arabic I (0 - 2) Credit 1.00

Reading Comprehension; Letters and Pronunciation; Construction of words; Use of letters (Shamsi & Kamari) in words; Use of determiners and pronouns; Use of interrogatives; Use of nominal and verbal sentences; Use of adverbs; Use of tenses; Use of Feminine & Masculine Genders; Use of Numerical; Conjunctive Adverbs; Use of everyday conversation and dialogues and practice.

ITS 0107 Islamiat (2 - 0) Credit 2.00

Islam as Din; Sources of Islamic Code of Life; Social, Economic and Political system of Islam. Islamic Ethics: Human values in Islam, Dignity of Man, Women & Islam, Family Ties, Moral values, Decency and Decorum, Brotherhood, Friendship and Amity in human society, Truthfulness, Honesty, Sincerity, Righteousness, Piety and Religiousness; Social vices; Role of Islam in eradicating social evils; Islam and Environment; Islam and world peace.

MCE 4190 Workshop Practice (0 - 2) Credit 1.00

Workshop safety and safety rules. Filing practice. Turning Practice: facing, center drilling, boring in center lathe, layout and marking, Counter Boring, Reaming, Tapping, Arc welding. Butt and Lap joint welding.

Math 4201 Mathematics II (3 - 0) Credit 3.00

Ordinary differential equation: Definition, solution of first order differential equation, variable separable form, reducibility, exact differential equation, integrating factor. Solution of second order differential equations with constant co-efficient and their applications. Factorization of the operator, solution of simultaneous differential equation of first and second order with applications in electrical engineering problems. Solution of linear differential equations with variable Coefficients, series solution of differential equations.
Partial differential equations: First and second order partial differential equation, Boundary value problems. Laplace equation and Poisson equation and their solution in rectangular and cylindrical co-ordinates. Eigenvalue and boundary value problems in electrical and electronic Engineering.
Matrix: Inverse of a matrix, Rank of matrix Elementary transformations. Solution of simultaneous equations by using matrix. Eigenvalue and Eigenvectors.

Phy 4201 Engineering Physics II (3 - 0) Credit 3.00

Structure of matter: Classification of Solids; Crystalline & non-crystalline solids; unit cell, Crystal systems, Crystal structures, atomic radius and crystal packing and packing density. Crystal directions, Planes and Planar spacing and cell edge. Bragg's law. Deflects in Solids: Frankel & Schottky deflects; Diffusion in solids.
Modern Physics: Special theory of relativity, Galilean relativity, Lorentz transformation equations, relativistic length, time and mass. Mass energy relation. Photo-electric effect. Compton scattering. Radioactivity. Radioactive decay law. Half hfe, mean life. Introduction to Nuclear fission & fussion. Nuclear power plant.
Heat & Thermodynamics: Zeroth law of thermodynamics. Heat transfer through composite walls. First & 2nd law of thermodynamics and their application. Isothermal and adiabatic processes, entropy, Heat engines & Refrigerators, Efficiency & Co-efficient of performance.

Phy 4202 Engineering Physics II Lab. (0 - 3/2) Credit 0.75

Experiment based on Phy 4201.

EEE 4201 Electrical Circuit (3 - 0) Credit 3.00

Review of single-phase ac circuit analysis: Introduction to j-operator in the solution of ac circuits. Network theorems in ac, series and parallel resonance, polyphase circuits, voltage and current relations in balanced and unbalanced 3-phase circuits. Measurement of 3-phase power. Coupled circuits, co-efficient of coupling. Transient analysis of simple circuits energized by both dc and ac source, different types of damping.
Four terminal network parameters. Image impedance, characteristic impedance of tee and pi section. Matching network.
Electric wave filters: Fundamental filter equation, low-pass, high-pass and band-pass filter, constant-k and m-derived half and full section.

EEE 4202 Electrical Circuit Lab. (0 - 3/2) Credit 0.75

Experiment based on EEE 4201

EEE 4203 Electronics I (3 - 0) Credit 3.00

Introduction to semiconductors: P and N type semiconductors, P-N junctions under forward and reverse biases. Diode: Load lines, graphical analysis of diode circuits, equivalent circuits and frequency response. Diode applications: half and full-wave rectifiers, bridge rectifiers, clippers, clampers, voltage multipliers, voltage regulators. Characteristics of different types of diodes: Zener, tunnel, Schottky diode, LED's and photo diodes.
Transistor: Bipolar Transistor, Transistor biasing Circuits, DC, AC load lines, voltage, current and power gains. Concept of input and output impedance. Transistor Equivalent Circuits, hybrid model of transistors. Determination of h-parameters of CE, CC and CB configuration and their interrelations.

Transistor Amplifier: Small signal transistor amplifiers of different configurations and their characteristics at low-frequency, Mid-frequency and high frequency ranges. Amplifier gain bandwidth relations. Multistage amplifiers.
Large signal amplifiers: Class A, class AB. class B, and class C amplifiers. Analysis and Design of untuned and tuned power amplifiers. Linear-wave shaping circuits, comparator circuits and switching circuits.

EEE 4204 Electronics I Lab. (0 - 3/2) Credit 0.75

Experiment based on EEE 4203

EEE 4205 Computer Programming (3 - 0) Credit 3.00

Elements of computer structure and languages. The number system - Binary arithmetic. Principle of programming. Structured programming concepts. Survey of features of C language. Writing, debugging and running programs (including file handling) on C. Numerical methods and computational applications of computer in solving various types of problems.

EEE 4206 Computer Programming Lab (0 - 3/2) Credit 0.75

Experiment based on EEE 4205

EEE 4207 Electrical Technology for Computer (3 - 0) Credit 3.00

(for CIT Students)

Electrical Units and Standards. Electrical Networks, circuit solutions-series, series-parallel networks, loop and Nodal methods. Delta-wye Transformation, Circuit Theorems: Superposition theorem, Thevenen's and Norton's Theorem. Concept of Dual Networks.
Basic principle of generation of Alternating and Direct Current, Introduction to phasor algebra as applied to A.C. circuit analysis. Solution of A.C. circuits: Series, Parallel and Series-Parallel circuit, R.L.C circuits series and parallel resonance. Applications of Networks theorems to A.C. circuits.
The magnetic intensity, flux/density, magnetic effects of Electric current, Magnetic circuit concepts, BH curves, characteristics of magnetic materials, magnetic force and its utilization, Hysteresis **and** eddy current losses, magnetic circuit with A.C. and D.C. excitation.

EEE 4208 Electrical Technology for Computer Lab (0 – 3/2) Credit 0.75

Experiment based on EEE 4207.

EEE 4210 Electrical Workshop Practice (0 - 3/2) Credit 0.75

Electrical and Electronic Workshop: Workshop Regulations and Safety Rules. Electrical and Electronic Components and Accessories-exercises relating to their "rating-confirmation" and uses in the laboratory. Familiarization with the wires and cables used in domestic installation-exercises relating to their uses in the laboratory. Making up various types of electrical and electronic circuits by joining components on specific projects.
Familiarization with Transistor and Valve Data Books. Uses of multimeters, valve testers and transistor testers. Construction of simple circuits from diagrams, practices on PCB Technology. Construction of transistor projects from blue prints.

EEE 4220 Electrical Drawing & Drafting (0 - 3/2) Credit 0.75

Electrical and Electronic Symbols, Wiring or Connection Diagrams, Block Diagrams, Electron-Tube and Transistor (Semi-conductor) Symbols, Electronic Schematic Diagrams, Industrial Electronic Diagrams, Electric Power Drawing, Electrical Drawing for Domestic Buildings, Mills and Factories.

EEE 4221 Electronic Devices and Circuits (3 - 0) Credit 3.00

(for CIT Students)

Semiconductors, Junction Diode and characteristics, Bipolar transistor characteristics, small signal low frequency h parameter model, Hybrid pie model. Amplifiers, Darlington pairs, introduction to oscillators, differential amplifiers,

operational amplifiers, linear application of OP amp, gain, input and output impedance, offset null adjustments, frequency response and noise.
Introduction to JFET, MOSFET, PMOS, NMOS and CMOS: biasing and application in switching circuits.
SCR, TRIAC, DIAC, PJT, CRT: characteristics and applications. Introduction to rectifiers, active filters, regulated power supply, stabilizer and UPS.

EEE 4222 Electronic Devices and Circuits Lab. (0 – 3/2) Credit 0.75

(for CIT Students)

Experiment based on EEE 4221.

ITS 0207 Islamic History, Science & Culture (3 - 0) Credit 3.00

Life and works of the Prophet Muhammad (SM). Caliphate of the pious caliphs. Islamic Culture & Islamic festivals; Islamic Arts and Crafts. Importance of acquiring knowledge of Science and Technology in the light of the Holy Quran and the Sunnah. Relation between Science & Technology and Islam. Scientific indications in the Holy Quran. Impact of Science, Technology and Religion on Society and Social Development. Contributions of Islamic Civilization and scientific achievements to the development of modern Science and Technology.

ITS 0202 Spoken Arabic II (0 - 2) Credit 1.00

Reading Comprehension: General Exercise & Revision of previous lessons; Nouns; Singular; Plural and various modifications caused by them; Use of verbs with different persons and all pronouns; Use of new words (nouns & verbs) by changing different parts of speech; Spoken Arabic (Advanced level); Use of dialogues and conversations.

Math 4301 Mathematics III (3 - 0) Credit 3.00

Vector analysis: Tripe products, their geometric interpretation and application. Differentiation and integration of vectors Line, surface, and volume integrals. Gradient, divergence, curl, and their physical significance. Green's theorem, Stoke's theorem. Divergence theorem and their applications. Statistics and elementary quality control: Correlation. Regression, Elementary probability theory. Binomial, Poisson and Normal distribution. Tests of hypothesis. Application of elementary quality control to practical problems. Laplace Transform: Definition, elementary transformation and properties. Solution of differential and integro-diffenrential equation using Laplace transformation simple applications in circuit problems.

EEE 4301 Signals and Systems (3 - 0) Credit 3.00

Signals and Systems: Continuous-time and discrete-time signals, commonly encountered signals, unit impulse and unit step functions, sampling and aliasing, continuous-time and discrete-time systems, basic properties.
Linear Time-Invariant (LTI) Systems: The convolution sum for CT signals and DT signals, properties. Circular Convolutions.
Fourier Series Representation of Periodic Signals: Continuous and discrete-time periodic signals, properties of continuous and discrete-time Fourier series, Fourier series and LTI systems.
Continuous-Time Fourier Transform: Properties, convolution and multiplication properties.
Laplace Transform: Region of convergence, inverse Laplace transform, properties, analysis of LTI systems using the Laplace transform.

EEE 4302 Signals and Systems Lab. (0 - 3/2) Credit 0.75

Experiment based on EEE 4301

EEE 4303 Electronics - II (3 - 0) Credit 3.00

Review of tuned and untuned voltage and power amplifiers.
Unijunction Transistor: Field Effect Transistor (FET) construction, characteristics, equivalent circuits. MOS, PMOS, CMOS, NMOS, FETS, their fabrication, uses and characteristics.
The depletion & enhancement type of MOSFET, biasing and application of depletion & enhancement type MOSFET, high frequency FET analysis.
Feedback amplifier: Classification, effect of feedback on transfer gain input and output impedance, distortion, noise and stability.
Oscillators: Conditions for self-sustained oscillations in sinusoidal and no sinusoidal oscillators. Design of oscillator, Multivibrators; Schmitt Trigger.
Operational Amplifier: (OPAM) Introduction - type of OPAMS, integrating, and differentiating circuits, summing amplifier, voltage to current converter, voltage follower.
Electronic analogue computation. Instrumentation amplifier. Comparators, the window comparator, waveform conversion & generation.

EEE 4304 Electronics - II Lab. (0 - 3/2) Credit 0.75

Experiment based on EEE 4304

EEE 4305 Electrical Machines I (3 - 0) Credit 3.00

Review of electromagnetic induction. Basic principle of a Generator and a motor. Concept of torque angle. Power flow diagram for an elementary generator and motor.
D.C. Machines: Main constructional features, Function of brush and commutator. Armature winding systems, lap and wave windings.
Different types of excitations. Armature reaction and methods of neutralizing armature-reaction. Losses and efficiency of d.c. machines. Determination of efficiency by practical methods.
D.C. Motors: Torque equation, back e.m.f. factors determining speed, characteristic Curves. D.C. motor starters, speed control. Ward-Leonard method. Application of d.c. motors.
Transformers, basic principle, construction, cooling methods, use of conservator and breather. Turns-ratio, EMF equation. Phasor diagram and equivalent circuit of a transformer on no-load and on-load. Voltage regulation, losses and efficiency. Transformer - tests.
Auto-transformer and Instrument Transformers: (C.T. & P.T.), Parallel operation of transformers. Three-phase transformers.

EEE 4306 Electrical Machines I Lab. (0 - 3/2) Credit 0.75

Experiment based on EEE 4305

EEE 4307 Digital Electronics (4 - 0) Credit 4.00

Number system and Codes: General way of representing numbers, decimal, binary, octal and hexadecimal number systems and their representation conversion of number from one system to another. Compliment in number system. Different Codes: BCD, Alphanumeric, Gray, Excess-3, ASCII and error detection codes.
Digital Logic: Boolean algebra, De-Morgans Theorem logic gates and their truth tables. Canonical form of logic expression.
Simplification of logic expression: Algebraic method, K-Map and Quine-MC-Clauskey method. Realization by using NAND/NOR gates.
Classification of logic systems: Combinational logic system. Combinational logic design using MSI & LSI. Adders, subtractors, Code Converters. Magnitude Comparator Encoder, Decoder, Multiplexer, De-multiplexer, ROM, RAM, Programmable logic, Array (PLA), D /A & A/D converters with applications. Different types of digital storage media.
Sequential logic system: Flip-Flops, clocked RS, JK, Master Slave JK, D-type, T-type, Flip-Flops, Flip-Flop Design.
Sequential logic Registers: Different types of Registers and their applications. Counters and their simplified design.
Introduction to Hardware Description Language (HDL), Design examples using HDL

EEE 4308 Digital Electronics Lab (0 - 2) Credit 1.00

Experiment based on EEE 4307

EEE 4309 Electrical Engineering Materials (2 - 0) Credit 2.00

Conducting materials: General properties, common conducting materials, copper, aluminum and their physical, chemical and electrical properties, Light metals and alloys. Electrical resistance alloys, chrome-nickel, chrome-nickel alloy, chrome-nickel steel. Semiconducting materials: Conductivity, effect of temperature, Germanium and Silicon and their physical and electrical properties, Hall effect, photo conducting materials and their uses. Insulating materials: General properties of insulating materials, dielectric constant, potential gradient, dielectric strength, impregnating and filling compounds, insulating fabrics, rubber and gutta percha, mica compounds. Plastic materials as electrical insulators. Insulating oils and their properties, dielectric strength, viscosity, testing of insulating oils. Insulating gases used in electrical equipment and apparatus. Insulating materials used in cables, cable jointing materials. Magnetic materials: Magnetic materials and their properties, eddy current and Hysteresis losses, ferromagnetic materials and ferrites, permalloy and electrical sheets. Optical behavior of Materials: Luminescence, Light –emitting diodes, Lasers, Interaction of photons with a material.

EEE 4311 Digital Electronics and Logic Design (4 - 0) Credit 4.00

(for CIT Students)

Number system and Codes: General way of representing numbers, decimal, binary, octal and hexadecimal number systems and their representation, conversion of number from one system to another. Compliment in number system. Different Codes: BCD, Alphanumeric, Gray, Excess-3, ASCII and error detection codes. Digital Logic: Boolean algebra, De-Morgans Theorem logic gates and their truth tables. Canonical form of logic expression.

Simplification of logic expression: Algebraic method, K-Map and Quine-MC-Clauskey method. Realization by using NAND/NOR gates.

Classification of logic systems: Combinational logic system. And Hardware Description Language (HDL). Combinational logic design using MSI & LSI. Adders, subtractors, Code Converters. Magnitude Comparator Encoder, Decoder, Multiplexer, De-multiplexer, ROM, RAM, Programmable logic, Array (PLA), D /A & A/D converters with applications. Different types of digital storage media.

Sequential logic system and Hardware Description Language (HDL): Flip-Flops, clocked RS, JK, Master Slave JK, D-type, T-type, Flip-Flops, Flip-Flop Design.

Sequential logic Registers: Different types of Registers and their applications. Counters and their simplified design.

Timing Circuits: Application of logic gates in Timing Circuits, OPAMP - application in timing circuits-use of IC-555 as timing circuits.

Transistor Switches, Transistor gates, MOS gates, Logic families: CMOS logic with detail operations. Electronic circuits for flip flops, counters and register.

EEE 4312 Digital Electronics and Logic Design lab (0 - 2) Credit 1.00

(for CIT Students)

Experiment based on EEE 4311

EEE 4315 Television Techniques I (3 - 0) Credit 3.00

(for ITS Students)

Monochrome Television: Basic Television system-Vision characteristics and scanning systems. Composite Video-signals and Television standards. Television cameras, picture tubes. Wide- band tuner, Broadcast television receivers, RF tuners, Video. IF amplifier and detectors. Video amplifier design, synchronization circuits. Horizontal-scan, wave form generation and extra high-tension D.C.,Vertical-scan, wave form generation and output circuit, sound channel and power supplies.

Closed circuit Television systems: TV wave propagation, TV antenna system, Testing, Alignment and servicing of television receivers.

EEE 4316 Television Techniques I Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4315.

EEE 4321 Digital Techniques I (3 - 0) Credit 3.00
(for ITS Students)

Number system and Codes: General way of representing numbers, decimal, binary, octal and hexadecimal number systems and their representation conversion of number from one system to another. Compliment in number system. Different Codes: BCD, Alphanumeric, Gray, Excess-3, ASCII and error detection codes.
Digital Logic: Boolean algebra, De-Morgans Theorem logic gates and their truth tables. Canonical form of logic expression.
Simplification of logic expression: Algebraic method, K-Map and Quine-MC-Clauskey method. Realization by using NAND/NOR gates.
Classification of logic systems: Combinational logic system. Combinational logic design using MSI & LSI. Adders, subtractors, Code Converters. Magnitude Comparator Encoder, Decoder, Multiplexer, De-multiplexer, ROM, RAM, Programmable logic, Array (PLA), D /A & A/D converters with applications. Different types of digital storage media.

EEE 4322 Digital Techniques I Lab (0 - 3/2) Credit 0.75

Experiment based on EEE 4321

EEE 4325 Electrical and Electronic Technology I
(3-0) Credit 3.00
(for MCE Students)

Electrical units and standards, Electrical networks, circuit solutions-series, parallel, series-parallel networks, loop and Nodal methods, Delta-wye- Transformation, circuit Theorems-Superposition Theorem. Thevenin's theorem, Norton's theorem. Concept of dual networks.
Basic principle of generation of Alternating and Direct Current. Introduction to Phasor Algebra as applied to A.C. circuit analysis. Solution of A.C. circuits: Series, Parallel and Series-parallel circuit, R.L.C. circuits- series and parallel Resonances, Applications of Networks theorems to A.C. circuits.
The magnetic field intensity, flux density, Magnetic effects of Electric Current, Magnetic circuit concepts, BH curves, characteristics of Magnetic materials, Magnetic force and its utilization, Hysteresis and eddy current losses, Magnetic circuit with A.C. and D.C. excitation.

EEE 4326 Elect. and Electronic Tech. I Lab. (0 - 2) Credit 1.00

Experiment based on EEE 4325

EEE 4327 Electrical Measurement & Instrumentation I
(3 - 0) Credit 3.00
(for ITS Students)

Measurement: Units and standards. Measurement of resistance, inductance and capacitance, A.C. and D.C. bridge methods, current, power and energy, measurement of frequency and phase difference. Earth resistance measurement, measurement of cable fault location.
Measuring Instruments: Indicating instruments and their classifications, moving coil and moving iron instruments. "Clip-on" instruments; Dynamometer and thermal instruments; Vibrating reed instruments, recording instruments, Megger with applications.

EEE 4328 Electrical Measurement & Instrumentation I Lab
(0 - 3/2) Credit 0.75

Experiments based on EEE 4327.

EEE 4329 Electrical Power Transmission (3 - 0) Credit 3.00

(for ITS Students)

General system layout, Low voltage D.C. distribution system, A.C. distribution system, radial and ring systems, distributor aspects, sag calculations, poles and towers insulators, calculation of inductance and capacitance. Current and voltage relations on a transmission line, short lines, Medium-length lines, long lines; cables, manufacture, laying and jointing of cables, insulation resistance and capacitance. Protection of transmission and distribution systems.

EEE 4330 Electrical Power Transmission Lab. (0 - 3/2) Credit 0.75

Experiments and field work based on EEE 4329.

EEE 4331 Switchgear and Protective Relay I (3 - 0) Credit 3.00

(for ITS Students)

Fundamentals of fault clearing, current interruption in A.C. circuit breakers, recovery voltage and restriking voltage transients, switching of capacitor banks and unloaded lines, rated characteristics of circuit breakers arc extinction, arc interruption, arc extinction in different types of circuit breakers, arc-extinction devices, operating mechanism, control apparatus. Air break circuit breakers, bulk oil circuit breakers, minimum oil circuit breakers, sulphur hexafluride(SF-6) circuit breakers, air blast circuit breakers, vacuum circuit breakers and their comparative study Control panels, basic control circuit devices. Alternator switchgear and control panels, automatic voltage control equipment. Apparatus for automatic voltage control equipment. Apparatus for automatic synchronization control. Transformer tap changing control equipment. Automatic reclosing control of circuit breakers and oil circuit reclosers (OCRS).

EEE 4332 Switchgear and Protective Relay I Lab (0 - 3/2) Credit 0.75

Experiments based on EEE 4331.

EEE 4359 Fundamentals of Computers (2 – 0) Credit 2.00

(For ITS students)

Familiarization with different components of a computer; microprocessor of different ages, microprocessor architecture and its operation; different types of registers; memory, memory classification and devices; different types of instructions, parallel processing and distributed processing; introduction to number system and logic gates; introduction to operating systems.

EEE 4360 Fundamentals of Computers Lab (0 - 3/2) Credit 0.75

Experiments based on EEE 4359

CIT 4350 Database Concepts & Programming Lab. (0 - 3) Credit 1.50

Experiments based on elementary data objects, elementary data structures, arrays, lists, stacks, queues, linked lists, pointers, graphs, trees. Memory management. Sorting and searching, hash techniques.
Techniques for analysis of algorithms, methods for the design of efficient algorithms: divide and conquer, greedy method, backtracking, branch and bound, basic search and traversal techniques, lower bound theory, concept of NP-hard and NP-complete problems.

Math 4401 Mathematics - IV (3 - 0) Credit 3.00

Complex Variable: Introduction to complex variable. Complex differentiation and integration. Calculus of residues. Contour integration and conformal mapping.
Fourier Series: Fourier series expansion, evaluation of Fourier co-efficient, full range and half range series. Odd and even function, harmonic analysis.

Numerical Analysis: Solution of polynomial equation and equation involving transcendental functions. Newton's forward and backward interpolation formula. Runge-Kutta method. Numerical integration, Simpson's rule and trapezoidal rule. Advanced programming and numerical techniques and their application to engineering problem.

EEE 4403 Measurement & Instrumentation (3 - 0) Credit 3.00

Measurement: Units and standards. Measurement of resistance, inductance and capacitance-A.C and D.C bridge methods. Measurement of frequency and phase difference.
Measuring Instruments: Indicating instruments and their classifications. Moving coil and moving iron instruments. "clip-on" instruments; Dynamometer and thermal instruments.
Magnetic measurements, ballistic galvanometer, flux meter. Cathode ray oscilloscope, Q - meters. Extension of instrument - range.
Transistor testers, digital voltmeter and multimeters. A/D and D/A converters.

EEE 4404 Measurement & Inst. Lab (0 - 3/2) Credit 0.75

Experiments based on EEE 4403.

EEE 4405 Electrical Machines II (3 - 0) Credit 3.00

Alternators: Basic Principle, construction, EMF equation, synchronous reactance, voltage regulation and parallel operation. Synchronous motors: Basic principle, Starting methods, effect of excitation on armature current, V - curves.
Three-phase induction motor: Theory of rotating magnetic field. Construction of induction motor, rotor types. Speed and slip, starting torque, speed control, performance characteristic and equivalent circuit.
Single-phase induction motor: Basic principle, cross-field theory, double revolving field theory. Different methods of starting a single-phase induction motor. Amplidyne and other special motors.

EEE 4406 Electrical Machines - II Lab. (0 - 3/2) Credit 0.75

Experiment based on EEE 4405

EEE 4407 Transmission and Distribution of Electrical Power (3 - 0) Credit 3.00

General system layout, Low voltage D.C. distribution system, A.C. distribution system, radial and ring systems, distributor aspects, sag calculations, poles and towers insulators, calculation of inductance and capacitance. Current and voltage relations on a transmission line, short lines, Medium-length lines, long lines; cables, manufacture, laying and jointing of cables, insulation resistance and capacitance. Protection of transmission and distribution systems.

EEE 4408 Transmission and Distribution of Electrical Power Laboratory (0 - 3/2) Credit 0.75

Experiments and field work based on EEE 4407.

EEE 4409 Telecommunication Principles (3 - 0) Credit 3.00

Introduction to communication systems: Fundamental elements, various signals and tones, different types of telephone instruments, different types of transmission media, bandwidth requirements, signal to noise ratio and rate of communication.
Information theory: Measure of information, error free communication over a noisy channel, channel capacity.
Noise: External noise, internal noise, noise calculations and noise figure.
Modulation and demodulation: Baseband and carrier transmission. Amplitude modulation: SSB, DSB, VSB. Angle modulation: bandwidth of angle modulated wave, demodulation of AM and angle modulated waves.
Sampling and PCM: Sampling theorem, signal reconstruction, aliasing, quantization, PCM, DPCM, Compounding.
Principles of digital data transmission: Simple digital

communication system, line coding, pulse shaping, scrambling.
Multiplexing: FDM, FDM hierarchy. TDM, digital hierarchy (T1 carrier system)
Traffic analysis: Network traffic load and parameters, GOS, blocking parameters.

EEE 4410 Telecommunication Principles (0 - 3/2) Credit 0.75

Experiments based on EEE 4409

EEE 4415 Television Techniques II (3 - 0) Credit 3.00
(for ITS Students)

Colour fundamentals, light and visible spectrum, primary colours and colour mixing, Colourtriangle and chromaticity diagram, Colour T.V. transmission. Colour TV Camera, transmission system (PAL, N.T. S.C. and SECAM) luminance information, chrominance information, quadrature modulation, correction, frequency spectrum.
Colour T.V. Receivers-introduction to basic CTV receiver with the aid of block diagram, tuner and IF amplifiers. Luminance detection, colour coding in different systems. chrominance decoder, burst, phase discrimination, Synchronous detection, PAL bistable switch: chrominance amplifiers, delay line. Colour TV picture tubes, testing, alignment and servicing of colour television.

EEE 4416 Television Techniques II Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4415

EEE 4421 Digital Techniques II (3 - 0) Credit 3.00
(for ITS Students)

Sequential logic system: Flip-Flops, clocked RS, JK, Master Slave JK, D-type, T-type, Flip-Flops, Flip-Flop Design.
Sequential logic Registers: Different types of Registers and their applications. Counters and their simplified design.
Timing Circuits: Application of logic gates in Timing Circuits, OPAM-application in timing circuits-use of IC-555 as timing circuits.

EEE 4422 Digital Electronics II Lab (0 - 3/2) Credit 0.75

Experiment based on EEE 4421

EEE 4425 Electrical and Electronic Technology II
(3 - 0) Credit 3.00
(for MCE Students)

Voltage and current relations in 3 – phase circuits, 3 – phase circuit analysis, Power measurements in 3 – phase systems.
Single phase and 3 – phase transformers: basic principle, transformer equation, equivalent circuits, testing of transformers, special transformers and their uses.
D.C. Machine: Principle of operation, types, performances and characteristics, speed control of D.C. motors, motor starters, parallel operation of D.C. generators.
A.C. Machine: Synchronous generators: e.m.f. equation characteristics and parallel operation of alternators, 3 – phase induction motors- principle of operation, equivalent circuit, speed, torque characteristics. Introduction to fractional horse-power motors.
Vacuum Tubes: Diodes, Triodes, Tetrodes, Pentodes and other special tubes.
Semiconductors: Semiconductors diodes, characteristics and uses. Transistors – principle of operation, equivalent circuits, biasing transistor circuits. Amplifiers and oscillators – various types and their characteristics. Silicon controlled rectifiers (SCR) and their uses. Cathode ray and tubes and oscilloscope. Introduction to digital electronics.
Practical uses of Transducers: Measurement of conductivity, strain, temperature, pressure, flow rate, speed and torque by using transducers.

EEE 4426 Elect. & Electronic Tech. II Lab (0 - 3/2) Credit 0.75

Experiments based on EEE 4425

EEE 4427 Electrical Measurement & Instrumentation II (3 - 0) Credit 3.00

(for ITS Students)

Measurement: Magnetic Measurements-Ballistic galvanometer-flux meter- measurement of non-electrical quantities like temperature, pressure speed, level, flow, rate, stress, strain etc. High voltage measurement and testing, radio frequencies measurements.
Effect of Instrument connection on the accuracy of measurement, care and handling of Instruments, sensitivity of Instruments.
Measurement Instruments: Cathode ray oscilloscope, Q meters, extension of Instrument range. Instrument transformers, tube and transistor testers, Tachometer Stroboscope, Instrumentation amplifier, digital voltmeter and multimeters, A/D and D/A converters.

EEE 4428 Electrical Measurement & Instrumentation II Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4327.

EEE 4429 Power System Analysis (3 - 0) Credit 3.00

Basic structure of electrical power systems, Representation of power systems, Single line diagrams, Impedance and reactance diagrams, Pet-unit quantities, Selection of base, Change of base, Symmetrical three phase faults, Recommended procedure for short circuit calculations, Symmetrical components, Application of symmetrical components, unsymmetrical faults, single line to ground fault, Double line to ground fault. Line to line fault, Introduction to power system stability.

EEE 4430 Power System Analysis Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4429

EEE 4431 Switchgear & Protective Relay II (3 - 0) Credit 3.00

(for ITS Students)

Circuit breaker testing, type tests, routine tests, short circuit testing of circuit breakers, short circuit testing plants, insulation requirement and high voltage testing of circuit breakers, H.R.C. fuses and their applications, indoor switchgear, metal clad switchgear, low voltage control gear, contractors, low voltage circuit breakers, molded case circuit breakers, isolators and earthing switches. Schemes of electrical layout and busbar designs in different types of stations and sub-stations. Control of power by reactance, automatic supervisory control equipment. Automatic Control Equipment for stand by supply.

EEE 4432 Switchgear and Protective Relay II Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4431.

MCE 4495 Thermofluid Mechanics (3 - 0) Credit 3.00

Thermodynamic system, state, process and cycle. First and Second laws of Thermodynamics. Internal Combustion Engines and their cycles; study of petrol engines and gas turbines. Steam generating units with mountings and accessories; vapor power cycle and study of steam turbines.
Fluid properties and statics. Fluid flow, continuity equation, Euler's equation, Bernoulli's equation, laminar and turbulent flow, flow through pipes and ducts, Darcy-Weisbach equation, Moody diagram. Fluid machinery; study of fluid movers: pumps, fans, blowers and compressors; and hydraulic turbines: Pelton wheels, Francis turbines and Kaplan turbines.

MCE 4496 Thermofluid Mechanics Lab. (0 - 3/2) Credit 0.75

Experiments based on MCE 4495.

EEE 4501 Power System I (3 - 0) Credit 3.00

Representation of power systems, single line diagrams, impedance and reactance diagrams, per-unit system of calculations. Reactances of synchronous generators and its equivalent circuits, Symmetrical fault calculations, limitation of short circuit current using reactors.
Symmetrical components, positive, negative and zero sequence network of generators, transformers and lines, Unsymmetrical fault calculations.
Power and reactive power flow calculations of simple systems, load flow studies of large systems, control of voltage, power and reactive power.

EEE 4505 Industrial Electronics I (3 - 0) Credit 3.00

Brief review of (i) Junction Diode, (ii) Schottky Diode, (iii) Zener Diode. Introduction to thyristors: (i) SCR and (ii) TRIAC. Introduction to trigger devices: (i) UJT, (ii) PUT, (iii) Schottkey diode, (iv) Silicon Unilateral Switch (SUS), (v) Diac; (vi) Silicon Bilateral Switch (SBS); (vii) Asymmetrical AC Trigger Devices. SCR power control circuits for DC and AC. TRIAC power control circuits for AC. Stabilized power supplies. Controlled Rectification: with SCRs for resistive and inductive loads, Single phase half-wave and full-wave rectification. Switch -mode power supplies. Magnetic Amplifiers, Induction Heating, Dielectric Heating & Microwave Heating.

EEE 4506 Industrial Electronics-I Lab. (0 - 3/2) Credit 0.75

Experiment based on EEE 4505

EEE 4507 Illumination Engineering (2 - 0) Credit 2.00

Basic Illumination, the visible spectrum, Terms used in illumination, solid angle, illuminous flux, Luminous intensity, reduction factor, illumination, luminance, reflection ratio, specific output, specific consumption, laws of illumination, Inverse square law, Lambert's cosine law, illuminations calculations, Polar curves of light distribution, Roussean's figure. Design of lighting schemes and layouts, Photometry, light generation, Incandescent lamps, fluorescent lamps, Lighting circuits, Economics of lighting systems.

EEE 4508 Illumination Technology Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4507

EEE 4509 Switchgear &Control Equipment I (3 - 0) Credit 3.00

Fundamentals of fault clearing, current interruption in A.C. circuit breakers, recovery voltage and restriking voltage transients, switching of capacitor banks and unloaded lines, rated characteristics of circuit breakers arc extinction, arc interruption, arc extinction in different types of circuit breakers, arc-extinction devices, operating mechanism, control apparatus. Air break circuit breakers, bulk oil circuit breakers, minimum oil circuit breakers, sulphur hexafluride(SF-6) circuit breakers, air blast circuit breakers, vacuum circuit breakers and their comparative study Control panels, basic control circuit devices. Alternator switchgear and control panels, automatic voltage control equipment. Apparatus for automatic voltage control equipment. Apparatus for automatic synchronization control. Transformer tap changing control equipment. Automatic reclosing control of circuit breakers and oil circuit reclosers (OCRS).

EEE 4510 Switchgear and control Equipment I Lab (0 - 3/2) Credit 0.75

Experiments based on EEE 4509

EEE 4511 Protective Relays I (3 - 0) Credit 3.00

Introduction to protective relaying. Faults, their causes and effect. Production zones, primary protection and backup Protection, time grading principles. Protective relay fundamental and different types of relays, features of electromechanical relays, auxiliary relays, overcurrent relays, I.D.M.T. characteristic, directional relays, different relays, percentage differential relays, distance relays, Testing and maintenance of protective relays. Manufacturers, tests, commissioning tests, routine maintenance tests and secondary injection testing.

EEE 4512 Protective Relays I Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4511

EEE 4515 Television Engineering (3 - 0) Credit 3.00

Introduction to TV Engineering; Monochrome TV system; Modulation: AM and FM.
Scanning and synchronizing; TV cameras; Signal transmission and channel bandwidth; Analysis and synthesis of TV pictures.

Color TV systems; Color TV principles, luminance and color difference signals; NTSC, PAL and SECAM encoders and decoders. Picture tubes. Switched mode power supplies; HDTV. Remote control. Antenna for TVs.

EEE 4516 Television Engineering Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4515.

EEE 4517 Instrumentation Engineering I (3 - 0) Credit 3.00

Introduction to Instrumentation: Review of Conversion of non-electrical signals into electrical signals. Linear wave shaping Technique. Switching circuits, pulse Transfers and its uses into instrumentation. Pulse Generations: Generation of monostable, bistable and astable pulses. Schmitt Trigger, Blocking Oscillators.
Timing Circuits: Ramps Circuits - Constant-current ramps, Boot strap ramps, Auto generation of CRT sweeps. Use of logic Gates in Timing Circuits.
Analog to Digital Converts (A/D), and Digital to Analog Convert (D/A) and their uses in Instrumentation.

EEE 4518 Instrumentation Engineering I Lab. (0 - 3/2) Credit 0.75

Experiment based on EEE 4517.

EEE 4523 Utilization of Electrical Energy (3 - 0) Credit 3.00

Industrial and Commercial Application of Electrical power. Application of a electricity in domestic services, factories (Case study), Cranes and lifts. Use of Electricity in Agro-based activities. Application of electricity in Aircraft and Aerospace-Vehicles. Electricity in automobile. Application in Railway traction and signaling. Uses of Electricity in Mining, Electroplating, Air Conditioning and Refrigeration.

EEE 4524 Utilization of Elect. Energy Lab (0 - 3/2) Credit 0.75

Experiment based on EEE 4523

EEE 4553 Random Signals and Processes (3 - 0) Credit 3.00

Introduction to Random Signals and properties of random signals. Transformation of random variables. Review of different types of distribution, density and characteristic functions of probability and random variables.
Covariance and correlations, autocorrelation and PSD. Weiner Kintchine's theorem. Importance of correlation in random signal analysis.
Introduction to Random Signal Inference: Students' t-test, Chi-square test for standard deviation and Chi-square test for distribution.
Introduction of Random processes, Stationarity: first order

stationary process, strict sense stationary process and wide sense stationary process. Examples of WSS, Ergodicity and examples.
Response of linear systems to random inputs. Mean square error estimation. Detection and linear filtering. Weiner Filters (Minimum Mean Square Error Filter). Monte Carlo Markov Chain modeling of random processes with memory.

EEE 4554 Random Signals and Processes Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4553.

EEE 4527 Control System Techniques I (3 - 0) Credit 3.00
(for ITS Students)

Feedback control fundamentals. Open-loop systems, dynamics of simple position and velocity control, transformer function-step ramp signals frequency response, stability and compensation. Control system components. Logic and sequential controls.

EEE 4528 Control System Tech. I Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4527.

EEE 4551 Utilization of Electrical Energy I (3 - 0) Credit 3.00
(for MCE Students)

Industrial and Commercial Applications of Electrical power. Properties of motors and their application. Electrical applications of domestic services, machine tools, crans, lifts, agricultural, textile, printing excavating and paper making machineries. Application of electrical energy in iron and steel works, milling, cement mills, petroleum industry and in transportation. Electricity in aircraft and aerospace vehicles, automotive electrical equipment and in marine power. Applications in railooad, systems of electric traction and signaling.

EEE 4552 Utilization of Elect. Energy II Lab (0 - 3/2) Credit 0.75

Experiment based on EEE 4551

EEE 4600 Project & Design (0 - 6) Credit 3.00

Individual project under EEE 4600.

CIT 4550 Computer Aided Circuit Analysis and Design Lab. (0 - 3) Credit 1.50

Electronic circuit design and analysis using PSPICE. Electrical power system design and analysis using Power World Simulator.

CIT 4551 Microprocessor & Assembly Language Programming (3 - 0) Credit 3.00

Information representation & transfer, instruction & data access methods; the control unit: hardwired and micro-programmed; memory organization, I/O systems, channels, interrupts, DMA. Assembler and high-level language, machine and assembly instruction types and their formats, character representation instructions, instruction sets and their implementations, addressing methods, subroutines, macros and files, I/O programming, program development and applications.

CIT 4552 Microprocessor & Assembly Lang. Programming Lab. (0 - 3/2) Credit 0.75

Sessional works based on CIT 4551.

CIT 4555 Operating System and System Programming (3 - 0) Credit 3.00

Introduction to O.S., evaluation of Operating Systems. Memory management: memory addressing, paging & storage multiplexing, virtual memory. Processing memory: process state, concurrent processing, synchronization, process scheduling, deadlocks & its handling, protection system.

Performance evaluation. Basic concepts of system programming, assembler, compiler, loader, technical design of assembler and compiler.

CIT 4556 Operating System and System Programming Lab. (0 - 3/2) Credit 0.75

Experiments based on CIT 4555.

ITS 4549 Social Studies and Accounting (3 - 0) Credit 3.00

Sociology: Concepts of family and society (Islamic and non-Islamic): growth of family and society; functions of family and society; obligations of family and social life. State and Nation: elements of the State and their characteristics; functions of the State; definition of the Nation, its elements and their characteristics. Relationship between Nation and State: Islamic and Western concepts. Government: different forms and types. Citizenship: rights and obligations. International blocs and organizations: OIC, UNO, Commonwealth of Nations, etc. Resources of the Muslim world. Possible socioeconomic and cultural integration of Muslim countries.

Accounting: Its origin and development. Definition of accounting and bookkeeping; uses and users of financial information; transactions, assets, liabilities and the accounting cycle. Journal, Ledger, Cashbook, Trial balance, Income statement, Retained earnings statement and balance sheet. Interpretation of financial statements; use of accounting information in project evaluation and other decision-making.

EEE 4601 Power System II (3 - 0) Credit 3.00

Power system stability involving two-machine systems, swing equation. Equal-area criterion of stability and its applications, solution of swing equation, factors affecting transient stability.

Economic operation of power systems: Distribution of load between units within a plant, Transmission loss as a function of plant Generation, Distribution of load between plants.

Types of bus systems and their layout, current limiting reactors. Over-voltage in power systems, Lightning surges, switching surges, surge diverters.

EEE 4603 Industrial Electronics II (3 - 0) Credit 3.00

Different types of transducers and their principle of operations: (i) Position and Displacement Transducers (a) Potentiometer, (b) Linear Variable Differential Transformers (LVDT), (ii) Pressure Transducer; (iii) Temperature Transducer; (iv) Optical Transducer; (v) Flow Transducer; (vi) Strain gauge Transducer; (vii) Ultrasonic Transducer; (viii) Humidity Transducer; (ix) Hall-Effect Transducer; (x) Speed Transducer.

Voltage Multipliers. Electronic Timers: using (i) UJT, (ii) PUT, (iii) IC 555 (iv) IC XR 2240. DC Motor Controls: (i) DC Motor braking and plugging circuits, (ii) Speed Control of PM/Shunt Motors: Electronic speed control using armature voltage control method, solid state motor speed controllers SCR speed control circuits for PM/shunt motor: (a) simple SCR circuit, (b) SCR plus UJT circuit: Variation of a pulse-width modulation (PWM) speed control circuit. (iii) Speed control of series/Universal motor: circuits using (a) SCR (half-wave control), (b) TRIAC and DIAC (full-wave control). TRIAC control with hysteresis compensation. (iv) DC Motor Reversing Control: Balanced bridge reversing drive for PM or Shunt motors, Reversing Control Circuit for Series DC Motors. AC Motor Controls: (i) AC motor braking, (ii) Speed control of AC Motors: Introduction to variable frequency converter. A simple single-phase inverter using (i) transistors. A simple single phase inverter using SCRs (McMurray Bedford commutation circuit). A simple Three-phase six-step Inverter circuit. A simplified single phase cycloconverter. Amplifiers in Industrial Electronics: DC Amplifiers, Balanced Push-pull DC amplifier, Chopper and Chopper Amplifier, Chopper stabilized DC Amplifier. Introduction to semiconductor Laser.

EEE 4604 Industrial Electronics-II Lab. (0 - 3/2) Credit 0.75

Experiment based on EEE 4603

EEE 4605 Electromagnetic Fields and Waves (3 - 0) Credit 3.00

Electrostatics: Coulomb's law, force, electric field intensity, electrical flux density. Gauss theorem with application, electrostatic potential, boundary conditions, method of images. Laplace's and Poissons equations, energy of an electrostatic system, conductors and dielectrics.
Magnetostatics: Concept of magnetic field. Ampere's law, Biot-Savert law vector magnetic potential, energy of magnetostatics system, mechanical forces and torques in electric and magnetic fields.
Graphical field mapping with applications, solution to Laplace's equations. Rectangular, cylindrical and spherical harmonics with applications.
Maxwell's equations, their derivations, continuity of charges, concept of displacement current. Boundary conditions for time-varying systems. Potential used with varying charges and currents. Retarded potential, Maxwell's equations in different coordinate systems.
Relation between circuit theory and field theory: Circuit concepts and the derivation from the field equations. High frequency circuit concepts, circuit radiation resistance, Skin effect and circuit impedance, Concepts of good and perfect conductors and dielectrics. Current distribution in various types of conductors, depth of penetration, internal impedance, power loss, calculation of inductance and capacitance.
Propagation and reflection of electromagnetic waves in unbounded media; Plane wave propagation polarization, power flow and Poyinting's theorem. Transmission line analogy, reflection from conducting and conduction dielectric boundary; Display lines ion in dielectric, liquids and solids, plane wave propagation through the ionosphere, introduction to radiation.

EEE 4607 Switchgear & Control Equipment II (3 - 0) Credit 3.00

Circuit breaker testing, type tests, routine tests, short circuit testing of circuit breakers, short circuit testing plants, insulation requirement and high voltage testing of circuit breakers, H.R.C. fuses and their applications, indoor switchgear, metal clad switchgear, low voltage control gear, contractors, low voltage circuit breakers, molded case circuit breakers, isolators and earthing switches. Schemes of electrical layout and busbar designs in different types of stations and sub-stations. Control of power by reactance, automatic supervisory control equipment. Automatic Control Equipment for stand by supply.

EEE 4608 Switchgear and Control Equipment II Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4607

EEE 4609 Protective Relays II (3 - 0) Credit 3.00

Types of protection, overcurrent, earth fault, directional, differential, distance and carrier protection in perspective, protection of alternators, abnormal condition and protection systems. Standby sets, protection of transformers. Protections of generator-transformer unit, transmission lines. Non-directional and directional timer graded systems of feeder protection. Overcurrent and earth fault protection of lines, distance protection, pilot protection, wire pilot and microwave pilot, carrier pilot and other types of protection.

Protection of motors: overload and short circuit protection of L.V. motors, overload and phase fault protection of large motors, single phasing and unbalanced current protection.

EEE 4610 Protective Relays II Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4609

EEE 4613 Radio Frequency Engineering (3 - 0) Credit 3.00

Introduction to radio communication, the history of radio transmission and its evolution throughout the years, radio frequency management. Radio Receiver, AM and FM superheterodyne receivers, AM and FM demodulators and detector, communication receivers, radio transmitter and

transceivers. Block diagram of an AM and FM transmitter system and their functional analysis. Direct and indirect methods of modulation.
Radio wave propagation and modeling, free space propagation model, plane earth model, radio wave reflections and diffractions, radio wave propagation through the troposphere, radio wave propagation through the ionosphere. Link budget calculations for broadcasting systems.
Radio channel modeling, time-invariant and time varying channels. Stochastic and deterministic channel models. Frequency and time domain characterization of the radio channel.
High Frequency Amplifiers: scattering parameters, array expressions.
Radio Antenna: dipole, folded dipole, yagi arrays, log-periodic antenna calculations, transmission loss, radiation pattern, gain, directivity of antennas, antenna matching.

EEE 4614 Radio Frequency Engineering Lab
(0 - 3/2) Credit 0.75

Experiments based on EEE 4613

EEE 4617 Instrumentation Engineering II (3 - 0) Credit 3.00

General instrumentation of plants: Operational amplifiers and their uses in instrumentation techniques. Digital instrumentation, Pneumatic instrumentation, signal conditioning. Data transmission. Indicating, recording and display systems. Case studies of instrumentation of a Chemical processing plant.

EEE 4618 Instrumentation Engg. II Lab. (0 - 3/2) Credit 0.75

Experiments/case studies based on EEE 4617

EEE 4619 Peripherals & Microprocessor Based Design
(3 - 0) Credit 3.00

Design of Simple-As-Possible Computers: Concepts of parallel bus, tri-state buffers, register-register transfer; design of SAP-1, SAP-1 instruction set, programming of SAP-1, instruction cycles, improvement of SAP-1 using microprogramming and variable machine cycle; SAP-2 architecture, memory-reference instructions and register instructions, JUMP and CALL, examples of SAP-2 programs; SAP-3, stack instructions, extended-register instructions, the data pointer, PUSH and POP.
Different types of I/O devices: characteristics of different I/O devices; Programmed, Interrupt-driven, unconditional, conditional, standard and memory-mapped I/Os, Direct Memory Access (DMA); examples of different types of I/O devices.
Methods of parallel data transfer: Simple input and Output, strobed I/O, handshake I/O.
Programmable Parallel Port devices: The 8255 (or other devices), block diagram, modes of operation and initialization; design problems involving parallel interfacing using different modes of the PPI for controlling stepper motors, key matrices, ADCs, etc.
Interrupts: the purpose of interrupts, software and hardware interrupts in the 80x86 family of microprocessors, interrupt vectors and vector tables, interrupt instructions, the Interrupt Service Routine, description of some software and hardware interrupts, sequence of operation on account of interrupt reception, interrupt flag bits, the sending of interrupt type number by interrupting device, expanding the interrupt structure.
Programmable interrupt controller (PIC): The 8259 (or other devices), general description and block diagram, system connections, cascading of multiple 8259s, initializing the PIC – initialization command words and operational command words.
Programmable interval timer: The 8254 (or other devices), block diagram and system connections, modes and control words, interval timer applications.
Keyboard/Display Controller: The 8279 (or other devices), block diagram, initialization.

EEE 4620 Peripherals and Microprocessor Based Design Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4619

EEE 4625 Electrical Installation (3 - 0) Credit 3.00

General requirement of installation, Symbols and Codes, electrical installation for residential, commercial and industrial buildings- preparation of Drawings for Electrical Installation: Consideration and selection of Conductors and Cables.
Installation of Electrical Machines, transformers and substations: Electrical Installation Protection, protection against lightning surges, over voltages and short circuits, selection of different types, cut-outs and circuit breakers.

EEE 4626 Electrical Installation Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4625

EEE 4627 Control System Techniques II (3 - 0) Credit 3.00

(for ITS Students)

Basic Analogue Computing, Numerical Control (NC) and systems. Dynamic characteristic of different process controller, P I+D controls, practical and commercial electronics and pneumatic controllers. Modes of control tuning, maintenance and calibration of automatic controllers. Digital process control and microprocessor applications. Interfacing techniques.

EEE 4628 Control System Tech. II Lab (0 - 3/2) Credit 0.75

(for ITS Students)

Experiments based on EEE 4627.

EEE 4631 Introduction to Microprocessor & Computer Programming (3 - 0) Credit 3.00

(for ITS Students)

Microprocessors and Microcomputers- their definitions. Block diagram representation. Functions of different blocks. Simple programming concepts and Instruction set. Input/Output; Interfacing and simple applications.

EEE 4632 Introduction to Microprocessor & Computer Programme Lab. (0 - 3/2) Credit 0.75

(for ITS Students)

Experiment based on EEE 4631.

EEE 4651 Utilization of Electrical Energy II (3 - 0) Credit 3.00

(for MCE Students)

Electrical heating and welding, Methods of electrical heating, Dielectric heating, Induction heatings, Electric welding, Resistance welding, Arc welding, Induction welding, Pressure welding, Electro-chemistry and Electro-metallurgy, Electro-deposition, Electro-plating, Electro-lysis, Air-conditioning and Refrigeration, Air-conditioning systems, Packaged systems, control equipment, Refrigeration systems, Compressor drives, Safety controls.

EEE 4652 Utilization of Elect.Energy II Lab (0 - 3/2) Credit 0.75

Experiment based on EEE 4651.

MCE 4629 Engineering Management (3 - 0) Credit 3.00

Basic management theory and practice; division of management structure into elemental functions; management functions and their interrelationships; industrial organization and organizational objectives; communications and job instructions; management of human resources; teamwork, leadership and human relationships; personnel systems, performance

appraisal and incentive schemes; manpower planning and forecasting labour demand; planning, scheduling and organizing work; industrial relations, general framework, procedures for settlement of disputes and current developments; industrial accident prevention; plant layout, working environment and material handling; work study, inventory control, basic costing and budgetary control.

EEE 4700 Project and Thesis (0 - 6) Credit 3.00

The students are required to undertake a major in the field of Electrical and Electronic Engineering. The objective is to provide an opportunity to the students to develop initiative, creative ability, confidence and engineering judgment. The results of the work should be submitted in the form of a report which include appropriate drawings, charts, tables, references etc.

EEE 4700T Related Project and Report (0 - 6) Credit 3.00
(For ITS students)

The students are required to undertake a project in the related field of Electrical and Electronic Engineering. The results of the work should be submitted in the form of a report.

EEE 4705 Control System Engineering (3 - 0) Credit 3.00

Concepts of an Engineering System and its representation. Dynamical System, their characterizations: mathematical models of physical systems; transfer function, signal flow diagrams. Steady state and transient response using place transform method; pole- zero concepts; error analysis. Stability analysis- Routh, Nyquist and Bode diagrams: Stability margins; M and N circles; Nichol's chart; experimental determination for transfer functions. Root- locus method-plot and analysis. Design and compensation techniques, perform specifications, introduction to system compensation design with examples of lead and lag compensation.

EEE 4706 Control System Engg. Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4705

Hum 4705 Business Communication (3 - 0) Credit 3.00

The Project Cycle, Project proposal, contractual provisions, Specification writing techniques, Preparation and evaluation of bids, Project evaluation. Written Communication: report writing, memoranda, letters, instructions, notices, personal filing systems etc. Oral Communication: Listening Skills, informal and formal meetings, Power Point, transparency based oral presentation, audio-visual Communications, Communications by various electronic media. Introduction to e-commerce. Professional ethics in Engineering.

EEE 4711 Power System Protection I (3 - 0) Credit 3.00

Introduction to power system protection, Explanation of the protective terms, Current transformers, HRC fuses, Electromechanical Relays, over current relays, IDMT relays, Reverse power relays, Under frequency relays, Differential relays, Impedance, reactance and other types of distance relays, Static relays, Testing and maintenance of relays.
Non-directional and directional time graded system or feeder protection, over current and earth fault protection of lines, Distance protection, Pilot wire protection, Carrier current protection, Protection of bus-bars, generators, transformers and motors.
Different types of surge protection, diverters and their selection. Performance of transmission lines with respect to lightning phenomena and stroke currents.
Different types of neutral and equipment grounding of power systems and selection. Earth resistance and their measurements.

EEE 4712 Power System Protection I Lab. (0 - 3/2) Credit 0.75

Laboratory Experiments based on 4711

EEE 4715 High Voltage Engineering (3 - 0) Credit 3.00

High Voltage Supplies: AC: Cascaded Transformers. Tesla Coils, DC: Valve Rectifier Circuits, Cascaded Rectifiers. Electrostatic Generators.
Vande-Graff Generators. Corona; Power loss calculations. Breakdown of solid, liquid and gaseous dielectrics. Insulation tests. Standard specification.
Impulse generators, Impulse wave shapes. Mathematical analysis and design consideration of impulse generators. Triggering of Impulse generators; Measurement of high voltages. Transmission line design based on direct stroke, Insulation co-ordination. Lighting arresters and protector tubes.

EEE 4717 Power System Stability (3 - 0) Credit 3.00

The stability problem of power system. Distinction between steady state and transient stability. The swing equation and its solution. Solution of networks for stability studies. Transients' stability limits criteria. Two machine and multimachine problems. Stability under different types of faults. Typical stability studies and methods of improving stability. The influence of swinging and out-of step operation upon protective relays. Rapid reclosing for improving stability.

EEE 4721 Microwave Theory and Tech. I (3 - 0) Credit 3.00

H.F. Transmission lines, Smith chart. Impedance matching and applications. E.M. wave propagation. Reflection and refraction. Wave guides: Parallel Plane, rectangular, coaxial wave guides.
Transit time effects: velocity modulation, space charge wave; Microwave tubes, Klystron, Magnetron, Traveling wave Tube Amplifier. Wave guide components. Cavity resonators. Antennas and radiation. Hertzian dipole. Long antenna analysis, Radiation patterns, Rhombic and slot antenna. Antenna arrays. Introduction to antenna array design.

EEE 4722 Microwave Theory and Techniques I Lab.
(0 - 3/2) Credit 0.75

Experiments based on EEE 4721

EEE 4723 Data Communication I (3 - 0) Credit 3.00

Mathematical Review: Continuous and discrete signal and systems. Sampling Random process, power density spectrum. Representation of digitally modulated signal and their spectral Analysis.
Introduction to modulation Tech.- Linear CW modulation exponential CW modulation: Pulse modulation pulse amplitude modulation, pulse width modulation, pulse quantization of signals. Adaptive pulse code modulation. Generation and detection of Modulated-signals: Binary PSK Quadriphase PSK (Q PSK). Fast Frequency-shift keying (FFSH) minimum shift keying: coherent detection of signal. Differential detection of PSK, MSK and detection of FFSK.
Carrier and clock Recovery: Multiple access Technique: Frequency Division Multiple Access: Time Division Multiple Access code Division Multiple Access. Noise in data Communication: Discrete channel with discrete noise, Discrete channel with continuous noise. System capacities and information concept of Message.

EEE 4725 Optical Communication (3 - 0) Credit 3.00

Introduction to Optical Communication. Elementary theory of propagation through optical fibers. Reflection, Refraction,Dispersion and attenuation of signals propagation through Fiber Cables. Propagation characteristics of different kinds of fibers.
Optical transmitter: Laser in the field of optical communication. Optical detector, receivers and amplifiers. Unguided and guided optical communication system. Economy of optical fiber system in Telecommunications, Local data distribution, data transmission and telemetry. Optical fiber digital communication.

EEE 4727 Advanced Electrical Machines I (3 - 0) Credit 3.00

A.C. commutator Machines, classifications of A.C. commutator motors. Single Phase series motors, universal motors, repulsion motors, brush-shifting series motors, brush-shifting polyphase shunt motor, industrial motor controls, brush-less synchronous machines, self-synchronous apparatus, self-synchronous power drives and special D.C. generators. Rotating regulators, rototrol, amplidyne, metadyne synchronous converters, static power converters.

EEE 4728 Adv. Electrical Machines I Lab (0 - 3/2) Credit 0.75

Experiments based on EEE 4727

EEE 4729 Discrete Mathematics & Numerical Analysis (3 - 0) Credit 3.00

Set theory, Elementary number theory, Graph theory, Paths and trees, Generating functions, Algebraic structures, Semigraph, Permutation graphs, Lattices, Finite fields and coding theory, Linear programming, Mathematical logic, Propositional calculus and predicate calculus.

Computational methods for solving problems in: linear algebra, nonlinear equations, approximations, interpolation and ordinary differential equations.

EEE 4731 Semiconductor Devices (3 - 0) Credit 3.00

Energy bands and charge carriers in semiconductors : energy bands and Fermi level, charge carriers in intrinsic and extrinsic semiconductors, diffusion and drift potential, space charge, depletion width, energy band description for reverse and forward bias, minority and majority carrier currents, capacitance of pn junction, pn diodes as rectifiers, half wave and full wave (centre tapped and bridge) rectifiers; Bipolar junction transistors (B.JT) : charge transport in transistor, minority carrier distributions and terminal currents, current transfer ratio, emitter injection efficiency, charge control analysis, V-I characteristics in common base and common emitter connections, the Ebers-Moil equations for the intrinsic transistor, regions of operation of the intrinsic transistor, intrinsic V-I characteristics in the normal active region at the collector- base junction, emitter efficiency in real transistors, base resistance, structural asymmetries and their consequences : Thermionic emission : theory and space charge current in a diode; Breakdown avalanche and zener breakdown.

EEE 4732 Semiconductor Devices Lab. (0 - 3/2) Credit 0.75

Laboratory Experiments based on EEE 4731

EEE 4733 Advanced Electronics I (3 - 0) Credit 3.00

Excess carriers in semiconductors, carrier lifetime, diffusion of carriers. Optical process in semiconductors: Radiative and non-radiative recombination, optical absorption, luminescence. Light Emitting Diodes: Visible and infrated LED, principle, material, construction. Photodetectors: photoconductor, junction photodiode, p-I-n photodiode, avalanche photodiode, phototransistor: Solar cell; Silicon solar cell, thin film solar cell, heterostructural solar cell, IC fabrication technology: Monolithic and hybird circuits, device elements, charge transfer devices, LSI, VLSI, and ULSI techniques.

EEE 4734 Advanced Electronics I Lab (0 - 3/2) Credit 0.75

Experiments based on EEE 4733

EEE 4735 Linear Circuits and Systems (3 - 0) Credit 3.00

Characteristics of a linear system methods of transient and steady state solutions of Differential and Integrodifferential equations. Network theorems. Analogous systems. Analysis by Fourier methods. Laplace Transformation and its application to linear circuits. Impulse function: Convolution integral and their applications. Matrix with simple applications in circuits: Network function, poles and zeroes of a network. Introduction

to Topological concepts in electrical and magnetic circuit networks.

EEE 4739 Microwave Engineering (3 - 0) Credit 3.00

Transmission Lines: Voltage and current in ideal lines, Reflection, transmission, standing wave, impedance transformation, Smith chart, impedance matching, quarterwave matching, single and double stub matching. Wave guides: General formulation for guided waves, parallel plate wave guides, losses in the parallel plate rectangular wave guides, different modes of propagation, losses in wave guides, Circular wave guides, Microstrips, their structuresand their characteristics impedances. Resonant Cavities: Simple rectangular resonant cavities, Energy storage, losses and Q of the resonators, other modes in rectangular resonators. Radiation: Radiation from a small current element. Radiation from Hertzian dipole, radiation resistance, radiation pattern, Properties of half wave dipole, Description of other types of antennas, mono-pole, horn, rhombic and parabolic reflector. Array antennas and their radiation patterns, Yagi-Uda antenna. Microwave Devices: Directional coupler, attenuator, phase shifter, circulator, isolator etc. Microwave amplifiers and oscillators.

EEE 4740 Microwave Engineering Lab. (0 - 3/2) Credit 0.75

Laboratory Experiments based on EEE 4739

EEE 4741 Digital Signal Processing (3 - 0) Credit 3.00

Introduction to digital signal processing.
Discrete Fourier Transform, Inverse Discrete Fourier Transform, 2-radix, 4-radix- DFT, Fast Fourier Transform. Fast Convolution
Difference Equations, Transfer Functions and z-Transformation.
Digital Filters: FIR filters, IIR filters, their design, realization of FIR and IIR filter design, finite precision effects.
Adaptive Filters: Weiner Filters, LMS algorithm and its different generics.
Introduction to multi-rate filtering and noise shaping.
Introduction to special purpose hardware and digital signal processors.

EEE 4742 Digital Signal Processing Lab. (0 -3/2) Credit 0.75

Laboratory Experiments based on EEE 4741

EEE 4790 Industrial Training Credit 1.00

This is an internship program. Students are free to join any company or industry to gain practical experience. At the end of the program, they must submit a formal report based on their learning and experience. The university authority will decide their grade according to the quality of the internship and report.

ITS 4749 Science, Technology and Islam (2 - 0) Credit 2.00

What is Science? Definition. What is Technology? Definition. Relation between Science and Technology. Development of Science and Technology: a brief overview up to the beginning of the twenty-first century. Islam: concept, origin and examples of main religions and their tenets. Comparative religion: Islam, Christianity, Judaism, Hinduism and Buddhism, etc. Relation between Science & Technology and Islam. Science & Technology in different religions and religious books.

MCE 4791 Engineering Economics (2 - 0) Credit 2.00

Introduction to engineering economic decisions, cash-flow analysis and basic concepts of discounting, cost of capital and required rate-of-return equivalence. Business mathematics: investment appraisal criteria for economic decisions, present worth, internal rate of return, social considerations in investment, benefit-cost ratio, decisions involving depreciation and inflation, taxes and sensitivity analysis.

EEE 4800 Project and Thesis (0 - 6) Credit 3.00

The students are required to undertake a major project in the field of Electrical and Electronic Engineering. The objective is to provide an opportunity to the students to develop initiative, creative ability, confidence and engineering judgment. The results of the work should be submitted in the form of a report which should include appropriate drawings, charts, tables, references etc.

EEE 4800T Related Project and Report (0 - 6) Credit 3.00
(for ITS students)

The students are required to undertake a project in the related field of Electrical and Electronic Engineering. The results of the work should be submitted in the form of a report.

EEE 4801 Power System Engg. II (3 - 0) Credit 3.00
(for ITS Students)

Power system stability involving two-machine systems, swing equation. Equal-area criterion of stability and its applications, solution of swing equation, factors affecting transient stability.
Economic operation of power systems: Distribution of load between units within a plant, Transmission loss as a function of plant Generation, Distribution of load between plants.
Types of bus systems and their layout, current limiting reactors. Over-voltage in power systems, Lightning surges, switching surges, surge diverters.

EEE 4803 Power Station (3 - 0) Credit 3.00

Energy sources: Fossil fuels, nuclear fission; renewable sources - hydro, biomas, solar, wind, geothermal; pumped storage hydro.
Power Plant performance; connected load, demand factor, diversity factor, load factor, plant factor, utilization factor.
Plant performance and operating characteristics, efficiency, heat rate, incremental rate method, Station performance characteristics, Station incremental rate, capacity scheduling, Base load and peak load, Load division between steam and hydro stations, choice of power station and units.
Interconnected System: Capacity savings, power sharing amongst units for economic allocation. Private generation: industrial co-generation, capacity generation. Site selection of Power Station.

Hydro - power stations and equipment, plant auxiliaries, plant operation. Nuclear power stations - chain reactions, Moderators, types of reactors, shielding.

EEE 4805 Telecommunication Engineering (3 - 0) Credit 3.00

Introduction: Introduction to basic telephone network, PSTN.
Electronic switching: Basic switching system, Evolution of modern switching systems. Stored program control (SPC), centralized SPC and distributed SPC. Basic time division switching, time slot inter change, time multiplexed time switch.
Pulse modulation: PPM, PWM.
Digital modulation: ASK: principle, bandwidth requirement, detection, noise performance. PSK: principle, bandwidth requirement, detection, noise performance. FSK: continuous and discontinuous phase FSK, MSK, bandwidth requirements, detection.
Digital Communication: Communication channels, introduction to source coding, example of some source coding techniques. Intersymbol interference. Receiver for AWGN channels: matched filter and correlation receiver. Introduction to channel coding, introduction block codes and convolution codes.
Wireless Communication: Mobile concept, Introduction to cellular systems, different generation of cellular systems. Concept of frequency reuse; handoff strategies.
Optical Fiber Communication: Electromagnetic spectrum. Use of light in communication; Principle of light propagation through optical fiber. Fiber structure. Total internal reflection and numerical aperture. Step and graded index fibers.

EEE 4806 Telecommunication Engg. Lab. (0 - 3/2) Credit 0.75

Laboratory experiments based on EEE 4805

EEE 4811 Power System Protection II (3 - 0) Credit 3.00

Application of CT's and PT's for Protective Relays.
Methods of analyzing generalizing and visualizing protective relay response: Superimposing Relay and System characteristics on R-X Diagram.
Power Swings and Loss of Synchronism, Effect on Distance Relays of Power Swing and Loss of Synchronism; Response of polyphase and single-phase Directional Relays under different System conditions.
Application of Protective Relays for Bus Zone protection.

EEE 4813 Energy Conversion (3 - 0) Credit 3.00

Energy Conversion Processes: General introduction, energy sources, renewal and non-renewal energy sources. Principle of conservation of energy. Total energy concept. Direct Electrical Energy Conversion. Fuel cell, Thermo-electric, Electric, Electrostatic and piezoelectric energy conversions.
Solar energy, Bulk power generation, photo electric and photo voltaic, solar cells; construction and characteristics.
Electro-mechanical Energy Conversion: Electrical to Mechanical, Mechanical to Electrical and Electrical to Electrical conversions. Bulk energy conversion devices; General formulation of equations. Introduction to generalized machine from field concept. Introduction to Electric Traction.

EEE 4815 Protective Relay Design (3 - 0) Credit 3.00

Electromagnetic Induction Type Relays; Actuating Structures for Induction Type Relays, Induction Disc, Cup and Loop units; Design Fundamentals.
Static Vs. Electromagnetic Relays; Static Relay Fundamental circuits – Design of Functional circuits.
Static Relays with Integrated Circuits.
Latest Trends in Static Relay Design – use of microprocessors in protection circuits.

EEE 4816 Protective Relay Design Lab. (0 - 3/2) Credit 0.75

Laboratory Experiments based on EEE 4815

EEE 4821 Microwave Theory & Techniques II (3 - 0) Credit 3.00

Microwave oscillators and amplifiers: Principles of generation of millimeter and sub-millimeter waves; detailed analysis of Klystrons, Magnetrons and TWT amplifiers and backward wave oscillators. Harmonic generators, Gun-effect devices. Microwave circuits; Microwave network analysis and synthesis. Matrix representation and scattering matrix. Analysis of waveguide discontinuation of obstacles, junctions and cavities and strip lines. Methods of microwave precision measurements.

EEE 4822 Microwave Theory & Techniques II Lab (0 - 3/2) Credit 0.75

Experiments based on EEE 4821

EEE 4823 Data Communication II (3 - 0) Credit 3.00

Major Components in Data Communication System: Types of Communication - Synchronous and Asynchronous Communication. Concept Networks Distributed Data Bases: Managing the Distributed Resources. Store and forward massage system, Modenus and protocols, Data security encryption, public keys, Local Area Network (LAN), Hardware interfaces, Software structure, Capacity assignment in network. Advanced topics in Digital Communication. Integrated Services Digital Networks (ISDN): Speech-coding Algorithm and Vector Quantization. Echo-cancellation in speech and Data transmission. Digital speech interpolation system, Guide line to Digital Network Design.

EEE 4827 Advanced Electrical Machines II (3 - 0) Credit 3.00

Electrical machine design, Design factors, Design Principles, Transformer design, Design of small single-phase transformers, Design of rotating Machines, General concepts and constraints, Design of three phase induction motors, design of single-phase induction motors. Special machines, generalized machines.

EEE 4828 Adv. Electrical Machines II Lab. (0 - 3/2) Credit 0.75

Experiments based on EEE 4827

EEE 4831 Semiconductor Devices (3 - 0) Credit 3.00

Energy bands and charge carriers in semiconductors: energy bands and Fermi level, charge carriers in intrinsic and extrinsic semiconductors, diffusion and drift potential, space charge, depletion width, energy band description for reverse and forward bias, minority and majority carrier currents, capacitance of pn junction, pn diodes as rectifiers, half wave and full wave (centre tapped and bridge) rectifiers; Bipolar junction transistors (B.JT): charge transport in transistor, minority carrier distributions and terminal currents, current transfer ratio, emitter injection efficiency, charge control analysis, V-I characteristics in common base and common emitter connections, the Ebers-Moil equations for the intrinsic transistor, regions of operation of the intrinsic transistor, intrinsic V-I characteristics in the normal active region at the collector- base junction, emitter efficiency in real transistors, base resistance, structural asymmetries and their consequences : Thermionic emission : theory and space charge current in a diode; Breakdown avalanche and zener breakdown.

EEE 4832 Semiconductor Devices Lab. (0 - 3/2) Credit 0.75

Laboratory Experiments based on EEE 4831

EEE 4833 Advanced Electronics II (3 - 0) Credit 3.00

Metal-semiconductor junctions: Schottky and ohmic contacts. Semiconductor heterojunctions: structure, band alignment. Negative conductance microwave devices: Transit time devices, Gunn effect and related devices. Spontaneous and stimulated emission, Einstein relationship, threshold conditions, pumping methods. Semiconductor Laser: population inversion, confinement, turn-on delay, emission power, materials Biomedical electronics: active and rest potentials, electrocardiograph (ECG), pacemaker.

EEE 4834 Advanced Electronics II Lab. (0 - 3/2) Credit 0.75

Laboratory Experiments based on EEE 4833

EEE 4835 Medical Electronics (3 - 0) Credit 3.00

Biomedical instrumentation; Electrography: ECG, EEG, EMG, EOG etc.; X-ray machines and tomography; Nuclear imaging; ultrasonic imaging; Artificial Kidney; Laser applied to biomedical fields; MRI; Radio therapy; Cardiac measurements; Pace-makers; Blood Cell counters; Hazards and safety measures in biomedical applications.

EEE 4836 Medical Electronics Lab. (0 - 3/2) Credit 0.75

Experiments and hospital visits based on EEE 4835

EEE 4839 Electrical Design (3 - 0) Credit 3.00

General design principles of electrical apparatus involving electric and magnetic circuits. Design and specification of chokes, transformers, starters, field regulators. Elements of design of rotating machines. Design and interpretation of electrical system layouts. Design details of an electrical substation.

General design aspect of electronic components: filters, amplifiers, oscillators, audio transformers, power supply from both mains and batteries. Typical design problems.

EEE 4841 Energy Conversion & Special Machines
(3 - 0) Credit 3.00

Generalized energy conversion process, general principles of electromechanical energy conversion, energy storage, Interpretation of generalized machines from field concepts. Linear induction motor, stepper motor, universal magnet motor, shaded pole motor, hysteresis motor, synchronous reluctance and switched reluctance motor, amplydynes and metadynes, synchros. Introduction to electric traction.

EEE 4843 Semiconductor Physics (3 - 0) Credit 3.00

Energy band model of solids: Carrier statistics and Fermi level. Carrier transport and Hall effect. Recombination. Optical processes in semiconductors. Homogeneous and in homogeneous semiconductors under equilibrium and non-equilibrium conditions. Thermionic and field emissions. Breakdown phenomena.
Quantum theory: Schrodinger's wave equation and one 0dimensional potential structures.

EEE4845 Renewable Energy Systems (3 - 0) Credit 3.00

Importance of renewable energy, sources. Statistics regarding solar radiation and wind speed. Insulation; geographical distribution, atmospheric factors, measurements. Solar cell; principle of operation, spectral response, factors affecting conversion efficiency, I-V characteristics, maximum power output. PV modules and arrays: stationery and tracking. PV systems: stand alone, battery storage, inverter interfaces with grid. Wind turbine generators: Types, operational characteristics, cut-in and cut-out speed, control, grid interfacings, AC-DC-AC link.

EEE4847 Advanced Electrical Machines (3 - 0) Credit 3.00

Special Machines: Universal motor, repulsion motor, hysteresis motor, single and three phase reluctance motors, switched reluctance motor, permanent magnet DC motor, brushless DC motor, stepper motor, brushless synchronous machines. DC and AC motor control: Semiconductor static power converters, fundamentals of DC and AC motor control by using semiconductor static power converters. Electrical machine design: Design principles, single and three phase transformer design, design of single and three phase induction motors, application of computers in modern design of electrical machines.

EEE 4848 Adv. Electrical Machines Lab. (0 - 3/2) Credit 0.75

Laboratory Experiments based on EEE 4847

EEE 4849 VLSI Circuits (3 - 0) Credit 3.00

VLSI technology: Terminology and trends, MOS transistor characteristics, nMOS and CMOS inverters, dc and transient characteristics. Pass transistors and Pass gates. CMOS layouts and design rules, Complex CMOS gates, Resistance and Capacitance estimation and modeling Signal propagation delay, Noise margins and power consumption. CMOS building blocks: adders, counters, parity generators, shift registers, multipliers, barrel shifters. Data paths, memory structures, PLAs and FPGAs. Speeding up technologies, BiCMOS circuits, GaAs technology.

EEE 4850 VLSI Circuits Lab. (0 - 3/2) Credit 0.75

Laboratory Experiments based on EEE 4849

EEE 4851 Advanced Communication Techniques (3-0) Credit 3.00

Radar and Satellite:Satellite Radio basics: Fundamental of radio systems. Transmitters. Receivers. Antennas. Sources of noise and interference. Propagation medium. Terrestrial and space

applications. Space propagation mechanisms.

The concepts of a geostationary satellite (Kepler Laws). Principles of satellite launches, Orbits of main satellites. Satellite construction. Satellite energy sources. Satellite radio system reliability

Radar Basics: Radar equation, minimum detectable signal, radar cross-section, pulse repetition frequency, range ambiguities. Introduction to MTI and Pulse radar. Introduction to Tracking radars. Radar clutter. Different types of radar display. Overview of radar antennas.

Mobile communication:

Introduction to wireless communications. Modern wireless communications systems, The cellular concept. Mobile radio propagation: large-scale path loss, small-scale fading. Modulation for wireless links. Improving wireless link performance: equalization, diversity, and channel coding. Multiple access techniques for wireless communications. Introduction to different mobile standards.

Optical communication:

Electromagnetic spectrum, use of light in communication, principle of light propagation through optical fiber, fiber structure, total internal reflection and numerical aperture, step and graded index fiber, single mode fiber, fiber characteristics, fiber loss connectors, couplers. Different types of sources and detectors. Optical modulation and demodulation techniques.

Course Contents For Postgraduate Programmes

EEE 6000 Thesis **Credit 18.00**

EEE 6002 Project *

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EEE 6101 Engineering Analysis (3-0) Credit 3.00

Wavelet transform, chaos and bifurcation theorems, Walsh function, Greens function, finite element techniques, Fuzzy logic, Genetic algorithims, Stochastic process.

EEE 6201 Advanced Analog Electronics (3-0) Credit 3.00

Feedback amplifier principles, linear wide-band low-noise feedback amplifier design, voltage and current regulators, switching regulators.

EEE 6203 Advanced Solid State Devices (3-0) Credit 3.00

Semiconductor theory, development of mathematical analysis and systematic modeling of solid-state devices, characteristics and properties of solid-state devices, p-n junction, bipolar and unipolar transistors, noise models of active devices.

EEE 6205 VLSI Design (3-0) Credit 3.00

Design of microelectronic circuits such as registers, CMOS subsystem, adder and related functions, multipliers, programmable logic arrays (PLAs) via large scale integrated circuitry with emphasis on high-level structured design methods for VLSI systems.

EEE 6207 IC Processing and Fabrication Technology (3-0) Credit 3.00

Integrated circuit processing, solid state diffusion, diffusion technology, nonideal effects in diffusion, ion implantation, thermal oxidation, oxide for diffusion, masking, film deposition, photolithography and etching, device isolation, contacts and metallization; Si bipolar and MOSFET technologies, advanced bipolar processes, BiCMOS.

EEE 6301 Power System Reliability (3-0) Credit 3.00

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 cummulant method to obtain loss of load probability (LOLP), Modeling for forecast uncertainty, Reliability evaluation: energy limited units, interconnected systems, composite transmission and generating system, and substation and switching stations.

EEE 6303 Power System Planning (3-0) Credit 3.00

Basic objectives of power system planning, Generation expansion planning procsss, Electrical demand forecasting: current demand forecasting approaches. Generation planning: economic analysis, expected energy generation, expected fuel cost, Booth-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, WASP, Joint ownership of generation.

EEE 6305 Transients in Power System (3-0) Credit 3.00

Transients in simple electric and magnetically linked circuits, impacts of switching on rotating machinary. Parallel operation of interconnected networks, Interaction of Governors in power systems. Overvoltage during power system faults. Systems voltage recovery characteristics. Effect of arc restriking on recovery voltage. Switching surges and overvoltage arrester requirements. Overvoltage caused by sudden loss of load and by open conductor.

* Number of credit hours will be decided depending on the program

EEE 6307 Power System Modeling (3-0) Credit 3.00

Overview of the applications of power electronics at utility and demand sides, sources of harmonics: utility devices and consumer loads. Various models for nonlinear and dynamic loads. High voltage direct current (HVDC) transmission system modeling. AC-DC load flow studies. Modeling of flexible AC transmission systems (FACTS): conventional thyristor-controlled reactors and phase shifters, voltage source inverter (VSI) based static condenser (STATCON) and unified power flow controller (UPFC). Transient stability and sub-synchronous resonance (SSR) studies incorporating magnetic energy storage (SMES) models. Modeling of utility interfaced with photovoltaic and wind energy sources. Power quality, cyclic and noncyclic voltage flicker, total harmonic distortion (THD) analysis, remedial measures and harmonic load flow studies.

EEE 6401 Optical Fiber Communication (3-0) Credit 3.00

Introduction to advantages and future prospects of optical fiber communication. Optical fiber-mode theory, fiber types and characteristics. Light sources: light emitting diode and laser diode. Detectors: PIN and avalanche photodetectors. Receiver analysis: direct detection and coherent detection, noises and limitations. Transmission limitations: chromatic dispersion, nonlinear refraction, scattering, four wave mixing, laser phase noises. Optical amplifier: laser and fiber amplifiers. Multichannel optical system: frequency division and wavelength division multiplexed systems. Optical devices and components for communication.

EEE 6403 Wireless Communication (3-0) Credit 3.00

Introduction to cellular concepts, frequency reuse, cochannel interference, handoff. Radio propagation in and around buildings. Friis equation, multipath, narrow-band and wideband channels, small scale and large-scale statistics, space and time signal variation. Receiver sensitivity, sources of noise. Performance statistics: coverage, margin, digital modulation, adjacent channel interference, and digital error rates. Wide band channels, maximum transmission rates. Multi-server queuing and traffic, Erlang formulas.

EEE 6405 Advanced Digital Signal Processing (3-0) Credit 3.00

Review of discrete-time signals and systems, applications of Z-transform, discrete Fourier transform (DFT) and fast Furier transform (FFT) to frequency analysis of signals and systems. Design of digital filters. Multirate digital signal processing. Linear prediction and optimum linear filters. Power spectrum estimation.

EEE 6407 Digital Communication (3-0) Credit 3.00

Elements of a digital communication system and information theory. Modulation and demodulation for the additive Gaussian noise channel. Efficient signaling with coded waveforms. Digital signaling over a channel with intersymbol interference and additive Gaussian noise-characterization of Band-Limited Channels. Digital signaling over fading multipath channels. Spread spectrum signals for digital communications.

EEE 6501 Switching Theory (3-0) Credit 3.00

Digital systems design; introduction to switching algebras, overview of integrated circuit technologies, analysis and synthesis of combinational circuits, special properties of selected switching functions, sequential circuits, fundamental mode analysis, pulse mode analysis, and sequential credit synthesis.

EEE 6503 Advanced Computer Architecture (3-0) Credit 3.00

Introduction to the problems involved in designing and analyzing current machine architectures. Performance and cost analysis, pipeline processing, vector machines and numerical

applications, hierarchical memory design, and multiprocessor architectures.

EEE 6505 Analysis and Design of Digital Integrated Circuits (3-0) Credit 3.00

MOS and bipolar device models and second order effects. Circuit Device and circuit level optimization of digital building blocks. design styles and arithmetic structures. Estimation and minimization of energy consumption. Interconnected models and parasitics; driver design; timing issues: clock skew, self-timed circuits. Memory architectures; circuits: sense amplifiers and devices. Testing of integrated circuits.

EEE 6507 CISC Microprocessor System Design (3-0) Credit 3.00

Overview of advanced architecture CICS microprocessors and their associated support components with emphasis on incorporating these devices into both general purpose and embedded board level designs for multi-microprocessor systems utilizing open architecture system buses. 32-bit CISC microprocessors, memory management, floating point support, advanced peripherals, PLD- based "glue logic" design, performance evaluation, IEEE standard open architecture system buses, and various pertinent interface and networking standards.

EEE 6601 Antennas and Propagation (3-0) Credit 3.00

Antenna theory; application of Maxwell's equations to determine electromagnetic fields of antennas; radiation, directional arrays, impedance characteristics, aperture antennas; application of reaction concept and variational principles in antennas and propagation.

EEE 6603 Microwave Devices and Circuits (3-0) Credit 3.00

Introduction to high frequency systems and circuits; fundamentals of microwave integrated circuits; microwave two-terminal and three-terminal solid-state devices; waveguide and microstrip solid-state circuits.

EEE 6605 Semiconductor lasers (3-0) Credit 3.00

III-V compound semiconductor materials, spontaneous and stimulated emission in lasers; optical wave guiding equation solutions, quantum noise and spectral linewidth properties of lasers; principle and structure of photodiodes; III-V compound material technology.

EEE 6701 Nonlinear Control System (3-0) Credit 3.00

Techniques available to analyze and synthesize nonlinear and discontinuous control systems. Modern stability theory, time-varying systems, DF, DIDF, Lyapunov theory, adaptive control, identification and design principles using these concepts; examples of electronic and electromechanical systems.

EEE 6703 Modern Control (3-0) Credit 3.00

Vector norms; induced operator norms; Lp stability; the small grain theorem; performance/robustness trade-offs; L1and Hoo optimal P control as operator norm minimization; H2 optimal control.

EEE 6801 Power Electronics (3-0) Credit 3.00

Principles and characteristics of power semiconductor devices; classification of static power converters and their applications, ac phase controller; pulse width modulation; switch mode DC to DC converters, resonant converters; Fourier analysis of static converter waveforms

Course Contents for Other Programmes

DVE Programme

EEE 2111 Radio Systems I (3 - 0) Credit 3.00

The operation and characteristics of solid-state devices; switching diodes, Controlled rectifiers, Zener diodes, tunnel diodes, MOS, FET, I.C.'s.

Amplifiers: Valve and transistor circuits of Amplifiers (A.F. & R.F.) gain band-width and Frequency response.
Power Amplifiers: Problems of matching, amplitude, phase and frequency distortion. Push pull Amplifiers, Single and Double and double ended.

Oscillators: Crystal controlled oscillators, Blocking oscillators, multivibrators.

Principle of operation of speakers and microphones. Impedance matching and phasing. Power, impedance and frequency responses in regard to speaker rating.

Block diagrams of Radio receivers and their functional analysis. A.M. and F.M. Receivers: Performance of A.M. and F.M. receivers, in regard to tracking, selectivity, stability and fidelity.

EEE 2112 Radio Systems I Lab. (0 - 3) Credit 1.50

Experiments based on EEE 2119.

EEE 2113 TV. Systems I (3 - 0) Credit 3.00

Principle of black and white television transmission and reception picture frequency and persistence of vision.
Aerial input circuits, filters, image rejection circuits.
Factors affecting choice of intermediate frequency (IF). Band – width requirement and means of obtaining it. Shaping circuits for I.F., the use of integrated circuits for I.F. amplifiers. Alignment of I.F. amplifiers.
Vision demodulators: Band – width, I.F. filtering and sound rejection. enter-carrier sound.
Video frequency amplification. Band-width and phase distortion. A.C. and D.C. coupling, D.C. restoration.
Sync. pulse separators.

Amplitude separation of pulses from video signal and frequency separation of line and field sync. pulses. Field sync. clippers.

Time basis: Valve and transistor circuits in common use. Methods of obtaining and controlling linearity and amplitude control. Synchronization : flywheel sync line circuits.

Use of line time base to supply Extra High Tension, (E.H.T) boost high tension, focus supplies and low voltage supplies for transistor operation. Voltage multipliers.

EEE 2114 TV. Systems I Lab. (0 - 3) Credit 1.50

Experiments based on EEE 2113.

EEE 2117 Electrical & Electronics Devices I (3 - 0) Credit 3.00

Principles of operation of: Solid state diodes: their application as rectifiers and voltage stabilizers.
Transistors: (bipolar and field effect), circuit configuration and biasing for amplifier circuits.
Thermistors: circuits employing thermistors as temperature sensors.
Thyristors, diacs and triacs; Circuits employing thyristors for variation of power and switching.
Construction and operation of Relays; General purpose reed and post office types.

EEE 2118 Elect. & Electronics Devices I Lab. (0 - 3) Credit 1.50

Experiments based on EEE 2117.

EEE 2119 Transducers and their Applications (3- 0) Credit 3.00

Classification of Transducers: Principles of operation, characteristics and application of the following transducers, Transducers for measurement of pressure and vacuum.
Resistances types: Strain gauge, potentiometer, thermister, light dependent resistor (LDR) and resistance thermometer.
Capacitive types: Using variable air – gap, plate area and permittivity. (its use as a variable impedance device and part of an oscillator tuned circuit).
Inductive Types: Synchronous tachogenerators, linear variable differential transformer (LVDT), variable reactance type.
Photoelectric, thermocouple and piezoelectric transducers.

EEE 2120 Transducers & their Applications Lab. (0 - 3) Credit 1.50

Experiments based on EEE 2119.

EEE 2211 Radio Systems II (3 - 0) Credit 3.00

Various types of power supplies, half wave and full-wave rectifiers, Filters, regulators and stabilizers.
Feed-back Amplifiers: Feedback circuits, negative feedback, automatic frequency control (A.F.C) Automatic Gain Control (A.G.C), effects of negative feedback on gain, stability etc. Basic principles of Amplitude and frequency modulation (F.M.), Relative merits of amplitude modulation and frequency modulation. M.F. detector, ratio detector limiter, discriminator.
Filters: Types of filters and their importance. V.H.F. tuners for M.F., Intermediate frequency I.F. Amplifiers, including factors affecting choice of intermediate frequency use of dual I.F. stages for A.M./ F.M. receivers.
Principle of magnetic tape and video recording Sound Systems.
Principle and construction of aerials, Simple binary counting. Principles of Boolean Algebra, Logic gates and truth tables, Addition, Subtraction, Multiplication. Switching circuits and techniques R.S.J.K. Bistables. Counters and registers; Multiplexing, coding and decoding.

EEE 2212 Radio Systems II Lab. (0 - 3) Credit 1.50

Experiments based on EEE 2211.

EEE 2213 TV. Systems II (3 - 0) Credit 3.00

Principle of Colour Television system, Colour picture tube. Composite video signal, luminance and chrominance signals and their band-width, colour bar pattern and Inter-relationship of colour signals. Colour TV. Camera, Transmission systems (PAL, N.T.S.C., SECAM).
Intermediate Frequency (I.F.) and Video Amplifiers.
Vertical oscillator, Horizontal oscillator and Automatic Frequency control (A.F.C).
Band-pass Amplifier, Colour Synchronisation and Colour Killer Circuits.
Electrostatic, magnetic and Dynamic Convergence circuit.

EEE 2214 TV. Systems II Lab. (0 - 3) Credit 1.50

Experiments based on EEE 2213.

EEE 2219 Electrical & Electronics Devices II (3 - 0) Credit 3.00

Basic principles of operation of Silicon controlled Rectifiers (SCR);
And their applications. Use of I.C. to implement logic functions. Operation of J.K., R.S.D-type bistables, using NOR/NAND elements as well as use of bistables to form registers and counters.
Principles of operation of Thyratron and Electronic Amplifiers, Operational Amplifiers, Instrumentation Amplifiers – other

special devices used for industrial control; Principles of operation and types of motors and generators, including techno-generators, servomotors and stepping motors.

EEE 2220 Elect. & Electronics Devices II Lab. (0 - 3)
Credit 1.50

Experiments based on EEE 2219.

EEE 2221 Ind. Instrumentation & Control (3 - 0)
Credit 3.00

Basic concept of instrumentation, Instrumentation elements based on resistance variation, Electrostatic and capacitance variation, instrumentation using magnetic and inductive elements. Instrumentation for measuring temperature, pressure, heads, level and flow measuring process instrumentation. Specialized instrumentation.

Definition of servo mechanism and process control. Dynamic response of servo systems. Methods of improving servo performance, Industrial process control.

EEE 2222 Ind. Instrumentation & Control Lab. (0 - 3)
Credit 1.50

Experiments based on EEE 2221.

PGDTE Programme

EEE 5100 Special Studies (0 - 4) Credit 2.00

The students are required to undertake a major project in the field of electrical & electronic engineering in their respective specialization. The objective is to provide an opportunity to the students to develop initiative, creative ability, confidence and engineering judgement. The results of the work should be submitted in the form of a report which should include approximate drawings, charts, tables, references etc.

EEE 5101 Analysis and Synthesis of Circuits (3 - 0) Credit 3.00

Introductory network concepts. Definitions and symbols. Sign convention. Terminals and ports. Network functions. Complex frequency, driving point and transfer functions. Representation by poles and zeros. Properties of network function. Properties of Immittance function; Positive real function. Hurwitz Polynomials, Natural frequencies of network; Parts of a network function. (Magnitude and phase plots, Bode and Nyquist diagrams). Minimum phase transfer function. Calculation of a network function from prescribed real part. Imaginary part. Magnitude or phases. Synthesis of two element; Kind-one port LC, RC and RL one port network.

Two port networks. Classification and characterization of two ports. Two port parameters and natural frequencies. Interconnections of two ports. Common two port configuration. Scattering parameters. One end parameter; Iterative and Image Parameters. Filters; Type of filters. Frequency and impedance scaling. Image parameter. Filters; Design frequency transformation. Butterworth and Schebychev response. Insertion loss. Methods of net-work analysis. Block diagrams. Signals flow graphs, State variable techniques. Lattice networks. Bartletts bisection theorem. Synthesis of Lattice network. Unbalancing of Lattice networks transmission characteristic. Signal distortions. Relationship between bandwidth and rise time, and between delay time and net-functions.

EEE 5103 Electric & Magnetic Properties of Materials (3 - 0) Credit 3.00

Atoms and aggregates of atoms; Crystals, waves in crystals; Schro-dinger wave equation, Quantum statics; Conductivity theory; Collision theory and conductivity of metals; Conductors; Carrier transport theory, P.N. Junction photo cells; Solar cells; Tunneling principles, Dielectric; polar and non-polar dielectrics; Langevin function, Clausius- Mossotti Equation, Ferro-electricity.
Magnetic properties of materials; Magnetic moment; Domain wall motion and coercive force in crystals; Polycrystalline and permanent magnetic materials; Magnetic resonance; Testing of magnetic materials; Super conductivity. Quantum electronics.

EEE 5200 Special Studies (0 - 4) Credit 2.00

The students are required to undertake a major project in the field of electrical & electronic engineering in their respective specialization. The objective is to provide an opportunity to the students to develop initiative, creative ability, confidence and engineering judgement. The results of the work should be submitted in the form of a report which should include approximate drawings, charts, tables, references etc.

EEE 5201 High Voltage Engineering (3 - 0) Credit 3.00

High voltage supplies: A.C.: Cascaded Transformers. Tesla Coils; D.C: Valve Rectifier Circuit, Cascaded Rectifiers. Electrostatic Generators:
Vande-Graff generators. Corona; Power loss calculations. Breakdown of solid, liquid and gaseous dielectrics. Insulation tests. Standard specification.
Impulse generators. Impulse wave shapes. Mathematical analysis and design consideration of impulse generators. Triggering of Impulse generators; Measurement of high

voltages. Transmission Line design based on direct strokes, Insulation Coordination. Lightning arresters and protector tubes.

EEE 5203 Power System Stability (3 - 0) Credit 3.00

The stability problem of power system. Distinction between steady state and transient stability. The Swing equation and its solution. Solution of networks for stability studies. Transient stability limits criteria. Two machine and multimachine problems. Stability under different types of faults. Typical stability studies and methods of improving stability. The influence of swinging and out-of step operation upon protective relays. Rapid reclosing for improving stability.

EEE 5205 Advanced Electronics (3 - 0) Credit 3.00

Designing Linear and nonlinear electronic circuits with operational amplifiers, Survey of available op-amps, Amplifications and limitations. Applications in Communication and instrumentation. Application of digital ICs in Communication circuits. Survey of logic families (TTL, ECL, CMOS, etc.) and their suitability for different applications. Design of Active filters, digital filters.

EEE 5207 Microwave Engineering (3 - 0) Credit 3.00

H.F. Transmission lines; Smith chart: Impedance matching and applications. E.M. Wave propagation. Reflection and refraction. Wave guides: Parallel plane, rectangular, coaxial wave guides.

Transit time effects; Velocity modulation; Space charge wave; Microwave tubes; Klystron, Magnetron, Travelling Wave Tube Amplifier. Wave guide components. Cavity resonators. Antennas and radiation. Hertzian dipole. Long antenna analysis Radiation patterns, Rhombic and slot antenna. Antenna arrays. Introduction to antenna array design.

M Sc TE Programme

EEE 6101 Engineering Analysis (3 - 0) Credit 3.00

Professional methods of dealing with problems in Electrical and Electronic Engineering. Mathematical and Physical principles applied to problems of diverse topics. Linear spaces, N-dimensional and infinite dimensional vector spaces. Spectral Theory of Linear operators and their applications, Grem's function and function concept and solution of engineering problems, variational methods. Simulation and optimisation techniques. Statistical methods with application in electrical and electronic engineering.

EEE 6103 Energy Conversion (3 - 0) Credit 3.00

Energy Conversion Processes: General introduction, energy sources, renewal and non-renewal energy sources, principle of conservation of energy, energy balance equations; Total energy concept. Direct Electrical Energy Conversion: Introduction; Magneto-hydrodynamic (MHD); Fuel Cell; Thermo-electric, Ferro-electric electrostatic and Piezoelectric energy conversions; characteristics including efficiency, power densities, terminal properties and limitations.
Solar energy, Bulk power generation; Photo – electric and photo – voltaic, Solar Cell, Construction, characteristics including efficiency, applications and limitations. Electromechanical energy conversion: General introduction of Electrical to Mechanical, Mechanical to Electrical, Electrical and Electrical convention; Bulk energy conversion devices; General formulations of equations; Coordinate transformation and terminal characteristics.

EEE 6201 Advanced Machine Design (3 - 0) Credit 3.00

General Treatment of Electrical Machine Design. Review of standard procedures in design of D.C. Machines, A.C. Machines, transformers and special machines, Optimisation and synthesis of design procedures. Application 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 non-linear ranges; Magnetic flux-plots and heat transfer process, etc. Mechanical Design of Electrical Machinery and relation between Mechanical and Electric Machine Design.

EEE 6203 Generalised Machine Theory (3 - 0) Credit 3.00

Introduction to generalised machine theory. Kron's Primitive machine; Moving to fixed-axis transformation; Parke's transformation; Three-phase to d-q transformation; Variable co-efficient transformation, other transformation; Matrix and tensor analysis of machine, Three-phase synchronous and induction machine; Two-phase servo motors; Single-phase induction motor. Smooth-motor two phase double excited machine; Smooth-airgap two-phase synchronous machine. Two-phase induction machine. The n-m winding symmetrical machine; diagonalisation by a change of variable; Symmetrical three phase machine and special limiting cases.

EEE 6205 Optimisation of Power System Operation (3 - 0) Credit 3.00

General principles of optimisation, its application to power system planning, design and operation. Probability analysis for bulk power security and outage data. Economic operation of power system-economic operation of thermal plants, combined thermal and hydro-electric plants. Theory of economic operation of inter connected areas. Development and application of transmission loss formulae for economic operation of power systems. Methods of optimum scheduling and despatch of generation.

EEE 6207 Computer Aided Power System Design
(3 - 0) Credit 3.00

General review of network and matrix theories. Algorithms for formation of network matrices. Three- phase networks flux-linkage calculations, line parameter calculations, short-circuit calculations, load flow studies, system stability studies, prediction of reliability, over voltages and relay coordinations.

EEE 6209 Transients in Power Systems (3 - 0) Credit 3.00

Transients in simple electric and magnetically linked circuits; Fundamentals. Impacts of Switching on rotating machinery. Parallel operation of interconnected networks;
Distribution of Power impacts. Interaction of Governor's in power systems. Overvoltages during power system faults. Systems voltage recovery characteristic. Effect of arc restriking on recovery voltage. Switching surges and overvoltage arrester requirements. Overvoltages caused by sudden loss of load and by open conductor.

EEE 6211 Modern Control Theory (3 - 0) Credit 3.00

General Introduction; State space concept: System design by State – Transition method concept of controllability and observability. Optimal control- variational calculus method; Principle of maximum and dynamic programming. Stochastic and adaptive control processor, On line computer control.

EEE 6213 Applied EM Theory (3 - 0) Credit 3.00

Generalized approached to field theory: Introduction to reaction concept; Wave propagation through isotropic, anisotropic and gyrotropic media. Scattering of EM waves. Microwave antennas-theory and design. Advance topics in EM Theory.

EEE 6215 Microwave Theory and Tech. (3 - 0) Credit 3.00

Microwave oscillators and amplifiers: Principles of generation of millimeter and sub-millimeter waves; Detailed analysis of Klystrons, Magnetrons and TWT amplifiers and backward wave oscillators. Harmonic generators, Guun-effect devices. Microwave Circuits: Microwave network analysis and synthesis. Matrix representation and scattering matrix. Analysis of waveguide discontinuation obstacles, junctions and cavities and strip lines. Methods of microwave precision measurements.

EEE 6217 Statistical Theory of Communication
(3 - 0) Credit 3.00

Periodic and random signals. Stationary random processes. Elements of probability theory. Statistical Characteristics of messages and noise, Autocorrelation: Cross-correlation and spectral analysis. Determination of correlation functions and separation of signals from noise.
Application of correlation techniques. Optimum filter, prodictor, etc. Synthesis of optimum linear systems.

EEE 6219 Telephone Traffic Theory (3 - 0) Credit 3.00

Introduction; Types of switching systems; Nature of telecommunication traffic; Full availability; Limited availability and link system; Lost call cleared theory; Lost call held theory; non-blocking networks; Characteristics of telecommunication network planning; Traffic measurement, Traffic prediction; Traffic simulation.

EEE 6221 Digital Computer & Microprocessor Theory & Design (3 - 0) Credit 3.00

Detailed study of the computer hardware and design of a small digital computer. Using feerite-core memory.

EEE 6225 Laser Theory & Optical Communication
(3 - 0) Credit 3.00

Quantum Electronics applied to electronic energy level transitions. Classical radiation and absorption by electronics. Narrow band spectra of solids. Principles of Gaseous and solid-

state Laser devices. Laser rate equations. Theory of Fibre optics. Optical Communications.

EEE 6227 Solid State Devices (3 - 0) Credit 3.00

Solid State Diodes and Triodes; Solid state microwave devices, Integrated electronic circuits.