Department of Electronic & Telecommunication Engineering
International Islamic University Chittagong
Faculty of Science and Engineering

1. The Mission, Vision, Objectives and Motto of IIUC:

1.1 Introduction: International Islamic University Chittagong (IIUC) is one of the top graded government approved private universities in Bangladesh. Having fulfilled the requirements as laid down in the Private University Act of 1992, and after obtaining the necessary clearance from University Grants Commission (UGC), and the permission of Government of Bangladesh (GOB) through the Ministry of Education, **International Islamic University Chittagong (IIUC)** started functioning on **February 11, 1995**. The credit for the idea of establishing this University goes to International Islamic University Chittagong Trust (IIUCT). IIUC framed its own Statutes, Ordinances and Regulations governing the manifold activities of IIUC - academic, administrative, financial, student welfare, discipline etc. as per the **Private University Act, 1992, 1998 and revised Act, 2010.** Most statutory bodies formed under the provisions of the Act have since then been functioning.

1.2 The Mission of the University is to produce through the pursuit of education properly trained up manpower to contribute to socio-economic development and moral upliftment of the society and to cultivate in our student's expertise as well as ethical sensitivity, intelligence and an ability to think independently beyond their areas of study, so that they can sustain justice in all walks of life.

1.3 The Vision of the University is to offer nationally competitive and internationally recognized opportunities for learning to make this University as the Centre of Excellence in different areas of scholarship, like Shari'ah and Islamic Studies, Business Studies, Social Science, Science & Engineering, Arts & Humanities, Law, and such other faculties that will be introduced in future. Its door is open to the admission seekers from all over the world, regardless of race, region and religion. This university cherishes the dream of becoming one of the highest seats of learning and creator of knowledge in the South East Asia.

1.4 The Objective of the University:

a. To create a new generation of competent youths, who will be equipped with academic excellence, professional expertise and adorned with moral height.

b. To follow a policy of continued Modernization of Knowledge and academic curricula in different disciplines of education so that its students can imbibe the true spirit of religious value as an effective guiding principle in their profession and daily life.

1.5 The Motto of the University is to "**Combine Quality with Morality".**

2. Teaching Methods and Policy:

2.1 Methods: Outcome–based education (OBE) and Bi- Semester system of Continuous Quality Improvement (CQI) through self-examination and external review. In this process students are evaluated throughout a course of study rather than exclusively by examination at the end. It is multidimensional based on student's (a) attendance in the Classes; (b) performance in Assignments and Class Tests, (c) Scores in the Mid-Term and the Final Examination (d) Lab. Reports, (e) Thesis/ Project/ internship, (f) Presentations (g) Viva-voce, (f) Industry visits (g) Co-Curricular and Extra-curricular activities.

2.2 Policy: The University is committed to the life-long success of students in its undergraduate and master's programs through high-quality instruction and learning experiences. IIUC has **Integrated Education** Policy, where a student achieves holistic learning through awareness of his surroundings and other relevant knowledge bases. IIUC emphasizes the diffusion of scientific, technical and professional knowledge on the one hand, & building up of character in youth by making religion and ethics an integral part of education on the other. In this regard, there are some courses for the students of all Faculties at IIUC, which are not a part of the main curriculum of the Departments, but those are named as **University Requirement Courses (URC).**

2.3 Morality Development Program: IIUC incorporates studies on the values of mutual respect & peaceful co-existence in the courses under the "**Morality Development Program (MDP)**" which includes all students of the university irrespective of caste, creed or religion.

2.4 Co-Curricular and Extra-curricular activities: **IIUC** supports student participation in a broad array of *Co-Curricular and Extra-curricular activities* as an integral component of its commitment to student life and success. These programs mainly include leadership training, cultural, environmental, recreational and social activities, debating & public speaking programs, intellectual discussions, games & sports, excursion and study tours home & abroad to complement academic pursuits. By these programs' students earn capacity to express out themselves properly, maintain personality and learn to respect people of other faiths through mutual understandings among various regions, religions, beliefs and cultures. All *Co and Extra-curricular* activities are run by the clubs named after the Departments such as Computer club, Business club etc. under the close supervision and monitoring of Students Affairs Division (STAD).

2.5 Student Advisor: IIUC provides academic counseling, career and student welfare counseling by the **Student Advisor** of the respective section of students of each **Semester**.

3. The Mission, Vision and Objectives of Faculty of Science and Engineering (FSE)

3.1 MISSION:

The mission of the Faculty of Science and Engineering is to foster excellence in teaching, research, and learning within a systems approach to science and engineering education. Our goal is to produce engineering graduates with both a strong base of technical knowledge and the complementary skills needed to be successful professional engineers in the modern world.

3.2 VISION:

The vision of the Faculty of Science and Engineering is to be a dynamic centre of innovation and creativity dedicated to teaching, learning, professionalism, research, entrepreneurship, and partnership with local and global communities. The aims of the Faculty are to provide international standard quality programs of undergraduate and graduate education; to be a research active unit advancing the knowledge of science and engineering; and to serve the community and industry as an agent of technological, and educational innovation and advancement.

3.3 OBJECTIVES:

The Faculty plans to achieve this vision and mission through the pursuit of the following specific objectives:

1. To provide high quality degree programs of international standards at undergraduate and graduate level.
2. To build programs to meet evolving student, industry, and community needs.
3. To advance research and scholarship by promotion of excellence in education and professionalism.
4. To build the physical infrastructure and human resource capacity to ensure our students are gaining the skills, experience and ethical values needed to work as professional engineers.
5. To foster collaboration with academic institutions and professional bodies in the region and beyond so as to extend our impact to the country, region and whole world.

4. The Mission, Vision and Objectives of Electronic & Telecommunication Engineering (ETE) Department:

4.1 MISSION:

The Mission of the department is to produce, through the pursuit of education, properly trained up and ethically sound manpower in the field of Electronic and Telecommunication Engineering to contribute to the socio-economic development and moral upliftment of the society and to cultivate in our student's an ability to think independently beyond their areas of study, so that they can sustain justice in all walks of life.

Mission Statements:

M1: Properly Trained up Manpower.

M2: Contribute to Socio-economic Development.

M3: Ethically Sound.

M4: Ability to Think Independently.

M5: Sustain Justice in all Walks of Life.

4.2 VISION:

To produce globally competitive and socially sensitized Engineering graduates and to establish the department as a center of excellence by bringing out the professional competence in the core areas of Electronic and Telecommunication Engineering also becoming one of the best departments in the South East Asia.

5. Program Educational Objectives (PEOs):

The Program Educational Objectives for Electronic& Telecommunication are as follows:

PEO 1: Graduates will successfully engage in careers in Electronic and Telecommunication Engineering related fields appropriate to their background, interest, and skills.

PEO 2: Exploit the habit of teamwork using leadership qualities with clarity of communication to achieve social and economic objectives of related projects in the professional field.

PEO 3: Exhibit ethical attributes and proper responsibility to society and the environment in personal and professional conduct.

PEO 4: Involve in lifelong self-learning, career enhancement, and adapt to changing multidisciplinary professional and social needs.

5.1 Mapping Between PEOs and Departments Mission Statements:

Program Educational Objectives (PEOs) and their alignment with the departmental mission are presented in the following table:

Table 5.1: Mapping of PEO Statements with Mission Statements of the Institution

PEO No.	PEO statement	Institutional/departmental mission statements				
		Mission Statement - 1	Mission Statement- 2	Mission Statement - 3	Mission Statement - 4	Mission statement - 5
1.	Graduates will successfully engage in careers in Electronic and Telecommunication Engineering related fields appropriate to their background, interest, and skills.	Properly Trained up Manpower				
2.	Exploit the habit of teamwork using leadership qualities with clarity of communication to achieve social and economic objectives of related projects in the professional field.		Contribute to Socio-economic Development		Ability to Think Independently	
3.	Exhibit ethical attributes and proper responsibility to society and the environment in personal and professional conducts			Ethically Sound		Sustain Justice in all Walks of Life
4.	Involve in lifelong self-learning, career enhancement and adapt to changing multidisciplinary professional and social needs		Contribute to Socio-economic Development		Ability to Think Independently	

5.2 Relationship between the POs and PEOs

For the first round of PO establishment, The POs of B. Sc in the ETE program is adapted from the Program Outcomes defined in BAETE Accreditation Manual for Undergraduate Engineering program published in April-2017 as they are in complete harmony with PEOs of the program of B.Sc. in ETE. Graduates of the B.Sc. in

Electronic and Telecommunication Engineering (ETE) program are expected to achieve the following Program Outcomes (POs) by the time of graduation, as shown in Table 5.2.

Table 5.2: List of Program Outcomes (POs) that will be attained by the ETE graduates

PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences, and the engineering sciences (Fundamentals and Specialization).
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal, and environmental concerns.
PO4	**Investigation:** Conduct investigations of complex problems, considering the design of experiments, analysis, and interpretation of data and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and advanced engineering and IT tools, including prediction and modeling to complex engineering problems with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply to reason informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and the norms of the engineering practice.
PO9	**Individual Work and Teamwork:** Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.
PO10	**Communication:** Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work as a member or a leader of a team to manage projects in multidisciplinary environments.
PO12	**Life-Long Learning:** Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

5.3 Mapping Between POs and PEOs:

Table 5.3: Mapping Between POs and PEOs

No.	PO Statements	PEO 1	PEO 2	PEO 3	PEO 4
1	Engineering Knowledge	√			√
2	Problem Analysis	√			√
3	Design/development of Solutions	√			√
4	Conduct Investigations of Complex Problems	√			√
5	Modern Tool Usage				√
6	The Engineer and Society		√	√	
7	Environment and Sustainability			√	
8	Ethics			√	
9	Individual and Teamwork		√		
10	Communication		√		
11	Project Management and Finance		√		
12	Life-long Learning				√

6. Relationship between Course Outcomes (COs) and Program Outcomes (POs) Mapping:

Table 6.1: CO and PO Mapping for Courses in B.Sc. in ETE

SL. No	Course No. & Title	COs	Program Outcomes (POs)											
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1.	MATH-1107 Mathematics-I (Differential and Integral Calculus)	CO1	√											
		CO2		√										
2.	PHY-1101 Physics I	CO1	√											
		CO2		√										
3.	EEE-1121 Electrical Circuits – I DC	CO1	√											
		CO2		√										
4.	EEE-1122 Electrical Circuits – I DC Sessional	CO1	√											
		CO2		√										
		CO3					√							
		CO4									√			
5.	CE-1108 Engineering Drawing	CO1	√											
		CO2			√									
		CO3		√										
		CO4				√								
6.	MATH-1207 Mathematics-II (Geometry and Differential Equations)	CO1	√											
		CO2		√										
7.	PHY-1201 Physics II	CO1	√											
		CO2		√										
8.	PHY-1202 Physics II Sessional	CO1	√											
		CO2				√								
9.	CHEM-2341 Chemistry	CO1	√											
		CO2							√					
		CO3	√											
10.	CHEM-2342 Chemistry Sessional	CO1	√											
		CO2				√								
11.	CSE-1221 Computer Programming	CO1	√											
		CO2	√											
		CO3		√										
		CO4		√										
12.	CSE-1222 Computer Programming Sessional	CO1	√											
		CO2		√										
		CO3		√										
13.	EEE-1243 Electrical Circuits – II AC	CO1	√											
		CO2		√										
		CO3	√											
14.	EEE-1244 Electrical Circuits – II AC Sessional	CO1	√											
		CO2		√										
		CO3									√			
15.	ETE-1245 Electronic Devices	CO1	√											
		CO2		√										
16.	ETE-1246 Electronic Devices Sessional	CO1	√											
		CO2				√								
17.	ETE-2341 Analog Electronics	CO1	√											
		CO2		√										
18.	ETE-2342 Analog Electronics Sessional	CO1	√											
		CO2				√								
19.	ETE-2343 Digital Electronics and Logic Design	CO1	√											
		CO2		√										

20.	ETE-2344 Digital Electronics and Logic Design Sessional	CO1				√								
		CO2									√			
21.	ETE – 2325 Signals and Linear Systems	CO1	√											
		CO2		√										
22.	MATH-2307 Matrices, Linear System of Equations and Vector Analysis	CO1	√											
		CO2		√										
23.	ETE-2441 Analog Communication	CO1	√											
		CO2		√										
		CO3		√										
		CO4		√										
		CO5												√
24.	ETE-2442 Analog Communication Sessional	CO1	√											
		CO2		√										
		CO3				√								
		CO4					√							
		CO5									√			
25.	ETE-2407 Electromagnetic Fields and Waves	CO1	√											
		CO2		√										
		CO3		√										
26.	ETE-2445 Electrical Machines & Industrial Electronics	CO1	√											
		CO2		√										
		CO3	√	√										
27.	ETE-2446 Electrical Machines & Industrial Electronics Sessional	CO1	√											
		CO2		√										
		CO3				√	√							
		CO4			√									
		CO5									√			
28.	ETE-2443 Data Structure and Algorithm	CO1	√											
		CO2		√										
		CO3		√										
29.	ETE-2444 Data Structure and Algorithm Sessional	CO1	√											
		CO2	√											
30.	ETE-2427 Numerical Analysis	CO1	√											
		CO2		√										
31.	STAT-2441 Probability and Statistics	CO1	√											
		CO2		√										
32.	MATH-2407 Complex Variable, Higher Trigonometry and Random Process	CO1	√											
		CO2		√										
33.	ETE-3543 Microprocessor & Peripherals	CO1	√											
		CO2		√										
34.	ETE-3544 Microprocessor & Peripherals Sessional	CO1	√											
35.	ETE-3505 Information Theory & Coding	CO1	√											
		CO2		√										
36.	ETE-3545 Object-oriented Programming with Java	CO1	√											
		CO2		√										
		CO3		√										
37.	ETE-3546 Object-oriented Programming with Java Sessional	CO1	√											
		CO2		√										

38.	ETE-3529 Telecommunication Switching & Networks	CO1	√										
		CO2		√									
		CO3			√								
		CO4	√										
		CO5		√									
		CO6											√
39.	ETE-3522 Design of Electronic Systems	CO1	√										
		CO2		√									
		CO3										√	
		CO4				√	√						
		CO5						√	√				
		CO6			√								
		CO7										√	
		CO8									√		
40.	ETE-3641 Digital Communications	CO1	√										
		CO2	√										
		CO3											√
41.	ETE-3642 Digital Communications Sessional	CO1					√						
		CO2									√		
42.	ETE-3643 Mobile and Wireless Communications	CO1	√										
		CO2		√									
43.	ETE-3644 Mobile and Wireless Communications Sessional	CO1	√										
		CO2		√									
44.	ETE -3645 Electronic Measurement & Instrumentation	CO1	√										
		CO2	√										
45.	ETE -3646 Electronic Measurement & Instrumentation sessional	CO1	√										
		CO2					√						
		CO3			√	√							
		CO4									√	√	
46.	ETE-3649 Antenna & Propagation	CO1		√									
		CO2			√								
		CO3	√										
		CO4							√				
47.	ETE-3650 Antenna & Propagation Sessional	CO1					√						
		CO2			√								
		CO3							√				
		CO4									√		
		CO5					√						
48.	ETE-4741 Microwave Engineering	CO1	√										
		CO2		√									
		CO3				√							
		CO4					√						
		CO5									√		
		CO6										√	
49.	ETE-4742 Microwave Engineering Sessional	CO1	√										
		CO2		√									
		CO3				√							
		CO4					√						
		CO5									√		
		CO6										√	
50.	ETE-4743 Digital Signal Processing	CO1	√										
		CO2											√
51.	ETE-4744 Digital Signal Processing Sessional	CO1	√										
		CO2		√									
		CO3				√							

		CO4					√							
		CO5									√			
		CO6										√		
52.	ETE-4745 Satellite Communications	CO1	√											
		CO2		√										
53.	ETE-4749 Computer Networks	CO1	√											
		CO2		√										
54.	ETE-4750 Computer Networks Sessional	CO1	√											
		CO2		√										
		CO3			√									
		CO4		√										
55.	ETE-4715 Research Methodology	CO1	√											
		CO2		√										
		CO3												√
		CO4								√				
56.	ETE-4800 Project/ Thesis	CO1	√											
		CO2			√									
		CO3		√										
		CO4					√							
		CO5			√									
		CO6				√								
57.	ETE-4843 Optical Fiber Communications	CO1	√											
		CO2												√
58.	ETE-4844 Optical Fiber Communications Sessional	CO1	√											
		CO2		√										
		CO3				√								
		CO4					√							
		CO5										√		
59.	ETE-4841 Energy Conversion	CO1	√											
60.	ETE-4804 Industrial Tour /Training	CO1	√											
		CO2	√											
		CO3	√											√
61.	ETE-4822 General Viva	CO1	√											
62.	ETE-4755 Multimedia Communications													
63.	ETE-4756 Multimedia Communications Sessional													
64.	ETE-4757 Database Management Systems													
65.	ETE-4758 Database Management Systems Sessional													
66.	ETE-4759 Network Programming													
67.	ETE-4760 Network Programming Sessional													
68.	ETE-4751 Digital Image Processing	CO1	√											
		CO2		√										
69.	ETE-4752	CO1	√											

	Digital Image Processing Sessional	CO2		√										
		CO3			√									
		CO4				√								
		CO5					√							
		CO6									√			
70.	ETE-4753 Embedded System Design													
71.	ETE-4754 Embedded System Design Sessional	CO1	√											
		CO2		√										
		CO3				√								
		CO4			√									
		CO5					√							
		CO6									√			
72.	ETE-4845 Bio-medical Electronics	CO1						√						
		CO2	√											
		CO3		√										
		CO4	√											
73.	ETE-4846 Biomedical Electronics Sessional	CO1	√											
		CO2									√			
		CO3					√							
74.	ETE-4847 VLSI system Design & Modeling	CO1												
		CO2												
		CO3												
75.	ETE-4848 VLSI system Design & Modeling Sessional	CO1												
		CO2												
		CO3												
76.	ETE-4849 RF and Microwave Devices	CO1												
		CO2												
		CO3												
77.	ETE-4850 RF and Microwave Devices Sessional	CO1												
		CO2												
		CO3												
78.	ETE-4851 Opto-electronics	CO1												
		CO2												
		CO3												
79.	ETE-4852 Opto-electronics Sessional	CO1												
		CO2												
		CO3												
80.	ETE-4855 Cryptography and Network Security	CO1	√											
		CO2		√										
81.	ETE-4856 Cryptography and Network Security Sessional	CO1	√											
		CO2		√										
		CO3			√									
		CO4				√								
		CO5					√							
		CO6									√			
82.	ETE-4857 Neural Networks and Fuzzy Logic	CO1	√											
		CO2		√										
83.	ETE-4858 Neural Networks and Fuzzy Logic Sessional	CO1	√											
		CO2		√										
		CO3			√									
		CO4				√								
		CO5					√							
		CO6									√			

84.	ETE-4859 Radar and Navigation Aids	CO1												
		CO2												
		CO3												
85.	ETE-4860 Radar and Navigation Aids Sessional	CO1												
		CO2												
		CO3												

7. Attendance

(Ref. Faculty of Science and Engineering Ordinance (FSEO) article no-11):

Table-7.1: Awarding marks for Attendance

Attendance	Awarding marks
90% and above	10
85% to less than 90%	9
80% to less than 85%	8
75% to less than 80%	7
70% to less than 75%	6
65% to less than 70%	5
60% to less than 65%	4
less than 60%	0

In order to be eligible to appear, as a regular candidate, at the semester final examinations, a student shall be required to have attended at least 70%of the total number of periods of lectures/tutorials/laboratory classes offered during the semester in every **course.** A student whose attendance falls short of 70% but not below 60% in any **course** may be allowed to appear at the final examinations **as non-collegiate student**. A student, appearing the examination under the benefit of this provision shall have to pay in addition to the fees, the requisite fee prescribed by the authority for the purpose. Students having **less than 60% attendance** in lecture/tutorial/ laboratory of **any course will be declared dis-collegiate. They will not allow appearing in that course** at the final examinations of the semester. They will get 'F' grade in the semester result.

8. The Grading System:

(Ref. FSEO article 3.1) The Grading System for course assessing the performance of the students shall be as follows:

Table-8.2: Grading System

Numerical grade Marks%	Letter Grade (LG)		Grade Point (GP/unit)	Remarks/Status
80-100	A+	A plus	4.00	Excellent
75 to less than 80	A	A regular	3.75	Very good
70 to less than 75	A-	A minus	3.50	
65 to less than 70	B+	B plus	3.25	Good
60 to less than 65	B	B regular	3.00	
55 to less than 60	B-	B minus	2.75	Satisfactory
50 to less than 55	C+	C plus	2.50	
45 to less than 50	C	C regular	2.25	Pass
40 to less than 45	D	D	2.00	
less than 40	F	F	0.00	Fail

The performance of a student will be evaluated in terms of semester **grade point average (GPA)** and **cumulative grade point average** (**CGPA**) which is the grade average for all semesters. To have graduation degree a student **must obtain CGPA at least 2.5.**

Grade Point Average (GPA): The Grade Point Average (GPA) is computed by dividing the total grade points earned by the number of credit hours attempted in a given semester. The Cumulative Grade Point Average CGPA) is computed by dividing the total grade points earned by the total number of credit hours attempted at the University up to a particular semester.

9. Earned Credit

(Ref. FSEO article 3.6)**:** The courses in which a student has obtained minimum 'D' in 'Theoretical courses', Laboratory courses & General Viva-voce' or higher grade will be counted as credits earned by the student. Any course in which a student has obtained 'F' grade will not be counted towards his/her earned credit. 'F' grade will not be counted for GPA calculation but will stay permanently on the Grade sheet and transcripts.

10. Distribution of Courses

(**Ref. FSEO article 6)**: The study program for the B. Sc. Engg. (ETE) shall carry a total of 161 credit hours. Distribution of courses is shown in Table-3.

Table-10.1: Distribution of Courses

Course type	Credit hours
University Requirement Courses	13
Humanities Courses	8
Basic Sciences with laboratory [Mathematics, Statistics, Physics and Chemistry]	24.5
Electronic and Telecommunications Engineering Courses (Including inter-disciplinary engineering courses) (a) Theoretical 86 CH (b) General Viva-voce 1 CH (c) Laboratory 28.25 CH	115.25
Total	**161**

11. Semester Workload:

Minimum Workload for a regular semester is **12** credit hours or its equivalent and maximum load is up to 28 credit hours. Since IIUC is following the **Open Credit Hour System**, a student may register the expected number of credits with the recommendation of his/ her respective **academic advisor** and the approval of the Head of the Department or the Dean of the Faculty or the Pro-Vice Chancellor as the case may be. But the semester workload must be consistent with the range of GPA. Advisable semester workload for the Faculty of Science and Engineering under Open Credit Hour System (OCHS) based on GPA is given in Table-4 **(**Ref. FSEO article 5.4)

Table-11.1: Advisable Semester Workload

RANGE of GPA	Maximum Load Allowed
3.75 – 4.00	28 Cr.Hrs.
3.50 – 3.74	26 Cr.Hrs.
2.75 – 3.49	24 Cr.Hrs.
2.25 – 2.74	22 Cr.Hrs.
2.00 – 2.24	20 Cr.Hrs.
1.70 – 1.99	15 Cr.Hrs.
Below 1.70 or Repeat Case (Due to very poor performance)	12 Cr.Hrs.

12. Rules for Promotion

(Ref. **FSEO** article -17)**:**

12.1 Criteria for Semester Promotion:

12.1.1 No semester fail status would exist under open credit hour system.

12.1.2 If any student earns **'D' i.e. 40** or above grade for any course, the course should be credited.

12.1.3 The students must complete Pre-requisite Courses and previous incomplete or 'F' or 'W' grade courses before registration of advance courses.

12.1.4 Students who will not clear all prescribed courses of 1st& 2nd Semester within the 4th Semester he/she would not be allowed to get promoted/registered in the 5th Semester and students who will not clear all prescribed courses of 3rd& 4th Semester within the 6th Semester he/she would not be allowed to get promoted/registered in the 7th Semester. Student can go for internship in the 7th / 8th Semester.

12.2 Criteria for Special Examination:

Special Final Examination has been **withdrawn from Spring-2008** for all students of Bachelor programs. If a graduating /last semester/outgoing student has an incomplete course only, he/she can complete the course/s according to the following rules:

12.2.1 If any student could not attend Final Examination in a course only **due to illness, accident 0 scoring of F grade**, he/she can complete the course by attending Special Final Examination. To the approval of Special Final Examination, the incumbent has to apply to the Pro-Vice-Chancellor through the Head of the concerned Department and Controller of Examination within 72 hours of Examination held with necessary documents. After getting approval, the incumbent has to pay the **S**pecial Final Examination fee.

12.2.2 If any course remains unregistered or not repeated due to removal of the courses from syllabus or has not been offered in the last a few semesters, the course may be completed under special arrangement. To get approval of special arrangement/Independent Study, the incumbent has to apply to the Pro-Vice-Chancellor through the Head of the concerned Department and Controller of Examination subject to the availability of course teacher. The application period will be immediate after publication of Semester result. After getting approval, the incumbent has to complete registration by paying **the tuition fee double than that of the normal fees (based on credit hour). There is no scope of special arrangement for the course /s which are offered by the department or center.**

12.3 Criteria for Repeating Courses

12.3.1 For 'F' grade holders the course must be repeated within the next 2 consecutive semesters. Pre-requisite courses should be repeated on priority basis.

12.3.2 The final grade will be computed in the Final Transcript and the previous grade /s will be marked with 'R' grade (as intake course) which has no effect on GPA or CGPA. 'R' is deleted from Final Transcript during graduation

12.4 Criteria for Failing in a Course:

12.4.1 A student, who fails in a course within specific requirements of the Faculty and the curriculum of his/her program, may repeat the same course if the course is classified as "CORE" or "REQUIRED" course.

12.4.2 Or, the fail student may replace the course with another one if it is classified as "SUPPORTIVE" or "ELECTIVE" or "OPTIONAL" as determined by the department or the faculty as the case may be.

12.4.3 Notwithstanding any other provisions of these Regulations, a graduating student who obtains the minimum CGPA **2.50**, but fails in any course, may be allowed to re-sit for that course subject to the examination rules and approval of the authority concerned.

12.5 Criteria for Improvement of Grade:

12.5.1 The range of grade in that particular course should be "B-" (B minus).

12.5.2 That an application must be submitted to the Controller of Examination through the Head of the Department in order to repeat the course for the purpose of improvement at least two weeks prior to the deadline of registration and it has to be approved by the competent authority.

12.5.3 That the opportunity for improvement of grade shall be availed within two consecutive Semesters.

12.5.4 That payment shall be made in full amount for the course/s on credit hour basis.

12.6 Re-Evaluation of Examination Results:

12.6.1 If the awarding grade is in order but the student wants his/her answer script to be reevaluated, then a prescribed Form (available at ACAD) shall have to be filled in and submitted by the student to the University Board of Appeals through the ACAD.

12.6.2 Per Course a fee (as determined by the University Board Examination) must be deposited along with the Form.

12.6.3 **An appeal may be made** on any or all of the following grounds:

- If a student strongly believes that he/she deserves higher marks than he/she got in the course in question.
- If a student reasonably believes that the evaluation has been conducted improperly or a portion of his/her marks has not been counted.

13. Eligibility for Examination:

13.1 No student shall be eligible to take part in any Semester Final Examination unless:

13.1.1 He/she is officially registered in such a course; and

13.1.2 He/she has fulfilled the required percentage of attendance and other requirements.

13.2 B**arring from examination**:

13.2.1 A student may be barred from taking examination if he/she fails to meet any of the above requirements (article 21.1) for eligibility to sit for an Examination. In such a case, the student may be given the chance to appeal for exoneration.

13.2.2 Unless otherwise recognized, any student debarred from any examination shall automatically receive a grade "Y" which is equivalent to an "F" for that course irrespective of course performance

13.2.3 In addition, the scholarship or financial assistance of students who are barred from the Semester Final Examination may be withdrawn or reduced by a certain amount as the University authority decides on case–by-case basis.

13.3 Cheating in Examination:

13.3.1 A student cheating in examination shall be deemed to have committed an offence and will be liable to disciplinary punishment.

13.3.2 Such punishment may be cancellation of the course in question, drop of the current semester, expulsion for an academic year or expulsion from the University, based on the weight and gravity of the offence.

13.3.3 Student receives the expulsion from the university for cheating in examination cannot be readmitted. In addition, the student will be deprived of any financial assistance in the following semester as the university authority decides on case by case basis.

14. Graduation Requirements:

14.1 Pre-Graduate Requirements:

14.1.1 One Semester prior to graduation a student should submit a check list to Controller of Examination duly filled in.

14.1.2 Students intending for graduation should submit an application for graduation to Controller of Examination in the terminal semester in the University.

14.2 Academic Requirements:

14.2.1 Have passed all required and elective course as per program of curriculum.

14.2.2 Be an acceptable academic standing with a CGPA of at least 2.5.

14.2.3 Be free from any negative report from the University authority in general and academic Discipline Committee in particular.

14.2.4 Have fulfilled co-curricular activities.

14.2.5 Have fulfilled other University requirements

14.3 Transcripts:

14.3.1 Results of each semester are normally distributed to every student at the beginning of the following semester. The result is for student's reference only and not to be used for any official purposes. The result produces report including the grades of all courses for that semester, the GPA and CGPA.

14.3.2 **Official Transcripts** is issued before graduation and upon written request of a student who has paid up all fees. Partial transcripts may also be issued in the

same manner to existing students. However, a fee is charged for partial transcript (or testimonial.) of each semester.

14.3.3 **Final Transcript and Provisional Certificat**e may be withdrawn on payment of fee. Besides, **Original certificate** may be issued on payment of fee only. Charges will be applied for the re-issue of duplicate certificate and transcript also.

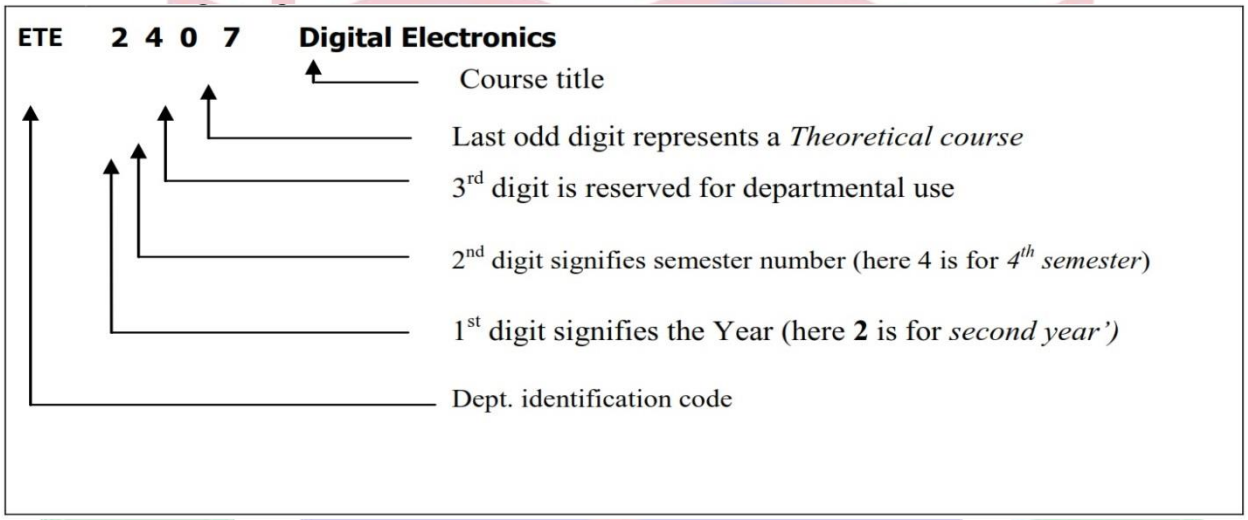
14.4 Release of Student 's Record:

Student's records are considered highly confidential. Therefore, a written consent from the student is needed before releasing information from his personal record to person outside the University. Information may be furnished to a student's parents or sponsor without such written consent. No information concerning a student's grades will be given over telephone.

15. Course Identification Plan:

For course identification, the following code plan has been adapted:

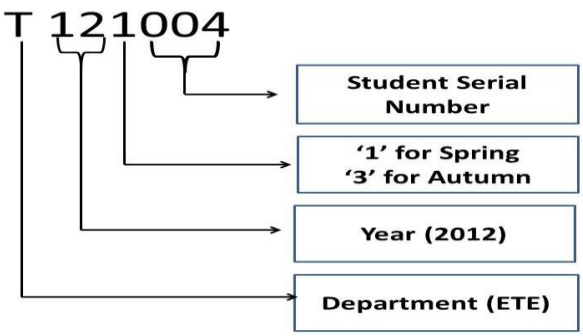
First digit stands for Year, Second digit stands for Semester and Third & Fourth digit stand for the course number (odd number has been assigned to theory course and the even number has been assigned to laboratory course). An example is given below:



16. Student Identification Plan:

For Student identification, the following code plan has been adapted:

First two digit stands for Year, Third digit stands for Semester (Spring or Autumn) and next digits for student serial number. An example is given below:



17. Programs of Study:

The B. Sc. (Engineering) program in the department of Electronic & Telecommunications Engineering consist of 80 courses carrying 161 Credit Hours. There are 9 University Requirement Courses (URC) carrying 9 credit hours, 4 Interdisciplinary Courses carrying 8 credit hours, 61 Core Courses carrying 132 credit hours and 3

Elective Courses carrying 12 credit hours. In the Core Courses there are 33 theory courses carrying 95 credit hours and 28 practical courses carrying 37 credit hours. In the elective courses there are 3-theory course carrying 9 credit hours and 3 practical courses carrying 3 credit hours.

Total 161 credit hours have to be undertaken and completed by a student during 8 semesters. Duration of each semester is 6 months. Each course carries 100 marks. Of the total marks allotted to each course, 10 marks are for class tests/assignments/oral tests, 10 marks for attendance, 30 marks for mid-term examination and 50 marks for the final examination. Out of 100 marks for Laboratory courses, 50 marks is allotted for running assessment and 50 marks is for practical exam, viva, quiz etc. at the end of semester final examination

Marks distribution for projects/thesis and general viva-voce is as follows:

1) Project/Thesis evaluation by Supervisor- 40%

2) Project/Thesis evaluation by Examiner- 30%

3) General Viva-Voce- 30%

Total: 100%

18. Summary of Courses

Types of Courses	No. of Courses	Credit Hours
University Requirement Courses	09	13
Interdisciplinary Courses	04	008
Core Courses (Compulsory)	64(Theory 36 & Sessional 28)	129.75
Core Courses (Elective)	06 (Theory 3 & Sessional 3)	10.25
Total	**83**	**161**

19. Semester wise Summary of Courses

Semester	No. of Courses	Contact Hours/Week			Credit Hours		
		Theory	Sessional	Total	Theory	Sessional	Total
1st	(5+2) = 7	14	4	18	12	2	14
2nd	(6+4) = 10	17	10	27	17	5	22
3rd	(6+3) = 9	17	6	23	16	3	19
4th	(7+3) = 10	17	7	24	17	3.5	20.5
5th	(7+3) = 10	17	7	24	16	3.5	19.5
6th	(7+4) = 11	18	10	28	17	5	22
7th	(8+4) = 12	19	8	27	18	4	22
8th	(5+6) = 11	13	16	29	13	9	22
Total	**(51+29) = 80**	**132**	**68**	**200**	**126**	**35**	**161**

19.A. List of University Requirement Courses

S.L.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Sessional	Theory	Sessional	
1	URTE-1101	Text of Ethics and Morality	2		1		
2	UREL-1106	Advanced English	3		2		
3	URED-1201	Basic Principles of Islam ('Aqidah+ Ibadah')	2		2		
4	URED-2302	Science of Qur'an and Hadith	2		1		

S.L.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Sessional	Theory	Sessional	
	URED-2305	Comparative Religion 3 Credits 3 Contract Hours for Non-Muslim Students (Substitute to **URED-1202 and URED-2302**)					
5	URBL-2401	Function of Bengali Language	2		2		
6	URED-3503	Political Thoughts and Social Behavior	2		1		
7	URED-3604	Life and Teachings of the Prophet Muhammad (SAAS)	2		1		
8	URIH-4701	A Survey of Islamic History and Culture	2		1		
9	URBS-4802	Bangladesh Studies and History of the Independence	2		2		
	Total	**9 Courses**	**19**		**13**		

19.B. List of Interdisciplinary Courses

S.L.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Sessional	Theory	Sessional	
1	ACC-2401	Financial and Managerial Accounting	2		2		
2	ECON-3501	Principles of Economics	2		2		
3	MGT-3601	Industrial Management	2		2		
4	LAW- 4721	Professional Ethics and Environmental Protection Law	2		2		
	Total	**4 Courses**	**8**		**8**		

19.C. Core Courses

SL	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
1.	MATH-1107	Differential and Integral Calculus	3	0	3	0	
2.	PHY-1101	Physics I	3	0	3	0	
3.	EEE-1121	Electrical Circuits – I DC	3	0	3	0	
4.	EEE-1122	Electrical Circuits – I DC Sessional	0	2	0	1	
5.	CE-1108	Engineering Drawing	0	2	0	1	
6.	MATH-1207	Geometry and Differential Equations	3	0	3	0	MATH-1107
7.	PHY-1201	Physics II	3	0	3	0	PHY-1101
8.	PHY-1202	Physics II Sessional	0	3	0	1.5	PHY-1101
9.	CHEM-2341	Chemistry	3	0	3	0	

10.	CHEM-2342	Chemistry Sessional	0	2	0	1	
11.	CSE-1221	Computer Fundamentals & Programming	3	0	3	0	
12.	CSE-1222	Computer Fundamentals & Programming Sessional	0	3	0	1.5	
13.	EEE-1243	Electrical Circuits – II AC	3	0	3	0	EEE-1121
14.	EEE-1244	Electrical Circuits – II AC Sessional	0	2	0	1	EEE-1122
15.	ETE-1245	Basic Electronic	3	0	3	0	EEE-1103
16.	ETE-1246	Basic Electronic Sessional	0	2	0	1	EEE-1104
17.	ETE-2341	Analog Electronics	3	0	3	0	ETE-1245
18.	ETE-2342	Analog Electronics Sessional	0	2	0	1	ETE-1246
19.	ETE-2343	Digital Electronics and Logic Design	3	0	3	0	
20.	ETE-2344	Digital Electronics and Logic Design Sessional	0	2	0	1	
21.	ETE – 2325	Signals and Linear Systems	3	0	3	0	
22.	MATH-2307	Metrics, Linear System of Equations and Vector Analysis	3	0	3	0	MATH-1207
23.	ETE-2441	Analog Communication	3	0	3	0	ETE-2325
24.	ETE-2442	Analog Communication Sessional	0	3	0	1.5	ETE-2325
25.	ETE-2445	Electrical Machines & Industrial Electronics	3	0	3	0	ETE-2341
26.	ETE-2446	Electrical Machines & Industrial Electronics Sessional	0	2	0	1	ETE-2342
27.	ETE-2443	Data Structure and Algorithm	2	0	2	0	ETE-1221
28.	ETE-2444	Data Structure and Algorithm Sessional	0	2	0	1	ETE-1222
29.	ETE-2427	Numerical Analysis	2	0	2	0	MATH-1107
30.	STAT-2441	Probability and Statistics	2	0	2	0	
31.	MATH-3511	Complex Variable, Higher Trigonometry & Random Process	3	0	3	0	MATH-2307
32.	ETE-3507	Electromagnetic Fields and Waves	3	0	3	0	MATH-2411
33.	ETE-3543	Microprocessor& Peripherals	2	0	2	0	ETE-2343
34.	ETE-3544	Microprocessor& Peripherals Sessional	0	2	0	1	ETE-2344

35.	ETE-3505	Information Theory & Coding	3	0	3	0	
36.	ETE-3545	Object-oriented Programming with Java	2	0	2	0	ETE-2443
37.	ETE-3546	Object-oriented Programming with Java Sessional	0	2	0	1	ETE-2444
38.	ETE-3529	Telecommunication Switching & Networks	3	0	3	0	
39.	ETE-3522	Design of Electronic Systems	0	3	0	1.5	ETE-2342
40.	ETE-3641	Digital Communications	3	0	3	0	ETE-2441
41.	ETE-3642	Digital Communications Sessional	0	3	0	1.5	ETE-2442
42.	ETE-3643	Mobile and Wireless Communications	3	0	3	0	ETE-2441
43.	ETE-3644	Mobile and Wireless Communications Sessional	0	3	0	1.5	ETE-2442
44.	ETE -3645	Electronic Measurement & Instrumentation	3	0	3	0	ETE-2341
45.	ETE -3646	Electronic Measurement & Instrumentation sessional	0	2	0	1	ETE-2342
46.	ETE-3649	Antenna & Propagation	3	0	3	0	ETE-2407
47.	ETE-3650	Antenna & Propagation Sessional	0	2	0	1	ETE-2407
48.	ETE-4741	Microwave Engineering	3	0	3	0	ETE-2407
49.	ETE-4742	Microwave Engineering Sessional	0	2	0	1	ETE-2407
50.	ETE-4743	Digital Signal Processing	3	0	3	0	ETE-2325
51.	ETE-4744	Digital Signal Processing Sessional	0	2	0	1	ETE-2325
52.	ETE-4745	Satellite Communications	2	0	2	0	ETE-3641
53.	ETE-4749	Computer Networks	3	0	3	0	
54.	ETE-4750	Computer Networks Sessional	0	2	0	1	
55.	ETE-4715	Research Methodology	1	0	1	0	
56.	ETE-4800	Project/ Thesis	0	8	0	4	110 Credit Hours
57.	ETE-4843	Optical Fiber Communications	3	0	3	0	ETE-1245
58.	ETE-4844	Optical Fiber Communications Sessional	0	2	0	1	ETE-1246
59.	ETE-4841	Energy Conversion	2	0	2	0	PHY-1201
60.	ETE-4804	Industrial Tour /Training	0	1 week	0	1	110 Credit Hours
61.	ETE-4822	General Viva	0	2	0	1	
	Total	**Core Courses 61**	**96**	**62**	**96**	**32**	

19.D. Elective Courses:

List of Elective Courses: 12 Credit Hours

Elective-I (Any one course along with respective Sessional to be taken)

SL. No	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
1.	ETE-4755	Multimedia Communications	3	0	3	0	ETE-2441
2.	ETE-4756	Multimedia Communications Sessional	0	2	0	1	ETE-2442
3.	ETE-4757	Database Management Systems	3	0	3	0	ETE-2443
4.	ETE-4758	Database Management Systems Sessional	0	2	0	1	ETE-2444
5.	ETE-4759	Network Programming	3	0	3	0	ETE-3545
6.	ETE-4760	Network Programming Sessional	0	2	0	1	ETE-3546
7.	ETE-4751	Digital Image Processing	3	0	3	0	CSE-1221
8.	ETE-4752	Digital Image Processing Sessional	0	2	0	1	CSE-1222
9.	ETE-4753	Embedded System Design	3	0	3	0	ETE-3543
10.	ETE-4754	Embedded System Design Sessional	0	2	0	1	ETE-3544

Elective-II (Any two course along with respective Sessional to be taken)

SL. No	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
1.	ETE-4845	Bio-medical Electronics	3	0	3	0	ETE-2341
2.	ETE-4846	Biomedical Electronics Sessional	0	2	0	1	ETE-2342
3.	ETE-4847	VLSI system Design & Modeling	3	0	3	0	ETE-2343
4.	ETE-4848	VLSI system Design & Modeling Sessional	0	2	0	1	ETE-2344
5.	ETE-4849	RF and Microwave Devices	3	0	3	0	ETE-4741
6.	ETE-4850	RF and Microwave Devices Sessional	0	2	0	1	ETE-4742
7.	ETE-4851	Opto-electronics	3	0	3	0	ETE-4843
8.	ETE-4852	Opto-electronics Sessional	0	2	0	1	ETE-4844
9.	ETE-4853	Statistical Signal Processing	3	0	3	0	STAT-2401
10.	ETE-4854	Statistical Signal Processing Sessional	0	2	0	1	ETE-4744
11.	ETE-4855	Cryptography and Network Security	3	0	3	0	ETE-4749

12.	ETE-4856	Cryptography and Network Security Sessional	0	2	0	1	ETE-4750
13.	ETE-4857	Neural Networks and Fuzzy Logic	3	0	3	0	CSE-1221 & ETE-3545
14.	ETE-4858	Neural Networks and Fuzzy Logic Sessional	0	2	0	1	CSE-1222 & ETE-3546
15.	ETE-4859	Radar and Navigation Aids	3	0	3	0	ETE-4745
16.	ETE-4860	Radar and Navigation Aids Sessional	0	2	0	1	ETE-3650

20. Semester wise Course Offerings:

The semester wise course distribution will follow in the following sub sections.

(v-1)

First Semester

SL	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
1.	EEE-1121	Electrical Circuit I DC	3	0	3	0	
2.	EEE-1122	Electrical Circuit I DC Sessional	0	2	0	1	
3.	MATH-1107	Differential and Integral Calculus	3	0	3	0	
4.	PHY-1101	Physics I	3	0	3	0	
5.	UREL–1106	Advanced English	3	0	2	0	
6.	UREM–1101	Text of Ethics and Morality	2	0	1	0	
7.	CE-1108	Engineering Drawing	0	2	0	1	
Sub Total			**14**	**4**	**12**	**2**	
Total credit hour for 1st Semester is-14							

Second Semester

SL	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
8.	CSE-1221	Computer Fundamentals & Programming	3	0	3	0	
9.	CSE-1222	Computer Fundamentals & Programming Sessional	0	3	0	1.5	
10.	EEE-1243	Electrical Circuit II AC	3	0	3	0	EEE-1121
11.	EEE-1244	Electrical Circuit II AC Sessional	0	2	0	1	EEE-1122
12.	ETE-1245	Basic Electronic	3	0	3	0	EEE-1121
13.	ETE-1246	Basic Electronic Sessional	0	2	0	1	EEE-1122
14.	PHY-1201	Physics-II	3	0	3	0	PHY-1101
15.	PHY-1202	Physics-II Sessional	0	3	0	1.5	PHY-1101
16.	MATH-1207	Geometry and Differential Equations	3	0	3	0	MATH-1107
17.	URED – 1201	Basic Principles of Islam ('Aqidah+ 'Ibadah')	2	0	2	0	URE– 1101
Sub Total			**17**	**10**	**17**	**5**	
Total credit hour for 2nd Semester is-22							

Third Semester

SL	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
18.	ETE-2341	Analog Electronics	3	0	3	0	ETE-1245
19.	ETE-2342	Analog Electronics Sessional	0	2	0	1	ETE-1246
20.	ETE-2343	Digital Electronics & Logic Design	3	0	3	0	
21.	ETE-2344	Digital Electronics & Logic Design Sessional	0	2	0	1	
22.	ETE-2325	Signal & Systems	3	0	3	0	
23.	CHEM-2341	Chemistry	3	0	3	0	
24.	CHEM-2342	Chemistry Sessional	0	2	0	1	
25.	URED-2302	Science of Qur'an and Hadith	2	0	1	0	
	URED-2305	Comparative Religion 3 Credits 3 Contract Hours for **Non-Muslim Students** (Substitute to **URED-1202 and URED-2302**)					
26.	MATH-2307	Metrics, Linear System of Equations and Vector Analysis	3	0	3	0	MATH-1207
Sub Total			**17**	**6**	**16**	**3**	
Total credit hour for 3rd Semester is-19							

Fourth Semester

SL	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
27.	ETE-2441	Analog Communication	3	0	3	0	ETE-2325
28.	ETE-2442	Analog Communication Sessional	0	3	0	1.5	ETE-2325
29.	ETE-2445	Electrical Machines & Industrial Electronics	3	0	3	0	ETE-2341
30.	ETE-2446	Electrical Machines & Industrial Electronics Sessional	0	2	0	1	ETE-2342
31.	ETE-2443	Data Structure and Algorithm	2	0	2	0	CSE-1221
32.	ETE-2444	Data Structure and Algorithm Sessional	0	2	0	1	CSE-1222
33.	ETE-2427	Numerical Analysis	2	0	2	0	MATH-1107
34.	MATH-2407	Complex Variable, Higher Trigonometry & Random Process	3	0	3	0	MATH-2307

35.	STAT-2441	Probability and Statistics	2	0	2	0	
36.	URBL-2401	Function of Bengali Language	2	0	2	0	
Sub Total			**17**	**7**	**17**	**3.5**	
Total credit hour for 4th Semester is -20.5							

Fifth Semester

SL	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
37.	ETE-3543	Microprocessor & Peripherals	2	0	2	0	ETE-2343
38.	ETE-3544	Microprocessor & Peripherals Sessional	0	2	0	1	ETE-2344
39.	ETE-3545	Object-oriented Programming with Java	2	0	2	0	ETE-2443
40.	ETE-3546	Object-oriented Programming with Java Sessional	0	2	0	1	ETE-2444
41.	ETE-3505	Information Theory & Coding	3	0	3	0	
42.	ETE-3522	Design of Electronic Systems	0	3	0	1.5	ETE-2342
43.	ETE-3529	Telecommunication Switching & Networks	3	0	3	0	
44.	ETE-3507	Electromagnetic Fields & Waves	3	0	3	0	MATH-2307
45.	ACC-2401	Financial and Managerial Accounting	2	0	2	0	
46.	URED-3503	Political Thoughts and Social Behavior	2	0	1	0	
Sub Total			**17**	**7**	**16**	**3.5**	
Total credit hour for 5th Semester is-19.5							

Sixth Semester

SL	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
47.	ECON-3501	Principle of Economics	2	0	2	0	ACC – 2401
48.	ETE-3641	Digital Communications	3	0	3	0	ETE-2441
49.	ETE-3642	Digital Communications Sessional	0	3	0	1.5	ETE-2442
50.	ETE-3643	Mobile and Wireless Communications	3	0	3	0	ETE-2441
51.	ETE-3644	Mobile and Wireless Communications Sessional	0	3	0	1.5	ETE-2442

52.	ETE -3645	Electronic Measurement & Instrumentation	3	0	3	0	ETE-2341
53.	ETE -3646	Electronic Measurement & Instrumentation sessional	0	2	0	1	ETE-2342
54.	ETE-3649	Antenna & Propagation	3	0	3	0	ETE-2407
55.	ETE-3650	Antenna & Propagation Sessional	0	2	0	1	ETE-2407
56.	MGT-3601	Industrial Management	2	0	2	0	ECON-3501
57.	URED-3604	Life and Teachings of the Prophet Muhammad (SAAS)	2	0	1	0	
Sub Total			**18**	**10**	**17**	**5**	
Total credit hour for 6th Semester is–22							

Seventh Semester

SL	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
58.	ETE-4741	Microwave Engineering	3	0	3	0	ETE-2407
59.	ETE-4742	Microwave Engineering Sessional	0	2	0	1	ETE-2407
60.	ETE-4743	Digital Signal Processing	3	0	3	0	ETE-2325
61.	ETE-4744	Digital Signal Processing Sessional	0	2	0	1	ETE-2325
62.	ETE-4745	Satellite Communications	2	0	2	0	ETE-3641
63.	ETE-4749	Computer Networks	3	0	3	0	
64.	ETE-4750	Computer Networks Sessional	0	2	0	1	
65.	ETE-47XX	Elective I	3	0	3	0	
66.	ETE-47XX	Elective I Sessional	0	2	0	1	
67.	LAW-4721	Professional Ethics and Environmental Protection Law	2	0	2	0	
	ETE-4800	Project/Thesis	xx	0	xx	0	
68.	ETE-4715	Research Methodology	1	0	1	0	
69.	URIH-4701	A Survey of Islamic History and Culture	2	0	1	0	URED-3604
Sub Total			**19**	**8**	**18**	**4**	
Total credit hour for 7th Semester is–22							

Eighth Semester

SL	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
70.	ETE-4800	Project/ Thesis	0	8	0	4	110 Credit Hours
71.	ETE-4841	Energy Conversion	2	0	2	0	PHY-1201
72.	ETE-4843	Optical fiber Communications	3	0	3	0	ETE-1245
73.	ETE-4844	Optical fiber Communications Sessional	0	2	0	1	ETE-1246
74.	ETE-4804	Industrial Training	0	1week	0	1	110 Credit Hours
75.	ETE-48XX	Elective II	3	0	3	0	
76.	ETE-48XX	Elective II Sessional	0	2	0	1	
77.	ETE-48XX	Elective II	3	0	3	0	
78.	ETE-48XX	Elective II Sessional	0	2	0	1	
79.	URBS-4802	Bangladesh Studies and History of the Independence	2	0	2	0	
80.	ETE-4822	General Viva	0	2	0	1	
Sub Total			**13**	**16**	**13**	**9**	
Total credit hour for 8th Semester is-22							
Total							
Grand Total		**Theory Course and Sessional**	**200**		**161**		

List of Elective Courses: 12 Credit Hours

Elective-I(Any one course along with respective Sessional to be taken)

SL.	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
1.	ETE-4755	Multimedia Communications	3	0	3	0	ETE-2441
2.	ETE-4756	Multimedia Communications Sessional	0	2	0	1	ETE-2442
3.	ETE-4757	Database Management Systems	3	0	3	0	ETE-2443
4.	ETE-4758	Database Management Systems Sessional	0	2	0	1	ETE-2444
5.	ETE-4759	Network Programming	3	0	3	0	ETE-3545
6.	ETE-4760	Network Programming Sessional	0	2	0	1	ETE-3546
7.	ETE-4751	Digital Image Processing	3	0	3	0	CSE-1221
8.	ETE-4752	Digital Image Processing Sessional	0	2	0	1	CSE-1222
9.	ETE-4753	Embedded System Design	3	0	3	0	ETE-3543

10.	ETE-4754	Embedded System Design Sessional	0	2	0	1	ETE-3544

Elective-II (Any two course along with respective Sessional to be taken)

SL.	Course Code	Course Title	Contact Hour/Week		Credit Hours		Prerequisite Course
			Theory	Sessional	Theory	Sessional	
1.	ETE-4845	Bio-medical Electronics	3	0	3	0	ETE-2341
2.	ETE-4846	Biomedical Electronics Sessional	0	2	0	1	ETE-2342
3.	ETE-4847	VLSI system Design & Modeling	3	0	3	0	ETE-2343
4.	ETE-4848	VLSI system Design & Modeling Sessional	0	2	0	1	ETE-2344
5.	ETE-4849	RF and Microwave Devices	3	0	3	0	ETE-4741
6.	ETE-4850	RF and Microwave Devices Sessional	0	2	0	1	ETE-4742
7.	ETE-4851	Opto-electronics	3	0	3	0	ETE-4843
8.	ETE-4852	Opto-electronics Sessional	0	2	0	1	ETE-4844
9.	ETE-4853	Statistical Signal Processing	3	0	3	0	STAT-2401
10.	ETE-4854	Statistical Signal Processing Sessional	0	2	0	1	ETE-4744
11.	ETE-4855	Cryptography and Network Security	3	0	3	0	ETE-4749
12.	ETE-4856	Cryptography and Network Security Sessional	0	2	0	1	ETE-4750
13.	ETE-4857	Neural Networks and Fuzzy Logic	3	0	3	0	CSE-1221 & ETE-3545
14.	ETE-4858	Neural Networks and Fuzzy Logic Sessional	0	2	0	1	CSE-1222 & ETE-3546
15.	ETE-4859	Radar and Navigation Aids	3	0	3	0	ETE-4745
16.	ETE-4860	Radar and Navigation Aids Sessional	0	2	0	1	ETE-3650

21. SYNOPSIS OF THE COURSES

21.A. University Requirement Courses

Course Code: UREM -1101
Course Title: Text of Ethics and Morality

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. To make students capable of understanding the text of the Holy Qur'an so that they can understand the rules of ethics from the main and basic ethical book.
2. To make students capable of understanding the basic Arabic language so that they can communicate with the foreign countries and be fit with labor market worldwide especially in the Middle East.
3. To inspire students and make them interested in reading the Holy *Qur'an,* the basic ethical book, the last divine scripture and the complete code of life.
4. To make students familiar with *Ayats* of *Ahkam* of the Holy *Qur'an* so that they can lead their life being enlightened with them.
5. To go towards achieving the motto of the university – to combine quality with morality.

Course Outcomes:

Students who successfully complete the course will be able to:

1. The recitation ofthe Holy Qur'an properly following the rules of recitation.
2. The meaning of the significant words & expression mentioned in the text.
3. Understanding the formation of Qur'anic verses as per Arabic language.
4. Central theme and subject matter of the text.
5. General meaning of the text.
6. Teachings and implication of the text.
7. Comparison between the requirements of *Ayats* and the reality of our life.
8. Understanding basic formation of Arabic sentences.
9. Obtaining the capability of Arabic conversation.

Course Contents:

Mid-term Exam: 30 Marks

1. **An introduction to the text of Ethics and Morality.**
2. **An introduction to Arabic language; Arabic alphabet, *harakah*, *tanween*, *sukun* and *tashdeed*.**
3. **Text of Ethics, and Arabic Language Lesson:** Selected text on the introductory chapter of the holy Qur'an (*SuratulFatihah*), Writing of the forms of Arabic alphabet with example.
4. **Text of Ethics, and Arabic Language Lesson:** Selected text on procreation of the creation of humankind: 22:5, The sun letters and the moon letters.
5. **Text of Ethics, and Arabic Language Lesson:** Selected text on *iman*: 2: 1-5, Arabic numbers (10-100).
6. **Text of Ethics, and Arabic Language Lesson:** Selected text on *twheed*: 112: 1-4, Some common Arabic words used in daily life (20 words).
7. **Text of Ethics, and Arabic Language Lesson:** Selected text on *resalah*: 4: 163-165, The name of days in Arabic.
8. **Text of Ethics, and Arabic Language Lesson:** Selected text on *akhirah*: 39: 68-74, The name of months in Arabic.
9. **Text of Ethics, and Arabic Language Lesson:** Selected text on *taharah:* 5:6, The formation of Arabic word; noun, verb and particle.
10. **Text of Ethics, and Arabic Language Lesson:** Selected text on *salah*: 11: 114, 24: 68, Exercise of Damaaer (ٱلضَّمَائِر): pronouns.
11. **Text of Ethics, and Arabic Language Lesson:** Selected text on Zakat: 9: 34-35, Exercise of Arabic relative pronouns.
12. **Text of Ethics, and Arabic Language Lesson:** Selected text on Sawm: 2: 184-185, Exercise of demonstrative pronouns. (إسم الاشارة)

Final Exam: 50 Marks

1. **Text of Ethics, and Arabic Language Lesson:** Selected text on hajj and Ka'ba 2: 127-128; 3: 96-97, Practice of *huruf al-jarr* (حروف الجار): prepositions.

2. **Text of Ethics, and Conversation:** Text on ensuring social peace by removing bad behavior 49:5-12, Conversation: myself and my family members.
3. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected text on duties and obligations towards family and relatives = 4: 34-36, Exercise of adverb of time and place (ظرف الزمان والمكان) and Conversation: at the house.
4. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected text on the operation of creatures in the universe. 2:164, Exercise of simple nominal sentence (الجملة الإسمية)& Conversation: at the university.
5. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected text on the transition of human life: 10:24, Subject of a sentence (المبتدأ)& Conversation: about the weather.
6. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected text on the rule of livelihood = 2: 172- 174, 5:3-5, Predicate of a sentence (الخبر)& Conversation. At masjid.
7. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected text on the rule of al-*riba* = 2: 275-279, Exercise of interrogative pronoun إسم الاستفهام& Conversation: at library
8. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected text on the rule of loan =2: 282**,** Exercise of possessive phraseالمركب الاضافي& Conversation: at kitchen.
9. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected Text on the rules of drug and gambling =5: 90-91, Exercise of descriptive phraseالمركب التوصيفي, Conversation: at market.
10. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected Text on the rule of veil and *mahram* (unmarriageable persons) :24:30-31,33:59, Formation of Verb الفعل -1 & Conversation: at stadium.
11. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected Text on the rule of marriage and *ma*hr: 4: 2-4, Formation of Verb الفعل -2 & Conversation: the visiting to a sick man.
12. **Text of Ethics, Arabic Language Lesson and Conversation:** Text on the rule of divorce 2:227-230, Formation of Verb الفعل -3 & Conversation: at relative's house.
13. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected text on *kufr,*shirk and *nifaq*=5:72, 9:68, Formation of Verbal sentence الجملة الفعلية& Conversation: performing salat.
14. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected text on the sermon of a father to his son =31:13-19, Exercise of Verbal sentence الجملة الفعلية-1 & Conversation: giving *zakah* and *sadakah.*
15. **Text of Ethics, Arabic Language Lesson and Conversation:** sentence & Conversation Eid festival and performing hajj.
16. **Text of Ethics, Arabic Language Lesson and Conversation:** Selected text on characteristics of ideal servants of Allah ('IbadurRahman) as depicted in the Qur'an= 25: 63-76, Formation and exercise of Arabic negative imperative sentence.

Recommend Book

Textbook:

1. Abbott, N., *"Studies in Arabic literary papyri II, Qur'anic commentary and tradition",* University of Chicago Press, 1967.
2. Dr. M. Fazlur Rahman, *"Everyday Arabic Conversation",* Riyad Prakashani, Dhaka, 2005.
3. Haleem, M. A., *"Understanding the Qur'an: themes and Style",* London: I. B. Tauris, 1999.
4. Izzath Uroosa, *"Learning Arabic Language of the Qur'an",* Darussalam, Riyadh, 2010.
5. Saheeh International, *"The Qur'an Arabic Text with Corresponding English Meanings"*, Jeddah, Saudi Arabia, 1997.

Course Code: UREL-1106
Course Title: ADVANCED ENGLISH

Credit Hour: 2/ Contact Hour: 3 per week

Course Objectives:

On successful completion of this course, you will be able to:

The objective is to develop four basic skills of English (i.e. Listening, Speaking, Reading and Writing) to a level so that the students can comprehend lectures given in English, comprehend literary, non-literary, formal and informal texts and communicate effectively both orally and in written form. IELTS exam can be taken as a standard. Emphasis will be given for improving English comprehension and communication skill by practicing in the classroom and by doing home works. Less emphasis will be given for teaching the basics of English grammar. Grammar will be taught with a view to correcting common mistakes and identifying the correct structure of a sentence.

Course Outcomes:

Students who successfully complete the course will be able to:

1. Comprehend the lectures delivered by the course teachers in English.
2. Comprehend the texts written in English.
3. Write answers in English using correct English.
4. Develop a confidence about the correctness of their own writing and speaking.
5. Identify their own mistakes in their writing and speaking and correct the same.

Course Contents:

Mid-term Exam: 30 Marks

Chapter: 1- Reading from the Prescribed Text: (Any one of the following texts will be chosen for midterm examination)

- Exercises in Reading Comprehension
  Edited by: E.L. Tibbits
  Longman Group Limited, Longman House
  Burnt Mill, Essex, UK
- Build up Your English, A.J. Glover, The English Language Book Society and J.M. Dents and Sons Ltd. London
- The Pilgrim's Progress (selected passages)
  John Bunyan
  William Collins Sons & Co. Ltd. London (part one)
- The Old Man and the Sea (selected passages)
  Earnest Hemingway
  Peacock Books
  B-2, Vishal Enclave, New Delhi-110027

Chapter: 2 - Passages in the Examination will be Unseen: Students will practice reading Dhaka Courier/daily newspaper/Passages for IELTS reading module at the lab.

Focus will be given on: Strategies of reading, scanning for specific details and skimming for general understanding, identifying main and supporting ideas, summarizing, understanding argument, identifying opinion/attitude and making inferences, analysis and interpreting variety of texts, techniques and strategies for improving comprehension skills, practicing comprehension from literary and non-literary texts, techniques of speed reading.

The following websites will be used:

- http://www.dhakacourier.com.bd/
- http://ielts-up.com/reading/ielts-reading-practice.html#academic
- https://allmedialink.com/english-newspaper-of-bangladesh/

Chapter: 3 - Sentence Writing and Composition: Sentences: Sentence variety, (Construction of assertive, imperative, interrogative, optative, exclamatory, simple, complex, compound), common errors (use of active in

place of passive and vice versa/sequence of tense/WH questions/ Y/N questions etc.). Composition: Paragraph (free and guided) and Writing/completing a story.

Chapter: 4 Speaking and Listening: Speaking- Introducing oneself, dialogue and Listening: Listening for specific information, identifying detail.

Developing vocabulary: Students are required to sign up with –

- https://www.vocabulary.com/
- https://helloenglish.com/

(Students will use their own android devices/laptops/computers at the lab and work at home with the above two sites. The teacher will monitor their progress and take occasional tests)

The following site will be used for listening practice.

- http://ielts-up.com/listening/ielts-listening-practice.html

Final Exam: 50 Marks

Chapter: 1- Reading from the Prescribed Text: (Any one of the following texts will be chosen for final examination)

- Exercises in Reading Comprehension
  Edited by: E.L. Tibbits
  Longman Group Limited, Longman House
  Burnt Mill, Essex, UK
- Build up Your English, A.J. Glover, The English Language Book Society and J.M. Dents and Sons Ltd. London
- The Pilgrim's Progress (selected passages)
  John Bunyan
  William Collins Sons & Co. Ltd. London (part one)
- The Old Man and the Sea (selected passages)
  Earnest Hemingway
  Peacock Books
  B-2, Vishal Enclave, New Delhi-110027

Chapter: 2 - Passages in the Examination will be Unseen. Students will practice reading Dhaka Courier/daily newspaper/Passages for IELTS reading module at the lab.

Focus will be given on: Strategies of reading, scanning for specific details and skimming for general understanding, identifying main and supporting ideas, summarizing, understanding argument, identifying opinion/attitude and making inferences, analysis and interpreting variety of texts, techniques and strategies for improving comprehension skills, practicing comprehension from literary and non-literary texts, techniques of speed reading.

The following websites will be used:

- http://www.dhakacourier.com.bd/
- http://ielts-up.com/reading/ielts-reading-practice.html#academic
- https://allmedialink.com/english-newspaper-of-bangladesh/

Chapter: 3 - Sentence Writing and Composition: Sentences: common grammatical problems, tense, article, preposition, subject verb agreement, clause, modals, conditional sentence. Composition: Describing pie chart, column chart, graphs, tables, Agreeing/ disagreeing on some opinion, Business letters, formal and informal letters.

Chapter: 4 Speaking and Listening: Speaking- describing people and places, narrating events, extempore speech and presentation techniques.

Listening: Listening for specific information, identifying detail

Developing vocabulary: Students are required to sign up with –

- https://www.vocabulary.com/

- https://helloenglish.com/

(Students will use their own android devices/laptops/computers at the lab and work at home with the above two sites. The teacher will monitor their progress and take occasional tests)

The following site will be used for listening practice.

http://ielts-up.com/listening/ielts-listening-practice.html

Recommend Book

Textbooks:

1. Raymond Murphy, *"Intermediate English Grammar"*, Cambridge University Press, 1995
2. Wren & Martin, *"High School English Grammar and Composition",* S. Chand & Company Ltd. 2002.
3. Thomson & Martinet, *"Practical English Grammar",* Oxford University Press, 1993
4. Michael A. Pyle and Mary Ellen Munoz, *"Cliffs TOEFL Preparation Guide",* BPB Publications, 1992.
5. Bruce Rogers, *"Peterson's TOEFL Success",* Princeton, 2000.
6. AS Hornby, *"Oxford Advanced Learner's Dictionary of Current English",* Oxford University Press, 2003
7. Chowdhury & Hossain, *"Advanced English",* Dhaka, 2004
8. A J Glover, *"Build Up Your English"*, Dent, 1952

Reference Books:

1. E.L. Tibbitts, *"Exercises in Reading Comprehension",* Longman, 1976
2. John Bunyan, *"The Pilgrim's Progress",* CreateSpace Independent Publishing Platform, 2016
3. Earnest Hemingway, *"The Old Man and the Sea",* Peacock Books, 2010

Course Code: URED-1201
Course Title: Basic Principles of Islam (*Aqidah* + `*Ibadah*)
Credit Hour: 2/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. To provide the students with proper knowledge and clear conception regarding the Islamic beliefs and comprehensive concept of 'Ibadah' to develop their ethical understanding.
2. To make them aware of the existing misconceptions & traditional superstitions contradicting with the basic faith & tenets of Islam.
3. To enable the students to have the widespread impacts of 'Ibadah' on their lives and to inspire them to follow Islam in all walks of life.

Course Outcomes:

Students who successfully complete the course will be able to:

1. The students will be equipped with the knowledge and clear conception regarding the Islamic beliefs and comprehensive concept of 'Ibadah'.
2. They find themselves ethically developed ones.
3. They will have inspiration to live their lives in accordance with Islamic guidance.

Course Contents:

Mid-term Exam: 30 Marks

Chapter – 01: Islam: An introduction:

(a) Islam: Its definition and characteristic (b) Islamic 'Aqidah: Its definition and importance.

Chapter – 02: Articles of Faith (Pillars of Iman): Believe in Allah (Swt):

(1) Existence of Allah (Swt) (2) Tawhid: Definition and classifications (Tawhid Al-Rabubiah, Tawhid Al-Uluhiyyah and Tawhid Al-Asma Was-Sifat) (3) Impact of Tawhid. **Shirk:** (1) Definition, classifications and consequences (2) Examples of some Shirks in the contemporary society. **Belief in Allah's Angels (Malaikah):** (a) Belief in Angels of Allah (SWT): Its meaning, their Nature and Functions (b) Benefits of belief in Angels. **Belief in the Books of Allah:** (a) Belief in the Books of Allah: Its meaning and an introduction to the revealed Books and Scriptures (b) The position of the Holy Qur'an amongst the other revealed Books (c) Benefits of belief in the Books of Allah (SWT).

Chapter – 03: Belief in Allah's Prophets:

(a) Belief in Allah's Prophets: Its meaning and purpose of their sending (b) Features of Prophethood and Contributions of the Prophets towards the Humanity (c) Muhammad (SAAS) is the greatest, the best and the last among all the Prophets and Messengers. **Belief in the Akhirah (Life After Death):** (a) Definition and Stages of Akhirah (b)The logic and evidence regarding Akhirah (c) Impact and benefits of belief in Akhirah. **Belief in Qadr/ Taqdir (Fate) and divine decree:** (a) Definition of belief in Qadr/ Taqdir (b) Opinions of the scholars regarding Taqdir (c) Concept of man's freedom of will in Islam. **The nullifiers of Iman:** (a) Kufr and Nifaq: Definition, classifications and consequences (b) Description of the nullifiers of Iman in details.

Final Exam: 50 Marks

Chapter – 04: `Ibadah: Its introduction:

(a) Meaning of 'Ibadah (b) Various types of 'Ibadah (c) The best 'Ibadah (d) Objectives and aims of 'Ibadah. (e) Conditions of 'Ibadah.

Chapter – 05: Characteristics of `Ibadahand signs of `IbadurRahman:

Characteristics of 'Ibadah in Islam:Free from Intermediaries, Not being confined to specific places, All-Embracing View (Scope of 'Ibadah)...etc. **Signs of `IbadurRahman (Servent of Ar- Rahman):** According to the holy Qur'an. **Taharah &Najasah:** Definition of **Taharah** (purity) and **Najasah** (impurity). Ways and means of Taharah: Wadu, Gusl,

Chapter – 06: *Some Articles of Islam (Pillars of Islam) and* Defense system of Islam*:*

Salah (Prayer): Its significance, teachings & some basic rules: (a) Definition and kinds (b) Importance (c) Pre-requisites of Salah (Shurutus-Salah) (d)Essentials/ Basic components of Salah (Arkanus-Salah) (e) How to perform the Salah in detail (practically)? (f) Things that invalidate the prayer (Mufsidatus-Salah) (g) Sajdah that makes prayer correct (Sajdatus-Sahu) (h) Friday prayer (Salatul-Jumu 'ah) (i) The funeral prayer (Salatul-Janazah) (j) Prayer of the traveler (Salatul-Musafir) (k) 'Eid prayer (Salatul- 'Eid) (l) Impact of Salah. **Zakah (poor due): Its significance, teachings & some basic rules:** (a) Definition and types (b) Importance (c) kinds of property on which Zakah is obligatory (d) Who should give Zakah (e) Due recipients of Zakah (f) Zakah and poverty alleviation (g) Impacts/ benefits of Zakah.

Chapter – 07: Sawm (Fasting): Its significance, teachings & some basic rules:

(a) Definition and types (b) Importance (c) Things which invalidate the fast (Mufsidatus-Sawm) (d) Who must fast? (e) Exemption from fasting (f) Recompense of mistake (Qada' and Kaffarah) (g) Sadqatul Fitr/ Zakatul Fitr (h) Impact of Sawm. **Hajj (pilgrimage): Its significance, teachings & some basic rules:** (a) Definition and types (b) Importance (c) How to perform Hajj in detail? (d) Impact of Hajj.

Chapter – 08: Defense system of Islam:

(a) Definition and classification of Jihad from various aspects (b) Importance of Jihad(b) Differences between Jihad and Terrorism.

Recommend Book

Textbooks:

1. Rafique Dr. Abu Bakr, *"Islam The Ultimate Religion (Book one) Islamic 'Aqidah'",* Chittagong: ABC Publications, 2002
2. Mohammad Shafiul Alam Bhuiyan, *"The Fundamental Beliefs of a Pure Muslim",* 1st edition, 2003
3. Sabiq, Assayed, Al-`Aqaeed Al- Islamiyah, Cairo, *"Al-Fathu Lil-Ielamil Arabi",* 10th edition, 2000
4. Bilal Philips, Dr. Abu Ameenah, *"The Fundamentals of Thwhid (Islamic Monotheism)",* International Islamic Publishing House
5. Farid, Ahmed, *"An Encounter with Islam",* Dhaka: Islamic Foundation, 1995

Reference Book

1. Mohammad Amimul Ahsan, *"Towards Understanding `Ibadah in Islam",* Bangladesh Institute of Islamicthought (BIIT), 2015
2. Abdalati & Hammudah, *"Islam in Focus",* Adam, 2006
3. Al-Quardawi, Dr. Yousuf, "*Al-Ibadah in Islam",* Wahba publication, 24th edition, 1995
4. Alkhuli, Muhammad Ali, "*The Light of Islam",* E 4, Riyad: Al Farazdak Press, 1983.
5. Sarwar, Ghulam, "*Islam: Beliefs and Teachings",* London: The Muslim Educational Trust, 1980.

Course Code: URED-2302
Course Title: Sciences of *Qur'an* and *Hadith*

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. To make the students familiar with the basic sciences of Qur'an & Hadith to understand them properly.
2. To provide them with proper knowledge to establish their authenticity and remove misconceptions concerning them.
3. To achieve the main goal of the University in Islamization of Knowledge through enlightening the students with revealed knowledge of the Qur'an and Hadith.

Course Outcomes:

Students who successfully complete the course will be able to:

1. The students will have knowledge of the status of Qur'anic verses and Hadiathic text.
2. They will be able to establish the authenticity of Qur'an and Sunnah.
3. To have inspiration to achieve knowledge from the Qur'an and Sunnah directly

Course Contents:

Mid-term Exam: 30 Marks

Chapter – 01: Sciences of Qur'an:

(1) Definition of the Qur'an Literally and Terminologically (2) Various Names and Attributes of the Holy Qur'an and their Significance (3) Characteristics of the Holy Qur'an (4) Central Subject Matter & the Main Themes of the Holy Qur'an (5) The necessity of the Holy Qur'an (6) The authenticity of the Holy Qur'an.

Chapter – 02: Wahi (Revelation) of the Holy Qur'an:

(1) Meaning of Wahi (2) Various classifications and procedure of Wahi (3) Stages of revelation of the Holy Qur'an (4) Gradual revelation of the Holy Qur'an and the wisdom behind it (5) The First and the Last Revelation.

Chapter – 03: The Ayah and Surah of the Holy Qur'an:

(1) The Aayah of the Qur'an: Definition of Aayah. The Number of Ayah, words and letters of the Holy Qur'an. The Arrangement of the Ayah of the Holy Qur'an (2) The Surah of The Qur'an: Definition of Surah. The Arrangement of Surah of the Holy Qur'an. The classification of Surah of the Holy Qur'an.

Final Exam: 50 Marks

Chapter – 04: Makki & **Madani Revelations:**

(1) The Definition of Makki and Madani (2) The Characteristics of Makki and Madani Revelations (3) The benefits of knowing Makki and Madani Revelations.

Chapter – 05: Preservation, Compilation & Asbabunnuzul (Revelational Background):

(1) Preservation & Compilation of the Holy Qur'an (2) The Causes of Revelation (Asbabunnuzul): The Definition of Asbabunnszul. The classification of Asababunnuzul. The benefits of Knowing Asbanunnuzl.

Chapter – 06: Al-Naskh (Abrogation) & I`jaz (inimitability) of The Qur'an:

(1) Abrogation (Al-Naskh) in the Holy Qur'an:Definition of Naskh. The proofs of Naskh. The Classifications of Naskh. The benefits of knowing Nasikh(abrogating) and Mansukh (abrogated) verses. (2) The Miraculous Nature of The Qur'an (I`jaz Al-Qur'an): Definition of I'jaz. The Proofs of I`jaz. Various aspects of I`jazAl-Qur'an.

Chapter – 07: Sciences of Hadith:

(1) Definition of Sunnah (2) Difference among Qur'anSunnah and Hadith Qudshi (3) The Position, importance and authority of Sunnah in Islamic Shari`ah (4) Explanation of some important terms of Sunnah: Isnad/ Sanad, Matn, Rawee and Riwayah,Al-jame`, Al-Musnad, Al-Sahih, Al-Sunan, Sahihayn, Muttafaqun`Alayh, Al-kutub As-Sittah…etc. (5) Collection & Compilation of Sunnah.

Chapter – 08: The classification of Hadith and fabrication in Hadith:

(1) The classification of Hadith: (a)According to the reference to a particular authority (b) According to the links in the Isnad(c) According to the number of narrators involved in each stage of the Isnad(d) According to the reliability and memory of the narrator. (2) Fabrication in Hadith:(a) Definition of Fabrication (b) Causes and consequence of fabrication (c) Some examples of commonly used fabricated Hadith in our society.

Recommend Books

Textbooks:

1. Ahmad Von Denffer, *"Ulum al Qur'an: An Introduction to the Sciences of the Qur'an (Koran)",* The Islamic Foundation; Revised edition, 2009
2. Ushama, Dr. Thameem, *"Sciences of the Qur'an: An Analytical Study",* International Islamic University Malaysia, Cooperative Limited, 1998
3. Bucaille, Dr. Maurice, *"The Bible the Qur'an & Science",* Thinkers Library, 1996
4. Badruddin Muhammad bin Abdullah Al-Badruddin Al- Zarkashi, *"Al-Burhan Fi Ulumil Qur'an",* Dar Al-Marifah, Bairuth, Vl. 01.
5. Khalid Mahmood Shaikh, *"A Study of the Holy Qur'an and its Teachings",* First edition, IQRA International Education Foundation, 1999

Reference Book

1. Al-Azami, Dr Mohammad Mustafa, *"Studies in Early Hadith Literature",* American Trust publication, 1978
2. Hasan, Dr. Suhaib, *"An Introduction to the Science of Hadith",* AL-Qur'an Society, 1994
3. Marhribi, Al-Hassan, *"Introduction to the Study of the Hadith",* Roshmee Islamic School, 1994
4. Salih, Muhammad Adeeb, *"Lamahat fee Usul al-Hadeth",* Damascus, 1393 AH.
5. Siddiqi, Muhammad Zubayr, *"Hadith Literature: its Origin, Development & Special Features",* Cambridge, Islamic Texts Society, 1993.

Course Code: URED 2305
Course Title: Comparative Religion (for Non-Muslims)

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

On successful completion of this course, you will be able to:

This course is designed to engage the students in the different types of religions and increase their knowledge. This course will feature the Muslim, Christian, Hindu, Buddhist and Jewish religious origins, customs and traditions, and some basic principles. These topics will require solutions and teamwork. Every student will be partnered up with another student for the duration of the course.

Course Outcomes:

Students who successfully complete the course will be able to:

1. Students will demonstrate understanding of the central beliefs and concepts of major living religious traditions of the world, including Hinduism, Buddhism, Judaism, Christianity, and Islam.
2. Students will demonstrate familiarity with the structure and ritual life of religious communities, including significant holidays and rituals.
3. Students will demonstrate a grasp of the methodology of the study of religion.
4. Students will develop skills in critically analyzing religion and comparing particular aspects of religious traditions.
5. Students will develop skills in reading source texts as documents of religious life.
6. Students will develop skills in observing and critically analyzing religion in the contemporary world.
7. Students will be aware of how to decrease Islam phobia among the non-Muslim community and increase mutual relationship among them.

Course Contents:

Mid-term Exam: 30 Marks

Chapter – 01: Concept of religion:

a) Definition of religion,
b) Significance, necessity and characteristics of religion
c) Approaches to the study of religions (Historical, Anthropological, Sociological, Philosophical and Phenomenological etc.).

Chapter – 02: Origin and Development of Major Religions:

a) Basic history of major religions (Judaism, Christianity, Hinduism, Buddhism and Islam)
b) Founders and profounder of religions.

Chapter – 03: The Features of Major Religions and Holy books and Sacred Texts:

a) The distinguishing features of major religions (Judaism, Christianity, Hinduism, Buddhism and Islam).
b) Holy books and sacred texts of major religions.

Final Exam: 50 Marks

Chapter – 04:Religious rituals, festivals and Holy places:

a) Rituals of major religions.
b) Festivals of major religions.
c) Holy places of major religions.

Chapter – 05: The Comparative study of God in major religions:

a) Concept of God in Judaism.
b) Concept of God in Christianity.
c) Concept of God in Hinduism.
d) Concept of God in Buddhism.
e) Concept God in Islam.

Chapter – 06: The Comparative study of religious mentors and prophets in major religions:

a) Necessity of Prophets and Spiritual guides for human life.
b) Comparative study of prophecy and religious mentorship in famous religions.

Chapter – 07: The Comparative Study of Life after Death in major religions:

a) Concept of Death in different religions.
b) Concept of Day of Judgment in different religions.
c) Concept of Heaven and Hell in different religions.

Chapter – 08: The understanding of Man and Universe in major religions:

a) The purpose of Human being.
b) The purpose Universe.

Chapter – 09: The common values in major religions:

a) Ethics and Morality.
b) Evil.
c) Justice.
d) Destiny and Luck.
e) Religious diversity.
f) Non-violence and Peaceful co-existence.
g) Harmony and Interfaith dialogue.
h) Social Justice and Human Ideological rights.

Recommend Book

Textbooks:

1. Sharpe, E. J., *"Comparative religion: A history",* Bristol Classical Press, 2nd edition, 1986.
2. Eliade, M., "*Patterns in Comparative Religion"*, Nebraska Press, 1996
3. Eastman, Roger, "*The Ways of Religion: An Introduction to the Major Traditions",* Oxford University Press, 3rd editions, 1999

Course Code: URBL-2401
Course Title: Functional Bengali Language

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

The objective of this course is to enlighten the learners with a comprehensive skill on Bangla Language with emphasis on correct sound system; pronunciation skills; the IPA system; problem sounds; vowels; consonant and diphthongs; lexical and syntactic stress and all other grammatical rules for interpersonal communication and the interpretation and production of the language in written and oral forms. This course examines the history and developments of Bengal literature with the contributions of prominent literate personalities to the development of Bangla language and literature from early age to modern time.

Course Outcomes:

Students who successfully complete the course will be able to:

By studying this course, the learners will be able to adopt the principle structures of Bangla language in a systematic and coherent manner and, at the same time, make reading and articulation, pronunciation, spelling knowledge, vocabulary, and linguistic skills and tools that are needed to work and succeed in the language. The students will also be able to estimate the successive development of Bangla language and literature, and students will learn specialized Bangla in academic terminology and acquire the language skills needed to understand and discuss, in speaking and writing, topics within a professional environment.

Course Contents:

(Mid-term Exam: 30-Marks)

প্রায়োগিকবাংলা : ২০

১. বাংলাভাষার উদ্ভব ও সাধারণপরিচয়।
২. বাংলাবর্ণ ও ধ্বনিপরিচয়।
৩. বাংলাবানান : ণ-ত্ব বিধান, ষ-ত্ব বিধান ও প্রমিতবাংলাবানানেরনিয়ম।
৪. পরিভাষা

বাংলাসাহিত্য : ১০

১. গদ্য : (ক) পোস্ট মাস্টার, মুসলমানীগল্প (রবীন্দ্রনাথ ঠাকুর)
(খ) তরুন্নেরসাধনা, যৌবনেরগান (**কাজী নজরুল ইসলাম**)

(Final Exam: 50 Marks)

প্রায়োগিকবাংলা : ৩০

১. শব্দপ্রকরণ।
২. সমাস ও প্রকৃতি-প্রত্যয়।
৩. বাক্য প্রকরণ।
৪. প্রতিবর্ণীকরণ (ওচঅ) পরিচিতি।
৫. সারাংশ, সারমর্ম, ভাবসম্প্রসারণ।
৬. পত্রলিখন।

বাংলাসাহিত্য : ২০

১. বাংলাসাহিত্যেরইতিহাস (প্রাচীন, মধ্য ও আধুনিকযুগ)
২. কবিতা : (ক) বঙ্গভূমির প্রতি (মধুসূদন দত্ত)

(খ) সোনারতরী (রবীন্দ্রনাথ ঠাকুর)

(গ) সাম্যবাদী (**কাজী নজরুল ইসলাম**)

(ঘ) আজান (কায়কোবাদ)

Recommend Book

Textbooks:

১. রবীন্দ্রনাথ ঠাকুর, গল্পগুচ্ছ, বিশ্বভারতী, কলকাতা।

২. কাজী নজরুল ইসলাম, অগ্নিবীনা, সর্ব্বহারা, সঞ্চিতা, ইসলামীকবিতা, গজল ও প্রবন্ধএবংকাব্য আমপারা।

৩. মুহাম্মদ শহীদুল্লাহ, বাঙ্গালা ভাষারইতিবৃত্ত, শহীদুল্লাহরচনাবলী ৩য় খন্ড, বা.এ. ঢাকা- ১৯৯৫।

৪. মুহাম্মদ শহীদুল্লাহ, বাঙ্গালা ব্যাকরণ, ঐ।

৫. নরেনবিশ্বাস, বাংলাউচ্চারণঅভিধান, বা.এ.।

৬. জ্যোতিভূষনচাকী, বাংলাভাষারব্যাকরণ, কলকাতা, আনন্দ পাবলিকেশন, ১৯৯৬।

৭. মাহবুবুল হক, বাংলাবানানেরনিয়ম।

৮. প্রমিতবাংলা, বানানেরনিয়ম।

৯. ড. মো: মাছউদুররহমান, বাংলাভাষায়ইসলামীসাহিত্য চর্চা- পি.এইচ.ডিথিসিস, ঢাকাবিশ্ববিদ্যালয়।

১০. আ: মান্নন সৈয়দ- কাজীনজরুল !কবি ও কবিতা।

Course Code: URED-3503
Course Title: Political Thoughts and Social Behavior

Credit Hour: 1/ Contact Hour: 1 per week

Course Objectives:

On successful completion of this course, you will be able to:

This course is designed:

1. To provide the students with basic idea concerning the political thoughts and social justice.
2. To inculcate in them Islamic manners and etiquettes for their development as a human being.
3. To discharge their duties and responsibilities towards Allah (SWT) and His creatures.

Course Outcomes:

Students who successfully complete the course will be able to:

1. The students will be equipped with the basic idea of political thoughts and human development in Islam.
2. They will be able to establish a society on the basic of social justice and to run it according to the direction of Islam.
3. They will be able to perform their duties and responsibilities towards Allah (SWT) and His creatures.

Course Contents:

Mid-term Exam: 30 Marks

Chapter – 01: Introduction to Political Thoughts:

Government and Politics: Meaning and Organs

Islamic Political System: Meaning, Importance and Principles

Chapter – 02:

Shari`ah (Islamic Law):** Meaning, Sources and Differences between Shari`ah and Manmade Law.**
Constitution: Definition, Islamic Constitution and Special Features of an Islamic Constitution.

Chapter – 03:

Islamic State: Concept of Islamic State, Differences between Islamic and Secular State, Necessity of Islamic State, Main Organs of Islamic State, Principles of Islamic State

The Executive (Head of the state): Conception, Qualifications, how to select a Head of the State, Factions of the Executive.

Chapter – 04:

Legislative (Al-Shura): Meaning, Importance, Example and Functions

The Judiciary (Al-Qada'): Meaning, Importance, Nature and Implementation, Types of Punishment

Citizenship (Nationality): Meaning, Types, Rights

Hisbah: Meaning, Importance, Objectives, Functions and Selection of Mushtasib

Chapter – 05: Social Behavior

Dealings and Behavior in Islam (Mu`amalah): Its Meaning, Definition and Scope.

Family life in Islam: (a) Role of Marriage as the basis of Islamic Family (b) Status of women in Islam, comparison with other religion (c) Rights and duties of women in Islam (d) Husband-wife relations (Duties and obligations to each other) (e) Rights of children in Islam (f) Duty towards Parents.

Chapter – 06:

Principles of Islamic Economic System: (a) Earning and expenditure by Halal means (b) Right to own property and individual liberty (c) System of Zakah (d) Prohibition of interest (Riba) (e) Law of Inheritance (Mirath) (f) Various Islamic transactions.

Chapter – 07:

Political System: Definition, Principals**,** Islamic State, Islamic monuments.

Dress code: Dress code in Islam for male and female

Duties and obligations towards: Relatives, Neighbors, Guests, Needy and Orphan.

Chapter – 08:

Basic virtues and Islam: Duties of the Muslims to each other

(1) Honesty (2) Truthfulness (3) Kindness (4) Perseverance (5) Firmness against evil (6) Tolerance (7) Punctuality (8) Courage (9) Trustworthiness (10) Forgiveness (11) Chastity for women (12) Intention (13) Modesty (14) Charity (15) Gifts (16) Thankfulness (17) Visiting the sick, Vices, Greediness, Jealousy, enviness, hated …etc.

Social Manners: (1) Brotherhood (2) Greetings (3) Co-operation (4) Meetings (5) Talking (6) Keeping promises (7) Asking permission before entering someone's house. Welfare.

Recommend Book

Textbooks

1. Jalal Al-Ansari, *"Introduction to the Systems of Islam",* Al-Khilafah Publications, 1996
2. Muhammad Asad, *"The Principles of State and Government in Islam",* Literary Licensing, 2011
3. Abdul Rashid Moten & Syed Serajul Islam, *"Introduction to Political Science",* Cengage Learning Asia, 3rd edition, 2008
4. H. K. Sherwani, *"Studies in Muslim Political Thought & Administration",* Kazi Pubns Inc, 1990
5. Mohammad Shafiul Alam Bhuiyan, *"The Government and Politics in Islam",* Noor Publications, 4th edition, 2016
6. Abdul Hannan, Shah, *"Social Laws of Islam",* BIIT, Dhaka, 1995
7. Abdalati, Hammudah, *"The Family Structure in Islam",* American Trust Publications. 1977
8. Al-Minawi, KawtherM, *"The Child Rights in Islam",* Riyadh: Dar al-Amal Publishing House, 1993
9. Umer, Chapra, *"Islam and the Economic Challenge",* Islamic Foundation and Virginia, 1992
10. Taqi, Usmani, M., *"An Introduction to Islamic Finance",* Pakistan: Idaratul Ma'arif, 1998

Course Code: URED-3604
Course Title: Life and Teachings of Prophet Muhammad (SAAS)

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. To help the students to develop an in-depth study for clear understanding of the last Prophet's life, mission and teachings.
2. To show that the Prophet Muhammad (SAAS) is only ideal mentor to follow by the entire humanity.
3. To familiarize the students with the exalted characters, manners, habits and behaviors of our beloved Prophet (SAAS) in order to emulate it in their practical life.

Course Outcomes:

Students who successfully complete the course will be able to:

1. The students will have proper knowledge regarding the life and times of Prophet Muhammad (SAAS).
2. They will be able to identify the Prophet (SAAS) as the only ideal mentor to follow.
3. They will be able to lead their life according to the exalted characters, manners, habits and behaviors of our beloved Prophet (SAAS).

Course Contents:

Mid-term Exam: 30 Marks

Chapter – 01: An introduction to *Siratunnabi* (SAAS):

A comprehensive view, *Sirah* and its literally and technical meaning, Selection of Arabia as the birthplace of the Final Prophet *(SAAS)*, Socio-Political, Religious condition of pre-Islamic Arabia: An Overview.

Chapter – 02: Early life of Prophet (SAAS):

Birth and Childhood, Business trip to Syria with his uncle *Abu Talib,* Battle of *Fujjar* and formation of *Hilful-Fudul,* Contribution of Mohammad (SAAS) in the business of Khadijah, Marriage with Khadijah, Rebuilding of *Al-Ka`bah,* Search for the truth and receiving the truth.

Chapter – 03: Beginning of Islamic Movement at *Makkah*:

(From first revelation to the emigration to Abyssinia): Prophethood, First revelation and its impact. Propagation of Islam Begins in secret, The early Muslims, End of the First Phase. Islamic Movement becomes public, The Prophet on the Mount of *Safa*. Oppositions from the Qurayshbegin, Qur'anic approach towards Quraysh Oppositions. Migration to Abyssinia.

Final Exam: 50 Marks

Chapter – 04: Prophet *(SAAS)* at *Makkah*:

(From emigration to Abyssinia to the migration to *Madinah*)-Boycott and Confinement of the Prophet (SAAS) and Banu Hashim by the Quraysh, The year of sorrow.

Chapter – 05:

Ta'if- the most difficult day, *Mi'raj* of the Prophet. Covenants of *Al-'Aqabah*. *Hijrah* of the Prophet (SAAS).

Chapter – 06: The Prophet (SAAS)at *Madinah*:

(From migration to *Hudaybiyah*) Construction of the Mosque, The Charter of Madinah, Important Battles till the agreement of *Hudaybiyah*- The Battle of *Badr*, The Battle of *Uhud*, Battle of *Ahzab*, Campaigns against the Jews of *Madinah*, *Hudaybiyah* Agreement.

Chapter – 07:

Letters of the Prophet (SAAS) to the kings beyond Arabia, Battle of *Muta*, Battle of *Hunayun*, The conquest of *Makkah*.

Chapter – 08:

The Farewell Pilgrimage, The Farewell Address of the Prophet (SAAS) and its lessons, Departure of the Prophet (SAAS), Contributions of the Prophet (SAAS) as a reformer and as a nation builder and as an Ideal for the all.

Recommend Book

Textbooks

1. Nadwi, Saiyid Sulaiman, "*Muhammad The Ideal Prophet: A Historical, Practical, Perfect Model for Humanity*", Translated by Mohiuddin Ahmad. Islamic Book Trust K.L.N.D.
2. Guillaume, Alfred, "*The Life of Muhammad: A Translation of Ibn Ishaq's Sirat Rasul Allah",* London: Oxford University Press, 1955.
3. Lings, Martin., "*Muhammad: his life based on the earliest sources",* New York: Inner Traditions International, 1983.
4. Nasr, Seyyed Hossein, "*Muhammad: Man of God*", Chicago, IL: Kazi Publ., 1995.
5. Ramadan, Tariq., "*In the Footsteps of the Prophet: Lessons from the Life of Muhammad",* New York: Oxford University Press, 2009.
6. Watt, William Montgomery., "*Muhammad: Prophet and Statesman",* London: Oxford University Press, 1961.

Course Code: URIH-4701
Course Title: A Survey of Islamic History and Culture

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

The objective of this study is to enrich the learners with the glorious history of four pious *Khalifah* of Islam and their remarkable contributions towards the development of just administration, advancement of civilization and education and their great services towards humanity at large. This course also aims at making the students acquainted with the glorious contribution of the Muslims towards the world civilization during the *Ummayads* and *Abbasids Khilafah.* The contributions include the advancement of administration, society, civilization, different branches of science such as geography, mathematics, history, medical science, philosophy etc.

Course Outcomes:

Students who successfully complete the course will be able to:

With the study of this course, the learners will be able to explore the glorious history of early Islamic society and state, particularly of four pious *Khalifah* and their successors. The learners will also have the idea about the Muslim contributions towards the difference branches of world civilization. This study will also help the students to realize the historical processes of development of Muslim society in early time and to make a comparison with the present society. It will enable the learners to appreciate various good practices and cultures which will in turn be resulted in becoming a responsible citizen.

Course Contents:

Mid-term Exam: 30 Marks

Chapter One: Khilafah: Definition, Origin and Development of Khilafah, Difference between Khilafah in general sense and Khilafah 'Ala-minhaj al- Nabuwwah, election to the office of the Khilafah, Khilafahvs Mulukiyyah, End of Khilafah, duties and responsibilities of a Khalifah.

Chapter Two:Introduction to the Four Pious Khalifah: Character and achievements of the Pious Caliphs, an overall portrayal of four pious Khalifah: Abu Bakr (R) -the savior of Islam, Umar (R) - the model of administration and great conqueror of Islamic empire, Conquest during his Khilafah, Usman (R) - compilation of Qur'an and his other achievements, Causes of revolt, assassination of Usman (R) and its effects on the history,Ali (R) - civil wars during his time and his other achievements.

Chapter Three: Administration under the Four Pious Khalifah: The Shura, Civil Administration, Sources of Revenue, Bait-al-Mal, judicial Administration, Police-Prison, Religious Administration and Military Administration.

Final Exam: 50 Marks

Chapter Four: The Umayyad Khilafah (661 A.D-750 A.D): A brief discussion on Umayyad Khilafah, Administrative reforms of Abdul Malik bin Marwan, Conquest and expansion of Islamic empire under Walid bin Abdul Malik, Umar bin Abdul Aziz and his Administration Policies.

Chapter Five: The Umayyad Administration: Central and Provincial Administration, Social Condition. Umayyah's contribution towards the development of civilization & education, Fall of the Umayyahs. An overall portrayal of Umayyad Khilafah.

Chapter Six: The Abbasid Khilafah (750 A.D-1258 A.D): Golden Prime of the Abbasids- Abul Abbas as Suffa, Abu Zafar al Mansur, Harun or Rashid, Al Amin and Al Mamun, Abbasid Society, Scientific and Literary development, Education, Development of Art and Architecture, Civil, Military, Judicial and Revenue Administration under the Abbasids. An overall portrayal of Abbasid Khilafah.

Chapter Seven: The Umayyad Khilafah of Spain and The Fatimid Khilafah of Egypt. A brief analysis.

Chapter Eight: Society during Khilafah: Rights and Status of women, orphans, disables, non-Muslim citizens in Islamic Society during the period of Kulafa al- Rashideen, the Umayyad and Abbasid Khilafah.

Chapter Nine: Muslim contribution to the different fields of world civilization:

a) Geography,
b) Medicine,
c) Chemistry,
d) Mathematics,
e) Astronomy,
f) Historiography,
g) Art and literature.

Recommend Book

Reference Books

1. P.K. Hitti, "*History of the Arabs"*, Macmillan edition, 1970
2. S.A.Q. Hussaini, "*The Arab Administration"*, 1956
3. Syeed Ameer Ali, "*A Short History of Saracens"*, Macmillan edition, 1916
4. T.I. Arnold, "*The Caliphate"*, Oxford, 1924
5. Muhammad Ali, "*The Early Caliphate"*, Cambridge, 1936
6. W.Muir, "*Caliphate, Its Rise, Decline and fall"*, Edinburg, 1934.
7. B, Lewis, & P.M. Holt(ed.), "*Cambridge History of Islam"*, 1947.
8. Syeed AmeerAli, "*The Spirit of Islam"*, Christophers, 1891
9. Thomas Arnold, "*The Legacy of Islam"*, Oxford, 1931
10. Joseph Hell, "*The Arab Civilization",* W. Heffer & sons, limited, 1926
11. Hamilton GibbA.R. "*Studies on the Civilization of Islam"*, Princeton, 1982
12. R. Levy, "*The Social Structure of Islam"*, Cambridge 1979
13. R.A. Nicholson, "*A Literary History of the Arabs"*, Cambridge 1930
14. A.M.A. Shushtery, "*Outline of the Islamic Culture"*, The Bangalore Printing & Publishing Co. Ltd., 1954
15. S.M. Imamuddin, "*Arab Muslim Administration"*, 1976
16. M. Akbor Ali, *"Bigghane Musalmander Obodan (Muslim Contribution to science)"* Volume 1-12, 1936, Dhaka.

Course Code: URBS-4802
Course Title: Bangladesh Studies and the History of Independence

Credit Hour: 2/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

The objective of this study is to create awareness among the students about the History and Heritage, Geography and Environment, People and Society, Politics and Constitutional Development, International Relations, Economics and Natural Resources, Education and Literature, Philosophy and Religion, Art and Culture of Bangladesh and such other conceptions and ideas that are significantly related to the people and society of Bangladesh with a view to develop patriotism among the learners.

Course Outcomes:

Students who successfully complete the course will be able to:

By studying this course, the learners will be able to have a comprehensive and clear concept about the historical developments of Bengali nation from pre-historic age until the independence from British government in 1947. The students will also be able to understand the geographical characteristics of Bangladesh, Origin of its people, Population growth, distribution and challenges, Political developments and crises of Democracy in Modern Bangladesh, Foreign Policy and international relations of Bangladesh, Constitutional development of Bangladesh. This comprehensive study will undoubtedly increase patriotism among the students towards the beloved Motherland Bangladesh. The learners will also be able to appreciate any significant national issue in context of demand of time and future integrities.

Course Contents:

Mid-term Exam: 30 Marks

Chapter One: Outline study of Bangladesh Geography: Location, Area, Boundary, Physiographical features, River System, Forest and Climate. Geographical Impact on the People and Society.

Chapter Two: **The People of Bangladesh:** Origin of the People, Population growth and composition, Literacy, Population challenges and prospects for Bangladesh.

Chapter Three: History and Society of Ancient Bengal: The old Regions of Bengal, Pre-historic and Pre-Aryan Civilization in Bengal, Bengal under Gupta, Pala and Sena Dynasties, Socio-economic condition of Bengal before the advent of Islam.

Final Exam: 50 Marks

Chapter Four: History and Society of Bengal under Muslim Rule (1204-1757): Advent of Islam in Bengal and the Muslim conquest, its impact on the people and society, origin and composition of the Muslim society in Bengal, impact of Sufism, the consolidation of Muslim rule (1204-1757), educational and literary development in Muslim Bengal, the evaluation of over-all impact of Muslim rule on the people and society of Bengal.

Chapter Five: History and Society of Bengal under British Rule (1757-1947): The introduction of British rule in Bengal, British policy towards economy and education. A brief discussion on the socio-religious reform movements in Bengal and the struggles for freedom from the British Colonialism, Intellectual Movements, Partition of Bengal and its impact, formation and role of Muslim League and Congress, development of Bengali Literature, rising of the nationalism movements and the creation of Pakistan, impact of British administrative policy on the society of Bengal.

Chapter Six: Constitutional Development of Bangladesh: Background to the constitution, characteristics, contents, constitutional organizations, amendments and administrative structure of Bangladesh.

Chapter Seven: Political Developments of Modern Bangladesh: formation and role of the major political parties, regime analysis of modern Bangladesh, critical issues of Bangladesh politics including Caretaker Government System, Students Politics, Crises of Democracy, etc.

Chapter Eight: Foreign Policy and International Relations of Bangladesh: emergence of Bangladesh and the global super powers, principles of foreign policy, international relations of Bangladesh, the role of

Bangladesh in the international organizations such as the UN, OIC, SAARC, ASEAN, BIMSTEC etc. Millennium Development Goals (MDGs), Sustainable Development Goals (SDGs) and Bangladesh.

Chapter Nine: Economic condition of Bangladesh, minerals and natural resources of Bangladesh.

Chapter Ten: Socio-cultural problems and prospects of Bangladesh.

Recommend Book

Reference Books

1. Sirajul Islam (ed.), "*Banglapedia: National Encyclopedia of Bangladesh", Vol-* 1-14, Asiatic Society of Bangladesh, Dhaka, 1998.
2. HarunEr Rashid, "*Geography of Bangladesh"*, University Press Limited, Dhaka, Bangladesh, 1991.
3. Mosharraf Hossain, "*Graphoman World Atlas"*, 7th edition, Graphosman, Dhaka, 2012.
4. Mohar Ali, "*History of the Muslims of Bengal",* Vol – 1-3, Islamic Foundation Bangladesh, Dhaka, 2003.
5. Abdul Karim, "*Social History of the Muslims of Bengal"*, Baitush Sharaf Islamic Research Institute, Chittagong, Bangladesh, 1985.
6. Dr. EnamulHuq, "*A History of Sufism in Bengal"*, Bangla Academy, Dhaka, 1975.
7. Board of Researchers, "*Islam in Bangladesh through Ages"*, Islamic Foundation Bangladesh, 1995.
8. Sufia Ahmed, "*Muslim Community in Bengal (1884-1912)"*, Oxford University Press, Dhaka, 1974.
9. M.A. Rahim, "*The Muslim Society and Politics in Bengal"*, University of Dhaka, Bangladesh, 1978.
10. Prof. Dr. Muinuddin Ahmed Khan, "*Islamic Revivalism"*, Bangladesh Institute of Islamic Thought, 2010.
11. Dr. Muinuddin Ahmed Khan, "*Muslim Struggle for freedom in Bengal",* Islamic Foundation Bangladesh, 1983.
12. Dr. Muhammad Inamul Huq, "*Varoter Musalman O Shwadinota Andolan"*, Bangla Academy, 1995.
13. Azizur Rahman Mallick, "*British Policy and the Muslims in Bengal"*, Asiatic Society of Pakistan, 1961.
14. Dr. M.A. Rahim, and others, "*Bangladesher Itihash"*, Nowroz Kitabistan, Dhaka, Bangladesh, 1994.
15. Md. Thowhidul Islam and others, "*Bangladesh Studies",* Bangladesh Institute of Islamic Thought, 2017.
16. Abbas Ali, Khan, "*Banglar Musalmander Itihash"*, Bangladesh Islamic Center, Dhaka, 2002.
17. Sirajul Islam, "*History of Bangladesh"*, Vol – 1-3, Asiatic Society of Bangladesh, Dhaka, 2008.
18. Abul Asad, "*Ekshobochorer Itihas"*, Bangladesh Co-operative Book Society, Dhaka, 1997.
19. M.A. Barnik, "*Rasthra Bhasha Andoloner Itihas",* AHDPH.
20. Oli Ahad, "*Jatiyo Rajniti 1945-1975"*, Bangladesh Co-operative Book Society, Dhaka, 2004.

Useful web links:

1. http://www.bangladesh.gov.bd
2. http://www.bangladesh.com
3. http://www.banglapedia.org
4. http://www.ru.ac.bd/ibs/
5. http://www.bbs.gov.bd

21.B. Synopsis of Interdisciplinary Courses

Interdisciplinary Courses

Course Code: ACC-2401
Course Title: FINANCIAL AND MANAGERIAL ACCOUNTING

Credit Hour: 2/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. Learn about the term "Financial and Managerial Accounting'
2. Analyzing financial statement of an organization.
3. Understand the bookkeeping system.
4. Auditing to errors correction in the trial balance.
5. Develop budget and planning.
6. Create the bank reconciliation statement.

Course Outcomes:

Students who successfully complete the course will be able to:

1) Analyze financial statement of an organization.
2) Develop budget and planning of an organization.
3) Develop and refine the bank reconciliation statement.
4) Create the bank reconciliation statement.
5) Apply the bookkeeping system.

Course Contents:

Mid-term Exam: 30 Marks

1. **Preliminaries:** Introduction to Accounting, History and development of accounting thought, types of accounting, Accounting Principles & ethics, Accounting Equation & Transaction Analysis.
2. **Introduction to Financial Statements. Recording Business Transactions:** The Accounts & their types.
3. **Double-Entry Book keeping system;** Invoice, discount from purchase price, purchase return and allowances, Sale of inventory, sales discount, sales returns and allowances; Journals, ledger & Trial balance.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Correcting errors in the trial balance. The Adjusting and Closing Procedure:** The adjusting process, Accrual versus cash basis Accounting, Preparation of Adjusted trial balance and financial statements, Closing entries & Reversing entries.
2. **Using accounting information in decision-making. Accounting in practice:** Worksheet. Purchase book, sales book, cashbook, patty cashbook, etc. Control accounts and subsidiary accounts. Bank reconciliation statement.

Part – B: 30-Marks

1. **Cost In General:** Cost in general: objectives & classifications; Costing Journals; Job order costing, Process costing & Overhead costing, cost sheet; Cost of goods sold statement.
2. **Marginal & Relevant costing:** Marginal costing tools and techniques, cost-volume-profit analysis.
3. **Guidelines for decision-making. Budget:** Capital budgeting; planning, evaluation & control of capital expenditures.

Recommend Book

Reference Books:

1. Charles T Horngren, Walter T Harrison & M. Suzanne Oliver, "Financial & Managerial Accounting 2nd Edition".
2. Adolph Matz & Milton F. Usry, "Cost Accounting: Planning and Control", Wadsworth Pub. Co., 9 r.e. edition, 1989
3. Sankar Prasad Basu & Monilal Das, "Practice in Accountancy", Rabindra Library, 9th Edition, 2002
4. Jerry J. Weygandt, Donald E. Kieso & Paul D. Kimmel, "Accounting Principles", JOHN WILEY; 9th Revised edition, 2009
5. Jay M Smith & K Fred Skousen, "Intermediate Accounting: Comprehensive Volume", South-Western College Pub; 12th edition, 1994
6. Noureen & Garrison, "Managerial Accounting", McGraw-Hill/Irwin, 11th Edition, 2004…

Course Code: ECON-3501
Course Title: PRINCIPLES OF ECONOMICS

Credit Hours: 2 / Contact Hours: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

- Understand a broad range of economic concepts, theories and analytical techniques that will cover the understanding of both micro and macro- economics.
- Learning and grasping the economic behavior of human and exposed to economic way of thinking.
- Understand the markets of goods and services and policy choices that affect these markets.
- Introducing to GDP, growth, instability, monetary policy, fiscal policy, and economic planning.

Course Outcomes:

Students who successfully complete the course will be able to:

- Demonstrate knowledge of the fundamental concepts and theories of micro and macro-economics.
- Identify the key indicators of economic growth and how to use the indicators for national and international comparisons.
- Identify and explain the key macroeconomic policies.

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction:** Definition of economics, Scope and utility of studying economics.
2. **Micro-economics:** The theory of demand and supply and their elasticity, Price determination, Nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curves technique, Marginal utility analysis,
3. **Production:** Production function, types of productivity, the nature of Isoquants and Isocosts, Rational region of production of an engineering firm. Euler's theorem

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Market:** Concepts of market and market structure. Cost analysis and cost function. Small scale production and large-scale production, Optimization, Theory of distribution.
2. **Macroeconomics:** Savings, investment, employment, National income analysis, Inflation.

Part – B: 30-Marks

1. **Economic Policy:** Monetary policy, Fiscal policy and trade policy with reference to Bangladesh.
2. **Economics of development:** Dimensions of development, Relevance of theory, the employment problem, Human resource development
3. **Economics of planning:** Planning and market, Policy models, Planning experience.

Recommend Book

Reference Books:

1. Richard H Leftwich, *"The Price System and Resource Allocation",* Holt, Rinehart and Winston, 3rd edition, 1966
2. Paul Samuelson & William Nordhaus, *"Economics",* McGraw-Hill Education, 19th edition, 2009
3. George J. Stigler, *"Theory of Price",* Pearson College Div, 1987
4. Campbell R. McConnell, Stanley L. Brue & Sean Masaki Flynn Dr, *"Economics: Principles, Problems, & Policies",* McGraw-Hill Education; 20th edition, 2014

Course Code: MGT-3601

Course Title: INDUSTRIAL MANAGEMENT

Credit Hours: 2 / Contact Hours: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. Understand the basic principles of management and four functions of managers.
2. Being familiar with the principles of organizing and manpower development.
3. Interpret financial statements and other financial reports of industrial companies.
4. Design different combinations of systems for management control in an organization.
5. Introducing different industrial laws relating to employee rights and work environment.
6. Understanding the industrial production system and quality control.
7. Understanding the basic principles of marketing management.

Course Outcomes:

Students who successfully complete the course will be able to:

1. Comprehend how an organization is formed and managed.
2. Understand the different roles of the owners, employees, board of directors and other stakeholders in an organization.
3. Make plan and budget in different functional area of the organization i.e. marketing, production etc.
4. Understand the legal rights and duties of the workers in a workplace.
5. Know about the copyright, patent right and validity, different aspect of quality assurance etc.

Course Contents:

Mid-term Exam: 30 Marks

1. **Preliminaries:** Definition, Importance of management, Evolution, Functions of management, Introduction to Industry & organizational management.
2. **Organization and Its Environment**: Environmental context of the Organization.
3. **Organizing & stuffing:** Theory & structure, Co-ordination, Span of control, Authority delegation, Formal & Informal Groups, Committee and task force, Manpower planning & Development.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Cost & Financial Management:** Investment analysis, benefit-cost analysis &its implications in decision making. Cost planning & Price Control, budget & budgetary control, development planning process
2. **Marketing management:** Concepts, strategy, sales promotion, Transportation & Storage. Technology management: Management of innovation & changes, technology lifecycle.

Part – B: 30-Marks

1. **Production Management**: Designing operations system in production and service-oriented industry. Product layout, process layout, & fixed position layout. Organizational technologies: automation, computer-assisted manufacturing, flexible manufacturing system, and robotics. TQM, bench marking, ISO 9000, SQC.
2. **Industrial law**: Law of contract, sale of goods, Hire and purchase, Negotiable instrument Act, patent right and validity. Factories act, Industrial relations ordinance, workmen's compensation act.
3. **Professional Practice:** Tender documentation, General conditions of tender, Technical Specification, Purchase & procurement rules-2004, Technical evaluation, Copyright, Intellectual property right.

Recommended Books:

Reference Books

1. Terry Franklin, *"Principles Of Management",* Aitbs Publishers,India, 1899
2. Ricky W. Griffin, *"Management",* Cengage Learning, 11th edition, 2012
3. Heinz Weihrich & Harold Koontz, *"Management A Global Perspective",* McGraw-Hill Education Asia, 11th edition, 2004
4. Arun Monappa, *"Industrial Relations",* Tata McGraw-Hill Education, 1985

Course Code: LAW-4721
Course Title: PROFESSIONAL ETHICS AND ENVIRONMENTAL PROTECTION LAW

Credit Hours: 2 / Contact Hours: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

The purpose of the course is to give students an appreciation of the role of law in the society of their profession and signifying the development process of the Engineering ethics and analyzing the issues of cyber law with regard to the existing regulation of cyber-crime that will better equip them to deal with the challenges of globalization.

Course Outcomes:

Students who successfully complete the course will be able to:

Engineering law or law in engineering is the empirical study of the application of laws and legal strategy in engineering. Applied law aims to explain how law interacts with industry. The current school of thought within the academic community of lawyers and engineers is the pragmatic paradigm. Commonly, professionals have a Bachelors in Engineering and a Bachelors in Law, and increasingly commonly a Masters of Business Administration. Pragmatic application of laws means the empirical study of how a corporate legal framework should be adopted.

Course Contents:

Mid-term Exam: 30 Marks

1. **Law Basics:** Definition and Theories of Law, Nature and Scope of Law, Purposes of Law, Sources of Law, School of Jurisprudence, Theories of Punishment, Meaning of Rights and Duties, Legal Personality, Ownership and Possession, Administration of Justice.
2. **Law of Contract:** Definition and Essential Elements of Contract, Principles of Law of Contract, Law of Agency, Law of Partnership, Law of Sale of Goods, Law of Negotiable Instruments, Law of Insurance and Insolvency.
3. **Labour Law:** The Scope and Sources of Labour Law, Elementary Principles of Labour Law, Labour Laws in Bangladesh, Law in relation to wages, working hours and leave, Law in relation to health, safety and other condition to work.
4. **Company Law:** The Companies Act with special reference to the amendment and ordinances applicable in Bangladesh. Law relating to the formation, incorporation, management and winding up of companies

Final Exam: 50 Marks

Part – A: 20-Marks

1. **History and development of Engineering Ethics**: History and Development of Engineering Ethics, Meaning of Ethics and Engineering Ethics, Applied Ethics in Engineering, Human Qualities of an Engineer, Obligation of an Engineer to the clients and to other Engineers, Measures to be taken in order to improve the quality of engineering profession.
2. **Ethical Expectation:** Employers and Employees inter-professional relationship, maintaining a commitment of Ethical Standards, Desired characteristics of professional code.

Part – B: 30-Marks

1. **Cyber Law Introduction:** Definition and Nature of Cyber Law, The need for cyber law, Regulation of Technology and Internet, The Internet and Problems of Geography and Sovereignty, Freedom of Expression on Internet.
2. **The Relationship between Legal and Technological Regulations:** Intellectual Property, Copy rights, Trademarks, Industrial Designs, Electronic and Digital Signature, Electronic Contract.
3. **Liabilities of Internet Intermediaries:** Defamatory Contents, Privacy, copy rights, infringement. Liabilities relating to electronic financial transaction
4. **Cyber Crime:** Definition, Nature and Scope of Cybercrime, Regulation of Cyber Crime, Offences and Punishment of Technology Crimes.

Recommended Books:

Reference Books

1. Mohammadullah Mojaher, *"Essential Laws for Professionals",* Arabi Library, 2017
2. M.C. Kuchhal & Vivek Kuchhall, *"Mercantile Law",* Vikas Publishing House, 8th Edition, 2000
3. AI Khan, *"Fundamentals of Company Law with The Law of Partnership",* Dhaka, 8th edition, 2017
4. Abdul Halim, *"The Bangladesh Labour Code, 2006",* Dhaka CCB Foundation, 2011

21.C. Synopsis of Core Courses

Course Code: MATH-1107
Course Title: Differential and Integral Calculus

Credit Hours: 3 / Contact Hours: 3 per Week

Course Objectives:

Calculus divides naturally into two parts, differential calculus and integral calculus. Differential calculus is concerned with finding the instantaneous rate at which one quantity changes with respect to another, called the derivative of the first quantity with respect to the second. Integral calculus deals with the inverse of the derivative, namely, finding a function when its rate of change is known.

The objective of this course is to provide the students with an understanding of how to find out the rate of change of various functions, and to determine the area and volume of different types of objects. This course aims to introduce the student with the various techniques of differentiation and integration.

Course Outcomes:

Students who successfully complete the course will be able to:

ILOs / COs	Description
ILO / CO: 1	For complex Engineering problems, it is essential to get Knowledge of the limit, continuity, and differentiability, power series, Rolle's Theorem, Mean value theorem, Taylor, and Mclaurin's series. Also the need concept of the partial derivative and Integration.
ILO / CO: 2	By using the above mentioned foundational mathematical information; One can implement it to solve the mathematical problems, which is expressing engineering principles.

Course Contents:

Mid-term Exam: 30 Marks

1. **Functions:** Limit of Functions, continuity and differentiability, physical meaning of derivative of a function, Indeterminate Form.
2. **Ordinary Differentiation:** Differentiation, successive differentiation and Leibniz theorem,
3. **Expansions of Functions:**
    a. Rolle's theorem, mean value theorem
    b. Taylor's and Maclaurian's Formulae

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Partial Differentiation:** Partial Differentiation, Euler's formula, Maxima and minima.
2. **Indefinite integral:** Physical meaning of integration of a function, method of Substitution, Integration by parts, special trigonometric functions and rational fractions different techniques of integration.

Part – B: 30-Marks

1. **Definite integral:** Fundamental theorem, general properties, and evaluations of definite integral and reduction formula, definite integral as the limit of a sum, Integration by successive reduction, Gamma and Beta Function
2. **Multiple Integral:** Double Integral, Evaluation of double integral, Change of order of integration, triple Integral, Application of double and triple integral.
3. **Integration by Revolution:** Determination of length of curves, Areas of plane region and Areas of surfaces of solids of revolution, Volumes of solids of revolution.

Recommend Books

Textbook:

1. Mohammad, Khosh; Bhattacharjee, P. K.; Latif, Md. Abdul "*A textbook on differential calculus*", Gonith Prokashon, 10th Edition, 2001.
2. Mohammad, Khosh; Bhattacharjee, P. K.; Latif, Md. Abdul "*A textbook on integral calculus : with differential equations* ", Gonith Prokashon, 9th Edition, 2001.

Reference Book:

1. K A Stroud, *"Engineering Mathematics"*, Industrial Press Inc.,U.S., 7th Edition., 2013
2. Erwin Kreyszig, *"Advanced Engineering Mathematics"*, Wiley, 10th Edition., 2010
3. Das BC and Mukherjee, *"Differential Calculus"*, Calcutta, U.N. Dhar Publishers, 2006
4. Das BC and Mukherjee, *"Integral Calculus"*, Calcutta, U.N. Dhar Publishers, 2006

Course Code: PHY-1101

Course Title: PHYSICS-I

Credit Hours: 3/ Contact Hours: 3 per Week

Course Objectives:

This course is designed to provide students in Applied Science who wish to study engineering at university with an enhanced background in order to improve their chances of success in their chosen program. The material will be presented using the normal mix of lectures and laboratory experiments and demonstrations. This course objective is also to:

1. Study some of the applications of physics to technology and other scientific fields.
2. Give a solid grounding in basic physics that will serve as a basis for further study in Engineering.
3. Develop analytical and mathematical skills that will be applicable to many scientific endeavors.
4. Demonstrate the application of the scientific method through laboratory experiments.
5. Develop an appreciation for how scientific measurements are made.
6. Assess the role of physics, in helping us to better understand the complex, technological society.

Course Outcome:

ILOs / COs	Description
ILO / CO: 1	**Demonstrate** an understanding of mechanics, waves, optics, heat and thermodynamics.
ILO / CO: 2	**Apply** basic physics laws and formulae to complex cases like; Fly wheel, Elastic bending, forced oscillation, Compound Pendulum, Heat engine, Polarization etc.

Course Contents

Mid-term Exam: 30 Marks

1. **Dynamics of Rigid Body:** Linear motion of a body as function of time, position and velocity, momentum, conservation theorem of momentum and energy, collision and torque, center of mass of rigid body, rotational kinetic energy, fly wheel, axes theorems and their applications.
2. **Gravity and Gravitation:** Definitions, compound pendulum, gravitational potentials and fields and relation between them, potential due to spherical shell, escape velocity and Kepler's law of planetary motion.
3. **Elasticity:** Hooke's law, relation between different elastic constants, bending of beams, cantilever, determination of Young's modulus and its engineering applications.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Surface Tension:** Definitions, cohesion, adhesion and molecular range, molecular theory of surface tension, capillarity, angle of contact, expression for surface tension, relation between surface energy and surface tension.
2. **Fluid Dynamics and Viscosity:** Stream line and turbulent motion, equation of continuity, energy of a liquid in motion, Bernoulli's theorem, viscosity, coefficient of viscosity, Stoke's law.

Part – B: 30-Marks

1. **Waves and Oscillations:** Waves in elastic media, standing waves, Sound waves, beats and Doppler's effect in sound, simple harmonic motions, total energy and average energy, damped and forced vibration, resonance.
2. **Thermodynamics:** Thermodynamic system, first and second law of thermodynamics and their applications, the thermodynamic temperature scale, Carnot's heat engine, the efficiency of engine, combined first and second law of thermodynamics, entropy and refrigerator.
3. **Optics:** Theories of light, interference of light, Young's double slit experiment, Fresnel and Fraunhofer diffraction, diffraction of single slit, polarization of light, Production and analysis of polarized light, Brewster's law, Malus' law.

Recommend Books

Textbooks:

1. D.S. Mathur, *"Elements of Properties of matter"*, S. Chand and Company, 5th Edition, ISBN: 9788121908153, 2008.
2. D. Halliday and R. Resnick, *"Fundamentals of Physics Extended"*, Wiley, 10th Edition, ISBN: 978-1118230619, 2013.

3. Brij Lal & N Subrahmanyam, *"Heat Thermodynamics and Statistical Physics"*, S. Chand Publishing, 3rd Edition, 2012

Reference Books:

1. Brij Lal and N Subrahmanyam, *"A Textbook of Sound"*, Vikas Publishing House, 2nd Edition, 2008
2. Brij Lal and N. Subrahmanyam, *"Properties of Matter"*, S. Chand and Company, 2002
3. F.W.Sears, *"Thermodynamics Kinetic Theory and Statistical Thermodynamics"*, 3rd Edition, Narosa Publishing House, 1998.

Course Code: EEE-1121
Course Title: ELECTRICAL CIRCUITS – I DC

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

1) To introduce the fundamental ideas of DC electrical circuits
2) To comprehend and apply ohm's law
3) To get the basic ideas about series and parallel circuits
4) To learn to find equivalent resistance of complex circuits
5) To Comprehend and Apply various types of circuit theorems
6) To introduce the fundamental ideas of magnetic circuit
7) To analyze the performance of R-C and R-L circuits with DC excitation

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Understand the concepts of basic Circuit element, basic circuit, and basic circuit Laws and magnetic circuit laws.
ILO / CO: 2	Introduce series parallel circuit and different network theorem to analysis the circuits.

Course Contents:

Mid-term Exam: 30 Marks

1. **Circuit variables and elements**: Voltage, current, power, energy, independent and dependent sources, and resistance.
2. **Basic laws:** Ohm's law, Kirchoff's current and voltage laws. Simple resistive circuits: Series and parallel circuits, voltage and current division.
3. **Wye-delta transformation:** Necessity of Delta-Wye Conversion, Application, Delta to Wye Conversion, Wye to Delta Conversion.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Techniques of circuit analysis**: branch current analysis, Nodal and mesh analysis including super node and super mesh.
2. **Network theorems**: Source transformation, Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem.

Part – B: 30-Marks

1. **Energy storage elements**: Inductors and capacitors, series parallel combination of inductors and capacitors, Source free RC circuit, Source free RL circuit, Step response of RC circuit, Step response of RL circuit.
2. **Magnetic Circuits:** Magnetic quantities and variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve. Laws in magnetic circuits: Ohm's law and Ampere's circuital law. Magnetic circuits: series, parallel and series-parallel circuits.
3. **Second Order Circuit:** Source free series RLC circuit, Source free parallel RLC circuit, Step response of series RLC circuit, Step response of parallel RLC circuit.

Recommend Books

Textbooks:

1. Robert L. Boylestad, *"Introductory Circuit Analysis"*, 11th ed. Pearson education international, USA, 2007
2. Charles K. Alexander and Matthew N. O. Sadiku, "Fundamental of Electric Circuits", 5th ed., McGraw Hill, New York, 2009

Reference Books:

1. L. Theraja and A. K. Theraja, *"A text book of Electrical Technology"*, Volume IV, 23rd ed. Rajendra Ravindra Printers, India, 2007

Course Code: EEE-1122
Course Title: ELECTRICAL CIRCUITS – I DC SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Objective:

1. To introduce the typical lab equipment's used in the laboratory
2. To give general guideline about the safety precautions necessary
3. To verify different circuit laws and theorems

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Introduce basic required component of electrical circuit.
ILO / CO: 2	Examine the different laws of basic circuit and theorem.
ILO / CO: 3	Analyze the different laws of basic circuit and theorems using modern tools.
ILO / CO: 4	Able to do the lab works individually and as members or leader of a team.

Contents:

S.L.	Contents
1.	Familiarization with the Electrical circuit instruments and components.
2.	Study of Ohm's law.
3.	Verification of KVL & Voltage Divider Rule.
4.	Verification of KCL &Current Divider Rule.
5.	Introduction to modern tools (PSpice) to analyze the circuit.
6.	Equivalent Resistance of Series-Parallel Network.
7.	Analysis of Delta–Wye Network.
8.	Analysis of Nodal circuit.
9.	Verification of Superposition Theorem.
10.	Verification of Thevenin's Theorem.
11.	Verification of Maximum Power Transfer Theorem.

References:

- Md Jashim Uddin, Md. Mostafa Amir Faisal, ETE-1103 Lab Manual, 2015.

Course Contents:

Laboratory works based on **ETE – 1103**

Course Code: CE-1108
Course Title: Engineering Drawing

Credit Hours: 1 / Contact Hours: 2 per Week

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Understand the importance of ISO Standards in Engineering Drawing, lettering and Dimensioning.
ILO / CO: 2	Perform basic sketching techniques (2D & 3D) will improve through exercises in Orthographic Projection, isometric, sectional, and perspective drawing.
ILO / CO: 3	Use extract information from drawings and geometric models to solve Engineering Drawing problems.
ILO / CO: 4	Use the knowledge of sketching and technical drawing in the various fields of engineering.

Course Contents:

S.L.	Contents
1.	Introduction orthographic projection: Scale drawing, Sectional view, Top and side view Isometric views, Missing line, Auxiliary view, Pictorial views.
2.	Drawing standard and practices: Interpenetrating of surface, Development of surfaces, Machine drawings, and Technical sketching.
3.	Introduction to Computer Aided Design (CAD): Project on Engineering Drawing and CAD using Contemporary packages in engineering drawing
4.	Introduction and Familiarization of Drawing Instrument.
5.	Line, Dimensioning, Scale of drawing and Plane Geometry.
6.	Orthographic views (Free hand Drawing)
7.	Orthographic views (With Dimension)
8.	Missing line, Auxiliary view, Pictorial view and sectional view
9.	Isometric views
10.	Development of surfaces
11.	Machine drawings and technical sketching
12.	Study on CAD Drawing
13.	Project on engineering drawing and CAD using contemporary packages in 2D

Recommended Books

Reference Books:

1. Fredw Rick E Giesecke, Alva Mitchell, Henry C. Spencer, Ivan L. Hill, Robert O, *"Engineering Graphics"*, Pearson Learning Solutions; 8th Edition, 2013

Course Code: MATH-1207
Course Title: Geometry and Differential Equations

Credit Hours: 3 / Contact Hours: 3 per Week

Course Objectives:

Geometry deals with space and shapes. The objective of this course is to develop an understanding of the visual ability, to enable the students to make the design of solving problems, and to improve the skills of reasoning. Through this course student will learn how to solve different types of differential equations.

By applying geometry students will be able to think outside the box. After completing this course students will be able to analyze the real-world problems related to population dynamics, mixtures, growth and decay, heat transfer, electronic circuits, mechanical vibrations, transport phenomena and Industrial Organization through a set of differential equations. A student will be able to know how to formulate the mathematical model and how to interpret the results

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Reflect a basic understanding of change of axes, system of circles, Pair of straight lines and their properties, rectangular co-ordinate System, coplanar lines, equation of planes and sphere, basic idea of finding shortest distance.
ILO / CO: 2	Developing ability to be manipulated and identify the linear, nonlinear, partial and ordinary differential equations and solve the complete solution of a differential equation with constant coefficients .Applying the ordinary and partial differential equations to solve the real world problems such as Electrical Circuits problems, Growth and Decay Problems, Temperature Problems, Falling Body Problems and Dilution Problems.

Course Contents:

Section-A (Mid-term: 30 Marks)

1. **Two-Dimensional Geometry**: Change of Axes**,** Pair of straight lines, General equation of second degree presents a pair of straight lines, Properties of Pair of straight lines, System of circles.
2. **Three-dimensional Geometry**: Rectangular co-ordinate System, Direction cosines, Direction ratios, Projections, Equation of planes, Different forms of planes.
3. **Straight lines in three-dimension**, Angle between two lines, Angle between a lines and a plane, coplanar lines and Shortest distance, Spheres.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. **First order differential equation:** Definition, solution of first order and first-degree differential equation with initial conditions, Solution of Linear differential Equation, Separable Equations, homogeneous equations, Bernoulli Equation, Exact Differential equations, Integrating Factors, Boundary Value Problems.
5. **Higher order Differential equations with constant coefficients**: Solution of higher order homogeneous differential equations, Solution of non-homogeneous differential equations, Auxiliary Equations, Complementary function and particular integral

Group-B (30 Marks)

6. **Bessel's functions**, Legendre's polynomials and their properties, Linear differential Equation of second-degree using Method of variation of parameter & Method of Undetermined coefficients.
7. **Linear & Non-Linear Partial Differential Equations:** Elimination of arbitrary constants and functions, Lagrange's method, Charpit's method. Solving linear partial differential equations with constant coefficients, Complementary function and particular integrals, Short method.
8. **Physical Applications:** Solution of Practical (Real world) problems using differential equations such as Growth and Decay Problems, Temperature Problems, Falling Body Problems, Dilution Problems, Electrical Circuits problems, Orthogonal Trajectories, Spring Problems, Buoyancy Problems, Classifying Solutions etc

Recommend Books

Textbooks:

[1]. Stein, Sherman K., and Anthony Barcellos.,*" Calculus and Analytic Geometry*", New York: McGraw-Hill, 1992.

Reference Books:

[1]. Stroud, Kenneth Arthur, and Dexter J. Booth.," Engineering *Mathematics",* Macmillan International Higher Education, 2013.

[2]. Pfahler Eisenhart Luther, *"Coordinate Geometry"*, Luther Press, 2007

Course Code: PHY-1201
Course Title: PHYSICS- II
Credit Hours: 3 / Contact Hours: 3 per Week

Course Objectives:

This course is designed to provide students in Applied Science who wish to study engineering at university with an enhanced background in order to improve their chances of success in their chosen program. The material will be presented using the normal mix of lectures and laboratory experiments and demonstrations. This course objective is also to:

1. Study some of the applications of physics to technology and other scientific fields.
2. Give a solid grounding in electromagnetism, Structure of matter and modern physics that will serve as a basis for further study in Engineering.
3. Provide knowledge and to develop an understanding of modern physics.
4. Develop analytical and mathematical skills that will be applicable to many scientific endeavors.
5. Demonstrate the application of the scientific method through laboratory experiments.
6. Develop an appreciation for how scientific measurements are made.
7. Assess the role of physics, in helping us to better understand the complex, technological society.

Course Outcome:

ILOs / COs	Description
ILO / CO: 1	**Demonstrate** an understanding of Electricity & Magnetism, Alternating Current, Solid state physics, Modern Physics & Relativity.
ILO / CO: 2	**Apply** basic physics laws and formulae to complex cases like; Gauss's law for dialectic material, Biot-Savart law for solenoid, toroid, Ampere's law, Faraday's laws, Crystal lattice formation for solid state electronic materials, Photo-electric and Compton effect etc.

Course Contents:

Mid-term Exam: 30 Marks

1. **Charge and Electric Potential:** Electric charge, conductors and insulators, Coulomb's law, electric field, Electric field strength, Gauss's law and its applications, electric potential and potential function, electric dipole, dielectrics in Gauss' law.
2. **Magnetic Field:** The definition of magnetic field **B,** magnetic force on charge and current, Ampere's law, Biot-Savart law and their application, Lorentz force.
3. **Electromagnetic Induction:** Faraday's law of electro-magnetic induction, Lenz's law, self and mutual induction, energy density in the magnetic field.

Final Exam: 50 Marks
Part – A: 20-Marks

1. **Current and Resistance:** Current and current density, Ohm's law, potential difference, RC circuits, generation of alternating current and e.m.f.
2. **Structure of Matter:** Crystalline and non-crystalline solid, single crystal and polycrystalline solids, unit cell, bonds in solids, Inter atomic distances, calculation of cohesive and bonding energy.

Part – B: 30-Marks

3. **Relativity**: Postulates of special theory of relativity, Lorentz transformation, time dilation and length contraction, relativity of mass, energy-mass relation, energy- momentum relation.
4. **Modern Physics**: Bohr's atomic model, radius and energy of Hydrogen atom, atomic nucleus and binding energy, photo-electric effect, Compton effect, De-Broglie waves, X-ray diffraction, atomic spectra and Zeeman effect.
5. **Radioactivity:** Definition, radioactive decay laws, half-life, mean life, alpha decay, beta decay, gamma decay, cross section, nuclear fission & fusion.

Recommended books:

Textbooks:

1. Robert Halliday, David & Resnick, *"Physics (Part 2)"*, John Wiley & Sons, Inc., 1968
2. Arthur Beiser, *"Concepts of Modern Physics"*, McGraw-Hill Higher Education, 6th Edition, 1994
3. B L Theraja, *"Modern Physics"*, S. Chand Publishing, 16/e, 1975
4. Dr. Giasuddin Ahmed, *"Physics for Engineers-II"*
5. Brij Lal & N Subrahmanyam, *"Atomic and Nuclear Physics"*, 2/e, S. Chand Publishing, 2013

Course Code: PHY-1202
Course Title: PHYSICS-II Sessional
Credit Hours: 1 / Contact Hours: 3 per Week

Course Outcome:

ILOs / COs	Description
ILO / CO: 1	Apply the fundamental laws of Mechanics, Electricity &Magnetism in practical engineering.
ILO / CO: 4	Design and conduct experiments, as well as to analyze and interpret data.

Course Contents:

1. Determination of the end corrections for a meter bridge.
2. Determination of specific resistance of the material of a wire by a meter bridge.
3. Determination of the resistance of a wire by means of post office box.
4. Experimental verification of the laws of series and parallel connections of resistance by means of a post office box.
5. Calibration of a meter bridge wire.
6. Determination of the value of low resistance by the method of fall of potential (Mathiesen and Hockins Method)
7. Determination of the resistance of a galvanometer by half deflection method.
8. Determination of the current sensitivity (figure of merit) of a galvanometer.
9. To determine the moment of inertia of a flywheel about its axis of rotation.
10. To determine the value of 'g', acceleration due to gravity by means of a compound pendulum.
11. To determine the Young's Modulus by the flexure of a beam (Bending Method).

Recommend Book:

Reference Book:

1. Dr. Giasuddin Ahmad and Md. Shahabuddin, *"Practical Physics"*

Course Code : CSE - 1221
Course Title: COMPUTER FUNDAMENTALS AND PROGRAMMING
Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

This course introduces/analyze students to: i) recognize and understand the purpose of basic computer components, ii) understand the concept of program, iii) understand the concept of variable, constant, loop, array, function, structure, pointer and file, iv) understand the parts of a computer system and how they interact, v) understand the concept of a program in a high-level language being translated by a compiler into machine language program and then executed.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Define the components of a computer system including the basic terminology used in computer programming.
ILO / CO: 2	Demonstrate C language by writing, compiling and debugging programs with the use of different data types, variables, constants and numerous input/output functions.
ILO / CO: 3	Apply control statements, functions, structures, unions, arrays and pointers of C language to solve real world problems.
ILO / CO: 4	Adapt the concept of file handling to manipulate file data.

Course Contents:

Mid-term Exam: 30 Marks

1. Computer Organization:

Basic organization and functional units of computer, Input/storage/output/arithmetic logic/control and central processing unit, internal structure of CPU. Memory location and address, RAM, ROM, Basics of software.

2. Introduction to Programming:

Definition of Software, its classification, Problem solving steps, Introduction of C and its structure, history and Characteristics, Introduction to keywords, constants and identifiers, Fundamental of C variable and data types, Rules of constants, Introduction to arithmetic, relational and logical operators, Introduction to expressions, Managing data input, Managing data output.

3. Program Control Statements:

Decision making and branching. If and if… else statements, Other control statements, switch and the '?:' operator, Decision making and looping. While looping, Do…while and for looping statements, Jump statement go to, break and continue.

Final Exam: 50 Marks

Part – A: 20-Marks

4. User-defined Functions:

Need for multifunction programs, return values, types and some examples, Calling functions and arguments, Recursions, passing arrays to functions, Storage class.

5. Arrays:

Introduction to arrays. One-dimensional array. Some sample programs, Two-dimensional array. Some sample programs, String handling in C and some examples.

Part – B: 30-Marks

6. Structures and Unions:

Definition of Structure, Union, Structure union applications, Self-referential Structure, Linked list, Array of structure and some examples.

7. Pointers:

Understanding pointers, Pointers and arrays. Pointers and functions, pointers and structures.

8. File Management:

File management concept in C, Defining, opening and closing a file, Input/output operations in file, Error handling and command line arguments, Dynamic memory allocation, Some special features of C (Macros, Enumerations).

Recommend Books

Textbooks:

[1]. Balagurusamy, E, "*Programming in ANSI C*", 6th ed. Tata McGraw-Hill, Delhi, 2012

Reference Books:

[1]. Herbert Schildt, *"C: The Complete Reference"* Osborne McGraw-Hill Company Inc, 2000.

[2]. Byron S. Gottfried, "*Theory and Problems of Programming with C*" 3rd ed., McGraw-Hill Company Inc, 1996

Course Code : CSE - 1222
Course Title: COMPUTER PROGRAMMING SESSIONAL

Credit Hour: 1.5/ Contact Hour: 3 per week

Course Outcomes:

CO1. Write, compile and execute C programs based on simple constructs like arrays, loops, structures, conditional statements etc.
CO2: Apply the concepts of pointer and functions to solve problems.
CO3: Demonstrate the use of file handling operations.
CO4: Develop simple C program for standard applications.

Course Contents:

[1]. Introduction to C programming
[2]. Data types and expressions
[3]. Operators
[4]. Decision making and Branching (if-else, nested if-else)
[5]. Decision making and Branching (if-else, if-else-if ladder and switch)
[6]. Decision making and Looping (do-while, while and for)
[7]. String manipulation
[8]. User define function
[9]. Call-by-value and call-by-reference
[10]. Recursion
[11]. Arrays-one dimensional
[12]. Arrays-two dimensional
[13]. Structure and Union
[14]. Pointers
[15]. File management

Recommend Books

Textbooks:

[1]. Balagurusamy, E, *"Programming in ANSI C"*, 6th ed. Tata McGraw-Hill, Delhi, 2012

Reference Books:

[1]. Herbert Schildt, *"C: The Complete Reference"*, Osborne McGraw-Hill Company Inc, 2000.
[2]. Byron S. Gottfried, "*Theory and Problems of Programming with C*" 3rd ed., McGraw-Hill Company Inc, 1996

Course Code: EEE – 1243
Course Title: ELECTRICAL CIRCUITS – II AC

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

1. To introduce AC electric circuits and systems with AC power concepts.
2. To introduce the concepts of impedance, phasor and frequency response.
3. To introduce passive and active analogue filters.
4. To introduce the Laplace transform and its application in electrical circuits.
5. To introduce polyphase circuits and electrical transformers.
6. To introduce two ports networks.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Acquire basic knowledge on AC quantities and different waveforms and their applications.
ILO / CO: 2	Understand and Recognize AC Circuit analysis methods and the network theorems for AC.
ILO / CO: 3	Familiar with single phase and three phase AC circuit and their Applications.

Course Contents:

Mid-term Exam: 30 Marks

1. Alternating current, AC quantities, Sinusoidal waveforms,
2. AC circuits, AC Power and Power factor.
3. Network theorems.

Final Exam: 50 Marks

Part – A: 20-Marks

4. Resonance and Q-factors,
5. Balanced Polyphase systems

Part – B: 30-Marks

6. Unbalanced Polyphase systems.
7. Coupled circuits.
8. Filters, Transients in AC circuits.

Recommend Books

Textbook

1. R. M. Kerchner and G. F. Corcoran, *"Alternation- Current Circuits"*, 4th edition, john Wiley & Sons, Inc, 2006

Reference Book:

1. K. Alexander and M. N. O. Sadiku, "*Fundamentals of Electric Circuits*", 3rd Edition, McGraw-Hill, 2006.
2. W. H. Hayt, Jr., J. E. Kemmerly, and S.M. Durbin,"*Engineering Circuit Analysis*", Sixth Edition, McGraw-Hill, 2002.
3. J. David Irwin, "*Basic Engineering Circuit Analysis*", Wiley, 7th Edition, 2001

Course Code: EEE – 1244
Course Title: ELECTRICAL CIRCUITS – II AC SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Introduce basic required component and equipment of Alternating electrical circuit.
ILO / CO: 2	Construct and analyze different types AC circuit and theorem.
ILO / CO: 3	Able to do the lab works individually and as members or leader of a teams

Course Contents:

Contents
1. Familiarization with the Alternating Current Wave and learn how to use Function Generator and Oscilloscope.
2. To Study the characteristic of an R-C series circuit.
3. To Study the characteristic of an R-L series circuit.
4. Assessment-1
5. Study of Resonance in an R-L-C series circuit.
6. Study of Resonance in an R-L-C parallel circuit.
7. Single Phase power measurement using wattmeter.

Course Notes:

- Lab Manual Prepared by course instructor.

Recommend Books

Reference Books:

[1]. Charles K. Alexander and Matthew N. O. Sadiku, *"Fundamental of Electric Circuits"*, McGraw Hill, New York, 2009
[2]. Robert L. Boylestad, *"Introductory Circuit Analysis"*, 11th ed. Pearson education international, USA, 2007
[3]. B. L. Theraja and A. K. Theraja, *"A text book of Electrical Technology"*, Volume IV, 23rd ed. Rajendra Ravindra Printers, India, 2006

Course Code: EEE – 1245
Course Title: Basic Electronics

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

1. To introduce students' structures, physical operations, and circuit applications of basic semiconductor devices.
2. To provide students a base for a further study of analog and digital electronics.
3. To develop the ability to analyze and design electronic circuits.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Apply knowledge of Basic Electronics to Distinguish schematic symbol and Recognize basic concepts of electronic components and circuits.
ILO / CO: 2	To analyze the functionality of various devices including several types of Diode, BJT and FET through problem analysis.

Course Contents:

Mid-term Exam: 30 Marks

1. **Semiconductors materials**: Classification of material in terms of energy band, Extrinsic material and Intrinsic material, Electrons and holes in an intrinsic semiconductor, Donor and acceptor impurities, mobility, Hall effect, structure of N-type and P-type materials and their conductivity.

   Density of States and Fermi Dirac function. Calculation of Carrier Concentration, Drift of carriers, Mobility, Carrier Diffusion, Einstein Relation, Generation and Recombination, Excess carriers, Quasi-Fermi level, Basic Semiconductors Equations.
2. **P-N junctions Diode**: Formation of P-N junction, Depletion layer formation, PIV of Diode, Diode V-I characteristics, Small signal model of diode, transition and diffusion capacitance.
3. **Applications of diodes**: Circuit applications of diode, Rectifiers, Filter circuit, voltage doubler, Voltage tripler, Clamper and Clipper. Zener diode, LED, Photodiode, varactor diode, photo resistor, Crystal diode and Solar Cell.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Bipolar Junction Transistors**: Working principle of N-P-N and P-N-P transistor, V-I Characteristics of transistor, Different configuration of transistors amplifiers, input and output Characteristics, Cutt off and Saturation region, Load line analysis.
2. **Transistor biasing:** Various biasing method, Conditions of proper transistor biasing, Stability factor, Thermal stabilization.

Part – B: 30-Marks

1. **Small Signal model of Bipolar transistor**: Small signal low frequency h-parameters, Determinations of Hybrid parameters in CE, CC and CB configurations.
2. **Field Effect Transistor**: introduction, JFET, MOSFET, PMOS, NMOS, CMOS and their switching characteristics.
3. **Small Signal model of FET**: Small signal model for JFET, MOSFET and biasing of JFET and MOSFET.

Recommend Books

Textbooks:

1. Robert L. Boylestad, *"Electronic Devices and Circuit Theory"*, Pearson, 11th Edition, 2012

Reference:

1. David A. Bell, *"Electronic Devices and Circuits"*, Oxford University Press, 4th Edition, 1978
2. Thomas L. Floyd, *"Electronic Devices*", Prentice Hall, 6th Edition, 2001
3. V.K. Mehta, *"Principles of Electronics*", S Chand, 10th Edition, 2006

Course Code: EEE – 1246
Course Title: BASIC ELECTRONICS SESSIONAL

Credit Hour: 1 / Contact Hour: 2 per week

Course Objectives:

1. To introduce students' structures, physical operations, and circuit applications of basic semiconductor devices.
2. To develop the ability to understand, analyze and to do problem analysis of electronic circuits.
3. To investigate the functionality of Electronics Devices through experimentation.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Apply knowledge of Basic Electronics to Distinguish schematic symbol and Recognize basic concepts of electronic components and circuits.
ILO / CO: 2	To investigate the functionality of Electronics devices including several types of Diode, BJT and FET.

Course Contents:

Contents
1. Diode and It's application
2. Semiconductor Diode Characteristics.
3. Applications of Diode-1 (Logic Gates)
4. Applications of Diode-2 (Rectifiers and Filter)
5. Applications of Diode-2 (Doubler/Cliper/Clamper)
6. Zener Diode and It's application
7. Zener Diode Characteristics.
8. Application of Zener Diode (Voltage Regulation Properties)
9. Transistor and It's application
10. Demonstrate and measure input-output characteristics of a NPN transistor under Common Emitter/Common Collector /Common Base configuration.

Recommend Books

Textbooks:

A Lab Manual Prepared by instructor

Reference:

1. Robert L. Boylestad, *"Electronic Devices and Circuit Theory"*, Pearson, 11th Edition, 2012
2. David A. Bell, *"Electronic Devices and Circuits"*, Oxford University Press, 4th Edition, 1978
3. Thomas L. Floyd, *"Electronic Devices"*, Prentice Hall, 6th Edition, 2001
4. V.K. Mehta, *"Principles of Electronics"*, S Chand, 10th Edition, 2006

Course Code: CHEM-2341
Course Title: CHEMISTRY

Credit Hours: 3 / Contact Hours: 3 per Week

Course Objectives:

- To classify elements/matter by its state and bonding behavior using the Periodic Table as reference.
- To make predictions about the atomic structure and chemical properties of the elements based on their position in the periodic table.
- To identify the patterns in bonding, molecular geometry, and chemical reactions.
- To understand the principles of kinetics and thermodynamics and equilibrium positions of chemical reactions.
- To explain the physical properties of solids, liquids, gases, and solutions.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	To understand the chemical behavior and physical properties of elements (under-PO1).
ILO / CO: 2	To develop the knowledge on chemical reaction and solution, metallic and nonmetallic substance and its environmental aspect and impacts (under-PO7).
ILO / CO: 3	To understand the chemical reaction and bonding and its influence in day to day life (under-PO12).

Course Contents:

Mid-term Exam: 30 Marks

1. **Periodic Classification of Elements:** Modern periodic table, Periodic law, Periodic system, Correlation of atomic structure with periodic properties of elements, Ionization potential, Electron affinity, Electromagnetivity, Atomic and ionic radii, Properties of oxides.
2. **Electronic Theory of Elements:** Different types of bonds, ionic, covalent, co-ordinate and hybridization of atomic orbitals, bonding in simple molecules, Elementary idea about MOT.
3. **Chemistry of Transition Elements, Lanthanides and Actinides:** Definitions, Electronic configurations, general properties.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Electrochemistry:** Electrolytic dissociation, Theory of electrolytic conductance. Ionic mobility and transference number, Simple ideas about electrode potential and reversible cells.
5. **Types and properties of solutions:** Units of concentration, ideal and real solutions, Henry's Law, Distribution of solids between two immiscible liquids, Distribution law, Partition coefficient and solvent extraction, Properties of dilute solutions.

Part – B: 30-Marks

6. **Chemical Equilibrium: Law** of mass action, Determination of equilibrium constant, heterogeneous and homogeneous equilibrium, Le Chateilar principle and Van Hoff equation.
7. **Chemical Kinetics:** Order and molecularity kinetics of first and second order reaction, Determination of order of reactions, Arrhenius equation and energy of activation.
8. **Surface Chemistry and Colloids:** Adsorption, Langmuir and Gibbs adsorption isotherm, Colloids, Definitions of terms, Electrodialysis, Classification, Preparation and properties of colloids, Elementary idea about emulsions and gels. Importance of colloids.

Recommend Books

Textbooks:

1. R D Madan & Satya Prakash, *"Modern Inorganic Chemistry",* S. Chand Publishing, 4/e, 1987
2. M.M. Haque and M.A. Nawab, *"Principles of Physical Chemistry",* Nawab Publications, 2005
3. E.S Gilreath, *"Fundamental Concepts in Inorganic Chemistry",* McGraw-Hill, 1958

Course Code: CHEM-2342
Course Title: CHEMISTRY SESSIONAL

Credit Hours: 1 / Contact Hours: 2 per Week

Course Objectives:

1. Describe processes and procedures used in the scientific method.
2. Differentiate terms such as observation, hypothesis, data, conclusion, theory, precision and accuracy.
3. Balance simple chemical reactions.
4. Perform basic stoichiometric calculations to determine the quantity of products given various quantities of reactants.
5. Use quantitative measures of solution in different units of concentration.
6. Apply quantitative reasoning skills to determine quantities of matter and energy involved in physical and chemical changes.
7. Explain the physical properties of solids, liquids, gases, and solutions.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	To develop the knowledge on determination and standardization of different chemical solution (under-PO1).
ILO / CO: 2	To conduct the experiment and analyze data properly (under-PO4).

List of experiment names:

1. **Experiment No: 1** Introduction to chemistry laboratory use of equipment's: Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Quantitative analysis errors etc.
2. **Experiment No: 2** Acidimetri-Alkalimetri: Determination of the strength and amount of hydrochloric acid.
3. **Experiment No: 3** Preparation of sodium oxalate solution and standardization of potassium permanganate solution.
4. **Experiment No: 4** Determination of Ferrous ion (Fe^{2+}) with standard potassium permanganate solution.
5. **Experiment No: 5** Preparation of standard potassium dichromate solution and standardization of sodium thiosulphate solution.
6. **Experiment No: 6** Determination of copper by iodometric ally with standard sodium thiosulphate solution.
7. **Experiment No: 7** Determination of calcium in calcium carbonate.
8. **Experiment No: 8** Conductometric titration of strong acid with strong base.
9. **Experiment No: 9** Conductometric titration of weak acid with strong base.
10. **Experiment No: 10** Determination of P^H of a solution: P^H metric titration of a strong acid with strong base.

Recommend Books

Textbooks:

1. G.H. Jeffery, J. Bassett, J. Mendham, & R.C. Denney, *"Vogel's Textbook of Quantitative Chemical Analysis"*, John Wiley & Sons Inc, 5th Edition, 1989
2. S.K Hazari, *"Principles Qualitative and Quantitative Chemical Analysis"*

Course Code: ETE – 2341
Course Title: ANALOG ELETRONICS

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

Analog Electronics is the 2nd fundamental course for the students who have keen desire to develop their career in Electronics arena from ETE Students. The primary objective of the course is to gain the basic concept of electronics components and circuit. Also, the students will have ability to analyze the functionality through problem analysis and enrich ability to construct the electronics circuit in next courses according to the program requirement.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	To acquire knowledge of Basic Electronics to recognize basic concepts of electronic components and circuits.
ILO / CO: 2	To analyze the functionality of various devices including several types of Operational amplifier, Regulator, amplifiers and etc.

Course Contents

Mid-term Exam: 30 Marks

1. **Feedback Amplifiers:** Feedback concept, Types of Feedback, effect of feedback on transfer gain input and output impedance, distortion, noise and stability, Practical Feedback Circuits, Feedback Amplifier-Phase and Frequency Considerations, Loop gain,
2. **Sinusoidal Oscillators**: Barkhausen criterion for oscillations, phase shift oscillator, Wien's bridge oscillator, tuned oscillator circuit, crystal oscillator, Colpitts and Hartley Oscillators, series-resonant circuits, parallel-resonant circuits.
3. **Multi-vibration Circuits:** Concept of multi-vibrator: astable, monostable, and bistable and their applications, block diagram of IC 555 and its working principle, IC 555 as monostable and astable multi-vibrator.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Pulse Shaping Circuit and Multistage amplifiers:** High pass and low pass RC circuits (sinusoidal, step voltage, pulse square wave exponential and ramp inputs), The R-C coupled amplifiers, Low and High frequency response of R-C coupled amplifiers.
2. **Power Amplifier:** Introduction—Definitions and Amplifier Types, Series-Fed Class A Amplifier, Transformer-Coupled Class A Amplifier, Class B Amplifier Operation, Class B Amplifier Circuits, Amplifier Distortion, Power Transistor Heat Sinking, Class C and Class D Amplifiers

Part – B: 30-Marks

1. **Regulated power supply**: Zener diode as a voltage regulator, Shunt and Series voltage regulator and Emitter follower regulator, Step Up and Stepdown switching mode power supply
2. **Operational Amplifiers**: Ideal OP-AMP, Bias voltage, Offset voltage, Slew rate, Inverting and Non inverting amplifiers, Phase inverters, Scale changer, Integrating and Differentiating circuits, Adder or Summing amplifiers, Voltage to Current, Current to Voltage converters, Voltage follower.
3. **Applications of Op-Amp:** Zero crossing detectors and voltage level detectors, Differential Instrumentation and Bridge amplifiers, Active filters. Instrumentation amplifier, Comparators, the window comparator, waveform conversion & generation.

Recommend Books

Textbooks:

1. Thomas L. Floyd, *"Electronic Devices",* Prentice Hall, 6th Edition, 2001
2. James M. Fiore, *"Operational Amplifiers and Linear Integrated Circuits: Theory and Applications",* West Group, 3rd Edition, 1992

Reference:

1. Robert L. Boylestad, *"Electronic Devices and Circuit Theory",* Pearson, 11th Edition, 2012
2. David A. Bell, *"Electronic Devices and Circuits",* Oxford University Press, 4th Edition, 1978
3. V.K. Mehta, *"Principles of Electronics",* S Chand, 10th Edition, 2006

Course Code: ETE – 2342
Course Title: ANALOG ELECTRONICS SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

1. Design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers, ADC converters etc.
2. Understand their capabilities and limitations and make decisions regarding their best utilization in a specific situation.
3. Understand the nature and scope of modern electronics
4. To develop the ability to analyze and design electronic circuits.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Apply knowledge to analyze the functionality of various devices including several types of Operational amplifier, Regulator, multivibrator and etc.
ILO / CO: 2	To construct and investigate basic electronic circuit.

Course Contents:

S.L.	Contents
1.	Operational Amplifier and its application
2.	Operational Amplifier - Inverting Amplifier
3.	Operational Amplifier – Noninverting Amplifier
4.	Operational Amplifier as a comparator
5.	Operational Amplifier as a differentiator
6.	Operational Amplifier as an integrator
7.	Operational Amplifier as a summing amplifier
8.	Oscillator and its application
9.	RC phase shift Oscillator
10.	Multi-vibrator and its application
11.	Astable Multi-vibrator
12.	Monstable Multi-vibrator
13.	Schimit Trigger

Recommend Books

Textbooks:

A Lab Manual prepared by instructor

Reference:

1. Robert L. Boylestad, "Electronic Devices and Circuit Theory", Pearson, 11th Edition, 2012
2. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 4th Edition, 1978
3. V.K. Mehta, "Principles of Electronics", S Chand, 10th Edition, 2006
4. Thomas L. Floyd, "Electronic Devices", Prentice Hall, 6th Edition, 2001
5. James M. Fiore, "Operational Amplifiers and Linear Integrated Circuits: Theory and Applications", West Group, 3rd Edition, 1992

Course Code: ETE – 2343
Course Title: DIGITAL ELECTRONICS & LOGIC DESIGN
Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

Digital Electronics and Logic Design is a foundational course for those majoring in the communication option in second year. This course introduces/analyze students to: i) Introduce the concept of digital and binary systems ii) Be able to design and analyze combinational logic circuits. iii) Be able to design and analyze sequential logic circuits. iv) Understand the basic hardware tools for the design and implementation of digital circuits and systems v) Reinforce theory and techniques taught in the classroom through experiments and projects in the laboratory.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	**To get introduce** basic digital Electronics, Boolean algebra and fundamental concept for designing logic circuits with simplification various techniques.
ILO / CO: 2	**Ability to solve** Combinational Logic Circuit and Sequential Circuit.

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction**
   Digital vs. analog systems. Advantages of digital system, Application of Digital system, Digital waveform, Data Transfer, NOR, NAND, AND, OR, INVERT Implementation. Diode logic gates, Transistor Switch. Logic Families: TTL, ECL, IIL and CMOS logic with operation details
2. **Number Systems and Codes**
   Representation of Number in different bases. binary arithmetic, octal arithmetic, hexadecimal arithmetic. Base conversions. Base Complement: Subtraction using Complements. Binary codes.
3. **Algebraic Methods for the Analysis and Synthesis of Logic Circuits**
   Fundamentals of Boolean algebra. Basic postulates: fundamental theorems of, Boolean algebra, switching functions, truth tables. Algebraic forms of switching functions. Derivation of canonical forms. Switching circuits.

Final Exam: 50 Marks
Part – A: 20-Marks

4. **Simplification of Switching Functions**
   Characteristics of minimization methods. Karnaugh maps. K-maps of four or more variables. Simplification of switching functions using K-maps. Tabular minimization method.
5. **Combinational Logic Circuits**, Design Procedure, Adder, subtractor, Code Converter, parity Checker etc, Analysis of Combinational Circuits and its truth table, Encoder, Decoder, ROM and PLA.

Part – B: 30-Marks

6. **Multiplexers/Data.** Selectors. Multiplexer Circuit Structures. Applications of Multiplexers. Demultiplexers/Data Distributors. Binary Arithmetic Elements. Binary Adder Circuits. Binary Subtraction Circuits. Comparators.
7. **Introduction to Sequential Logic Models for sequential circuits.** Block diagram representation. State tables and diagrams. Memory devices. Latches: set-reset latch, gated SR latch, delay latch. Flip-flops: master-slave SR flip-flops, master-slave D flip-flops, master-slave JK flip-flops, edge-triggered D flip-flops, edge-triggered JK flip-flops, T flip-flops.
8. **Design of counters**, shift registers and their applications

Recommend Books

Textbooks:

1. M. Morris Mano, *"Digital Logic and Computer Design",* Prentice Hall, India, 4th Edition, 2000
2. J.F. Wakerly, *"Digital Design Principles & Practices",* 4th Edition, Prentice Hall, 2005
3. Floyd & Jain*, "Digital Fundamentals",* Pearson Education,8th Edition, 2009

Reference Books:

1. Dr. V.K. Jain, *"Switching Theory",* Khanna Publishers, 1989
2. Tocci-Widme, *"Digital Systems",* Pearson/Prentice Hall, 2004

Course Code: ETE – 2344
Course Title: DIGITAL ELECTRONICS & LOGIC DESIGN SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Get introduced to Basic trainer Board and implement various Digital Circuitry related design problems.
ILO / CO: 2	To solve design circuitry problem by teamwork.

Course Contents:

S.L.	Contents
1.	Digital vs. analog systems. Advantages of digital system, Application of Digital system,
2.	Diode logic gates, Transistor Switch. Logic Families: TTL, ECL, IIL and CMOS logic with operation details
3.	Digital waveform, Data Transfer, NOR, NAND, AND, OR, INVERT Implementation.
4.	Verification of basic logic gates
5.	Justifying NAND and NOR logic gate
6.	Verification of application of half adder circuit
7.	Verification of application of full adder circuit
8.	Implementation of XOR and XNOR gate
9.	Verification of operation of half and full subtractor
10.	Verification of operation of odd parity generator

Recommend Books

Course Notes:

[1]. www.tutorialspoint.com. (2018). *Diital Circuits Tutorial*. [online] Available at: https://www.tutorialspoint.com/digital_circuits/ [Accessed 1 Nov. 2018].

Textbooks:

[1]. M. Morris Mano, *"Digital Logic and Computer Design",* Prentice Hall, India, 4th Edition, 2000
[2]. J.F. Wakerly, *"Digital Design Principles & Practices",* 4th Edition, Prentice Hall, 2005
[3]. Floyd & Jain*, "Digital Fundamentals",* Pearson Education,8th Edition, 2009

Course Code: ETE – 2325
Course Title: SIGNALS AND LINEAR SYSTEMS
Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

The objective of this course is to introduce the concepts and techniques associated with the understanding of signals and systems and to familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems which provides foundation for more advanced subjects like signal processing, system theory, control and robotics.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Classify signals and systems based on their properties and determine the mathematical representations of signals and systems.
ILO / CO: 2	Analysis of signals transformation and predict the behavior of Linear time invariant (LTI) systems.

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction with signals:** Definition of signal, mathematical & graphical representation of signal, classification of signals: continuous & discrete time, even & odd, periodic & non-periodic, deterministic& random, causal & non-causal, power & energy.
2. **Basic Operation on signal:** Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, reflection, time shifting, combination of shifting and scaling.
3. **Elementary signals:** Exponential signal, sinusoidal signal, complex exponential signal, step function, Impulse function, ramp function, representation of arbitrary signal by elementary signals. Introduction with systems: Definition of system, system viewed as interconnection of operations, properties of the system: stability, memory, causality, invertibility, time invariance, linearity.
4. **Convolution theorem:** Convolution sum, convolution integral.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Interconnection of LTI systems:** parallel connection & cascade connection, relation between LTI systems, LTI systems properties and impulse response, invertible systems, step response of the system.
2. **Differential and Difference equation representations of LTI systems:** Homogeneous solution, particular solution, complete solution, characteristics of systems described by differential and difference equations: natural and forced response of the system, block diagram representation of the systems
3. Frequency response of LTI systems, Fourier series and Fourier transformation of continuous time signals.

Part – B: 30-Marks

1. Discrete time Fourier series and DTFT of discrete time signals.
2. Inverse Fourier series and inverse Fourier transformation of continuous and discrete time signals.
3. **Properties of Fourier representations:** Linearity and symmetry properties, convolution properties, differentiation and integral properties in time and frequency domain, time and frequency shifting properties, inverse Fourier transformation using partial fraction expansion, multiplication property, scaling property, duality.
4. **Laplace transformation:** Laplace transforms representation, convergence, the s-plane, the unilateral Laplace transformation, properties of unilateral Laplace transformation, initial and final value theorem, inversion of the unilateral Laplace transformation, solving differential equation with initial condition, properties of the bilateral Laplace transformation.

Recommend Books

Textbooks:

[1]. Simon Haykin and Barry Van Veen, *"Signals and Systems",* John Wiley & Sons, Pte. Ltd. 2005
[2]. P. Lathi, *"Signal Processing & Linear Systems",* Oxford University Press, 1998.
[3]. A Nagoor Kani, *"Signals and Systems"*, McGraw-Hill Education, 2018.

Reference Books:

[1]. Alan V. Oppenheim and Alan S. Willsky, *"Signals and Systems",* Pearson Education Inc. 1997.
[2]. H. P. Hsu*, "Signals and Systems",* McGraw Hill Professional, 1995.
[3]. Mathew N. O. Sadiku and Warsame Hssan Ali, *"Signals and Systems: A Primer with Matlab",* CRC Press/Balkema 2016.

Course Code: MATH-2307

Course Title: Matrices, Linear System of Equations and Vector Analysis

Credit Hour 3 / Contact Hour: 3 per week

Course Objectives:

This course will:

1. Present basic concepts of matrices and matrix algebra.
2. Present methods of solving systems of linear equations.
3. Present basic concepts of vector spaces.
4. Present concepts of linear transformations.
5. Present the concept of and methods of computing determinants.
6. Present methods of computing and using eigenvalues and eigenvectors.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Demonstrate the basic idea of vector spaces, subspaces, Linear dependence and independence of vectors, Linear mappings, and Inner product spaces and be able to find the eigenvalues and eigenvectors of a square matrix using the characteristic polynomial and will know how to diagonalize a matrix. Applying these to solve the linear algebra in electric network.
ILO / CO: 2	Get the basic understanding about scalar and vectors, dot Product, cross product derivative of vectors, vector integration. Analyze complex engineering problems be able to know gradient, divergence, curl and their physical significance and to learn the Greens, Gauss & Stocks theorem and their applications and be familiar with vector components in spherical and cylindrical systems.

Course Contents:

Mid-term Exam: 30 Marks

1. **Vector Spaces and Subspaces:** Definition of vector spaces, subspaces, basic theorem, Linear combinations of vectors, spanning set, Linear dependence and independence of vectors.
2. **Basis and Dimension and Linear Mappings:** Basis and Dimensions of Vector spaces, Sums and Direct sums of subspaces. Mappings, Linear mappings, Kernel and image of a linear mapping, Singular and nonsingular mappings, Linear mapping and systems of linear equations.
3. **Inner Product Spaces:** Inner product spaces, Cauchy-Schwarz inequality, Orthonormal sets, Gram-Schmidt orthogonalization process, and Application of Linear algebra in electric network.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Matrix and Linear System of Equations:** Vector presentation by matrix, different types of matrices, algebraic operations on matrices, adjoint and inverse of a matrix, augmented matrix, row operation method, rank of Matrices, some problems, Normal Vector, Ortho normal Vectors, Orthogonality, Echelon form, consistency and inconsistency, solution of homogeneous and non- homogeneous linear system of equations.
2. **Characteristic equation and Diagonalization:** Eigen values and eigenvectors, characteristic polynomial, Caley-Himilton theorem, Diagonalization of matrices and symmetric matrices, Characteristics roots.

Part – B: 30-Marks

4. **Vector analysis**: Scalar and vectors, operation of vectors, vector addition and multiplication - their applications. Scalar Field, Vector Field, Dot Product, Cross product, Triple Product, Derivative of vectors and problems.
5. **Del operator and Vector Integration:** Del operator, gradient, divergence and curl and their physical significance, Line Integrals, physical significance of Vector integration and Problems.
6. **Vector's Theorem: Greens**, Gauss & Stocks theorem and their applications, Vector components in spherical and cylindrical systems.

Recommend Books

Textbooks:

1. Richard Bronson & Gabriel B. Costa, *"Linear Algebra",* Academic Press, 2nd Edition, 2007
2. HK Dass, *"Advanced Engineering Mathematics",* S Chand, Reprint Edn. 2006 edition

Reference Books:

1. Seymour Lipschutz & Marc Lipson, *"Linear Algebra: Seymour Lipschutz",* McGraw Hill Education, Kindle Edition, 2018
2. Murray Spiegel, Seymour Lipschutz & Dennis Spellman, *"Vector Analysis",* McGraw-Hill Education, 2nd Edition, 2009
3. PN Chatterjee, *"Matrices",* Rajhans Agencies
4. Seymour Lipschutz & Marc Lipson, *"Schaum's Outline of Linear Algebra",* McGraw-Hill Education, 5th Edition, 2012
5. Jr. Frank Ayres, *"Theory and Problems of Matrices: Including 340 Solved Problems, Completely Solved in Detail (Schaum's Outline Series)",* McGraw-Hill, 1st Edition, 1967.

Course Code: ETE – 2441
Course Title: ANALOG COMMUNICATION

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

Analog Communication is a foundational course for those majoring in the communication option in second year. This course introduces/analyze students to: (i) the essential approaches, fundamental concepts and design issues in communication engineering. The course emphasizes the understanding of engineering principles. Mathematics is used only at a level that is absolutely necessary; (ii) basic concepts of modulation and demodulation techniques including amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) that are widely used in analogue communication systems, and basic techniques for analyzing such systems in the time and frequency domains; (iii) basic idea about classification of noise; (iv) fundamental ideas about Television (TV) and basic techniques for analyzing the fundamentals TV receiver.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Understand the theoretical concept, generation of Amplitude modulation, Angle modulation, AM Transmitter and Receiver, FM Transmitter and Receiver,
ILO / CO: 2	Analyze and Identify the effect of DSB-SC, SSB, VSB, FM and PM in terms of modulation index and bandwidth efficiency.
ILO / CO: 3	Estimate the noise performance AM and FM signals.
ILO / CO: 4	Recognize and illustrate the theoretical operation of Radio, TV Transmitter and Receiver.
ILO / CO: 5	Prepare and Present a term presentation on selected topic.

Course Contents:

Mid-term Exam: 30 Marks

1. **Basic Concept:** Basic communication system, Modulation, Demodulation, Importance, Types of modulation, Standard classification of RF spectrum
2. **AM modulation:** AM theory, Power & Current of AM, Modulation index, Transmission efficiency, Square & switching modulation and demodulation, DSB-SC, Balance and Ring modulation, Coherent detection, SSB modulation- Filter method, Phase shift method, Third method, VSB modulation process and applications
3. **Angle modulation:** Generation of FM wave, Theory of FM & PM, Frequency deviation, Relation between FM & PM, Narrowband FM, Wideband FM, FM generation, Pre-emphasis and de-emphasis circuit.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Transmitter:** ***AM Transmitter:*** Classifications, Master oscillator, Harmonic generators, SSB transmitter, Radio telegraphy transmitter, Frequency shift keying transmitter, ***FM Transmitter:*** Reactance modulator, Frequency drift, Frequency mixing, Armstrong FM transmitter,
2. **Radio Receiver*****: AM receiver:*** Classification, TRF receivers**,** Super heterodyne receiver, RF amplifier, Sensitivity, selectivity & fidelity of receiver, Frequency mixers, IF amplifier, Noise limiter, Spurious response in radio receivers, ***FM receiver:*** Amplitude limiter, FM receiver- AGC & AFC, Slope detector, Balance slope detector, Center-tuned discriminator/ Foster-seeley discriminator, Ratio detector, PLL

Part – B: 30-Marks

1. **Noise: Classification**, Noise in receiver, AWGN, SNR, Analysis of noise effects on baseband systems, Effect of noise- AM, DSB-SC, SSB and FM
2. **Fundamentals of Television**: Block diagram of monochromic TV, Aspect ratio, Horizontal & vertical scanning, Standard scanning pattern, Flickers, Composite video signal, Picture tube, Synchronization, Blanking pulses, different TV system, Vestigial sideband transmission, TV channel for broadcast.
3. **TV Receiver:** Types, Basic principle of TV receiver, Picture tubes, Deflection circuit, High voltage power supply.

Recommend Books

Textbooks:

[1]. Kennedy & Davis, "*Electronic Communication Systems*", Tata McGraw-Hill, Delhi, 4th ed. 1999
[2]. G. K. Mithal, "*Radio Engineering*", Delhi: Khanna, 13th ed. 1988
[3]. Gulati, "*Monochrome and Color TV*", New age international, Delhi, 2nded. 2005

Reference Books:

[1]. B. P. Lathi, "*Modern digital and analog communication system*", Oxford University Press Inc., 2nd ed. New York, USA, 1995.

Course Notes:

[1]. www.tutorialspoint.com. (2018). *Analog Communication Tutorial*. [online] Available at: https://www.tutorialspoint.com/analog_communication/ [Accessed 1 Nov. 2018].
[2]. Daenotes.com. (2019). *Diploma & Electronics Engineering notes, Lectures, Projects | D&E notes*. [online] Available at: https://www.daenotes.com/ [Accessed 1 Dec. 2018].

Course Code: ETE – 2442
Course Title: ANALOG COMMUNICATION SESSIONAL

Credit Hour: 1.5/ Contact Hour: 3 per week

Course Outcomes:

ILOs / Cos	Description
ILO / CO: 1	Apply the knowledge of the basic functions of an analog communication system to justify the theoretical concept in different experiments of the analog communication system.
ILO / CO: 2	To provide hands-on experience to the students, so that they are able to apply theoretical concepts in practice.
ILO / CO: 3	Investigate the performance, effect of modulation and demodulation process such as AM, DSB-SC, SSB, FM also Radio, TV Transmitter and Receiver System using Hardware Tools.
ILO / CO: 4	To write and Execute Programs in MATLAB to Simulate Various Modulation and Demodulation Techniques.
ILO / CO: 5	Able to do the lab works individually and as members or leader of a teams.

Course Contents:

S.L.	Contents
[1].	Introduction to the course, Basic Guidelines and advises for the course, Discussion about laboratory safety and Training Requirements on working in the LAB.
[2].	Experiment on Amplitude Modulation and Demodulation to calculation of modulation index with spectrum to variable's value changing using Hardware
[3].	Experiment on Amplitude Modulation and Demodulation to calculation of modulation index with spectrum to variable's value changing using Software.
[4].	Experiment on DSB-SC Modulation and Demodulation using Hardware
[5].	Experiment on DSB-SC Modulation and Demodulation using Software.
[6].	Experiment on SSB Modulation and Demodulation using Hardware.
[7].	Experiment on AM Transmitter and Receiver using Hardware Tools.
[8].	Study on Basic Construction on Cathode Ray Tube (CRT) and Observation Circuit Diagram of TV

Recommend Books

Textbooks:

1. Ece.gecgudlavalleru.ac.in. (2019). "*ANALOG COMMUNICATIONS LAB MANUAL*". [online] Available at: http://ece.gecgudlavalleru.ac.in/pdf/manuals/AC-LabwithoutReadings.pdf [Accessed 24 Feb. 2019].
2. Gettextbooks.com. (2019). "*Basic Television: Theory and Servicing: A Text-Lab Manual (The Radio-television servicing series)*", [online] Available at: https://www.gettextbooks.com/author/Paul_Zbar [Accessed 24 Feb. 2019].

Course Code: ETE-2407

Course Title: Electromagnetic Fields and Waves

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

The overall aim of the course is to introduce the students to the basic principles of Electrostatics, Magnetostatics and Electromagnetic Waves. The course equips the students with techniques to determine Electric Field and Magnetic Field for different scenarios. It also equips the student with analysis of Electromagnetic Waves of different frequencies, propagation of waves through different guided and unguided mediums etc. The course will help the students with knowledge and skills that will help them solve complex engineering problems related to overall electromagnetism, antenna designing, microwave and mm-wave communication components designing, optical fiber communication etc.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Understand and analyze the basic concepts related to Electrostatics, Magnetostatics and Electromagnetic Waves.
ILO / CO: 2	Determine Electric and Magnetic Field for different scenarios with varying specifications using different techniques.
ILO / CO: 3	Analyze propagation of Electromagnetic Waves in different mediums using Maxwell's Equations.

Course Contents:

Mid-term Exam: 30 Marks

1. **Electrostatics**: Coulomb's law, force, electric field intensity, electrical flux density. Gauss Law with application, Divergence of an Electrostatic Field, Electrostatic potential, Electric Dipole, boundary conditions in Electrostatics, The use of images, Laplace's and Poisson's equation energy of an electrostatic system.
2. **Magneto statics**: Concepts of magnetic field, Ampere's law, Stokes Theorem, Vector magnetic potential, Magnetic Dipole, Energy of a static Magnetic Field, Completeness of Specification of Electric and Magnetic Fields
3. **Co-ordinate System**: rectangular, cylindrical and spherical coordinates Solution to static field problems. Graphical field mapping with applications, solution to Laplace equations, rectangular, cylindrical and spherical harmonics with applications.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Maxwell's equations:** Voltages induced by changing Magnetic Fields, Continuity of charge, the concept of displacement current physical pictures of displacement current, Maxwell's Equations in Differential equation form, in large Scale form and for the time periodic case.
2. **Propagation of E-M waves**: Poynting's Theorem for Energy relations in an Electromagnetic Field. Application of Maxwell's equations in Wave Propagation, Application of Maxwell's Equations in Penetration of Electromagnetic Fields into a Good Conductor.

Part – B: 30-Marks

1. **Boundary Conditions**: Boundary Conditions for Time Varying systems, Wave Propagation. Potentials used with varying charges and currents. The Retarded Potential concepts. Maxwell's equations in different coordinate systems.
2. **Transmission line**: Circuit Concepts and Impedance Elements. Skin Effect and Internal Impedance: Internal Impedance of a Plane wave, general equation of transmission line.
3. **Polarization and Reflection of E-M wave**: Uniform Plane waves in a Perfect Dielectric, Polarization of Plan Waves, Waves in Imperfect Dielectrics and Conductors. Reflection of Normally incident Plane Waves from perfect conductors, Normal Incidence on a Dielectric, Reflection Problems with several dielectrics, Incidences at any angle on perfect conductors Phase velocity and impedance for waves at oblique incidence, Incidence at any angle on dielectrics, Total Reflection, Brewster angle.

Recommend Books

Textbooks:

1. Sadiku, M.," Elements *of electromagnetics*", Oxford University Press, 4th edition, 2007
2. Cheng, D.," *Field and wave electromagnetics*", USA: Addison-Wesley, 5th edition, 2008

Reference Books:

1. Ramo, S. and Whinnery, J.," *Fields and waves in modern radio"*, New York: Wiley, 1953

Course Code: ETE –2445
Course Title: ELECTRICAL MACHINE & INDUSTRIAL ELECTRONICS

Credit Hour: 3/ Contact Hour: 3 per week

Objectives:

In this course student will learn about 'principle of motor and Power Electronics' in regard to:

1. Constructional details, principle of operation and Performance of DC Machine
2. principle of operation, performance characteristics of DC motors and enumerate its applications
3. power semiconductor switches and triggering devices,
4. uncontrolled, controlled rectifiers,
5. DC-DC converters,
6. Pulse-width-modulated and resonant pulse inverters,
7. AC voltage controllers**.**

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Gain basic knowledge of DC motor and Generator and their types.
ILO / CO: 2	Familiar with different power electronic devices and their applications.
ILO / CO: 3	Analyze Different types of power converter circuits.

Course Contents:

Mid-term Exam: 30 Marks

1. **Motor:** Principle of generator and motor, Significance of back e.m.f., Type of motors, torque equation, Torque-speed characteristics of shunt, series & compound motors, losses and efficiency, Necessity of starter, Speed control: Basic concept of speed control of shunt, series & compound motors, Stepper motor.
2. **Power Semiconductor Switches and Triggering Devices:** Thyristor Characteristics and Applications, Two Transistor model of Thyristor, Thyristor Turn-On and Turn-Off, Thyristor types, SCR: characteristics curve, turn-on and turn-off, GTO: structural diagram, turn-on and turn-off,
3. **Triggering Devices: IGBT**: cross-section and equivalent circuit, turn-on and turn-off process. TRIAC and DIAC: structural diagram, Turn-on and turn-off process, Unijunction transistor (UJT), Programmable UJT (PUT)

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Speed Control of motor using power switches:** SCR speed control circuits for Shunt motors; Series motor control circuit using TRIAC and DIAC (full wave control).
2. **Uncontrolled Rectifiers:** Single-Phase Half-Wave rectifier, Performance parameters, Single-Phase Full-Wave Rectifiers with R load and RL load,
3. **Single-Phase Controlled Rectifiers:** principle of Phase Controlled Converter operation, Single-Phase Full Converters with R Load and RL load,

Part – B: 30-Marks

1. **DC-DC Converters:** Generation of Duty Cycle, Step-Down Converter, Step-Up Converter, Classification of Converter, And Switching-Mode Regulators: Buck regulators, Boost Regulators. Buck-Boost Regulators, Cuk Regulators.
2. **Pulse-Width-Modulated Inverters:** principle of operation, performance parameter, single-phase bridge inverter, voltage control of single-phase inverters.
3. **Resonant Pulse Inverters**: Principle of Operation, Single-Phase Bridge Inverters, Series and Parallel Resonant Inverters, Zero-Current Switching and Zero- Voltage-Switching Resonant Converters, Comparisons between ZCS and ZVS Resonant Converters.
4. **AC voltage Controllers**: Principle of On-Off Control, Principle of Phase Control, Single Phase Controllers with Resistive and Inductive load, single phase cycloconverters.

Recommend Books

Textbooks:

[1] L. Theraja and A. K. Theraja, *"A Textbook of Electrical Technology",* Vol. II AC & DC Machines, 23rd edition, 2007

[2] M.H. Rashid, *"Power Electronics Circuits, Devices and Applications",* Third Edition, PrenticeHall of India Private Limited, New Delhi-2004

Reference Books:

[1] Rehg, James, A., Sartori, Glenn., *"Industrial Electronics".* 5th edition, Upper Saddle River: Prentice Hall. 2006

[2] Maloney, Timothy. *"Modern Industrial Electronics",* 5th edition, Upper Saddle River: Prentice Hall. 2004

[3] P.C. Sen, *"Principles of Electric Machines and Power Electronics",* Second Edition, John Wiley & Sons-1996

Course Code: ETE –2446
Course Title: ELECTRICAL MACHINE & INDUSTRIAL ELECTRONICS SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	To apply the knowledge of power electronic devices in developing solution of a complex electronic design project.
ILO / CO: 2	Analyze and compare design alternatives and use measures of performance or other criteria to rank alternatives.
ILO / CO: 3	Consult manual and data sheets, design experiments, simulate, analyze and interpret results to decide best solution.
ILO / CO: 4	Construct electronic circuit meeting the array of criteria.
ILO / CO: 5	Able to do the lab works individually and as members or leader of a teams

Course Contents:

S.L.	Contents
1.	Study of a simple DC switching circuit using SCR and determine the holding current.
2.	Study of a Unijunction Transistor (UJT) Relaxation Oscillator.
3.	Implementation of SCR controlled single phase rectifier circuit.
4.	Study of programmable Unijunction Transistor (PUT).
5.	Study of a full-wave AC power control circuit using a TRIAC.
6.	Complex Engineering-1: developing a complex problem.
7.	Complex Engineering-2: Possible solution of a complex electronic design project, analyze and compare design alternatives.
8.	Complex Engineering-3: Construct electronic circuit meeting the array of criteria.

Recommend Books

Course Notes

1. Lab Manual Prepared by course instructor.

Reference Books:

[1]. Charles K. Alexander and Matthew N. O. Sadiku, *"Fundamental of Electric Circuits",* McGraw Hill, New York, 2009
[2]. Robert L. Boylestad, *"Introductory Circuit Analysis",* 11th ed. Pearson education international, USA, 2007
[3]. B. L. Theraja and A. K. Theraja, *"A text book of Electrical Technology",* Volume IV, 23th ed. Rajendra Ravindra Printers, India, 2006

Course Code: ETE –2443
Course Title: DATA STRUCTURE AND ALGORITHM

Credit Hour: 2/ Contact Hour: 2 per week

Course Objective:

This course introduces/analyze students i) To assess how the choice of data structures and algorithm design methods impacts the performance of programs. ii) To choose the appropriate data structure and algorithm design method for a specified application. iii) To study the systematic way of solving problems, various methods of organizing large amounts of data. iv) To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps tournament trees, binary search trees, and graphs and writing programs for these solutions. v) To employ the different data structures to find the solutions for specific problems.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Identify various terminologies of data structures and algorithms
ILO / CO: 2	Implement various data structures such as arrays, records, pointers, stacks, queues, recursions, linked lists, trees and graphs
ILO / CO: 3	Analyze and Compare various searching and sorting techniques

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction:** Data types & data structures, data structure operations, Introduction to algorithms, performance analysis.
2. **Arrays, Records and Pointer:** Linear arrays, Relationships of arrays, Operation on arrays, Multidimensional arrays, pointer arrays, Record structures, representation of records, Sparse matrices.
3. **Stacks, Queues and Recursion:** Fundamentals, Different types of stacks and queues: circular, dequeues, etc., Evaluation of expressions, recursion, direct and indirect recursion, depth of recursion, Implementation of recursive procedures by stacks.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Linked List:** Linked lists, Representation of linked list, Traversing & searching a linked list, Doubly linked list & dynamic storage management, Generalized list, Garbage collection & compaction.
2. **Trees and Graphs:** Basic terminology, Binary trees, Binary tree representation, Tree traversal, Extended binary tree, Huffman codes/algorithm, Graphs, Graph representation, Shortest path and transitive closure, Traversing a graph.

Part – B: 30-Marks

1. **Sorting & Searching:** Sorting, Insertion sort, Shell sort, Heap sort, Radix sort, The general method of divide & conquer method, Merge sort, Quick sort, Selection sort, binary search.
2. **Symbol Tables:** Static tree tables, Dynamic tree tables, Hash tables overflow handling, Theoretical evaluation of overflow techniques.
3. **Dynamic programming:** The general method, multistage graphs, all pairs shortest paths, single source shortest paths problems.

Recommend Books:

Textbooks:

1. Ellis Horowitz, Sartaj Sahni & Dinesh Mehta, *"Fundamentals of Data Structures in C++",* W. H. Freeman, 1st Edition, 1995
2. Ellis Horowitz & Sartaj Sahni, *"Fundamentals of Computer Algorithms",* Silicon Pr; 2nd Edition, 2007
3. Seymour Lipschutz, *"Schaum's Outline of Theory and Problems of Data Structures",* McGraw-Hill, 1986
4. Edward M. Reingold & Wilfred J. Hansen, *"Data Structures",* Addison Wesley Publishing Company, 1998
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest & Clifford Stein*, "Introduction to Algorithms",* The MIT Press; 3rd Edition, 2009

Course Code: ETE –2444
Course Title: DATA STRUCTURE AND ALGORITHM SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Implement various data structures such as arrays, records, pointers, stacks, queues, recursions, linked lists, trees and graphs
ILO / CO: 2	Analyze and Compare various searching and sorting techniques

Course Contents:

S.L.	Contents
1.	Introduction to the course, Basic Guidelines and advises for the course, Discussion about specifications of the course
2.	Array
3.	Stacks
4.	Queues
5.	Recursions
6.	Searching
7.	Sorting
8.	Trees
9.	Graphs

Recommend Books

Textbooks:

[1]. Dr. Md. Ismail Jabiullah: Data Structure and Algorithms - Applied Approach

Reference Books:

[1]. Ellis Horowitz, Sartaj Sahni & Dinesh Mehta, *"Fundamentals of Data Structures in C++",* W. H. Freeman, 1st Edition, 1995
[2]. Ellis Horowitz & Sartaj Sahni, *"Fundamentals of Computer Algorithms",* Silicon Pr; 2nd Edition, 2007
[3]. Seymour Lipschutz*, "Schaum's Outline of Theory and Problems of Data Structures",* McGraw-Hill, 1986

Course Code: ETE-2427
Course Title: NUMERICAL ANALYSIS
Credit Hour: 2/ Contact Hour: 2 per week

Course Objectives:

This course is intended as an introduction to techniques for carrying out numerical computation on computers, historically one of the fundamental disciplines of computer science. It may be considered to be a preparatory course for a course in numerical analysis. Numerical methods, based upon sound computational mathematics, are the basic algorithms underpinning computer predictions in modern systems science. Such methods include techniques for simple optimization, interpolation from the known to the unknown, linear algebra underlying systems of equations, ordinary differential equations to simulate systems, and stochastic simulation under random influences.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
ILO / CO: 2	Apply numerical methods to obtain approximate solutions to mathematical problems.

Course Contents:

(Mid-term Exam: 30 Marks)

1. **Errors in Numerical Calculations:**
   Significant figure, rounding off numbers, Error in Numerical Calculation
2. **Roots of Nonlinear Equation:**
   Solution of Algebraic and Transcendental Equation
3. **Interpolation:**
   Interpolation with equal and unequal intervals- Missing values, Newton's binomial expansion formula, Newton's forward and backward interpolation formula. Central difference interpolation formulae, inverse interpolation.

(Final Exam: 50 Marks)
Group- A (20-Marks)

1. **Numerical Differentiation:**
   Derivates using Newton's forward backward and Starlings' formula.
2. **Numerical Integration:**
   General quadrature formula for equidistant ordinates. Trapezoidal rule, Simpson's one-third rule, Simpson's three-eight rules, Weddle's rule.

Group-B (30 Marks)

1. **Numerical solution of ordinary differential equations:**
   Taylor's series method, Euler's method, Adams Back forth Moulton method, Runge-Kutta method.
2. **Solution of linear equations:**
   Gauss-elimination method, Iteration methods. Gauss-Seidel method, Gauss-Jordan method.
3. **Curve Fitting:**
   Objective of fitting a curve, fitting a straight line, fitting a parabola

Recommend Books

Textbooks:

1. S.S Sastry, *"Introductory Methods of Numerical Analysis",* Prentice-Hall of India, New Delhi, 7th ed. 2005.

References Books:

1. Richard L. Burden, J. Douglas Faires, *"Numerical analysis, Boston: Prindle",* Weber & Schmidt, 3rd ed. 1985.
2. Cheney W., Kincaid D., *"Numerical Mathematics & Computing",* Brooks/Cole, 5th Edition, 2004

Course Code: STAT-2441
Course Title: PROBABILITY & STATISTICS

Credit Hours: 2 / Contact Hours: 2 per Week

Course Objectives:

This course is to provide an understanding for the engineering student on statistical concepts to include measurements of location and dispersion, probability, probability distributions, hypothesis testing, regression, and correlation analysis.

Course outcomes:

ILOs / COs	Description
ILO / CO: 1	Demonstrate understanding of descriptive statistics by practical application of quantitative reasoning and to the solution of engineering problems with data visualization.
ILO / CO: 2	Be able to compute and interpret the results of correlation and regression.

Course Contents:

Mid-term Exam: 30 Marks

1. **Preliminary idea of Statistics:** Origin, History and Development Statistics, Definition of Statistics, Characteristics, Function, Limitations, Necessity & importance of Statistics, The role of Statistics in Engineering, Population and Sample, Variable and Constants, Different types of variables, Parameter, Statistic, Scale of measurement, Statistical data, collecting engineering data, Preparation of Questionnaire and Schedule, Presentation and Classification of Data, Construction of Frequency distribution, Graphical presentation of Frequency distribution.
2. **Measures of Central Tendency:** Different types of mean with their properties and relationship, Quintiles with their graphical presentation, Application of different measures of central tendency.
3. **Measures of Dispersion of a Series of Data:** Range, Standard Deviation, Mean Deviation, Quartile Deviation, Variance and Standard Deviation, Coefficient of Variation and their uses, Properties and applications of different measures of dispersion, moments, skewness and kurtosis.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Correlation Theory and Regression Analysis:** Simple Correlation and its measure, Scatter Diagram, properties of simple correlation coefficient, Spearman's Rank correlation coefficient, Simple linear regression, properties of regression coefficient, regression curve, regression equation, Least-square method of curve fittings, Co-efficient of determination, Theorems & Problems.
2. **Basic concepts of probability:** History, meaning and Scope of probability, Approaches of defining probability: Classical, Empirical, Subjective and Axiomatic probability, Experiment, random experiment, Sample Space, Event, different types of events, Tree diagram, Conditional probability and independence, some elementary theorems on probability, and conditional probability, Laws of Probability – Additive and Multiplicative Law, Prior probability, Posterior probability, total probabilities & Bayes' theorem and their applications

Part – B: 30-Marks

1. **Random Variables and Mathematical Expectation:** Discrete and continuous random variables, Probability mass function and density function, Distribution function and their properties, Mathematical expectation and variance of a random variables. Theorems & Problems.
2. **Probability Distributions:** Binomial distribution, Poisson distribution and Normal distribution – Their properties, uses, Theorems & Problems.
3. **Test of hypothesis and Estimation:** Preliminary ideas of statistical hypothesis test, level of significance, one tailed and two tailed test, p-value, Test of significance, Test regarding single mean, test of equality of two mean, test of equality of several means (Analysis of variance), test regarding proportion. General concepts of Estimation.

Recommend Books:

Textbooks

[1]. Douglas C. Montgomery & George C. Runger, *"Applied Statistics and Probability for Engineers",* Wiley; 6th Edition, 2013

[2]. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers & Keying E. Ye, *"Probability & Statistics for Engineers & Scientists, MyLab Statistics Update",* Pearson; 9th Edition, 2016

[3]. Roy & Manindra Kumar, *"Business Statistics",* Jahangir Press, 2012
[4]. Roy & Manindra Kumar, *"Fundamentals of Probability & Probability Distributions",* Romax Publications, 4th Edition, 2016
[5]. R.N. Shill & S.C. Debnath, *"An introduction to the theory of Statistics",*
[6]. Alberto Leon-Garcia, *"Probability, Statistics, and Random Processes for Electrical Engineering",* Pearson; 3rd Edition, 2008

Course Code: MATH-2407
Course Title: Complex Variable, Higher Trigonometry and Random Process
Credit Hours: 3 / Contact Hours: 3 per Week

Course Objectives:

The course provides students with an understanding of how to analyze complex variable, higher trigonometry & random process, complex functions. Upon the successful completion of the course students will become proficient in Response of linear systems to random inputs. Mean square error estimation. Detection and linear filtering. Weiner Filters (Minimum Mean Square Error Filter). Monte Carlo modeling, Markov Chain modeling of random processes with memory, Trigonometric and Exponential functions for complex quantities, Different Relation between Circular Functions and Hyperbolic functions, Inverse circular and hyperbolic functions and Mathematical problems

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Demonstrate the basic idea of analyze complex variable, higher trigonometry & random process, complex functions.
ILO / CO: 2	The advancement of the knowledge of Complex variables, higher trigonometry & random process, complex functions, are implemented in engineering problem interpretation and applicability by using the mathematical formulations.

Course Contents:

Mid-term Exam: 30 Marks

1. **Pair of Straight lines:** Change of Axes**, Pair** of straight lines. General equation of second degree representing a pair of straight lines.
2. **General Equation of Second Degree:** Reduction of General equation of second degree into the standard forms, General equation of circles.
3. **Three-dimensional Geometry**: Rectangular co-ordinate System, Direction cosines, Direction ratios, Projections, Equation of planes.

Final Exam: 50 Marks
Part – A: 20-Marks

4. **Straight lines:** Equation of straight lines in three dimensions, Angle between two lines, Angle between a line and a plane.
5. **Solid Geometry:** Spheres, Plane of contact, Tangent plane, Intersection of two spheres, cylinder, cone, ellipsoids and paraboloids.

Part – B: 30-Marks

6. **Complex Valued Functions:** Complex mapping, Linear Transformation**:** translation, magnification and rotation, Non-linear transformations**:** inversion, bilinear etc.
7. **Complex Differentiation:** Differentiation of a complex function**,** Analytic function**,** Singularities, the Cauchy-Riemann Equations, harmonic functions.
8. **Complex Integration:** Complex Path Integrals, closed contour, Cauchy's Theorem, The Residue Theorem, Poles.

Recommend Books

Textbooks:

[1]. Boelkins, Matthew R., Jack L. Goldberg, and Merle C. Potter, "*Differential equations with linear algebra*", OUP USA, 2009.

Reference Books:

[1]. Stroud, Kenneth Arthur, and Dexter J. Booth. *Engineering mathematics*. Macmillan International Higher Education, 2013.
[2]. Mohammad, Khosh, P. K. Bhattacharjee, and Md Latif., *"A textbook on differential calculus.",* 2001
[3]. Das, B. C., and B. C. Mukherjee., *"Integral Calculus: Differential Equations.",* UN Dhur & Sons Private Limited. 55th Edition, 2012

Course Code: ETE – 3543
Course Title: MICROPROCESSOR AND PERIPHERALS
Credit Hour: 2/ Contact Hour: 2 per week

Course Objectives:

1. The objective of this course is to become familiar with the architecture and the instruction set of an Intel microprocessor. Assembly language programming will be studied as well as the design of various types of digital and analog interfaces. The accompanying lab is designed to provide practical hands-on experience with microprocessor software applications and interfacing techniques
2. To provide the students on developing of assembly level programs parallel providing the basics of processors.
3. To provide students with solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real-life problems.
4. To assist the students with an academic environment aware of excellence, guidelines and lifelong learning needed for a successful professional carrier.

Course Outcomes:

S.L.	Contents
1.	Gain knowledge of assembly level programming to write and test programs of moderate complexity for a real-time machine
2.	Apply knowledge to design circuits for various applications using Microcontrollers

Course Contents:

Mid-term Exam: 30 Marks

Introduction to Microprocessor

1. Basic architectures Von-Neumann and Hardwired, Evolution of Microprocessors, Computer generations and classifications, Mainframe, Mini, Micro and super computers, Microcomputer block diagram, different input output devices, different memory devices (Primary and Secondary).
2. Difference between microprocessor, microcomputer, microcontroller. Concept of multiprogramming multiprocessing, multiuser system, parallel processing.

Microprocessor 8085, 8086 and 80386

1. Pin-out diagram and pin description, Architecture, Instruction and data flow, addressing modes, Instruction fetch & execute, machine cycles, instruction cycle, timing diagrams, state transition diagram, instruction groups and instruction set.

Final Exam: 50 Marks

Part – A: 20-Marks

1. Assembly language programming: Simple arithmetic programs, data transfer array, string, bit manipulation, code conversion, delay routine and stack operations.

I/O interfacing and Memory System Design

2. Address design need of I/O, ports I/O, mapped I/O, memory mapped I/O, data transfer schemes PPI 8255 its modes, interface, initialization and programming.

Part – B: 30-Marks

1. Interfacing of key, L. E. D., seven segment, Dot matrix display, ADC 0808, and DAC 0809, with PPI 8255, address decoder and memory system design interface, stepper motor controller interfacing with 8255.

Peripheral Devices

1. 8251, 8253, 8257, 8279, interface with 8085, initialization and application-oriented programming. Data transfer schemes.
2. Interrupts SIM/RIM, PIC 8259 interface, initialization and programming with 8085, Micro Processor System Design, 8085 applications such as: Programmable Logic Controller, Temperature controller,

Recommend Books:

Textbook:

1. Barry B. Brey, *"The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, and Pentium Pro Processor Architecture, Programming, and Inter- facing",* Prentice Hall; 5th edition, 2000

Reference Books:

1. Ytha Yu & Charles Marut, *"Assembly Language Program & Organization of the IBM PC",* 3rd edition, 1992

2. Douglas V. Hall, *"Microprocessors and Interfacing: Programming and Hardware",* McGraw-Hill/Glencoe, 2nd Edition, 1998
3. Kip R. Irvine, *"Assembly Language for the IBM-PC",* Macmillan Coll Div, 3rd Edition, 2000
4. Peter Abel, *"IBM PC Assembly Language and Programming",* Prentice Hall, 5th Edition, 2003
5. Mohamed Rafiquzzaman, *"Microprocessor and Microcomputer Based System Design",* CRC Press, 2nd Edition, 1995
6. Ramesh Gaonkar, *"Microprocessor Architecture, Programming and Applications with the 8085",* Penram International Publishing, 6th edition, 2013

Course Code: ETE – 3544
Course Title: MICROPROCESSOR AND PERIPHERALS SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Outcome:

Analyze, write and test assembly language programs of moderate complexity

Course Contents:

S.L.	Contents
1.	Introduction to Assembly Language
2.	Write an Assembly program for printing 'Hello World'
3.	Write an Assembly program to understand the use of Register in Assembly program
4.	Write an Assembly program that reads a number from keyboard and display it on the screen
5.	Write an Assembly program for Arithmetic instruction (Addition, Multiplication, Division)
6.	Write an Assembly program for logical instruction ('AND' & 'OR' operation)

Recommend Books

Course Notes:

Lab Manual Prepared by course instructor.

Reference Books:

[1]. Ytha Yu & Charles Marut, "Assembly Language Program & Organization of the IBM PC", 3rd edition, 1992
[2]. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", McGraw-Hill/Glencoe, 2nd Edition, 1998
[3]. Kip R. Irvine, "Assembly Language for the IBM-PC", Macmillan Coll Div, 3rd Edition, 2000
[4]. Peter Abel, "IBM PC Assembly Language and Programming", Prentice Hall, 5th Edition, 2003

Course Code: ETE – 3505
Course Title: INFORMATION THEORY AND CODING

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

This course aims to address the efficient error free and secure delivery of information using binary data streams. For efficiency, the information source is coded to reduce redundancy. To minimise the effects of errors, channel coding is employed and, finally, cryptographic techniques are required to make the data secure. The aim is to present the basic theory and objectives of each of these steps, together with the basics of information theory.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Familiarization with the various fields/trends of communications like Information theory, error detection and error correction related to radio and telecommunication.
ILO / CO: 2	Analysis different types of error control code properties for secure and error free efficient communications.

Course Contents:

Mid-term Exam: 30 Marks

1. **Information Sources and Sources Coding**
   Logarithmic measure for information, self and average information. Entropy, information rate, discrete sources, extensions of a discrete source, Shannon's source coding theorem.
2. Markov source. Joint and conditional entropy. Source coding theorem and algorithms. Kraft inequality, Huffman code, prefix code,
3. Lempel-Ziv code, rate distortion theory. Scalar and vector quantization, waveform coding. Orthogonal Codes, biorthogonal Codes. Simplex Code. Application examples: MPEG audio compression, JPEG image compression standard and MPEG video compression.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Channel Capacity and Coding**
   Discrete channels, mutual information, Properties of Mutual Information, channel capacity, Shannon's channel coding theorem, bandwidth S/N trade-off. Channel capacity theorem.
5. **Model of digital communication system employing coding.** History of Coding, Types of Coding, Types of Decoding, Types of Error Control, Code Rate and Redundancy, Hamming distance, Hamming weight, Hamming bound. parity check codes, Hamming codes, Cyclic Codes.

Part – B: 30-Marks

6. Linear block codes, generator and parity check matrix, syndrome decoding. Cyclic codes, generation and detection. Coding for reliable communication, coding gain, bandwidth expansion ratio. Comparison of coded and uncoded systems.
7. Convolutional Codes, Encoding, Encoder representation, impulse Response of the Encoder, polynomial Representation, state representation and the State Diagram, Code tree, Trellis diagram, Turbo coding, LDPC
8. Decoding of convolutional codes, Veterbi's algorithm, sequential decoding. Transfer function and distance properties of convolutional codes. Error Correction Capability of Convolutional Codes, Coding gain. Application example: GSM systems.

Recommend Books

Textbooks:

[1]. N. Abramson, *"Information Theory and Coding",* McGraw-Hill, 1963.
[2]. Bernard Scalar, *"Digital Communication System"*, Prentice Hall, 2nd edition, 2017

Reference Books:

[1]. C.E. Shannon, *"A Mathematical Theory of Communications",* Bell System Tech. Journal, Vol. 27, July and Oct. 1948.
[2]. W.W. Peterson and E.J. Weldon, *"Error-Correcting Codes",* MIT Press, 1972.

Course Code: ETE – 3545

Course Title: OBJECT ORIENTED PROGRAMMING WITH JAVA

Credit Hour: 2/ Contact Hour: 2 per week

Course Objectives:

1. To understand Object Oriented Programming concepts
2. To understand the role that methods play in an object-oriented program 2 To understand the concept of a class hierarchy.
3. To know the basic characteristics of Java
4. To become familiar with the relationship between classes and objects in a Java program
5. To comprehend Java Data and Control Structures
6. To understand the difference between a Java application and a Java applet.
7. To understand the role that data plays in effective program design
8. To be able to solve problems involving repetition
9. To understand the goals and principles of structured programming
10. To write efficient and effective applications in Java

Course Outcomes:

S.L.	Contents
1.	Define the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
2.	Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
3.	Develop Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifies, multithreading, error exception handling)

Course Contents:

Mid-term Exam: 30 Marks

1. **Concepts of Object-Oriented Programming:** Java Features and advantages, Class, Object, Abstraction, Encapsulation, Inheritance, Polymorphism, JVM, Creating classes with Java, Nested Class, Java application and Applet
2. **Variables, Operators, and Control Statement**: Variables, Data Types, Arrays, Operators and Control Flow, string vector
3. **Classes and Objects:** Classes, Objects, Instance variables, Using methods, Constructors, *this*, *final*, *static* keywords, Calling a class method, Passing parameters, Nested class.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Inheritance and Polymorphism:** Implementation of Inheritance, Inheritance basics, Using Super, Constructor, Method overriding, Dynamic method dispatch, Abstract classes, Method overloading, Polymorphism examples,
2. **Exception Handling**: Overview of exception handling, the basic model, Hierarchy of Event classes, throw clause, throws statement, try-catch block, finally, User-defined exception subclasses, Chained exceptions, Use of exceptions.

Part – B: 30-Marks

1. **Multithreaded Programming**: Java thread model, Main thread, Crating single and multiple thread, Thread priorities, Synchronization, Interthread Communication, Suspending, Resuming, and Stopping threads, Using multithreading.
2. **Using Standard Java Packages**: Packages, Interfaces, Event handling of various components, AWT components
3. **Files and Streams**: Data Hierarchy, Files and streams, Class *File*, Sequential-access text files, Object Serialization, Random-access files, Vectors, Byte streams, Buffer Streams, Character streams.

Recommend Books:

Reference Books:

1. Robert Lafore, *"Object Oriented Programming in C++",* Sams Publishing, 4th edition, 2001
2. Herbert Schildt, *"Teach yourself C++",* MHC, 3rd edition, 1997
3. Deitel & Deitel, *"Java: How to Program",* Prentice Hall, 9th Edition, 2011
4. E Balagurusamy*, "Object-Oriented Programming with C++",* The McGraw-Hill Companies, 4th ed, 2010
5. P. Naughton and H. Schildt, *"Java 2: The Complete Reference",* Osborne Publishing, 5th edition, 2007
6. E. Balagurusamy, *"Programming with Java",* McGraw-Hill Education, 3rd edition, 2019

Course Code: ETE – 3546
Course Title: OBJECT ORIENTED PROGRAMMING WITH JAVASESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Outcomes:

- ✓ Apply knowledge of the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
- ✓ Identify classes, objects, members of a class and the relationships among them needed for a specific problem.

Course Contents:

S.L.	Contents
1.	Introduction with basic structure of JAVA programming
2.	Introducing Class and Object using basic program
3.	Implementation of simple method for arithmetic sum of two numbers using JAVA
4.	Calculate the area of rectangle using Scanner and a simple method
5.	Experiment on basic understanding of Constructor in JAVA
6.	Basic understanding of single Inheritance using JAVA
7.	Finding the volume of the Queue using Multi-level Inheritance in JAVA
8.	Implementation of Runtime Polymorphism as Method Overriding
9.	Implementation of Compile time Polymorphism as Method Overriding
10.	Implementation of Try and Catch for Exception handling using Single Catch
11.	Implementation of Exception handling using Multiple Catch statement

Recommend Books

Course Notes:

Lab Manual Prepared by course instructor.

Reference Books:

[1]. Robert Lafore, *"Object Oriented Programming in C++",* Sams Publishing, 4th edition, 2001
[2]. Herbert Schildt, *"Teach yourself C++",* MHC, 3rd edition, 1997
[3]. Deitel & Deitel, *"Java: How to Program",* Prentice Hall, 9th Edition, 2011
[4]. E Balagurusamy, *"Object-Oriented Programming with C++",* The McGraw-Hill Companies, 4th edition, 2010
[5]. P. Naughton and H. Schildt, *"Java 2: The Complete Reference",* Osborne Publishing, 5th edition, 2007
[6]. E. Balagurusamy, *"Programming with Java",* McGraw-Hill Education, 3rd edition, 2019

Course Code: ETE – 3529
Course Title: TELECOMMUNICATION SWITCHING AND NETWORKS

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

To prepare students for further work in the area of telecom networking and communications systems, providing a firm understanding of the fundamental principles and concepts involved in telecom systems.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Understand and analyze the basic concepts related to telecommunication system.
ILO / CO: 2	To develop ability to define, analyzed and distinguish electromechanical, electronic, digital and analog switching systems.
ILO / CO: 3	Understand and Illustrate telecommunication traffic system and solve the traffic related issue to improve the G.O.S of Telecommunication system.
ILO / CO: 4	Understand and analyzed the principle of gradings used in networking of telecommunication system along with call processing function and various types of signal used in telecommunication system.
ILO / CO: 5	Able to be analyzing how Synchronization of Telecomm Network and Network management can be possible in Telecommunication Systems.
ILO / CO: 6	Prepare and Present a term presentation on selected topic.

Course Contents:

Mid-term Exam: 30 Marks

1. **Evolution of Switching Systems:** Evolution of Telecommunications, Simple Telephone Communications, Basics of Switching System, Manual Switching System, Basic Elements of Strowger switching systems, Step-by-step switching system, Subscriber access to strowger switching, Crossbar exchange, Principle of Crossbar switching, Cross Bar Switch Configurations, Cross Point Technology.
2. **Computer-Controlled Switching-I:** Stored Program control, Centralized SPC, Distributed SPC, Software Organization, Enhanced Services, 2-stage and 3-stage networks.
3. **Computer-Controlled Switching-II:** Time Division Multiplexing. Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching. DMS-100 Systems, EWSD system.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Signaling Techniques:** Signaling, Pulse Dialing, Multi-frequency Dialing, DTMF, Forms of signaling, In channel Signaling: Loop-Disconnect-dc signaling, Multi-frequency-ac signaling, Voice-frequency-ac signaling, PCM signaling, Common Channel Signaling(CCS): CCS Signaling Message Formats, CCS Network, CCS Implementation, Signaling System 7(SS7): Purpose of SS7 Network, SS7 Network Architecture, Protocol architecture of SS7, SS7 Signaling Units, Basic Call Setup with ISUP
5. **Traffic Engineering:** Network Traffic Load and Parameters, Grade of Service and Blocking Probability, The birth and death process, Loss systems: Lost call cleared system, Lost call return system, Lost call held system, Delay systems, Combined Loss and Delay Systems.

Part – B: 30-Marks

6. **Telephone Networks:** Subscriber Loop Systems, Switching Hierarchy and Routing, Transmission Plan, Transmission Media, Numbering and Charging Plans, 2W/4W Circuits, Network management: Functions of network manager, Telecommunication Management Network (TMN), Transmission Equipment in the network.
7. **Advanced Transmission Networks:** Introduction; Digital Multiplexing: Wavelength Division Multiplexing (WDM), Dense Wavelength Division Multiplexing (DWDM): Digital Subscriber Line (DSL) technology, XDSL comparison with other technologies, Various types of XDSL, Principle of operation of XDSL, Encoding and Modulation, ADSL; SONET/SDH: SONET network and layers, SONET frame format, SONET multiplexing, SONET topologies, Synchronous Digital Hierarchy

8. **ISDN:** Introduction to ISDN, Advantages of ISDN, New services, Network and Protocol Architectures, ISDN services, ISDN Interface, ISDN Channels, ISDN Switching: Circuit switching and Packet switching, Functional Grouping, Reference Points, Broadband ISDN.

Recommend Books

Textbooks:

[1]. Viswanathan, Thiagarajan & Bhatnagar, *"Telecommunication Switching Systems and Networks"*, 2nd ed. Published August 30th, 2004 by Prentice-Hall of India Pvt.Ltd, ISBN8120307135
[2]. J.E. Flood, *"Telecommunications Switching, Traffic and Networks"*, Prentice Hall, 1995.

Reference Books:

[1]. M.T. Hills, *"Telecommunication Switching Principles"*, London: Allen and Unwin, 1979.
[2]. E. Keiser & E. Strange, *"Digital Telephony and Network Integration, (2/e)"*, Van Nostrand, 1995.

Course Notes:

[1]. www.tutorialspoint.com. (2018). *Telecommunication Tutorial*. [online] Available at: https://www.tutorialspoint.com/analog_communication/ [Accessed 1 Nov. 2018].

Course Code: ETE – 3522

Course Title: DESIGN OF ELECTRONIC SYSTEMS

Credit Hour: 1.5/ Contact Hour: 3 per week

Course Objective:

The objective of this course is to give a thorough understanding of how to create electronic systems, PCB layout design, soldering and testing, from 'building block' to timing in circuits, interfacing in electronic systems, power, relay and sensors.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	To apply the knowledge of circuit and electronics in developing solution of a complex electronic design project.
ILO / CO: 2	Analyze and compare design alternatives and use measures of performance or other criteria to rank alternatives
ILO / CO: 3	Plan and organize an engineering design project using tools such as Gantt charts to develop a work breakdown structure, develop a schedule including milestones, and estimate effort and costs.
ILO / CO: 4	Consult manual and data sheets, design experiments, simulate, analyze and interpret results to decide best solution
ILO / CO: 5	Assess legal and cultural issues, impact of the project on society, health and environment.
ILO / CO: 6	Build a prototype of the solution of complex electronic design project.
ILO / CO: 7	Communicate the team's logistical and technical approaches to the design project in a polished, co-authored, written proposal, using language and graphics appropriate to the technical discipline.
ILO / CO: 8	Able to do the lab works individually and as members or leader of a teams, report individual and team performance against the plan

Course Contents:

S.L.	Contents
1.	Lecture on components and instrumentation required for system design lab. Overall discussion of this course and assessment method.
2.	Design of a voltage regulator circuit using DIAC, Triac using hand through technology. (PCB layout design and concentrate on $Fecl_3$ solution)
3.	Design of a voltage regulator circuit using DIAC, Triac. (drill on PCB and Soldering)
4.	Design of a voltage regulator circuit using DIAC, Triac. (Testing output and Fault finding)
5.	Design automatic water tank level controller motor driver Circuit using hand through technology. (PCB layout design and concentrate on $Fecl_3$ solution), (drill on PCB and Soldering), (Testing output and Fault finding)
6.	Design automatic battery charger using hand through technology.
7.	Lecture on how to design PCB layout by using software and shown tutorial video.
8.	Software practice for PCB layout design
9.	Design of a Security Alarm Circuit by using Software.
10.	Design of an Automatic Night Lamp using software.

Recommend Books

Textbook:

1. B.S. Sonde, "Introduction to System Design Using Integrated Circuits", John Wiley & Sons (Asia) Pte Ltd., 1981

Reference Books:

1. Ramakant A. Gayakwad, *"Op-Amps and Linear Integrated Circuits",* Pearson Education, 4th edition, 2015

2. Fredrick J. Hill & Gerald R. Peterson, *"Digital Logic and Microprocessors",* Wiley, 1984
3. Franklin P. Prosser & David E. Winkel, *"The Art of Digital Design: An Introduction to Top-Down Design",* Prentice Hall, 1987
4. Bouwens, *"Digital Instrumentation",* McGraw-Hill Education - Europe, 1986
5. Ramesh Gaonkar, *"Microprocessor Architecture, Programming and Applications with the 8085",* Penram International Publishing, 6th edition, 2013
6. James E. Buchanan, *"Cmos/Ttl Digital Systems Design",* McGraw-Hill, 1990

Course Code: ETE – 3641
Course Title: DIGITAL COMMUNICATIONS

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

The aim of this course is to provide students with a good understanding of digital communications principles and digital techniques required in the rapidly expanding field of digital signal transmission and modulation in communication systems. Students will use standard mathematical methods to model and analyses digital communication systems and predict performance metrics such as received SNR and expected bit error ratio. The firm grounding in digital communications fundamentals and digital methods will also prepare students to anticipate, appraise and pursue future trends in digital communications research and technologies.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Identify and understanding the basic knowledge of digital communication system and theory. (Po1)
ILO / CO: 2	Apply the knowledge for different digital modulation technique, data transmission and performance evaluation. (po1)
ILO / CO: 3	Prepare and present a term paper for a specific topic. (po12)

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction to Digital Communications**
   Digital vs. analog communications, digital communication block diagram, classification of signals, spectra and filtering, signal transmission through linear systems,
2. **Digital Communications Theory**
   Orthogonal functions, random processes, autocorrelation, power spectrum, systems with random input/output, bandwidth of digital data, Information Capacity Theorem revisited, and bandwidth-efficiency diagram.
3. **Pulse Modulations and Digitization of Speech Signals**
   Pulse amplitude modulation, pulse width modulation, pulse position modulation, time division multiplexing. Sampling theorem, sample-and-hold.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Pulse Modulation**
   Pulse code modulation (PCM), quantization noise, narrowband noise, Companding, differential PCM, delta modulation, overload noise, adaptive delta modulation.
5. **Baseband Data Transmission**
   Line coding, intersymbol interference, Nyquist theorem, eye pattern, adaptive equalization. Transmission over bandpass channels: complex envelope representation of bandpass signals, signal space analysis.

Part – B: 30-Marks

6. **Digital Modulation and Multiple Access Techniques**
   ASK, FSK, PSK, DPSK, QPSK, 8PSK, 16PSK, QAM, M-ary modulation, continuous phase FSK, MSK. Coherent and non-coherent demodulation, multiple access techniques, FDMA, CDMA, TDMA, CDMA for wireless communications, near-far problem in CDMA, Rake receiver, handoff process in cellular communications, application examples.
7. **Performance of Digital Communication Systems**
   Bit rate, Baud rate, BER of Ask, PSK and FSK. Matched filter receiver, error function, probability of error calculation of BPSK, BFSK M-ary PSK, error rates in binary and M-ary transmission, error analysis of PCM repeater systems.

8. Spread Spectrum Communications

Brief history of spread spectrum communications, generation of pseudo noise sequences, properties of M-sequences, direct sequence spread spectrum, processing gain, jamming margin, frequency hopping spread spectrum.

Recommend Books

Textbooks:

1. Simon Haykin, *"Digital communication"*, Wiley India, India, 2011
2. Bernard Scalar, *"Digital Communication System"*, Pearson Education, California, 2nd ed., 2002

Reference Books:

1. N. Abramson, *"Information Theory and Coding",* McGraw-Hill, 1963
2. C.E. Shannon, *"A Mathematical Theory of Communications"*, Bell System Tech. Journal, Vol. 27, July and Oct. 1948.
3. W.W. Peterson and E.J. Weldon, *"Error-Correcting Codes"*, MIT Press, 1972.

Course Code: ETE – 3642
Course Title: DIGITAL COMMUNICATIONS SESSIONAL

Credit Hour: 1.5/ Contact Hour: 3 per week

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Simulate different digital modulation technique using MATLAB.
ILO / CO: 2	Perform and practice the digital modulation technique through laboratory setting (Hardware), individually or in a small team.

Course Contents:

S.L.	Contents
1.	Introduction to the course, Basic Guidelines and advises for the course, Discussion about laboratory safety and Training Requirements on working in the LAB.
2.	Introduction to Digital Communication and Waveform Sampling through MODICOM-1 Board.
3.	Study on wave Sampling System using MATLAB Software.
4.	Experiment on Pulse Amplitude Modulation (PAM) system using Hardware and Software.
5.	Experiment on Pulse Code Modulation (PCM) system using Hardware and Software.
6.	Experiment on Delta Modulation system using Hardware.
7.	Experiment on Adaptive Delta Modulation system using Hardware.

Recommend Books

List of References:

Lab Manual Prepared by course instructor.

Course Code: ETE – 3643
Course Title: MOBILE AND WIRELESS COMMUNICATIONS
Credit Hour 3/ Contact Hour: 3 per week

Course Objectives:

The course addresses the fundamentals of wireless communications and provides an overview of existing and emerging wireless communication Technology and networks. It covers radio propagation and fading models, fundamentals of cellular communications, multiple access technologies, and various wireless systems like GSM, CDMA etc., including past and future generation wireless networks.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Understanding of basic wireless and cellular communication techniques.
ILO / CO: 2	**Ability to solve** different propagation and path loss model related problems. Comprehend the operation of GSM and other types of Cellular Mobile Communication system, Diversity techniques, Rake Receiver, Multiple Input Multiple Output (MIMO) technique, underwater communication system etc.

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction to Wireless Communications (WC):**
   Evolution of Mobile Radio Communication, Example of WC, Comparison of common WC systems, second generation, third generation, fourth generation wireless network.
2. **Cellular Concept:**
   Historical development of Cellular Mobile Communication. A Mobile Wireless to Cellular concept, Frequency reuse and its application for different types of cell design, Co-channel interference and non-co channel interference, other Interferences. Call drops and necessity of Handoffs, types of Handoffs.
3. **Capacity Enhancement:**
   Cell design, 4 cell and 7 cell design concept, Cell divisions, Sectoral Antennas for the cell sites for different types of cell design, Types of antennas used in Cell sites.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Large scale path loss:**
   Introduction to radio wave propagation, Free space propagation models, Reflection, Diffraction, Scattering, Outdoor propagations models, indoor propagations models.
2. **Small Scale Path loss:**
   Small scale multipath propagation, Doppler shift, Parameters of mobile multipath channel, Rayleigh and Rician distribution details.

Part – B: 30-Marks

1. **GSM Architecture:**
   GSM, specifications for cellular telephony, Difference between GSM and other types of Cellular Mobile Communication system, GSM Architecture, Functions of MSC, BSC, BTS and other functional blocks (subsystems and parts) of a GSM system, Situations and Techniques of Handover in GSM.
2. **GSM Channels and Coding:**
   Different types of Channels and Signaling in GSM, Voice and Control channels of a GSM system, Channel Structure and traffic channels, Control Channel and Burst structure, Speech Coding, Channel coding, modulation and power coding in GSM.
3. **Advanced Cellular:**
   Fundamentals of Equalization, Diversity techniques, Rake Receiver, Multiple Input Multiple Output (MIMO) technique, Introduction to underwater communication system, Recent wireless communication systems.

Recommend Books

Textbooks:

1. Rappaport. T.S., "*Wireless communications*", Pearson Education, 2003.
2. Gordon L. Stuber, "*Principles of Mobile Communication*", Springer International Ltd., 2001.
3. Andrea Goldsmith, *Wireless Communications*, Cambridge University Press, 2007.

References:

1. Andreas.F. Molisch, "*Wireless Communications*", John Wiley – India, 2006.
2. Simon Haykin& Michael Moher, "*Modern Wireless Communications*", Pearson Education, 2007.

Course Code: ETE – 3644
Course Title: MOBILE AND WIRELESS COMMUNICATIONS SESSIONAL

Credit Hour: 1.5/ Contact Hour: 3 per week

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Simulate different Cellular System using MATLAB.
ILO / CO: 2	**Ability to solve** different propagation and path loss model related problems. Comprehend the operation of GSM and other types of Cellular Mobile Communication system, Diversity techniques, Rake Receiver, Multiple Input Multiple Output (MIMO) technique, underwater communication system etc.

Course Contents:

S.L.	Contents
1.	Introductory MATLAB command
2.	Introductory MATLAB for communication: User defined functions, Plotting, creating plot with special type, adding titles, axis labels annotations
3.	Experiment on free space propagation model
4.	Experiment on Capacity, Interface calculation due to reuse of channel and bandwidth
5.	Experiment on calculating received power in two ray propagation models
6.	Experiment on small scale fading: Data transmission and reception with Rayleigh Fading
7.	Experiment on brief discussion of multiple access technique
8.	Experiment on data transmission and reception using Rician fading

Recommend Books

Course Notes:

Lab Manual Prepared by course instructor.

Reference Books:

1. Rappaport. T.S., "*Wireless communications*", Pearson Education, 2003.
2. Gordon L. Stuber, "*Principles of Mobile Communication*", Springer International Ltd., 2001.
3. Andrea Goldsmith, *Wireless Communications*, Cambridge University Press, 2007.

Course Code: ETE – 3645

Course Title: ELECTRONIC MEASUREMENT & INSTRUMENTATION

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

The overall aim of this course is to provide the student with essential knowledge related to electronic measurement basics & instrumentation systems. On completion of this course the student shall be able to monitor, analyze and control any instrumentation system, understand how different types of meters work and their construction, design and create novel products and solutions for real life problems utilizing the knowledge availed from the course and use appropriate modern tools necessary for electrical/electronic projects for measurement purpose.

Course outcomes:

ILOs / COs	Description
ILO / CO: 1	Apply theoretical knowledge to familiarize with various measuring instruments & techniques, generators and recorders and utilize appropriate tools for measurement purpose.
ILO / CO: 2	Understand the performance characteristics, errors and different parameters associated with measuring instruments and analyze them.

Course Contents:

Mid-term Exam: 30 Marks

1. Measurements: significance, methods of measurement, different types of measurement errors and handle themselves. Instrumentation: definition, different instrument systems.
2. Ammeter, PMMC, Voltmeter – construction, errors, effect of temperature change, multirange systems.
3. Current transformer – characteristics, errors, clamp on ammeter, Sampling and vector voltmeter sync. Detector, Sound level measurement, RF power/Voltage measurement. Recorders, Signal generator, Function generator.

Final Exam: 50 Marks

Part – A: 20-Marks

4. AC voltmeters using rectifiers True RMS, Voltmeters, Digital voltmeter, vector voltmeter Q-meter, Electronic multi meter.
5. CRO-Principle and its working, dual trace CRO, Storage CRO, Digital storage CRO, Specifications of Generator, C.R.O., etc.

Part – B: 30-Marks

6. Wave analyzers, Harmonic Distortion analyzer, Spectrum analyzer logic & signature analyzer. Network Analyzer Swept frequency generator, Frequency synthesizer.
7. Measurement on Audio/Video amplifier, Measurement on Transmitter/Receiver Measurement of microwave frequencies RF/UHF.
8. Fiber optic power measurement, Fiber System loss modulation measurement Bolo meter, optical sources, optical detectors, optical transducer, fiber optic sensors & its advantages.

Recommend Books:

Textbooks:

1. A.K. Shawney and Puneet Sawney, "*Electrical & Electronic Measurement Instruments*", Dhanpat Rai & Co. Publications, 19th edition, 2013.

Reference Books:

1. E.W. Golding & F.C. Widdis, "*Electrical Measurements and measuring Instruments*", 5th Edition, Wheeler Publishing, 2005
2. Buckingham and Price, "*Electrical Measurements*", Prentice Hall
3. D.V.S. Murty, "*Transducers and Instrumentation*", Prentice Hall of India, 2nd edition, 2009.
4. A.S Morris, "*Principles of Measurement and Instrumentation*", Pearson/Prentice Hall of India, 2nd edition, 1994.
5. H.S. Kalsi, "*Electronic Instrumentation*", Tata McGraw-Hill Edition,1st Edition, 1995

Course Code: ETE – 3646
Course Title: ELECTRONIC MEASUREMENT & INSTRUMENTATION SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Apply mathematical, scientific and engineering knowledge, proper techniques and relevant tools to the specification, analysis, design, implementation and testing of any measuring product.
ILO / CO: 2	Compare and distinguish between various measuring instruments along with their corresponding symbols and cognize their proper methods of use.
ILO / CO: 3	Design and conduct experiments, analyze and interpret data and determine various electrical parameters with accuracy, precision and resolution implementing relevant modern electronic measuring equipment's.
ILO / CO: 4	Adapt in a cooperative environment to work effectively as part of a team, developing interpersonal, organizational, project management and problem-solving skills, exercising some personal responsibility.

Course Contents:

S.L.	Contents
1.	To Study the Measuring Instrument Symbol.
2.	To study the constructional details of Permanent Magnet Moving Coil (PMMC) and moving Iron instruments.
3.	To study the constructional details of moving Iron instruments.
4.	To measure high value of voltage using low range PMMC.
5.	To measure high value of current using low range PMMC.
6.	To measure high value of AC current using low range AC Ammeter and Current Transformer.
7.	To measure high value of AC Voltage using low range AC Voltmeter and Potential Transformer.

Recommend Books

Course Notes:

Lab Manual Prepared by course instructor.

Reference Books:

[1]. E.W. Golding & F.C. Widdis, *"Electrical Measurements and measuring Instruments",* 5th Edition, Wheeler Publishing, 2005
[2]. Buckingham and Price, *"Electrical Measurements",* Prentice Hall
[3]. D.V.S. Murty, *"Transducers and Instrumentation",* Prentice Hall of India, 2nd edition, 2009.
[4]. A.S Morris, *"Principles of Measurement and Instrumentation",* Pearson/Prentice Hall of India, 2nd edition, 1994.
[5]. H.S. Kalsi, *"Electronic Instrumentation",* Tata McGraw-Hill Edition,1st Edition, 1995

Course Code: ETE – 3649
Course Title: ANTENNA and WAVE PROPAGATION

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

Overall aim of the course is to give the students specialized knowledge on how to deal with antenna. It starts from covering the basic antenna parameters that define whether an antenna is suitable for an application or not. It goes on to discuss about various types of antenna and their designing. Second part of the course deals with propagation of Electromagnetic Waves through atmosphere and atmospheric effects on ground, sky and space wave propagation. The course builds on the mathematical knowledge of Co-ordinate Geometry, Vector Algebra and Vector Calculus, Knowledge of Electromagnetic Fields and Waves and wishes to make students equipped with skills to solve complex engineering problems in the field of antenna designing and wave propagation.

Course outcomes:

ILOs / COs	Description
ILO / CO: 1	Explain different antenna parameters and their use while designing an antenna.
ILO / CO: 2	Understand the basic Working Principle of different antennas and antenna arrays.
ILO / CO: 3	Design various antennas and arrays to meet the stated specifications in terms of antenna parameters
ILO / CO: 4	Explain how different types of waves propagate through atmosphere and atmospheric effect on them
ILO / CO: 5	Present understanding on a selected research paper.

Course Contents:

Mid-term Exam: 30 Marks

1. **Antenna Basics:** Definition of an antenna, Antenna patterns and antenna parameters: Radiation Intensity, beam width (HPBW, FNBW), directivity, Directive gain, side-lobes, Front to Back ratio, bandwidth, Input Impedance, Reflection Co-efficient and VSWR, Polarization, radiation resistance, equivalent circuit of receiving antenna, Power Gain, Efficiency, effective length, capture area, retarded potentials, isotropic source, Friis transmission formula, Reciprocity theorem.
2. **Thin Linear Wire Antennas:** Assumed current distribution for different dipoles, Radiation fields of elemental dipoles, Short dipole, Its radiation resistance and directivity, Half wave Dipole, Its radiation resistance and directivity, Monopole, Small loop antennas, Comparative Study of different dipoles.
3. **Antenna Arrays**: Definition, Two-element array-different cases, N-element linear array, uniform spacing and amplitude, Broadside and End fire array, Pattern Multiplication, non-uniform amplitude, Binomial array.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Analysis of Different types of Antennas:** Biconical antenna, cylindrical dipole, folded dipole, V Antennas, Inverted V Antennas, rhombic antenna- analysis and design, Yagi-Uda arrays, Helical antenna-Normal and axial mode.
2. **Analysis of Different types of Antennas:** log-periodic antenna, slot antenna – Babinet's principle, Impedance of slot antenna, micro strip antenna- Analysis and Design considerations, Horn antenna, rectangular horn Antenna, circular horn antenna, Cassegrain antenna, parabolic reflectors, lense antennas- operation, metallic and dielectric lenses.

Part – B: 30-Marks

1. **Ground Wave Propagation**: Electromagnetic waves, wave front, characteristic impedance of free space, reflection, refraction and diffraction. Ground waves, Space waves and Sky waves, Factors affecting wave propagation, Field strength for ground wave propagation, Roughness of earth, Reflection of EM wave from earth, Wave tilt of ground wave.

2. **Sky Wave Propagation:** The ionospheric layers, refractive index, Mechanism of refraction from ionospheric layers, Effect of earth's magnetic field, virtual height, critical frequency and angle, maximum usable frequency, skip zone, skip distance, fading, LUF, OWF, Multi Hop Propagation, Energy loss in ionosphere due to collisions.
3. **Space Wave Propagation**: VHF line of sight transmission. Tropospheric scattering communications. Relationship between transmitter power, antenna gains and received signal to noise in a free space radio link. Effect of earth's curvature, Radio Horizon, Modified Refractive Index, Duct Propagation, Summary of wave characteristics in different frequency ranges

Recommend Books

Textbooks:

1. G.S.N. Raju, *"Antennas and Wave Propagation",* Pearson Education India, 2nd edition, 2006
2. John D Krauss, Ronald J Marhefka, Ahmad S Khan, *"Antennas for all applications",* Mc Graw-Hill, 3rd edition, 2006
3. K D Prasad, Satya Prakashan, *"Antennas & Wave Propagation",* Tech India Publications, New Delhi, 2001

Reference Books:

1. E.C. Jordan and K.G. Balamain, *"Electromagnetic Waves and Radiating Systems",* Pearson Education, 2nd ed., 2000.
2. John D Kraus, *"Antennas",* Mc Graw-Hill, 2nd ed.,1988
3. C.A Balanis, *"Antenna Theory",* John Wiley & Sons, 2nd ed., 2001.

Course Code: ETE – 3650

Course Title: ANTENNA&WAVE PROPAGATION SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Objective:

Overall aim of the course is to enable students to design and analyze different antennas with respect to their parameters. Different types of antenna are designed, simulated and analyzed in this course with the help of CST Microwave Studio. Moreover, a horn antenna can be practically analyzed using Microwave Electronic Communication Base. The course ends with a project on antenna designing that has two or more types of complexities mentioned in the characteristics of Complex Engineering Problem.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	To apply the knowledge of different types of antenna and antenna parameters in analyzing a horn antenna developing solution of a complex antenna designing problem.
ILO / CO: 2	Analyze and compare design alternatives and use measures of performance or other criteria to rank alternatives in solution of the complex antenna designing problem.
ILO / CO: 3	Consult video instructions and materials, design experiments, simulate, analyze and interpret results to analyze different types of antenna and decide the best solution to the complex microwave engineering problem.
ILO / CO: 4	Model and simulate different types of antenna and develop a prototype of the solution of complex antenna designing problem using CST Studio Suite.
ILO / CO: 5	Able to do the lab works individually and as members or leader of a teams, report individual and team performance against the plan
ILO / CO: 6	Communicate the team's technical approaches to the design project in a polished, co-authored, written format, using language and graphics appropriate to the technical discipline.

Course Contents:

S.L.	Contents
1.	Discussion on Course Specification
2.	Design, Simulation and Analysis of Wire type antennas using CST Microwave Studio
3.	Design, Simulation and Analysis of Microstrip type antennas using CST Microwave Studio
4.	Optimization of Microstrip Patch antenna using CST Microwave Studio
5.	Design, Simulation and Analysis of Dipole type antennas using CST Microwave Studio
6.	Design, Simulation and Analysis of Antenna Arrays using CST Microwave Studio
7.	Distribution of Term Project
8.	Design, Simulation and Analysis of Waveguide type antennas using CST Microwave Studio
9.	Discussion and Approval of GroupWise Project Solution
10.	Analysis of Polarization and Radiation Pattern of Horn Antenna using Microwave Electronic Communication Base
11.	Project Submission

Recommend Books

Course Notes:

Lab Manual available in the Lab Titled ETE-3630: Antenna and Propagation Sessional

Textbooks: N/A

Reference Books: N/A

Course Code: ETE – 4741
Course Title: MICROWAVE ENGINEERING

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives

The overall aim of the course is to understand the theoretical principles underlying microwave devices and networks. The course also aims to deliver fundamental concepts and working principles of different microwave tubes, semiconductor devices and amplifiers. Different analytical techniques needed to understand operation of microwave circuits are also covered in the course. It also includes the design of different microwave system components such as transmission lines, waveguides, resonators, filters, waveguide components etc.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Understand the working principle of different Microwave Components
ILO / CO: 2	Analyze Microwave Circuits and Components using suitable engineering analytical techniques
ILO / CO: 3	Design different Microwave Components satisfying specified criteria
ILO / CO: 4	Prepare and Present a term paper on selected title

Course Contents:

Mid-term Exam: 30 Marks

1. **H.F Transmission Lines**: Telegrapher's Equation, Wave equation, Propagation constant, input impedance, insertion loss, transmission loss, Reflection Coefficient, transmission Coefficient, Standing Wave Pattern and VSWR, Phase and Group Velocities.
2. **Smith Chart and Impedance Matching and Tuning:** Smith chart, Applications of Smith Chart, Impedance matching with Lumped Elements (L Networks), Quarter wave Transformer, single double stub matching and double stub matching.
3. **Transmission Line and Waveguides:** Wave equations in waveguides, Basic Wave Types, Propagation of waves through Parallel plane waveguides (TE modes and TM Modes), Modes of wave propagation, rectangular waveguide (TE modes and TM Modes), TE_{10}mode in rectangular waveguide, propagation modes in circular waveguide (TE modes and TM Modes), Stripline, Microstrip line.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Microwave Networks Analysis:** Impedance matrix, admittance matrix, transmission (ABCD) Matrix, Definition of scattering matrix, characteristics of S-matrix, scattering matrix of a two-port network, salient features of S-matrix, salient features of multiport network, impedance matrix, S-matrix of series element in the transmission line, S-matrix for E-plane Tee junction, S-matrix for H-plane Tee junctions, S-matrix for directional coupler.
5. **Microwave Resonators**: Series and Parallel Resonant Circuits, Rectangular Cavity Resonator, Circular Waveguide Cavity Resonator, Dielectric Resonator, Excitation of Resonator, Quality factor.

Part – B: 30-Marks

6. **Microwave Components:** Waveguide Directional Coupler, Coupled line Directional Coupler, Attenuator, Phase shifter, Isolator, Microwave Filters: By insertion loss method and Coupled Resonators, E Plane Tee, H plane Tee and Magic Tee, Hybrid Tee Junction.
7. **Microwave Tubes**: Transit time effects, Bunching and Velocity modulation, two cavity and Multicavity Klystron amplifier, Reflex Klystron oscillator, Magnetron Oscillator Traveling Wave Tube Amplifier (TWTA), Backward Wave Oscillator (BWO).
8. **Microwave Amplifier and Oscillators**: Two port power Gains, Single stage transistor amplifier design, Low noise amplifier design, Broadband amplifier Design, Construction and Working Principles of Gunn Diode, PIN Diode, Tunnel Diode etc.

Recommend Books

Textbooks:

1. David M. Pozar, *"Microwave Engineering",* 3rd Edition, Wiley, Singapore.
2. Samuel Y. Liao, *"Microwave Devices and Circuits",* 3rd Edition, PHI, 1994.
3. Reinhold Ludwing & Pavel Bretchko, *"RF Circuit Design: Theory and Applications",* Pearson Education Asia Publication, New Delhi, 2001.

Reference Books:

1. R.E. Collin, *"Foundations for Microwave Engineering",* IEEE Press, John Wiley, 2nd Edition, 2002.
2. M. Kulkarni, *"Microwave and Radar Engineering",* Umesh Publications, 1998.
3. M.L. Sisodia & G.S. Raghuvanshi, *"Microwave Circuits and Passive Devices",* Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.

Course Code: ETE – 4742
Course Title: MICROWAVE ENGINEERING SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Objective:

Overall aim of the course is to introduce the students to Microwave Components with knowledge of what they do, to show how they look and are interconnected using ED-3000 Microwave Test Bench. The course also aims to make students skilled at designing and analyzing various microwave components using CST Microwave Studio software. The course finishes with a complex engineering problem solving project related to Microwave Engineering.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	To apply the knowledge of Microwave Transmission Lines, Waveguides, Waveguide Components, Resonators, Filters, Antenna etc. in developing solution of a complex microwave engineering problem.
ILO / CO: 2	Analyze and compare design alternatives and use measures of performance or other criteria to rank alternatives in solution of the complex microwave engineering problem.
ILO / CO: 3	Consult video instructions and materials, design experiments, simulate, analyze and interpret results to analyze microwave components and decide the best solution to the complex microwave engineering problem.
ILO / CO: 4	Model and simulate different microwave components and develop a prototype of the solution of complex microwave engineering problem using CST Studio Suite.
ILO / CO: 5	Able to do the lab works individually and as members or leader of a teams, report individual and team performance against the plan
ILO / CO: 6	Communicate the team's technical approaches to the design project in a polished, co-authored, written format, using language and graphics appropriate to the technical discipline.

Course Contents:

S.L.	Contents
1.	Discussion on Course Specification
2.	Design, Simulation and Analysis of Coaxial Transmission Line using CST Microwave Studio
3.	Design, Simulation and Analysis of Microstrip Transmission Line using CST Microwave Studio
4.	Analysis of Quarter Wavelength Transformer matching using CST Microwave Studio
5.	Design, Simulation and Analysis of Rectangular Waveguide and Waveguide Tees using CST Microwave Studio
6.	Distribution of Term Project
7.	Introduction to Microwave Test Bench ED-3000
8.	Discussion and Approval of GroupWise Project Solution
9.	Design, Simulation and analysis of Microwave Rectangular Cavity Resonator in CST Microwave Studio
10.	Design, Simulation and analysis of Microwave Filters using CST Microwave Studio
11.	Project Submission

Recommend Books

Reference Books:

CST Microwave Studio Manual, 2005.

Course Code: ETE - 4743
Course Title: DIGITAL SIGNAL PROCESSING

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

The overall aim of this course is to introduce the most important principles and methods in DSP environment. Consequently, the student will be able to implement the theoretical concepts, methods and algorithms for solving real world problems.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Interpret, represent and process discrete/digital signals and systems
ILO / CO: 2	Apply important algorithmic design paradigms and method of analysis in real life design problems.

Course Contents:

Mid-term Exam: 30 Marks

1. **Discrete Time Signals & Systems:** Discrete-time signals, Discrete-time systems, Linear Time-Invariant systems and their properties, Linear constant coefficient difference equations.
2. **Time-Domain Representation of Discrete Signals:** Frequency domain representation of discrete time signals and systems, Fourier transform of discrete sequences, Discrete time processing of continuous signals.
3. **z-Transform and Its Applications:** Definition of z-transform, Region of Convergence, Properties of z-Transform, Inversion of the z-Transform, Analysis of Linear Time-Invariant Systems in the z-Domain.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Structure of Discrete Time Systems:** Block diagram representation of constant coefficient difference equations, IIR and FIR systems and their basic structures, Stability of discrete time systems, Finite word length effect.
5. **Discrete-Time Fourier Analysis:** Discrete Fourier Transform and its properties, Inverse Discrete Fourier Transform, Linear Convolution using Discrete Fourier Transform, Fast Fourier Transform, Decimation in time and Decimation in frequency.

Part – B: 30-Marks

6. **Digital Filter Design and Applications:** IIR filter design, bilinear z-transform design approach, IIR filter realization, FIR filter design, realization of FIR filter, application examples.
7. **Implementation of Digital Filters:** Block-diagram representations; direct forms; cascade forms, first and second-order factors; parallel forms; feedback loops transposed forms; linear-phase FIR structures.
8. **Multi Rate DSP:** Interpolation and decimation, poly-phase representation and multistage implementation. Perfect reconstruction filter banks: Power symmetric, alias-free multi-channel and tree structured filter banks.

Recommend Books

Textbooks:

1. J.G. Proakis, D.G. Manolakis, "*Introduction to Digital Signal Processing*", Maxwell Macmillan, 1988

Reference Books:

1. Allen V. Oppenheim & Ranald W. Schafer, "*Discrete-Time Signal & Systems*", Prentice Hall
2. Lonnie C. Ludeman, *"Fundamentals of Digital Signal Processing",* John Wiley

Course Code: ETE - 4744
Course Title: DIGITAL SIGNAL PROCESSING SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Objective:

Overall aim of the course is to Design and implement a DSP system using MATLAB tool. Analyze and describe the functionality of a real-world DSP system. Work in teams to plan and execute the creation of a complex DSP system. Experiment concepts of DSP and its applications using MATLAB Software and apply DSP system design to real world applications.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Fundamentals of discrete-time signal transformation, properties and algorithms.
ILO / CO: 2	Analyze about various types of signals and their representation and their implementation on MATLAB.
ILO / CO: 3	Investigation of digital filter design for various applications and interpretation the z-domain transfer function of a discrete-time system
ILO / CO: 4	Simulation of digital signal processing models using MATLAB
ILO / CO: 5	Assign individual or group of student's tasks to design finite impulse response (FIR) and infinite impulse response (IIR) discrete-time filters for low-pass, high-pass, band pass, band stop, and arbitrary frequency response applications.
ILO / CO: 6	Lab report presentation of assigned lab tasks

Course Contents:

S.L.	Contents
1.	Study of Sampling, Quantization and Encoding
2.	Time domain Characterization of discrete time signals and systems
3.	Discrete time Fourier transform (DTFT) computation. Discrete Fourier transforms (DFT) & inverse DFT (IDFT) Computation.
4.	Computation of rational and Inverse Z Transform
5.	The Concept of Filtering and FIR Digital Filter Design.
6.	Design of Linear phase FIR Filter Based on Windowed Fourier Series Approach.
7.	Analog Filter Design (Butterworth Filter, Type 1 Chebyshev Filter & Elliptic Filter).
8.	Application of The FFT & IFFT function

Recommend Books

Course Notes:

Lab Manual available in the Lab Titled ETE-4744: Digital signal processing Sessional

Course Code: ETE - 4745
Course Title: SATELLITE COMMUNICATIONS

Credit Hour: 2/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. Determine the orbital parameters of a satellite.
2. Determine the azimuth and elevation angles and visibility of a geostationary satellite from an earth station.
3. Create link budgets for an uplink and a downlink and determine carrier to noise ratio (C/N) at an earth terminal receiver.
4. Calculate the baseband signal-to-noise ratio or bit error rate for a satellite link.
5. Design a communications satellite system to meet specified objectives for signal to noise ratio (S/N) in an analog baseband or BER in a digital link using appropriate multiple access techniques.
6. Determine the BER improvement obtained with various ARQ and FEC coding techniques.
7. Determine the effect of rain attenuation in a satellite link and the availability of the link based on the geographic location of the earth terminals.
8. Determine the type and dimensions of antennas for use on satellites and at earth stations.
9. Design satellite communication systems using GEO or LEO satellites to carry voice, video, or data signals using analog or digital modulation.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Acquire the basic knowledge of Satellite, Satellite launching technique, Link development and applications.
ILO / CO: 2	Investigate the real time problems and challenges in satellite communications
ILO / CO: 3	Ability to understand the future trends and applications of satellite communications

Course Contents:

Mid-term Exam: 30 Marks

1. **Overview of Satellite and Orbits:** Merits and demerits of satellite communications, Types of satellites based on their applications, Orbital Elements, Kepler's law of planetary motion, Developing the equations of the orbit, Describing the orbit of a satellite, Locating the satellite in the orbit, Locating the satellite with respect to the earth, Newton's Law of gravitation, Definitions of terms for earth-orbiting satellites, orbital parameters.
2. **Orbital Mechanics:** Types of orbits based on shapes and height, Geo-stationary orbits and non-geo-stationary orbits, Look angle determination, Limits of visibility, Orbital perturbations, Station Keeping, Earth eclipse of satellite, Subsatellite points, Launching orbits.
3. **Space Segment and Earth Segment:** Attitude and orbit control systems, Telemetry Tracking and Command subsystem, Transponders, Wideband receiver, Receive-only home TV system, MATV, CATV.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Propagation Effects and Their Impact on Satellite-Earth Links:** Introduction, Quantifying attenuation and depolarization, Propagation effects that are not associated with hydrometeors, Prediction of rain attenuation, Prediction of XPD, Propagation impairments countermeasures.
2. **Satellite Link Design:** EIRP, Transmission Losses, Free-space transmission, System noise temperature and G/T ratio, Noise figure, Design of downlinks, Design of uplink, Design of specified C/N: combining C/N and C/I values in satellite links, Overall C/N_o, Link design procedure.

Part – B: 30-Marks

1. **Multiple Access Techniques:** Pre-assigned FDMA, Demand-assigned FDMA, Spade System, TDMA, Frame and burst formats of TDMA, Reference burst, On-board signal processing, Network Synchronization, Satellite-Switched TDMA.

2. **VSAT:** Overview of VSAT systems, Network architectures, VSAT Access control protocols, Interference issues, VSAT earth station engineering.
3. **Application of Satellite:** GPS: GPS position location principles, satellite signal acquisition, GPS signal levels, Timing accuracy, GPS receiver operation, GPS navigation message.

Recommend Books

Textbooks:

1. Dennis Roddy, *"Satellite Communication System",* McGraw Hill Companies Inc., 2001
2. Tri. T. Haa, *"Digital Satellite Communications",* McGraw-Hill Companies Inc., 1990
3. Gerard Maral and Michel Bousquet, *"Satellite Communications Systems",* John Wiley & Sons Ltd. 2009
4. Louis J. Ippolito, Jr., *"Satellite Communications Systems Engineering",* John Wiley & Sons Ltd., 2008
5. Timothy Pratt, Charles W. Bostian, *"Satellite Communications",* John Wiley & Sons Ltd. 2006
6. Teresa M. Braun, *"Satellite Communications Payload and Systems",* John Wiley & Sons Inc., 2012

Course Code: ETE - 4749
Course Title: COMPUTER NETWORKS

Credit Hour: 3/ Contact Hour: 3 per week

Course Objective:

This course is to provide students with an overview of the concepts and fundamentals of computer networks. The course includes the following topics: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Have the basic knowledge of computer networks and its applications in telecommunication engineering.
ILO / CO: 2	Have the knowledge of data sharing and their protocols

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction:** Computer Networks and Applications, OSI reference model, TCP/IP model and terminology, Connectionless and Connection Oriented services, Service primitives, The ARPANET.
2. **Physical Layer:** Circuit switching and Packet switching, X-25 protocol, Frame relay and Cell relay, ATM reference model.
3. **Medium Access Sublayer:** Pure and slotted ALOHA, Persistent and Non-persistent CSMA, CSMA with collision detection and collision free protocols, IEEE standard 802.3 and Ethernet.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Data Link Layer:** Types of errors, framing, error detection & correction methods; Flow control, Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC.
2. **Network Layer:** Internet address, classful address, subnetting, static vs. dynamic routing, shortest path algorithm, flooding, distance vector routing, link state routing, ARP, RARP, IP, ICMP.

Part – B: 30-Marks

1. **Transport Layer:** UDP, TCP, Connection management, Addressing, Establishing and Releasing Connection, Congestion control algorithm, Flow control and Buffering, Multiplexing.
2. **Presentation Layer and Application Layer:** Data Compression techniques, Frequency Dependent Coding, Context Dependent Encoding.
3. **Networking in Practice:** Designing LAN, Cabling, Establishing Client- Server network, Configuring: Directory Server, Proxy server, FTP server, E-mail server, web server, DB server, Firewall, Network troubleshooting, network maintenance, network monitoring, Network programming.

Recommend Books

Textbooks:

1. Behrouz A. Forouzan, "*TCP/IP Protocol Suite*", McGraw-Hill
2. Andrew S. Tanenbaum, "*Computer Networks*", Prentice Hall
3. William Stallings, "*Data and Computer Communications*", Prentice Hall
4. Behrouz A. Forouzan, "*Data Communications and Networking*", McGraw-Hill

Course Code: ETE - 4750
Course Title: COMPUTER NETWORKS SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

This course introduces various types of cables, network topologies design and configuration procedures. Cisco packet tracer will be introduced in this laboratory.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Identify the different internetworking devices and their functions.
ILO / CO: 2	Identify the different types of network topologies and protocols.
ILO / CO: 3	Understand the concepts of routing mechanisms, network interfaces
ILO / CO: 4	Design and apply subnet mask and address to fulfill networking requirements
ILO / CO: 5	Implementation of given topology using Packet Tracer

Course Contents:

S.L.	Contents
1.	Introduce to Computer Network Security Laboratory experiment
2.	Basic Topology design using Cisco Packet Tracer
3.	Experiment on setting Banner and Password using Cisco Packet Tracer
4.	Experiment on creation of network topology for a location and ping testing
5.	Register Jacket (RJ)45 connector connection and configure design
6.	Experiment on creation of network topology between IIUC administration and ETE department and ping testing
7.	Experiment on Addition of Switch to Switch connection and new Ethernet slot addition to router

Recommend Books

References Books:

[1]. Behrouz A. Forouzan, "*TCP/IP Protocol Suite*", McGraw-Hill
[2]. Andrew S. Tanenbaum, "*Computer Networks*", Prentice Hall
[3]. William Stallings, "*Data and Computer Communications*", Prentice Hall
[4]. Behrouz A. Forouzan, "*Data Communications and Networking*", McGraw-Hill

Course Code: ETE - 4715
Course Title: RESEARCH METHODOLOGY

Credit Hour: 1/ Contact Hour: 1 per week

Course Objectives

On successful completion of this course, you will be able to:

1. To gain insights into how scientific research is conducted.
2. To help in critical review of literature and assessing the research trends, quality and extension potential of research and equip students to undertake research.
3. To learn and understand the basic statistics involved in data presentation.
4. To identify the influencing factor or determinants of research parameters.
5. To test the significance, validity and reliability of the research results.
6. To help in documentation of research results.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Comprehend various steps and their chronology for a good design of Research
ILO / CO: 2	Comprehend and apply the methods of efficient literature review, data collection and sampling design
ILO / CO: 3	Critically evaluate current research and propose possible alternate directions for further work
ILO / CO: 4	Comprehend various issues connected to writing a good research report including Plagiarism

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction to Research Methods:** Philosophy of Science, Evolutionary Epistemology, Scientific Methods, Hypotheses Generation and Evaluation.
2. Current issues in engineering education research, Code of Research Ethics, - Research Design - Survey Research - Case Study Research.
3. Definition and Objectives of Research, Various Steps in Scientific Research, Types of Research; Research Purposes.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Literature Reviews:** Element of research, reviewing of related works, choosing of methodology, comparative method, proposed method, Design of Research Methodology: Designing of proposed method.
2. **Data Collection and Sampling Design:** Sources of Data: Primary Data, Secondary Data; Procedure Questionnaire- Survey and Experiments – Design of Survey and Experiments.

Part – B: 30-Marks

1. **Sampling Merits and Demerits** - Control Observations - Procedures – Sampling Errors. Qualitative research approaches, Statistics & quantitative research approaches.
2. **Research Reports:** Structure and Components of Research Report, Types of Report, Layout of Research Report, Mechanism of writing a research report. Research design, including mixed methods, Measures of research quality.
3. **Plagiarism** Abstract, introduction, materials and methods, results, discussion, table, figures, citations, references, format, latex, conference paper, journal paper, Seminar and presentation.

Recommend Books

Textbooks:

1. C.R. Kothari, "*Research Methodology Methods and Techniques*", 2/e, Vishwa Prakashan, 2000

Course Code: ETE - 4800
Course Title: PROJECT/THESIS

Credit Hour: 4/ Contact Hour: 4 per week

Course Objective:

The objective of this course is to introduce the fundamental ideas of the research methodology and perform research or practical project on his related field of interest.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Identify summaries and critically evaluate relevant literature and write a literature review of the relevant field.
ILO / CO: 2	Identify key research questions within the field of Electronic and Telecommunication engineering on which the research will be carried out.
ILO / CO: 3	The capability to plan and use adequate methods to conduct qualified tasks in given frameworks and to evaluate this work.
ILO / CO: 4	Understand and apply theoretical frameworks to the chosen area of study.
ILO / CO: 5	Describe the process of carrying out independent research in written format and report your results and conclusions with reference to existing literature.
ILO / CO: 6	A consciousness of the ethical aspects of research and development work.

Course Contents:

Each student shall be required to undertake a project which is of academic value for a period of 2 semesters (semester 7 and semester 8). The project involves problem solving using engineering theories and techniques, and the implementation of the project design. The student is expected to design a possible solution to the problem, taking into account various aspects such as professionalism, economy, costing and engineering viability. At the end of the first trimester, the student is to present his/her progress at a seminar. At the end of the project, it is expected that the student submits a proper written report and to present his/her work at a seminar. The Grade will be calculated in the CGPA of the 8th semester of the Final Year.

Marks distribution for projects/thesis and general viva-voce is as follows:

1) Project/Thesis evaluation by Supervisor-	40%
2) Project/Thesis evaluation by Examiner-	30%
3) General Viva-Voce-	30%
Total	100%

Laboratory:

Access to the Sessional facilities shall be provided according to the needs and suitability of the projects.

References:

Reference materials relevant to the individual project to be provided by the project supervisor.

Course Code: ETE - 4843

Course Title: OPTICAL FIBER COMMUNICATIONS

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives

On successful completion of this course, you will be able to:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wavelength.
3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
4. To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
5. To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Understand basics of optical communication systems.
ILO / CO: 2	The practical techniques involved in real world optical fiber communication systems.

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction:** Light propagation through optical fiber: Ray optics theory and mode theory. Optical fiber: Types and characteristics, transmission characteristics, fiber joints and fiber couplers.
2. **Material Dispersion and Pulse Dispersion:** Time dispersion in bulk media, combined effects of material dispersion and multi path dispersion, Root mean square pulse width and frequency response comparison of three of optical fibers, Acceptance angle, an acceptance cone, numerical aperture.\
3. **Optical Sources and Light Detectors:** Introduction to various types of Lasers, Semiconductor Injection Laser: Structure, theory of operation including rate equations and characteristics, LED: Structure, theory of operation and characteristics, Device types, their characteristics, Detection principles, Quantum efficiency, Responsivity, Semiconductor photodiodes with and without internal gain. PIN diode, Avalanche photo diode, PIN FET and Integrated receivers and their characteristics.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Optical Amplifier:** Laser and fiber amplifiers, applications and limitations.
2. **Connectors and Couplers:** Active and passive, different types, applications and characteristics, Fiber Manufacturing Techniques, Signal Degradation in OF link Losses in optical fibers viz., 1) Absorption, 2) Rayleigh scattering 3) Wavelength dispersion 4) Radiation dispersion 5) Coupling losses 6) Splices and Connectors.

Part – B: 30-Marks

1. **Transmission Limitations:** Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises.
2. **Measurements:** Power attenuation measurement, dispersion, refractive index profile, numerical aperture, eye pattern bit rate OTDR measurements.
3. **Receiver Analysis and Multi-channel optical system:** Direct detection and coherent detection, noise and limitations, Frequency division multiplexing, wavelength division multiplexing and optical CDMA, Radio on fiber technology, Fiber optic access networks.

Recommend Books

Textbooks:

1. John M. Senior, "*Optical Fiber Communication*", Pearson Education, 2nd Edition, 2007
2. Gerd Keiser, "*Optical Fiber Communication*", McGraw Hill, 3rd Edition, 2000

Reference Books:

1. J.Gower, "*Optical Communication System*", Prentice Hall of India, 2001
2. Rajiv Ramaswami, "*Optical Networks*", Second Edition, Elsevier, 2004.
3. Govind P. Agrawal, "*Fiber-optic communication systems*", John Wiley & Sons, 3rd edition, 2004
4. R.P. Khare, "*Fiber Optics and Optoelectronics*", Oxford University Press, 2000

Course Code: ETE - 4844
Course Title: OPTICAL FIBER COMMUNICATIONS SESSIONAL
Credit Hour: 1/ Contact Hour: 2 per week

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Fundamentals, advantages and improvements in optical fiber communication system.
ILO / CO: 2	Familiarization with types, basic properties and transmission characteristic of optical fibers.
ILO / CO: 3	Investigation, working and analysis of important parts at the transmitter (LEDs, modulators etc.) as well as at the receiver sides (optical detector etc.) of the optical communications system.
ILO / CO: 4	Develop the configuration and architecture of optical communication and their applications using Opti system, OTDR, and splicing machine.
ILO/CO:5	Lab report presentation of assigned lab tasks

Course Contents:

S.L.	Contents
1.	Circuit board familiarization with FACET®91025. Identify the different circuit blocks on the Fiber Optic Communications circuit board. Describe the basic parts of a fiber optic communication link.
2.	Determination of Numerical aperture and core area of optical fiber cable. Measurement of the light Intensity through optical fiber cable.
3.	Experiment on splicing of optical fiber cable.
4.	Introduction to Opti system optical simulator tool.
5.	Design an Optical transmission system through Opti system Software.
6.	Performance analysis of Wavelength Division Multiplexing (WDM) technology using Opti System optical simulator tool.
7.	Measurement of Erbium Doped Fiber Amplifier (EDFA) gain for WDM light wave systems.
8.	Testing optical fiber cable link using optical time-domain reflectometer (OTDR)
9.	Observation of analog signal transmission using KL-95001 optical trainer board.

Recommend Books

Course Notes:

Lab Manual available in the Lab Titled ETE-4722: Optical fiber communications Sessional

Course Code: ETE - 4841

Course Title: ENERGY CONVERSION

Credit Hour: 2/ Contact Hour: 2 per week

Course Outcomes:

- **CO1.** Identify and solve DC machine and Transformer related problem
- **CO2.** Formulate and then analyze the working of any electrical machine using mathematical model under loaded and unloaded conditions.
- **CO3.** Troubleshoot the operation of an electrical machine.
- **CO4.** Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
- **CO5.** Know the need of renewable energy resources, historical and latest developments.
- **CO6.** Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.
- **CO7.** Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications
- **CO8.** Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.

Course Contents:

Mid-term Exam: 30 Marks

1. **Transformer:** Ideal transformer - transformation ratio, no-load and load vector diagrams; actual transformer - equivalent circuit, regulation, short circuit and open circuit tests.
2. **DC Machines:** Electromechanical energy conversion fundamentals: Faraday's law of electromagnetic induction, Fleming's rule and Lenz's law. Elementary generator: Commutation, electromagnetic force, left hand rule, counter emf and comparison between generator and motor action.
3. **Synchronous Generator:** Principle, operation, excitation systems, equivalent circuit. Parallel operation: Necessary conditions, synchronizing.
   Synchronous motor: Principle, Operation, applications.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Three phase induction motor:** Rotating magnetic field, equivalent circuit, torque-speed characteristics.
   Single phase induction motor: Theory of operation, equivalent circuit and starting.
5. **Solar Photovoltaic:** Characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, Modern solar energy applications (residential, electric vehicle, naval, and space). Solar power plants connected to grid.

Part – B: 30-Marks

6. **Wind turbines:** Wind turbine types and their comparison, power limitation, Betz"s law; Control mechanism: pitch, yaw, speed. Couplings between the turbine and the electric generator, Grid interconnection: active and reactive power control.
7. **Renewable energy:** Biomass and biogas electricity generation. mini-hydro, geothermal, biomass, wave and tides.
8. **Special machines:** Uses of different types of special machines. Like: stepper motor and control circuits, Reluctance and hysteresis motors with drive circuits, repulsion motor, synchro's and control transformers. Acyclic machines: Generators, conduction pump and induction pump. Magneto hydrodynamic generators.

Recommend Books

Textbooks:

1. Archie W. Culp, "Principles of Energy Conversion", McGraw-Hill College, 1990
2. F. M. Vanek, L. D. Albright and L. Angenent, "Energy Systems Engineering", McGraw-Hill, 2nd Edition, 2012

Course Code: ETE - 4804
Course Title: INDUSTRIAL TOUR/TRAINING
Credit Hour: 1/ Contact Hour: 1 WEEK

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Identify and understanding the basic knowledge of digital communication system and theory.
ILO / CO: 2	Apply the knowledge for different digital modulation technique, data transmission and performance evaluation.
ILO / CO: 3	Prepare and present a term paper for a specific topic.

Course Content:

As per training in the industry.

Course Code: ETE - 4822
Course Title: General Viva
Credit Hour: 2/ Contact Hour: 2

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Demonstrate the basic theorems and knowledge of all engineering topics offered in the program

Course Content:

As per Teacher's Plan.

21.D. Synopsis of Elective Courses

Course Code: ETE – 4755

Course Title: MULTIMEDIA COMMUNICATIONS (Not offered)

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

1. Understanding the multimedia communications systems, application and basic principles.
2. Analysis of the multimedia streaming.
3. Performing and establishing multimedia communication terminals.
4. Presentation of multimedia communications.

Course Outcomes:

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

Course Contents:

Mid-term Exam: 30 Marks

1. **Multimedia Systems Introduction:** Types of media, Multimedia signal characteristic, sampling, digital representation, signal formats.
2. **Signal Coding and Compression:** Entropy coding, transform coding, vector quantization. Architecture issues in multimedia.
3. **Coding Standards:** H.26x, LPEG, and MPEG.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Multimedia Communication Networks:** Network topologies and layers, LAN, MAN, WAN, PSTN, ISDN, ATM.
5. **Internetworking:** Internetworking devices, the internet and access technologies, enterprise networks, wireless LANs and wireless multimedia. Quality-of service guarantees, resource reservation, traffic specification, shaping and monitoring, admission control

Part – B: 30-Marks

6. **Entertainment Networks:** Cable, satellite and terrestrial TV networks, ADSL and VDSL, high speed modems.
7. **Transport Protocols:** TCP, UDP, IP, Ipv4, Ipv6, FTP, RTP and RTCP, use of MPLS and WDMA, Multimedia synchronization, security, QOS and resource management.
8. **Multimedia Applications:** The WWW, Internet telephony, teleconferencing, HDTV, email and e-commerce, audio and video conferencing, video on demand, voice over IP.

Recommend Books

Reference books:

1. John Villamil-Casanova & Louis Molina, *"Multimedia: An Introduction",* Pearson Education Ltd., 1997
2. John Villamil-Casanova, *"Multimedia Graphics",* Que Education & Training, 1997
3. John Villamil-Casanova, *"Multimedia Sound and Video",* Pearson Education Ltd., 1997

Course Code: ETE – 4756

Course Title: MULTIMEDIA COMMUNICATIONS SESSIONAL (Not offered)

Credit Hour: 1/ Contact Hour: 2 per week

Course Contents:

Laboratory works based on ETE – 4755.

Course Code: ETE - 4757
Course Title: DATABASE MANAGEMENT SYSTEMS (Not offered)

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. To understand the role of a database management system in an organization.
2. To understand basic database concepts, including the structure and operation of the relational data model.
3. Construct simple and moderately advanced database queries using Structured Query Language (SQL).
4. To Understand and successfully apply logical database design principles, including E-R diagrams and database normalization.
5. To Design and implement a small database project using Microsoft Access.
6. To understand the concept of a database transaction and related database facilities, including concurrency control, journaling, backup and recovery, and data object locking and protocols.
7. To Describe and discuss selected advanced database topics, such as distributed database systems and the data warehouse.
8. Understand the role of the database administrator.

Course Outcomes:

Students who successfully complete the course will be able to:

1. Master the basic concepts and appreciate the applications of database systems.
2. Master the basics of SQL and construct queries using SQL.
3. Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
4. Be familiar with the relational database theory and can write relational algebra expressions for queries.
5. Mater sound design principles for logical design of databases, including the E-R method and normalization approach.
6. Be familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.
7. Master the basics of query evaluation techniques and query optimization.
8. Be familiar with the basic issues of transaction processing and concurrency control.
9. (optional) Master working successfully on a team by design and development of a database application system as part of a team.

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction:** Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information, Retrieval, Specialty Databases, Database Users and Administrators.
2. **Introduction to the Relational Model:** Structure of Relational Databases, Database Schema, Keys, Schema, Diagrams, Relational Query Languages, Relational Operations.
3. **Introduction to SQL:** Overview of the SQL Query, Language, SQL Data Definition, Basic Structure of SQL, Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization.

Final Exam: 50 Marks
Part – A: 20-Marks

1. **Advanced SQL and Relational Query Languages:** Accessing SQL From a Programming, Language, Functions and Procedures, Triggers, Recursive Queries, Advanced Aggregation Features, OLAP, The Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus.
2. **Database Design and the E-R Model:** Overview of the Design Process, Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to

Relational Schemas, Entity-Relationship Design Issues, Extended E-R Features, Alternative Notations for Modeling, Data, Other Aspects of Database Design.

Part – B: 30-Marks

3. **Relational Database Design:** Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms, Database-Design Process, Modeling Temporal Data, Multivalued Dependencies, Domain-Key Normal Form.
4. **Application Design and Development:** Application Programs and User Interfaces, Web Fundamentals, Servlets and JSP, Application Architectures, Rapid Application Development, Application Performance, Application Security, Encryption and Its Applications.
5. **Object-Based Databases:** Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R Features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.

Recommend Books

Textbooks:

1. H. F. Korth, *"Database System Concept",* Mcgraw Hill, 4th Edition, 2001

Course Code: ETE - 4758
Course Title: DATABASE MANAGEMENT SYSTEMS SESSIONAL (Not offered)

Credit Hour: 1/ Contact Hour: 2 per week

Course Contents:

Laboratory works based on ETE – 4757.

Course Code: ETE - 4759
Course Title: NETWORK PROGRAMMING (Not offered)

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. To introduce students to programming fundamentals and TCP/IP socket programming. This is an entry level unit of study which provides a suitable basis for later networking units that require Java-based skills.
2. To understand fundamental program structures.
3. To understand the concepts of system analysis (from 2015).
4. To explain fundamental object-oriented concepts (from 2015).
5. To write small programs in Java that use TCP/IP sockets.
6. To design, write and debug small programs in Java with text input/output.
7. To write small programs in Java that use simple GUI.

Course Outcomes:

Students who successfully complete the course will be able to:

1. Analyze the requirements of a networked programming environment and identify the issues to be solved.
2. Create conceptual solutions to those issues and implement a programming solution.
3. Understand the key protocols that support the Internet.
4. Apply several common programming interfaces to network communication.
5. Understand the use of TCP/UDP Sockets.
6. Apply advanced programming techniques such as Broadcasting, Multicasting.

Course Contents:

Mid-term Exam: 30 Marks

1. **Basic Network Concepts:** The Layers of a network, IP, TCP, UDP, Ports, Internet, Internet address block, Network address translation, Firewalls, Proxy Servers, Client-Server model, DNS.
2. **Internet Addresses and HTTP:** The *InetAddress* class, Creating new *InetAddress* objects, Getter Methods, Address Types, Testing Reachability, Object methods, Inet4Address and *Inet6Address*, The network Interface class, Factory methods, Getter methods, Some useful programs like Spam Check, Processing web server logfiles, HTTP protocol Keep-Alive, HTTP methods, The Request body, *Cookie Manager*, *Cookie Store*.
3. **URLs and URIs:** URIs, URLs, Relative URLs, The URL Class, Creating new URLs, Retrieving Data from a URL, Splitting a URL into pieces, Equality and comparison of URLs, The URI class, Constructing a RUI, The parts of the URI, Resolving Relative URIs, *URL Encoder*, *URL Decoder*, Proxies, System properties of Proxies, Proxy Class, *Proxy Selector* Class, Communicating with Server-Side Programs through GET, Accessing Password-Protected Sites.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **URL Connections:** Opening URL connections, Reading data from a server, Reading the header, Web caches, Configuring the connection, Configuring the client Request HTTP header, Writing data to a server, Securing considerations for *URL Connections*, Guessing MIME media types, *Http URL Connection*.
5. **Sockets for Clients:** Using Sockets, Investigating Protocols with Telnet, Reading from Servers with Sockets, Writing to Servers with Sockets , Constructing and Connecting Sockets, Basic Constructors, Picking a Local Interface to Connect From, Constructing Without Connecting , Socket Addresses, Proxy Servers, Getting Information About a Socket, Setting Socket Options.

Part – B: 30-Marks

6. **Sockets for Servers and Secure Sockets:** Using *Server Sockets*, Serving Binary Data, Multithreaded Servers, Writing to Servers with Sockets, Closing Server Sockets, Logging, Constructing Server Sockets, Getting Information About a Server Socket, Socket Options, HTTP Servers, Secure Communications, Creating Secure Client Sockets, Choosing the Cipher Suites, Event Handlers, Session Management, Client Mode, Creating Secure Server Sockets, Configuring *SSL Server Sockets*.

7. **Java Database Connectivity:** The Vendor variation problem, SQL and versions of JDBC, Creating and ODBC data source, Simple database access, Modifying the database contents, Transactions, Metadata, Using a GUI to access a database, Scrollable *Result Sets* in JDBC 2.0, Modifying databases via Java methods, Using the *Data Source* interface.
8. **UDP:** The UDP protocol, UDP clients, UDP servers, The *Datagram Packet* class, The *Datagram Socket* class, Socket options, Applications of UDP, *Datagram Channel*.

Recommend Books

Textbooks:

1. Harold, E. R, "*Java Network Programming*", O'Reilly, 3rd Edition, 2004

Reference books:

1. Douglas E. Comer, *"Internetworking with TCP/IP: Principles, Protocols and Architecture"*, Prentice Hall, 2006

Course Code: ETE - 4760
Course Title: NETWORK PROGRAMMING SESSIONAL (Not offered)

Credit Hour: 1/ Contact Hour: 2 per week

Course Contents:

Laboratory works based on ETE – 4759.

Course Code: ETE - 4751
Course Title: DIGITAL IMAGE PROCESSING

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

This course is to provide students with an overview of the concepts and fundamentals of computer networks. The course includes the following topics: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Have the basic knowledge of computer networks and its applications in telecommunication engineering.
ILO / CO: 2	Have the knowledge of data sharing and their protocols?

Course Contents:

Mid-term Exam: 30 Marks

1. **Digital Image Fundamentals:** Human visual system, Sampling and Fourier analysis.
2. **Intensity Transformation and Spatial Filtering:** Histogram Processing, Spatial Filtering.
3. **Filtering in Frequency Domain:** Preliminary Concept, Extension to function of two variables, Image smoothing, Image Sharpening.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Image Restoration and Reconstruction:** Noise Models, Noise Reduction, Inverse Filtering, MIMSE Filtering.
5. **Color Image Processing:** Color Models, Color Transforms, Image segmentation based on color.

Part – B: 30-Marks

6. **Image Compression:** Lossless compression: Variable length coding – LZW coding – Bit plane coding predictive coding-DPCM. Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG, Basics of Vector quantization.
7. **Morphological Image Processing:** Erosion, dilation, Opening, Closing, Basic morphological algorithms: hole filtering, connected component, thinning, skeletons.
8. **Image Segmentation:** Point, line, edge detection, thresholding, Region based segmentation.

Recommend Books

References Books

[1]. R. C. Gonzales & R. E. Woods, *"Digital Image Processing",* Prentice Hall, 3rd Edition, 2003
[2]. Andrew S. Tanenbaum, "*Computer Networks*", Prentice Hall, 2001
[3]. W. K. Pratt, *"Digital Image Processing",* John Wiley, 2003
[4]. K. Jain, *"Fundamentals of Digital Image Processing",* Prentice Hall, 2000
[5]. J. S. Lim, *"Two-Dimensional Signal and Image Processing",* Prentice Hall, 2007

Course Code: ETE - 4752
Course Title: DIGITAL IMAGE PROCESSING SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

This course is to provide students with an overview of the concepts and fundamentals of computer networks. The course includes the following topics: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.

Course Outcomes:

ILOs / COs	Description
ILO / CO: 1	Have the basic knowledge of computer networks and its applications in telecommunication engineering.
ILO / CO: 2	Have the knowledge of data sharing and their protocols.

Course Contents:

S.L.	Contents
1.	Human visual system
2.	Sampling and Fourier analysis
3.	Histogram Processing
4.	Spatial Filtering
5.	Filtering in Frequency Domain: Preliminary Concept
6.	Extension to function of two variables
7.	Image smoothing
8.	Noise Models
9.	Noise Reduction, Inverse Filtering, MIMSE Filtering
10.	Color Models, Color Transforms, Image segmentation based on color
11.	Lossless compression: Variable length coding – LZW coding
12.	Bit plane coding predictive coding-DPCM. Lossy Compression: Transform coding – Wavelet coding
13.	Basics of Image compression standards: JPEG, MPEG, Basics of Vector quantization
14.	Erosion, dilation, Opening, Closing
15.	Basic morphological algorithms: hole filtering,
16.	Connected component, thinning, skeletons
17.	Point, line, edge detection, thresholding
18.	Region based segmentation

Recommend Books

Reference Books:

[1]. R. C. Gonzales & R. E. Woods, *"Digital Image Processing",* Prentice Hall, 3rd Edition, 2003
[2]. Andrew S. Tanenbaum, "*Computer Networks*", Prentice Hall, 2001
[3]. W. K. Pratt, *"Digital Image Processing",* John Wiley, 2003
[4]. K. Jain, *"Fundamentals of Digital Image Processing",* Prentice Hall, 2000
[5]. J. S. Lim, *"Two-Dimensional Signal and Image Processing",* Prentice Hall, 2007

Course Code: ETE - 4753

Course Title: EMBEDDED SYSTEM DESIGN (Not Offered)

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. Students have knowledge about the basic functions of embedded systems.
2. Students have knowledge about the basic structure of embedded systems.
3. Students have knowledge about the basic concepts of embedded systems.
4. Students have knowledge about the applications of embedded systems.
5. Students have knowledge about the development of embedded software.

Course Outcomes:

1. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Course Contents:

Mid-term Exam: 30 Marks

1. Embedded Microcontroller: Introduction, Evolution, Architecture, comparison with microprocessor, commercial Microcontroller devices, Applications, selection of a Microcontroller,
2. MCS51 architecture, 8051-pin description, connections, I/O ports and memory organization.
3. Addressing modes, Instructions, I/O port programming, Interrupts, Timer/Counters and serial communication. Real world interfacing such as LCD, ADC, DAC, stepper motor, Key Board, External memory and PPI 8255 Interface.

Final Exam: 50 Marks

Part – A: 20-Marks

4. Design with Atmel Microcontrollers 89CXX: Using flash and other memory devices, Flash programming, Applications such as pulse width measurement, Frequencies counter etc. PIC Micro controllers: Overview, Features PIC 16C6X / 7X , PIC 16F8XX based systems.
5. Embedded System: Definitions, Classification, Processors in the system, Other hardware units, Software embedded into a system, Software modules and tools for designing an embedded system.

Part – B: 30-Marks

6. Processor and memory organization: Structural units, features, and Processor selection for an embedded system. Memory devices, organization, Selection.
7. Memory Allocation and Maps. Devices and Buses for Devices Networks: I/O devices, Timer and counting devices serial communication using I2C, CAN and advanced I/O buses between Networked Multiple devices, Parallel communication using ISA, PCI, PCI –X and Advanced buses,
8. Device drivers and interrupts servicing mechanism, context and the periods for context switching Deadline and Interrupt latency.

Recommend Books:

Text Books:

1. M.A. Mazidi & J.G.Mazidi, "*The 8051 Microcontroller and Embedded Systems*", 3rd edition, Indian reprint Pearson Education

Reference Books:

1. Frank vahid & Tony givargis, "*Embedded system design*", CBS Distributors.
2. D.w.Lewis, "*Fundamental of Embedded*", S/w Pearson.
3. J.W.Valvano, "*Embedded microcomputers systems*", first edition Brooks /Colehomson Learning.

Course Code: ETE - 4754

Course Title: EMBEDDED SYSTEM DESIGN SESSIONAL (Not Offered)

Credit Hour: 1/ Contact Hour: 2 per week

Course Contents:

Laboratory works based on ETE – 4753.

Course Code: ETE - 4845

Course Title: BIOMEDICAL ELECTRONICS (Not Offered)

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

The undergraduate biomedical electronics course integrates the knowledge of electronics and modern biology to solve problems encountered in living systems. The educational foundation provides a broad pathway for students to pursue a wide variety of post-graduate opportunities.

Course Outcomes:

- **CO1.** Understand the basic concept of Physiology - Nervous system, Circulatory system, Respiratory system and Muscle Contraction.
- **CO2.** Analyze the Interaction of Wave and Radiation with Human Bodyand Physiological Information.
- **CO3.** Recognize the Technical Concepts and Operation of Medical Instrumentation.
- **CO4.** Discuss the Application of Electronics in Diagnostic and Therapeutic Area.

Course Contents:

Mid-term Exam: 30 Marks

1. **Physics of Human Body:** The cell, Body fluid, Musculo-skeletal system, Respiratory system, Nervous system, The circulatory system, The body as a control system, The heart, Bioelectricity, Work done by heart, blood pressure and its measurements, Membrane potentials, Electrical activity of excitable cells, Molecular basis of muscle contraction, Basic electrical signals from the muscles.
2. **Interaction of Wave and Radiation with Human Body:** Body's detector and matter wave, speech noise, physiological effects of intense matter waves, Interaction of electromagnetic radiation on living mater, penetration of ray's into tissue, Biological effects of ionizing radiation**:** Dosimetry, primary effects, Biophysical effects of whole body irradiation, radiation measurement and protection.
3. **Biopotentials Electrodes and Amplifiers:** Biopotential electrode, Sensors, Transducers and bioelectric amplifiers, Electromagnetic interference of medical electronic equipment, ENG, EMG, ECG, ERG, EEG, MEG.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Ultrasonography:** Physics of ultrasonic wave, Ultrasonic transducers, Absorption and attenuation of ultrasound, Scan modes, scan pattern and scanning systems, Doppler imaging, Echocardiography, Ultrasonic flow meter, Ultrasonic blood pressure measurement.
5. **X-ray:** X-ray production, X-ray image formation and contrast, Contrast types, Effects of photon energy, Area contrast, Fluoroscopic imaging system, computed tomography.

Part – B: 30-Marks

6. **Magnetic Resonance Imaging:** Nuclear magnetic resonance, Image characteristics, Gamma camera.
7. **Analytical and Medical Laboratory Instruments:** Blood components, Colorimeter, spectrophotometer, Blood cell counter, pH/Blood gas analyzer, chromatograph, Auto analyzer, Atomic absorption and atomic emission spectroscopy.
8. **Therapeutic and Prosthetic Devices:** Cardiac pacemaker, Hemodilysis, Defibrillator, Surgical diathermy.

Recommend Books:

Reference Books:

1. E.J. Casey., "Biophysics: Concepts and Mechanisms", Reinhold Pub., 1962
2. Joseph J Carr & John M Brown, "Introduction to Biomedical Equipment Technology", Prentice Hall; 2nd edition, 1993
3. John G. Webster, "Medical Instrumentation: Application and Design", Wiley, 4 edition, 2009
4. Perry Sprawls, "Physical Principles of Medical Imaging", Medical Physics Pub Corp, 1995
5. J. R. Cameron & J. G. Skofronick, "Medical Physics", JOHN WILEY & SONS, 1998

Course Code: ETE - 4846
Course Title: BIOMEDICAL ELECTRONICS SESSIONAL (Not Offered)

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

Maintain and improve students' technical competence through practicing. Design and conduct experiments, as well as to analyze and interpret data in an advanced degree program in a field such as biomedical engineering.

Course Outcomes:

CO1. Understand the Purpose of Measurement, the Methods of Measurements, Errors Associated with Measurements.

CO2. Develop the Concept About ECG, EMG and EEG

CO3. Ability to Design and Simulate the Biomedical Signals Using Hardware tool and analyze the Applications

Course Contents:

Laboratory works based on ETE –4845.

Course Code: ETE - 4847

Course Title: VLSI SYSTEM DESIGN & MODELING (Not Offered)

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

On successful completion of this course, you will be able to:

1) Get introduced to digital integrated circuits.
2) To teach fundamentals of VLSI circuit design and implementation using circuit simulators and layout editors.
3) To highlight the circuit design issues in the context of VLSI technology.
4) The main objective of this course is to introduce basic concepts of microelectronics, layout designing, floor planning and algorithms used in the chip designing process.
5) It offers a profound understanding of the design of complex digital VLSI circuits, computer aided simulation and synthesis tool for hardware design.

Course Outcomes:

Students who successfully complete the course will be able to:

1) To be aware about the trends in semiconductor technology, and how it impacts scaling and performance.
2) Able to learn Layout, Stick diagrams, Fabrication steps, Static and Switching characteristics of inverters
3) Synthesis of digital VLSI systems from register-transfer or higher-level descriptions in hardware design languages.
4) An ability to build a cell library to be used by other chip designers.
5) An ability to insert elementary testing hardware into the VLSI chip.
6) An ability to design elementary data paths for microprocessors, including moderate-speed adders, subtractions, and multipliers.
7) An ability to estimate and compute the power consumption of a VLSI chip.

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction:** Integrated Circuits trends, choice of technology, design approaches, the design process, Moor`s law, VLSI Design style, overviews of VLSI Design Tools.
2. **Introduction to MOS Devices and Basic Circuits:** MOS device structure, MOS device mode of operation(cut off, saturation, linear, accumulation, depletion), threshold voltage, body effect, NMOS I-V equations and characteristics, PMOSI-V equations and characteristics, Principle of inverter, NMOS Inverter with resister load, NMOS Inverter with NMOS Enhancement Transistor load, NMOS Inverter with NMOS Depletion Transistor load, Layout Design Rules and Latch up.
3. **CMOS Inverter Design:** The CMOS inverter, Circuit Characterization and Performance Estimation Transfer characteristics, noise merging, Resistance, capacitance, rise and fall times, delay, switching characteristics, gate transistor sizing and power consumption.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **CMOS Fabrication:** Introduction to Fabrication, Basic Fabrication Steps, Lithograpy, Diffusion and Ion Implementation, Epitaxy, Etching, Wafer cleaning, Metallization and Passivation, Steps for Fabricating a NMOS Transistor, n-Well CMOS Technology, p-Well CMOS Technology, Details (concept, properties, mechanism, types, applications etc. of Chemical Vapor Deposition (CVD), Oxidation and ion implementation.
2. **MOS Logical Circuit Design:** Combinational and sequential logic, Random logic, Static and Dynamic logic gates, N-MOS Transistor series/ Parallel combination, P-MOS Transistor series/ Parallel combination, DC analysis (NAND, NOR, X-OR, X-NOR), Series Parallel Equivalent Circuits, Pass transistor and Transmission gates.

Part – B: 30-Marks

1. **Applications of Combinational and Sequential Systems:** Parity generator, Multiplexers, General logic function blocks, Dynamic register element, Dynamic shift register, Arithmetic processor, Basic bus structures, 4-bit shifters, Adder, Dynamic RAM cell, pseudo-static RAM cell.

2. **Overview of Implementation Approaches:** Full Custom and Semi-Custom Design, Cell based design, Array based design, Standard cells design, Programmable Logic Array, FPGA, Stick Diagram, Scaling, Effect of Scaling in Circuit Performance.
3. **Introduction of HDLs and VHDL:** HDLs applications, Range of use, VHDL - overview: VHDL - History, VHDL - Application Field, VHDL benefits, VHDL model components, VHDL architecture bodies, Structural description, Behavioral description.

Recommend Books:

Textbooks:

1. Sung-Mo Kang & Yusuf Leblebici, "*CMOS Digital Integrated Circuits Analysis and Design*", Tata McGraw-Hill, 2nd Edition, 2003.
2. Douglas A Pucknell et al, "*Basic VLSI Design*", Prentice Hall, 3rd Edition, 2004.
3. Adel S. Sedra, Kenneth C. Smith, "*Microelectronics Circuits*", Oxford University Press, 5th Edition, 2004.
4. John P. Uyemura, "*Introduction to VLSI Circuits and Systems*", John Wiley & Sons, , Inc, 2002.

Reference books:

1. Neil Weste, David Harris, "*CMOS VLSI Design*", Addison Wesley, 4th Edition, 2011.
2. Brackenbury Linda E.M., "*Design of VLSI Systems- A Practical Introduction*", Macmillan Education Ltd., 2002.
3. Wayne Wolf, "*Modern VLSI Design: System-on-Chip*", Pearson Education International, 3rd Edition, 2003.
4. Weste N., Eshraghian K., "*Principles of CMOS VLSI Design: A Systems Perspective*", Addison-Wesley, 3rd Edition, 2004.

Course Code: ETE - 4848
Course Title: VLSI SYSTEM DESIGN & MODELING SESSIONAL (Not Offered)

Credit Hour: 1/ Contact Hour: 2 per week

Course Contents:

Laboratory works based on ETE – 4847

Course Code: ETE - 4849

Course Title: RF and MICROWAVE DEVICES (Not Offered)

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. Analyze Transmission line parameters using Smith Chart.
2. Determine the electrical characteristics of transmission lines through electromagnetic field analysis.
3. Analyze Impedance matching.
4. Understand properties RF passive & active components and circuits.
5. Design RF Transistor Amplifiers.
6. To interpret Oscillators and Mixers.

Course Outcomes:

Students who successfully complete the course will be able to:

1. Know about design techniques and current applications in RF Circuit Design.
2. Draw Smith chart for basic transmission line calculations.
3. Apply differential and complex calculus to obtain analytical and numerical solutions for RF circuits.
4. Design RF Transistor Amplifiers.
5. Evaluate various Oscillators and mixers.

Course Contents:

Mid-term Exam: 30 Marks

1. **Microwave Semiconductors:** Doping, semiconductor transport, comparison of key semiconductor properties, the p-n junction, band diagrams, the Schottky diode, MESFET and HEMTs, bipolar transistors, device characteristics, frequency response and equivalent circuits, Enhancement and Depletion mode FET integration, Bipolar and FET integration. Wideband gap materials and devices: SiC and GaN. Device Limitations: Noise, linearity and dynamic effects.
2. **MMICs:** Introduction to Monolithic Microwave Integrated Circuits (MMICs), examples of typical applications, overview of process technology, device modeling, Process Design Kits, designing your components, thermal design, using a foundry, process control and wafer acceptance.
3. **MMIC Design:** MMIC Design Considerations and Amplifier Design, Design consideration for MMICs, Chip size, Thermal design and wafer thickness, Low-inductance grounds and crossovers, Propagation modes and other design considerations.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Microwave Amplifiers:** Microwave FETs, relative merits of FETs and BJTs. Device and circuit linearity, harmonic and intermodulation distortion, and concept of 3rd order intercept. Biasing Techniques Microwave Amplifier Design, Design considerations, Procedure for general design of an amplifier, Design examples, 2-18 GHz distributed amplifier, 2-6 GHz feedback gain module, Low-Noise amplifier design, Circuit performance, Combining techniques for power amplifiers.
5. **High Power Devices and Magnetrons:** Tubes, Travelling wave Tube Amplifiers (TWTAs), Klystrons, Structure and operational principles of the magnetron, detailed analysis of Klystrons, Magnetrons and TWT amplifiers and backward wave oscillators.

Part – B: 30-Marks

6. **Microwave Oscillator:** High frequency transistors and oscillator design. Phase noise characteristics, Oscillations using IMPATT and Gunn diodes, Principles of generation of millimeter and sub-millimeter waves, Harmonic generators, Guun-effect devices.
7. **Millimeter Wave Propagation:** Fundamentals of Propagation, propagation issues at microwave bands. Applications in packet microwave wireless backhauls.
8. **High Frequency MCMs:** Definition of multi-chip modules (MCMs), Advantages, properties and types of MCM. Filter design examples. Assembly techniques, wire bonding and flip chip, Costing issues.

Recommend Books:

Textbooks:

1. Reinhold Ludwing, Pavel Bretchko, "*RF circuit design: Theory and applications*", Pearson Education Asia Publication, New Delhi 2001.

Reference books:

1. David M Pozar, "*Microwave Engineering*", 3rd Edition, Wiley, Singapore.
2. David M Pozar, "*Microwave and RF Design of Wireless Systems*", 1st Edition, John Wiley & Son, 2000.

Course Code: ETE - 4850
Course Title: RF AND MICROWAVE DEVICES SESSIONAL (Not Offered)
Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. Learn state of the art design, and testing techniques of RF and microwave devices.

Course Outcomes:

Students who successfully complete the course will be able to:

1. Explain the principles of operation of microwave circuits and devices.
2. Design and simulate microwave circuits and devices.
3. Select suitable measurement methodologies to characterize and verify the performance of microwave circuits and devices and undertake measurements to characterize and verify the performance of microwave circuits and devices.

Course Contents:

Laboratory works based on ETE – 4859.

Course Code: ETE - 4851
Course Title: OPTO-ELECTRONICS (Not Offered)
Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

1. Students understand the analysis of the operation and performance of optoelectronic materials.
2. Students understand design criteria for semiconductor optical sources (including light emitting diodes and laser diodes) for a variety of applications.
3. Students understand design criteria for semiconductor optical detectors (including photodiodes and solar cells) for a variety of applications.

Course Outcomes:

1. Students are conversant with the optical properties of semiconductors.
2. Students are conversant with optical processes in semiconductors.
3. The students are conversant with the application of optical properties and processes in semiconductor optical sources.
4. The students understand the operation of LEDs and lasers.
5. The students are familiar with the structures and performance of LEDs and lasers.
6. The students understand the application of LEDs and lasers.
7. The students are conversant with the application of optical properties and processes in semiconductor optical detectors.
8. The students understand the operation of photodetectors.
9. The students are familiar with the structures and performance of photodetectors.
10. The students understand the application of photodetectors.

Course Contents:

Mid-term Exam: 30 Marks

1. **Optical Sources:** Laser: Introduction to various types of Lasers, Semiconductor Injection Laser: Structure, theory of operation including rate equations and characteristics, LED: Structure, theory of operation and characteristics.
2. **Optical modulators**: description of different kinds of modulation techniques, basic characteristics of optical modulators, electro optic modulators, acousto-optic modulators, interferometric modulators.
3. **Optical Detector:** Device types, their characteristics, Detection principles, Quantum efficiency, Responsivity, Semiconductor photodiodes with and without internal gain. PIN diodes, Avalanche photo diode, PIN FET and Integrated receivers and their characteristics.

Final Exam: 50 Marks

Part – A: 20-Marks

4. **Receiver amplifier:** Signal to noise ratio, low and high impedance, trans impedance, front end, FET preamplifiers, integrated optics.
5. **Receiver Performance Considerations:** Noise: Thermal, Dark current, Quantum, Digital signaling and Analogue transmission quantum noise, Receiver noise.

Part – B: 30-Marks

6. **Optical Amplification:** Optical Amplifiers: semiconductor laser amplifier and fiber amplifier.
7. **Integrated Optics:** Planar waveguides. Some integrated optical devices: beam splitter, directional couplers, switches, modulators, filters, injection lasers, polarization transformers and frequency translator, Optoelectronics integration, Optical bistability and digital optics.
8. **Measurement:** Measurement of complex linear and nonlinear optical properties of materials, testing of optical communication and microwave signal processing subsystems, and conducting ultrafast time-resolved measurements.

Recommend Books:

Textbooks:

1. John. M. Senior, "*Optical fiber Communications: Principles and Practice*", Prentice Hall, 2nd Edition, 1993.

Reference books:

1. Henry Zanger, Cynthia Zanger, "*Fiber Optics: Communications and Other Applications*", Booknews Inc., 1990.

Course Code: ETE - 4852
Course Title: OPTO-ELECTRONICS SESSIONAL (Not Offered)

Credit Hour: 1/ Contact Hour: 2 per week

Course Contents:

Laboratory works based on ETE – 4851.

Course Code: ETE - 4853
Course Title: STATISTICAL SIGNAL PROCESSING (Not Offered)

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

The course introduces the notion of representing signals using parametric models; it extends the broad topic of statistical estimation theory covered in the Probability, Random Variables, and Estimation Theory course for determining optimal model parameters. In particular, the Bayesian paradigm for statistical parameter estimation is introduced. Emphasis is placed on relating these concepts to state-of-the-art applications and signals.

Course Outcomes:

Students who successfully complete the course will be able to:

1. Use the principle of orthogonality to derive least squares system identification and minimum mean square error state estimation algorithms.
2. Use probability theory to analyze properties of system identification and filtering algorithms.
3. Formulate and solve optimal system identification and filtering problems.

Course Contents:

Mid-term Exam: 30 Marks

1. **Random Processes:** Definitions, stationarity, Second-order description (mean, correlation function, power spectrum), Kullback-Leibler distance, linear vector spaces, Karhunen-Loève expansion.
2. **Optimization Theory:** Constrained and unconstrained problems.
3. **Estimation Theory:** Notions of error, parameter estimation, minimum mean-squared error estimation, relations to information theory, MAP estimation.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Estimation Theory:** Maximum likelihood estimation and the Cramér-Rao bound, linear estimators and the Orthogonality Principle, waveform parameter estimates.
2. **Linear Signal Estimation:** Wiener filters, adaptive filters adaptive filters, Kalman filters.

Part – B: 30-Marks

1. **Estimation Theory:** Bayesian filtering, spectral estimation filtering in the context of basis expansions, Denoising, wavelets, compressive sensing.
2. **Detection Theory:** Likelihood ratio test. ROC curves, *M* models, Neymann-Pearson detection, Stein's lemma, Sequential detection, Uncertainties in models.
3. **Detection Theory:** Simultaneous estimation and detection, Signals in additive noise, Non-Gaussian detection theory.

Recommended Books:

Reference Books:

1. D.H. Johnson. *"Statistical Signal Processing"*
2. Dimitris G. Manolakis, Vinay K. Ingle, Stephen M. Kogon, *"Statistical and Adaptive Signal Processing"*
3. L. Scharf, *"Statistical Signal Processing: Detection, Estimation, and Time Series Analysis"*
4. M. Hayes., "Statistical Digital Signal Processing and Modeling"
5. S. Kay., *"Fundamentals of Statistical Signal Processing: Vol. I Estimation Theory, Vol II. Detection Theory"*
6. Papoulis., *"Probability, Random Variables, and Stochastic Processes",* 3rd Edition.

Course Code: ETE - 4854
Course Title: STATISTICAL SIGNAL PROCESSING SESSIONAL (Not Offered)

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. Choose appropriate statistical tools to solve signal processing problems.
2. Analyze real data.
3. Interpret spectral content of signals.
4. Develop appropriate models for observed signals.
5. Assess / Evaluate advantages and limitations of different statistical tools for a given signal processing problem.

Course Outcomes:

Students who successfully complete the course will be able to:

1. The student will be either participates in a basic design experience or in a research experience through a team project.
2. The students will further their written and oral communication skills through the preparation of a written project report and a short oral presentation.

Course Contents:

Laboratory works based on ETE – 4853.

Course Code: ETE - 4855
Course Title: CRYPTOGRAPHY AND NETWORK SECURITY

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.
2. To study various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
3. To know Digital Signature Standard and provide solutions for their issues.
4. To be familiar with cryptographic techniques for secure (confidential) communication of two parties over an insecure (public) channel; verification of the authenticity of the source of a message.

Course Outcomes

Students who successfully complete the course will be able to:

CO1.	To understand basics of Cryptography and Network Security
CO2.	To be able to secure a message over insecure channel by various means

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction of Classical Encryption Techniques:** Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Symmetric Cipher Model, Substitution Techniques – Caesar cipher, Monoalphabetic ciphers, Playfair cipher, Hill cipher, Polyalphabetic cipher, One-time pad, Transposition Techniques.
2. **Block Cipher:** Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic.
3. **Advanced & Contemporary Symmetric Cipher:** Evaluation Criteria for AES, the AES Cipher, Multiple Encryption and Triple DES, Stream Ciphers and RC4.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Confidentiality Using Symmetric Encryption:** Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.
2. **Public-Key Encryption:** Introduction to number theory, Principles of Public-Key Cryptosystems, Applications for Public-Key Cryptosystems, Requirements for Public- Key Cryptography, the RSA Algorithm.

Part – B: 30-Marks

1. **Key Management and Elliptic Curve Cryptography (ECC):** Key Management, Daffier-Hellman Key Exchange, Elliptic Curve Arithmetic, ECC-Key exchange using ECC, Elliptic Curve Encryption/Decryption.
2. **MAC and Hash Function:** Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Security of Hash Functions and MACs, MD5 Message Digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC.
3. **Hash Algorithm, Digital Signatures and Authentication Protocols:** Secure Hash Algorithm, HMAC, HMAC Design Objectives, Digital Signature, Authentication Protocols, Digital Signature Standard, Mutual Authentication, One-Way Authentication, Digital Signature Standard.

Text books:

1. W. Stallings, "*Cryptography and Network Security: Principles and Practice*", Pearson, 6th Edition, 2013.

Reference books:

1. Chuck Easttom, "*Computer Security Fundamentals*", Prentice Hall, 2006.
2. Mark Merkow, James Breithaupt, "*Information Security: Principles and Practices*", Prentice Hall, 2006.
3. Matt Bishop, "*Computer Security: Art and Science*", 2003.
4. Charles Pfleeger, Lawrence Pfleeger, "*Security in Computing*", Third Edition, 2003.

Course Code: ETE - 4856
Course Title: CRYPTOGRAPHY AND NETWORK SECURITY SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.
2. To study various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
3. To know Digital Signature Standard and provide solutions for their issues.
4. To be familiar with cryptographic techniques for secure (confidential) communication of two parties over an insecure (public) channel; verification of the authenticity of the source of a message.

Course Outcomes:

CO1. Different types of vulnerabilities in a Network
CO2. Solve Problems using various Algorithms
CO3. Design of cryptographic algorithms using computer simulation.
CO4. Investigation of modern wireless Security
CO5. Using MATLAB tool for implementation of the cryptography and network security mechanisms.
CO6. Assign individual or group of students related tasks.

Course Contents:

Laboratory works based on ETE –4855.

Course Code: ETE - 4857

Course Title: NEURAL NETWORKS AND FUZZY LOGIC

Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

This course aims at introducing the fundamental theory and concepts of computational intelligence methods, in particular neural networks, fuzzy systems, genetic algorithms and their applications in the area of machine intelligence. This can be summarized as:

1. To understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
2. To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.
3. To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

Course Outcomes:

Students who successfully complete the course will be able to:

CO1. Comprehend the concept of fuzziness and concepts of neural networks

CO2. Knowledge representation using fuzzy rules, and fuzzy logic

Course Contents:

Mid-term Exam: 30 Marks

1. **Introduction:** Definition of artificial neural network. Similarities of neural network with human brain. Models of a Neuron, Neural Networks Viewed as Directed Graphs, Feedback, Network Architectures, Knowledge Representation, Classification of ANN. Terms used in ANN: Input/output sets, weights, bias or threshold.
2. **Learning Process:** Supervised & unsupervised, learning, error correction learning, Hebbian learning, Competitive learning, Kohonen self-organizing networks.
3. **Single Neuron/ Perceptron Networks:** Training methodology, application to linearly separable problems, multilayer perceptron networks, back propagation algorithm, virtues and limitations of back propagation, methods of speeding.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **Radial Basis Function Networks:** Interpolation problems, covers theorem, regularization networks, functional expansion networks: functional link artificial neural network (FLANN), Cascaded FLANN.
2. **Fuzzy Set Theory & Rules:** Introduction to fuzzy systems, membership function, fuzzy union, intersection and complement, fuzzy relational operations, fuzzy IF THEN rules, fuzzy reasoning.

Part – B: 30-Marks

1. **Fuzzy Inference Systems:** Introduction, Mamdani fuzzy model, Sugeno fuzzy model, Tekamoto fuzzy model, Neuro-fuzzy systems.
2. **Evolutionary Computing:** Introduction, gradient free optimization, genetic Algorithms: basic concept, search space, working principle, encoding, decoding, fitness function, selection, cross over, mutation, Particle swarm optimization: basic principle, algorithm & flowchart.
3. **Applications:** Applications of ANN, fuzzy systems & Evolutionary Computing to time series prediction, pattern classification, control, communication engineering and biomedical engineering.

Recommend Books:

Textbooks:

1. W. Stallings, "*Cryptography and Network Security: Principles and Practice*", Pearson, 6th Edition, 2013.

Reference books:

1. Chuck Easttom, "*Computer Security Fundamentals*", Prentice Hall, 2006.
2. Mark Merkow, James Breithaupt, "*Information Security: Principles and Practices*", Prentice Hall, 2006.
3. Matt Bishop, "*Computer Security: Art and Science*", 2003.
4. Charles Pfleeger, Lawrence Pfleeger, "*Security in Computing*", Third Edition, 2003.

Course Code: ETE - 4858
Course Title: NEURAL NETWORKS AND FUZZY LOGIC SESSIONAL

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems, Program the related algorithms and Design the required and related systems.

Course Outcomes:

CO1. Understanding principles of neural networks and fuzzy Logic fundamentals

CO2. Formulation of the mathematical structure for artificial neurons and observe activation functions

CO3. Design Artificial Neural Networks models and basics of fuzzy logic.

CO4. Investigating the concept of classical and fuzzy sets, fuzzification and defuzzification, with which they can be able to apply the conceptual things.

CO5. Simulation of neural networks and fuzzy logic systems using MATLAB toolbox.

CO6. Assign individual or group of students related tasks.

Course Contents:

Laboratory works based on ETE – 4857.

Course Code: ETE - 4859
Course Title: RADAR AND NAVIGATIONAL AIDS (Not Offered)
Credit Hour: 3/ Contact Hour: 3 per week

Course Objectives:

Main objective of this course is to make the students understand the basic concept in the field of Radar and Navigational aids. Students are taught about different types of Radar Systems.

1. To become familiar with fundamentals of Radar.
2. To gain in depth knowledge about the different types of Radar and their operation.
3. Need for signal detection in Radar and various Radar signal detection techniques.
4. To become familiar with Radio Navigation techniques.
5. To become familiar with the basic design of radar transmitter and receiver

Course Outcomes:

Students who successfully complete the course will be able to:

1. Demonstrate the ability to identify, formulate and solve engineering problems
2. Demonstrate the ability to design a system, component or process as per needs and specifications
2. Show the ability to participate and try to succeed in competitive examinations.

Course Contents:

Mid-term Exam: 30 Marks

1. **Principles of Radar:** Introduction, The simple form of Radar Equation, Radar Block diagram and Operation, Radar Frequencies, millimeter and submilimeter waves, Applications of Radar.
2. **Radar Equation:** Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Signal to Noise Ratio, Matched filter impulse response, Integration of radar Pulses, Radar Cross Section of Targets, Cross section Fluctuations, Radar Clutter-surface clutter, sea clutter and Land clutter ,weather clutter, Transmitter Power, Pulse Repetition Frequency and Range ambiguities, Antenna Parameters, system losses, propagation effects, other considerations.
3. **CW and FM Radar:** The Doppler effect, CW radar, FMCW radar, Airborne Doppler Navigation, Multiple Frequency CW radar.

Final Exam: 50 Marks

Part – A: 20-Marks

1. **MTI and Pulse Doppler Radar:** Introduction, Delay line Cancellers, Multiple or staggered Pulse Repetition Frequencies, Range gated Doppler Filters, Block Diagram of Digital Signal Processor, Example of MTI radar Processor, , Pulse Doppler Radar, Non coherent MTI ,MTI from moving platform, Other types of MTI, Airborne radar.
2. **Tracking and Imaging Radar:** Tracking with radar, Monopulse tracking, Conical scan and sequential lobing, Low angle tracking, Air Surveillance Radar, Introduction to Synthetic aperture radar (SAR).

Part – B: 30-Marks

1. **Navigation:** Introduction, Four Methods of Navigation, Loop Antenna, Loop input circuits, aural null direction finder, Goniometer, Errors in Direction Finding, Adcock Direction Finder, Its advantages over loop antenna, Direction Finding at very high frequency, Automatic Direction Finder, Range and Accuracy of Direction Finders.
2. **Radio Ranges:** LF/MF Four course Radio Range, VHF Omni Directional Range, and VOR receiving Equipment, Range and Accuracy of VOR.
3. **Hyperbolic Systems of Navigation and Modern Navigation:** LORAN, DECCA navigation system, Doppler navigation-Doppler Effect, New configuration, Doppler frequency equations, Track stabilization, Doppler navigation system, GPS principle of operation, Position location determination, principle of GPS receiver.

Recommend Books:

Textbooks:

1. Merrill I. SKOLNIK, "*Introduction to Radar Systems*", 3rd Edition, McGraw Hill.
2. N.S. NAGARAJA, "*Elements of Electronic Navigation*", Tata McGraw Hill, 1993.

Reference books:

1. Nadav Levanon, "*RADAR Principles*", John Wiley and Sons, 1989.

Course Code: ETE - 4860
Course Title: RADAR AND NAVIGATIONAL AIDS SESSIONAL (Not Offered)

Credit Hour: 1/ Contact Hour: 2 per week

Course Objectives:

On successful completion of this course, you will be able to:

1. To present a problem oriented introductory knowledge of Radar and Navigational Aids.
2. To address the underlying concepts and methods behind Radar and Navigational Aids.

Course Outcomes:

Students who successfully complete the course will be able to:

1. The student can identify different areas of Radar and Navigation.
2. Can find the applications of all the areas in day to day life.
3. Can identify the operations, working, construction, material used in radar technology.
4. Demonstrate the ability to design a system, component or process as per needs and specifications.

Course Contents:

Laboratory works based on ETE – 4859.

Appendix

Statements of COs of different courses are provided as per the table provided in SAR template