International Islamic University Chittagong

Department of Electrical and Electronic Engineering

Syllabus for 4 years B.Sc. Engineering Degree in Electrical & Electronic Engineering

Spring-2019 & Autumn-2019

As per recommendations made in the meeting of the Syllabus and Course Offering Committee of the Department of EEE held on 05.12.2018.

As per recommendations made in the meeting of the Committee of Courses of the Department of EEE held on 15.12.2018.

As per recommendation made in the 129th meeting of Faculty of Science and Engineering Committee held on 08.01.2019.

As per recommendation of the 41st Academic Council meeting held on 19.01.2019 and duly approved in the 218th Syndicate meeting held on __.__.____.

Contents

International Islamic University Chittagong
Faculty of Science and Engineering
Department of Electrical and Electronic Engineering
Syllabus for B. Sc. Engineering (EEE), Spring - 2018

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 Islamic University Chittagong Trust (IUCT).

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 properly trained up manpower to contribute to socio-economic development and moral upliftment of the society and to cultivate expertise among the students as well as sensitivity, intelligence and an ability to think freely beyond their areas of study, who shall sustain justice in all walks of life.

1.3 T**he Vision of the University** is 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 seat of learning and creating knowledge in the South East Asia.

1.4 The objective of the University to create a new generation of competent youths, who will be equipped with academic excellence, professional expertise and adorned with moral height.
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 IIUC 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 students (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 (MDP): 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 includes 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 the Faculty of Science & Engineering.

3.1. The Mission of the Faculty of Science and Engineering:
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. The Vision of the Faculty of Science and Engineering:
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. The Objectives of the Faculty of Science and Engineering:
The Faculty plans to achieve this vision and mission through the pursuit of the following specific objectives:

- **F1:** Prepare graduates for personal and professional success with awareness of and commitment to their ethical and social responsibilities, both as individuals and in team environments.
- **F2:** Enable graduates to keep on self- development throughout their careers.
- **F3:** Produce graduates with the necessary background and technical skills to work professionally and fulfill the need of industry.
- **F4:** Organize, in collaboration with stakeholders, conferences, symposia and workshops to upgrade technical and scientific levels in Electrical and Electronic Engineering.
- **F5:** Carry out and publish academic knowledge.
- **F6:** Activities to promote research innovation, commercialization and Entrepreneurship Increase.

3.4. Vision and Mission of the Department of Electrical and Electronic Engineering (EEE):

Vision: To produce comprehensively trained, socially responsible, innovative electrical engineers and researchers of high quality who can contribute to national and global development.

Mission: The Dept. of EEE supports the mission of the International Islamic University Chittagong (IIUC) through academic environment with a strong theoretical foundation, practical engineering skills, experience in interpersonal communication and team work along with emphasis on ethics, professional conduct and critical thinking. Further, the graduates will be trained to have successful engagement in research and development and entrepreneurship. The department invokes the desire and ability of life-long learning in the students for pursuing successful career in engineering. In short the departmental mission can be stated as follows:

MS1: Strong theoretical foundation
MS2: Practical engineering skill
MS3: Experience in interpersonal communication
MS4: Teamwork along with ethics, professional engagement and critical thinking
MS5: Engagement in research, development and entrepreneurship.

4. The Program Educational Objectives (PEOs) of Electrical and Electronic Engineering

The Program Educational Objectives or goals are the statements that describe the expected achievements of graduates within first few years of their graduation from the program. The program objectives are guided by global and local needs, vision of the institution, long term goals etc. The program objectives are expected to continuously evolve in agreement with local employers, industry, R & D advisors, and the alumni. **Program Educational Objectives (PEOs)** of B. Sc in EEE at IIUC are as follows:

	Topics	**Program Educational Objectives (PEOs)**
PEO-1	**Success in Electrical Engineering Fields**	To provide students with the knowledge of Basic Sciences in general and Electrical and Electronics Engineering in particular so as to acquire the necessary skills for analysis and synthesis of problems in generation, transmission and distribution
PEO-2	**Industrial awareness & research**	To provide technical knowledge and skills to identify, comprehend and solve complex tasks in industry and research and inspire the students to become future researchers, scientists with innovative ideas.
PEO-3	**Successful employment & professional ethics**	To prepare the students for successful employment in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to handle critical situations and meet deadlines
PEO-4	**Being a leader in professional & societal environment**	To train the students in basic human and technical communication skills so that they may be good team-members, leaders and responsible citizen.

These PEOs are quite broad by intention, as **Electrical and Electronics Engineering** graduates may seek further education or work in diverse areas. To make these PEOs meaningful, they will demonstrate following performance, actions, or achievements.

- Following indicators are considered as demonstration of **PEO-1:** Students will establish themselves with the knowledge of Basic Sciences in general and Electrical and Electronics Engineering in particular so as to acquire the necessary skills for analysis and synthesis of problems in generation, transmission and distribution may be demonstrated by any of the following:

a. Acceptance and satisfactory progress by students in a graduate degree program.
b. Significantly contributing and delivery of desired engineering component, product or process.
c. Formulating and solving, moderately complex electrical and electronics engineering problems.
d. Skillful use of state-of-the-art tools for electrical and electronics engineering processes.
e. Making practical recommendations that address issues related to Electrical and Electronics Engineering product and systems.
f. Producing clear written electrical and electronics engineering documentation (papers, reports and significant parts of proposals).
g. Being assigned to make reports or presentations for internal or external clients.
h. Publishing and reviewing papers for conferences / journals, or producing an internally reviewed publication.
i. Making a significant contribution to a proposal.
j. Participating in the field through public speaking, activity in professional societies/technical associations etc.
k. Addressing issues related to intellectual property rights.
l. Capability to handle societal, ethical, legal, business and technical issues related to a project.

- Following indicators are considered as demonstration of **PEO-2:** Students will establish themselves with the technical knowledge and skills to identify, comprehend and solve complex tasks in industry and research and

inspire the students to become future researchers, scientists with innovative ideas may be demonstrated by any of the following:

a. Leading a project or designed team.
b. Promotion to managerial position.
c. Election or appointment to leadership position in a professional society.
d. Delegating effectively.
e. Volunteering in a charitable organization.
f. Participating in team sports or coaching.
g. Effectively handling a situation involving ethics.

- Following indicators are considered as demonstration of **PEO-3:** Students will establish themselves for successful employment in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to handle critical situations and meet deadlines may be demonstrated by any of the following::

a. Appropriately using tools for collaboration, such as telecoms, Videocon's etc.
b. Skillfully using tools for project and configuration management, like resource planning systems, software source control systems, etc.
c. Working successfully on ethnically, technically and gender diverse teams.
d. Effectively resolving problems encountered in team work.
e. Communicating effectively in a group environment.
f. Estimating correctly the required resources (time, team, equipment etc.) for Electrical and Electronics Engineering projects.
g. Making appropriate decisions on outsourcing and developing components in-house.
h. Seeking assistance or elevating problems when necessary.

- Following indicators are considered as demonstration of **PEO-4:** Students will establish themselves for basic human and technical communication skills so that they may be good team-members, leaders and responsible citizen may be demonstrated by any of the following:

a. Successfully completing the graduate course
b. Self-learning; a new skill, tool, area system
c. Reading technical books, journals, conference papers, technical reports or standards
d. Attending a technical conference, symposium or workshop

F-I: Mapping between mission Statements (MSs) and Program Educational Objectives (PEOs)

PEOs	MS-1	MS-2	MS-3	MS-4	MS-5
PEO-1	✓	✓	✓	-	-
PEO-2	✓	✓	-	-	✓
PEO-3	-	-	-	✓	✓
PEO-4	-	✓	✓	✓	✓

5. B.Sc. in Electrical and Electronic Engineering Program Outcomes (POs)

It is the aim of EEE program to educate engineers who are ready to work actively in real-world, acquiring high ability in Electrical and Electronics Engineering discipline. Basic classes provided in the first two years give the students a concrete basis to be Electrical and Electronics Engineering. They begin their professional study from the second year, and step up year by year to be highly-educated engineers. All the students of EEE obtain basic knowledge and basic skills in Electrical and Electronics Engineering discipline with the courses being offered in the undergraduate program and these courses nurture highly-educated engineers in power generation and transmission, which have deep knowledge and problem-solving skills in the relevant fields. Our graduates are expected to have a wide range of abilities including professional knowledge and technical skills in electrical engineering.

Program Outcomes or POs are abilities that a graduate of Electrical and Electronic Engineering would be able to do at the time of graduation. A graduate of **EEE will have**

PO-1: Engineering Knowledge: an ability to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
Performance Criteria Definitions:

- Knowledge and understanding of scientific principles and methodology necessary to strengthen their education in their engineering discipline, to enable appreciation of its scientific and engineering context and to support their understanding of historical, current and future developments and technologies.
- Knowledge and understanding of mathematical principles necessary to underpin their education in their engineering discipline and to enable them to apply mathematical problems.
- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support the study of their own engineering discipline.

PO-2: **Problem Analysis:** an ability to identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
Performance Criteria Definitions
Practical application of engineering skills through combining theory and experience, use of other relevant knowledge and skills in fulfilling this objective, including:

- Knowledge of material characteristics, equipment, processes, or products
- Workshop and laboratory skills
- Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology development, etc.)
- Understanding use of technical literature and other sources of information
- Awareness of nature of intellectual property and contractual issues
- Understanding of appropriate codes of practice and industry standards
- Awareness of quality issues
- Ability to work with technical uncertainty
- Understanding of engineering principles and ability to apply them to analyze key engineering processes.
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modeling techniques
- Ability to apply quantitative methods and computer software relevant to their engineering discipline, in order to solve engineering problems.
- Understanding ability to apply a systems approach to engineering problems

PO-3: Design / Development of Solutions: an ability to Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
Performance Criteria Definitions
Design is the creation and development of an economically viable product, processor system to meet a defined application. It involves significant technical and intellectual skills that can be used, to integrate all engineering understanding, knowledge for the solution of real problems. Graduates will therefore need the knowledge, understanding and skills to:

- Investigate and define a problem and identify constraints relating to health, safety, environmental and sustainability and assessment of risks based on these constraints.
- Understand customer and user needs and the importance of considerations such as aesthetics
- Identify and manage costs and drivers thereof.
- Use creativity to establish innovative solution Ensure fitness of purpose, for all aspects of the problem including production, operation, maintenance and disposal.
- Manage the design process and evaluate outcomes.
- Knowledge and understanding of commercial and economic context of engineering Processes.
- Knowledge of management techniques which may be used to achieve engineering objectives within that context.
- Understanding of the requirement for engineering activities to promote sustainable development.
- Awareness of the framework of relevant legal requirements governing engineering activities including personnel, Health, Safety and Environmental (HSE) risks.

PO-4: Conduct Investigations of Complex Problems: an ability to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Performance Criteria Definitions

- Problem or opportunity identification
- Problem formulation and abstraction
- Information and data collection.
- Model translation.
- Experimental design and solution development.
- Implementation and documentation.
- Interpretation of results.

As the most engineers eventually learn, the problem solving process is never complete. Therefore, a final element here is feedback and improvement.

PO-5: Modern Tool Usage: an ability to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

Performance Criteria Definitions

- Encompasses a wide range of tools and skills needed by engineering graduates in computer software, simulation packages, diagnostic equipment, use of technical library resources and literature search tools.

PO-6: The Engineer and Society: an ability to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Performance Criteria Definitions

- Ability to make informed ethical choices and knowledge ability to of professional codes of ethics. Evaluates the ethical dimensions of professional practice and demonstrates ethical behavior.
- High degree of trust and integrity

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

Performance Criteria Definitions

- Focusing the knowledge and interpretation a socio economic, political and environmental issues.
- Obtaining in-depth knowledge on contemporary issue.

PO-8: **Ethics:** ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. Create a plan for success that connects their undergraduate education to future career as well as use the techniques and skills to face and succeed in competitive examinations like BCS, GRE, TOEFL etc.

Performance Criteria Definitions

- Graduates ready for immediate employment.
- Stick on to what they believed in.
- Make a smooth transition into post graduate studies
- Create a plan for success that connects their college education to future career.
    - Graduates ready for immediate employment.
    - Make a smooth transition into post graduate studies.

PO-9: Individual and Team Work: an ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Performance Criteria Definitions

- Maturity – requiring only the achievement of goals to drive their performance.
- Self-direction (take a vaguely defined problem and systematically work to resolution).
- Teams are used during the classroom periods, in the hands-on labs and in the design projects.
- Some teams change for eight-week industry oriented Mini-Project, and for the seventeen –week Design project.

- Instruction on effective teamwork and project management is provided along with an appropriate text book for reference.
- Teamwork is important not only for helping the students and to know their classmates but also in completing assignments.
- Students also are responsible for evaluating each other's performance, which is then reflected in the final grade.
- Ability to demonstrated and work with all levels of people in a team in organization.

PO-10: Communication: an ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
Performance Criteria Definitions

- **Written Communication: "**Students should demonstrate the ability to communicate effectively in writing."
  - Clarity.
  - Grammar/Punctuation
  - References
- **Verbal Communication:**"Students should demonstrate the ability to communicate effectively orally."
  - Speaking Style.
  - Subject Matter.

PO-11:Life-long learning and Successful Career: an ability to recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change as well as ability to use the techniques and skills to face and succeed in competitive examinations like BCS, GRE, TOEFL etc.
Performance Criteria Definitions
Inspire the students to further explore in his/her program to recognize the need for life-long Learning. Some aspects of life-long learning include:

- Knowledge and understanding of commercial and economic context of engineering processes.
- Knowledge of managerial techniques which may be used to achieve engineering objectives within that context.
- Understanding of the requirement for engineering activities to promote sustainable development.
- Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues.
- Personal continuing education efforts.
- Understanding of the need for a high level of professional and ethical conduct in engineering

PO-12: Project management and finance: an ability to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
Performance Criteria Definitions

- Project management professional certification.
- Begin work on advanced degree.
- Updating the knowledge, related to advanced electrical engineering concepts.
- Personal continuing education efforts.
- Ongoing learning– stays up with industry trends/ new technology.
- Continued personal development.
- Have learned same new significant skills.
- Have taken up to 80 hours training per year.

F-II: Mapping between Program Educational Objectives (PEOs) and Program Outcomes (POs)

PEOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
PEO-1	✓	✓	✓	✓	✓	-	-	-	-	-	-	-
PEO-2	✓	✓	✓	✓	✓	✓			✓	✓	✓	
PEO-3	✓	-	-	-	-	✓	✓	✓	✓	✓	✓	✓
PEO-4	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓

6. Admission Requirements:

Admission at IIUC is purely on the basis of merit. Furthermore, admission to the available programs depends on the type and level of the program that a candidate wishes to pursue. The general academic qualifications for admission in B.Sc. Engg.:

i. For SSC/ Dakhil, and HSC/ Alim (Science Group) system the minimum shall be (SSC GPA) +(HSC GPA) = 6.50. (But score of less than GPA 2.5 in any individual examination is not acceptable). An applicant must submit his/her results during the application. Provisional admission for appeared students should not be allowed.

ii. For '0' level &'A' level system an applicant must have completed 6 papers in '0'level and 6 papers in 'A' level, in the 'A' level the; student must have completed at least 2 papers of Physics, 2 papers of Chemistry and 2 papers of Mathematics. Minimum average GPA of combined '0'level 'A' &level shall be 'C' an applicant must submit his results during the application. Provisional admission for appeared students should not be allowed. (iii) For applicants from foreign countries similar standard should be maintained. The applicant must have completed Physics, Chemistry and Mathematics in the 12th level.

English is the primary languages used as the medium of instruction in the University.

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

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 be allowed to appear in that course** at the final examinations of the semester. They will get 'F' grade in the semester result. The basis for awarding marks for attendance is as follows (Ref. FSEO article 14.1.4):

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

8. The Grading System: (Ref. FSEO article 13.1): The letter grade system for assessing the performance of the students is shown below:

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	2.00	
00 to less than 40	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**. This policy will be effective from Autumn-2017 semester for newly admitted students and onwards. (Ref: 204th Syndicate Meeting held on 23rd September 2017).

9. Earned Credit (Ref. FSEO article 13.6): 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. (EEE) shall carry a total of 161 credit hours. Distribution of courses given Below:

Course type	Theoretical (Credit hour)	Laboratory (Credit hour)	Total
Total non- Departmental Courses	**21**	**0**	**21**
Total Basic Science Courses	**23**	**3**	**26**
Total EEE Courses	**80**	**34**	**114**
Total	**124**	**37**	**161**

11. Semester Work load (Ref. FSEO article 5.3): 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 below **(**Ref. FSEO article 5.4**):**

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

scoring of F grade, he/she can complete the course by attending Special Final Examination. To get 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 Special 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 2.00, 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 dead line 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, than 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 (Ref. FSEO article-22):

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.

12.3 **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 can not 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 (Ref. FSEO article-23):

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 GPA of at least 2.50.

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.

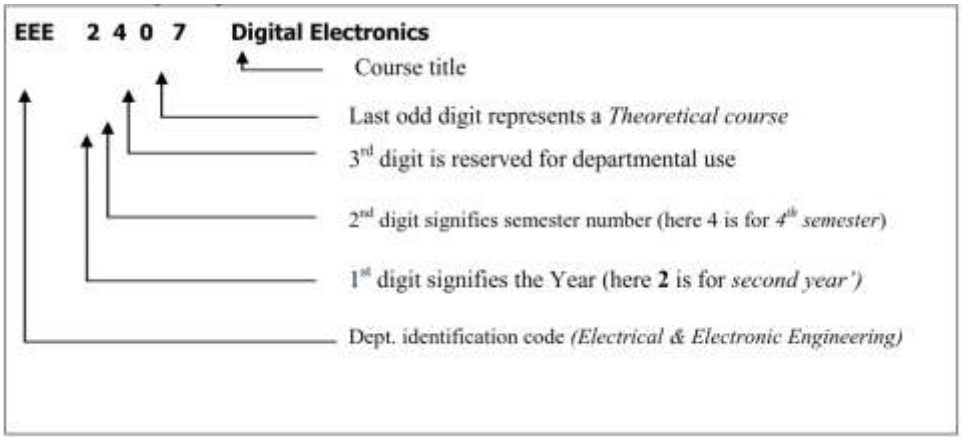
14.4 **Release of Student's Record**:

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 (Ref. FSEO article 4.10):

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 of the above statement is as follows:



16. Programs of Study:

The B. Sc. (Engineering) program in the department of Electrical & Electronic Engineering consist of 76 courses carrying **161 Credit Hours**. There are 9 University Requirement Courses (URC) carrying 13 credit hours, 4 Interdisciplinary Courses carrying 8 credit hours, 11 Basic Science Courses carrying 26 credit hours, 40 core course carrying 85.5 credit hours and 12 Elective Courses carrying 28.5 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 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 sessional courses; 10 marks for attendance, 40-50 marks is allotted for running assessment and 40-50 marks is for practical exam, viva, quiz etc at the end of semester final examination.

Marks distribution for projects/thesis is as follows:

1) Project/Thesis evaluation by Supervisor-	35%
2) Project/Thesis evaluation by Examiner-	35%
3) Viva-Voce-	30%
Total	100%

16.1 Summary of Courses

Course type	Details	Theoretical (Cr.hr)	Laboratory (Cr.hr)	Total
Non- Departmental Courses	University Requirement Courses	13	0	13
	Interdisciplinary Courses	8	0	8
Total non- Departmental Courses		**21**	**0**	**21**
Basic Sciences Courses	Mathematics	12	0	12
	Physics	6	1.5	7.5
	Statistic	2	0	2
	Chemistry	3	1.5	4.5
Total Basic Science Courses		**23**	**3**	**26**
Electrical and Electronic Engineering Courses	EEE Core	59	26.5	85.5
	EEE Elective	21	7.5	28.5
Total EEE Courses		**80**	**34**	**114**
Total		**123**	**38**	**161**

16.2 Semester wise number of courses, credits & contact hours

Semester	No. of Courses	Contact Hours/Week			Credit Hours		
		Theory	Lab	Total	Theory	Lab	Total
1st	6+2	16	5	21	14	2.5	16.5

2nd	5+4	13	10	23	13	5	18
3rd	7+3	18	8	26	17	4	21
4th	7+3	19	9	28	19	4.5	23.5
5th	6+3	16	8	24	15	4	19
6th	6+3	15	8	23	15	4	19
7th	7+4	17	13	30	16	6.5	22.5
8th	6+3	15	13	28	15	6.5	21.5
Total	**51+26**	**129**	**74**	**203**	**124**	**37**	**161**

16.3 University Requirement Courses

Serial No	Course Code.	Course Title	Contact Hours/Week	Credit Hours
			Theory	Theory
1	UREL-1106	Advanced English	3	2
2	UREM-1101	Text of Ethics and Morality	2	1
3	URED-1201	Basic Principles of Islam	2	2
4	URED-2302	Sciences of Qur'an and Hadith	2	1
	URED-2305	Comparative Religion	3	3
5	URBL-2401	Functional Bengali Language	2	2
6	URED-3503	Introduction to 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**

16.4 List of Interdisciplinary Courses

Serial No	Course Code	Course Title	Contact Hours/Week	Credit Hours
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	XXX-47XX	to be taken from Interdisciplinary optional courses in group **"E"**	2	2
	Total	**4 Courses**	**8**	**8**

16.5 Basic Science Courses

SL. No.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	MATH-1107	Mathematics -I (Differential & Integral Calculus)	3	-	3	-	-
2	MATH-1207	Mathematics-II (Differential Equation & Coordinate Geometry)	3	-	3	-	MATH -1107
3	MATH-2309	Mathematics III (Linear Algebra, Matrices and Vector Analysis)	3	-	3	-	MATH-1207
4	MATH-2409	Mathematics IV (Complex Variable, Lap laces and Fourier Analysis, Z-transform)	3	-	3	-	MATH-2309

SL. No.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
6	STAT-2303	Probability & Statistics	2	-	2	-	-
7	PHY-1101	Physics I	3	-	3	-	-
8	PHY-1201	Physics II	3	-	3	-	PHY-1101
9	PHY-1204	Physics Sessional	-	3	-	1.5	-
10	CHEM-2301	Chemistry	3	-	3	-	-
11	CHEM-2304	Chemistry Sessional	-	3	-	1.5	-
	Total	12 courses (9+3)	**23**	**6**	**23**	**3**	**= 26 CH**

16.6 Core Courses

Sl. No	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1.	CSE-1105	Computer Programming I	2		2		-
2.	CSE-1106	Computer Programming I Sessional		2		1	-
3.	CSE-1205	Computer Programming II	2	-	2	-	CSE-1105
4.	CSE-1206	Computer Programming II Sessional	-	2	-	1	-
5.	ME-2301	Fundamentals of Mechanical Engineering	2	-	2	-	-
6.	CE-1204	Engineering Drawing Sessional		2		1	
7.	EEE-1101	Electrical Circuits I	3	-	3	-	-
8.	EEE-1102	Electrical Circuits I Sessional		3	-	1.5	-
9.	EEE-1201	Electrical Circuits II	3	-	3	-	EEE-1101
10.	EEE-1202	Electrical Circuits II Sessional & Electrical Workshop		3		1.5	
11.	EEE-2301	Electronics I	3	-	3	-	EEE-1201
12.	EEE-2302	Electronics I Sessional	-	3		1.5	
13.	EEE-2303	Electrical Machine I	3	-	3	-	EEE-1201
14.	EEE-2306	Numerical Technique Sessional	-	2	-	1	
15.	EEE-2401	Electrical Machine II	3	-	3	-	EEE-2303
16.	EEE-2402	Electrical Machine Sessional	-	3	-	1.5	
17.	EEE-2407	Digital Electronics	3	-	3	-	EEE-2301
18.	EEE-2408	Digital Electronics Sessional	-	3		1.5	
19.	EEE-2411	Electronics II	3	-	3	-	EEE-2301
20.	EEE-2412	Electronics II Sessional and Electronics Workshop	-	3		1.5	
21.	EEE-2415	Transmission & Distribution of Electrical Power	3	-	3	-	EEE-1201
22.	EEE-3501	Continuous Signals and Linear Systems	3	-	3	-	MATH-2409
23.	EEE-3505	Microprocessor and Interfacing	3	-	3	-	EEE-2407
24.	EEE-3506	Microprocessor and Interfacing Sessional	-	3		1.5	
25.	EEE-3508	Circuit Simulation Sessional	-	2		1	EEE-2301
26.	EEE-3515	Electrical Properties of Materials	3	-	3	-	EEE-2301
27.	EEE-3519	Power System Analysis	3	-	3		EEE-2415

28.	EEE-3520	Power System Analysis Sessional	-	3		1.5	-
29.	EEE-3601	Communication Theory	3	-	3	-	EEE-3501
30.	EEE-3602	Communication Theory Sessional	-	3		1.5	
31.	EEE-3603	Digital Signal Processing I	3	-	3	-	EEE-3501
32.	EEE-3604	Digital Signal Processing I Sessional	-	3		1.5	-
33.	EEE-3607	Solid State Devices	3	-	3	-	EEE-3515
34.	EEE-3612	Electrical Service Design Sessional	-	2	-	1	
35.	EEE-3621	Engineering Electromagnetism	3	-	3		EEE-1201
36.	EEE-4701	Control System I	3	-	3	-	EEE-3501
37.	EEE-4702	Control System I Sessional	-	3		1.5	
38.	EEE-4709	Research Methodology and Seminar	1		1		
39.	EEE-4822	General viva-voice	1		1		
40.	EEE-4860	Project/Thesis	-	8	-	4	
	Total	40 courses	**59**	**53**	59	**26.5**	**=85.5 CH**

16.7 Interdisciplinary Optional Courses (one course to be taken)

Sl. No.	Course No.	Course Title	Contact Hours/Week	Credit Hours
1.	FIN-4701	Finance and Marketing for Engineers	2	2
2.	SCO-4703	Sociology	2	2
3.	PSY-4705	Psychology	2	2
4.	GOV-4709	Government	2	2
5.	LAW-4725	Professional Ethics and Environmental Protection Law	2	2

16.8 Elective Courses EEE

SL. No.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1.	EEE-47xx	Major-I	3	-	3	-	
2.	EEE-47xx	Major -I Sessional	-	3	-	1.5	
3.	EEE-47xx	Major-II	3	-	3	-	
4.	EEE-47xx	Minor-I	3	-	3	-	
5.	EEE-47xx	Minor-I Sessional		3		1.5	
6.	EEE-48xx	Major-III	3	-	3	-	
7.	EEE-48xx	Major-III Sessional	-	3	-	1.5	
8.	EEE-48xx	Major-IV	3		3		
9.	EEE-48xx	Interdisciplinary-I	3	-	3		
10.	EEE-48xx	Interdisciplinary-I Sessional	-	3		1.5	
11.	EEE-48xx	Interdisciplinary -II	3	-	3		
12.	EEE-48xx	Interdisciplinary -II Sessional		3		1.5	
	Total	(7+5) Courses	21	15	21	7.5	=28.5 CH

16.9 Major in Electrical and Electronic Engineering

There are **three** majors in EEE. Students obtain the degree in EEE taking any one of the following majors (subject to the offering of major).

1. Major in Power Systems Engineering (PSE)
2. Major in Electronic Engineering (EE)

3. Major in Communication Engineering (CE)

In order to achieve a degree in Electrical and Electronic Engineering from IIUC, a student will have to complete 12 elective courses (5 lab courses and 7 theory courses) of 28.5 credit hours from the following five disciplines or specialized area:

i. Power systems Engineering
ii. Electronics Engineering
iii. Communication Engineering
iv. Interdisciplinary Field

A student has to take 2 lab courses and 4 theory courses from one group as major; 1 theory course and 1 lab course from other groups as minor and 2 theory courses and 2 lab courses from interdisciplinary group (total 12 courses i.e 5 lab courses and 7 theory courses). Any lab course must be followed with the corresponding theory course and vice versa (if any).

16.10 Elective Courses

16.10.1 Power Systems Engineering

SL. No.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1.	EEE-4705	Power Electronics	3	-	3	-	EEE-2411
	EEE-4706	Power Electronics Sessional	-	3	-	1.5	
2.	EEE-4707	Power Plant Engineering	3	-	3	-	-
3.	EEE-4801	Power System Protection	3	-	3	-	EEE-3503
	EEE-4802	Power System Protection Sessional	-	3	-	1.5	
4.	EEE-4805	Power System Operation & Control	3	-	3	-	EEE-3503
5.	EEE-4807	High Voltage Engineering	3	-	3	-	EEE-3503

16.10.2 Electronic Engineering

SL. No.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1.	EEE-4753	VLSI I	3	-	3	-	EEE-3607
	EEE-4754	VLSI I Sessional		3		1.5	
2.	EEE-4713	Compound Semiconductor & Heterojunction Devices	3	-	3	-	
3.	EEE-4809	VLSI II	3	-	3	-	EEE-4753
	EEE-4810	VLSI II Sessional		3		1.5	
4.	EEE-4811	Opto-Electronics	3	-	3	-	EEE-2411
5.	EEE-4813	Semiconductor Device Theory	3	-	3		EEE-3607

16.10.3 Communication Engineering

SL. No.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1.	EEE-4723	Microwave Engineering	3	-	3		EEE-3501
	EEE-4724	Microwave Engineering Sessional	-	3		1.5	
2.	EEE-4715	Digital Signal Processing II	3	-	3	-	EEE-3601
3.	EEE-4833	Digital Communication	3	–	3	–	EEE-3601

	EEE-4834	Digital Communication Sessional		3		1.5	
4.	EEE-4835	Mobile Cellular Communication	3	–	3	–	EEE-3601
5.	EEE-4837	Telecommunication Engineering	3	–	3	–	EEE-3601

16.10.4 Interdisciplinary Fields

SL. No.	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1.	EEE-4825	Biomedical Instrumentation	3	-	3	-	EEE-2411
	EEE-4826	Biomedical Instrumentation Sessional	-	3	-	1.5	
2.	EEE-4827	Measurement and Instrumentation	3	-	3	-	EEE-2411
	EEE-4828	Measurement and Instrumentation Sessional		3		1.5	
3.	EEE-4841	Antenna & Propagation	3	-	3	-	EEE-3601
	EEE-4842	Antenna & Propagation Sessional		3		1.5	
4.	EEE-4843	Renewable Energy System	3	-	3		
	EEE-4844	Renewable Energy System Sessional		3		1.5	
5.	EEE-4845	Embedded System	3		3		EEE-3505
	EEE-4846	Embedded System Sessional		3		1.5	
6.	EEE-4847	Optical Fiber Communication	3	-	3	-	EEE-3601
	EEE-4848	Optical Fiber Communication Sessional		3		1.5	

17. Semester wise Course Distribution:

i. FIRST SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-1101	Electrical Circuits I	3	-	3	-	-
EEE-1102	Electrical Circuits I Sessional	-	3	-	1.5	-
CSE-1105	Computer Programming I	2		2		-
CSE-1106	Computer Programming I Sessional		2		1	-
MATH-1107	Mathematics -I (Differential & Integral Calculus)	3	-	3	-	-
PHY-1101	Physics I	3	-	3	-	-
UREL-1106	Advanced English	3		2	-	-
UREM-1101	Text of Ethics and Morality	2	-	1	-	-
Total	(6+2) Courses	**16**	**5**	**14**	**2.5**	Total= **16.5CH**

ii. SECOND SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-1201	Electrical Circuits II	3	-	3	-	EEE-1101
EEE-1202	Electrical Circuits II Sessional & Electrical Workshop	-	3	-	1.5	-
CSE-1205	Computer Programming II	2	-	2	-	CSE-1105
CSE-1206	Computer Programming II Sessional	-	2	-	1	-
PHY-1201	Physics II	3	-	3	-	PHY-1101
PHY-1204	Physics Sessional	-	3	-	1.5	-
MATH-1207	Mathematics-II (Differential Equation and Coordinate Geometry)	3	-	3	-	MATH-1107
CE-1204	Engineering Drawing Sessional	-	2	-	1	-
URED-1201	Basic Principles of Islam	2	-	2	-	-
Total	(5+4) Courses	**13**	**10**	**13**	**5**	**Total=18CH**

iii. THIRD SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-2301	Electronics I	3	-	3	-	EEE-1201
EEE-2302	Electronics I Sessional	-	3	-	1.5	
EEE-2303	Electrical Machine I	3	-	3	-	EEE-1201
EEE-2306	Numerical Technique Sessional	-	2	-	1	
MATH-2309	Mathematics III (Linear Algebra, Matrices and Vector Analysis)	3	-	3	-	MATH-1207
STAT-2303	Probability & Statistics	2	-	2	-	-
ME-2301	Fundamentals of Mechanical Engineering	2	-	2	-	-
CHEM-2301	Chemistry	3	-	3	-	-
CHEM-2304	Chemistry Sessional	-	3	-	1.5	-

URED-2302	Sciences of Qur'an and Hadith	2	-	1	-	-
Total	(7+3) Courses	**18**	**8**	**17**	**4**	**Total=21CH**

iv. FOURTH SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-2401	Electrical Machine II	3	-	3	-	EEE-2303
EEE-2402	Electrical Machine Sessional	-	3	-	1.5	-
EEE-2407	Digital Electronics	3	-	3	-	EEE-2301
EEE-2408	Digital Electronics Sessional	-	3	-	1.5	-
EEE-2411	Electronics II	3	-	3		EEE-2301
EEE-2412	Electronics II Sessional and Electronics Workshop	-	3	-	1.5	-
EEE-2415	Transmission & Distribution of Electrical Power	3	-	3	-	EEE-1201
MATH-2409	Mathematics IV (Complex Variable, Lap laces and Fourier Analysis, Z-transform)	3	-	3	-	MATH-2309
ACC-2401	Financial and Managerial Accounting	2	-	2	-	-
URBL-2401	Functional Bengali Language	2	-	2	-	-
Total	(7+3) Courses	**19**	**9**	**19**	**4.5**	**Total=23.5CH**

V. FIFTH SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-3501	Continuous Signals and Linear Systems	3	-	3	-	MATH-2409
EEE-3505	Microprocessor and Interfacing	3	-	3	-	EEE-2407
EEE-3506	Microprocessor & Interfacing Sessional	-	3	-	1.5	-
EEE-3508	Circuit Simulation Sessional	-	2	-	1	EEE-2301
EEE-3515	Electrical Properties of Materials	3	-	3	-	EEE-2301
EEE-3519	Power System Analysis	3	-	3		EEE-2415
EEE-3520	Power System Analysis Sessional	-	3	-	1.5	EEE-2415
ECON-3501	Principles of Economics	2	-	2	-	-
URED-3503	Introduction to Political Thoughts and Social Behavior	2	-	1	-	-
Total	(6+3) Courses	**16**	**8**	**15**	**4**	**Total=19 CH**

vi. SIXTH SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-3601	Communication Theory	3	-	3	-	EEE-3501
EEE-3602	Communication Theory Sessional	-	3	-	1.5	-
EEE-3603	Digital Signal Processing I	3	-	3	-	EEE-3501
EEE-3604	Digital Signal Processing I Sessional	-	3	-	1.5	-

EEE-3607	Solid State Devices	3	-	3	-	
EEE-3612	Electrical Service Design Sessional	-	2	-	1	
EEE-3621	Engineering Electromagnetism	3	-	3		MATH-3505
MGT-3601	Industrial Management	2	-	2	-	-
URED-3604	Life and Teachings of the Prophet Muhammad (*SAAS*)	2	-	1	-	-
Total	(6+ 3) Courses	**15**	**8**	**15**	**4**	**Total=19CH**

vii. SEVENTH SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-4860	Project/Thesis	-	4	-	2	
EEE-4701	Control System I	3	-	3	-	EEE-3501
EEE-4702	Control System I Sessional	-	3	-	1.5	-
EEE-4709	Research Methodology and Seminar	1	-	1	-	
EEE-47xx	Major-I	3	-	3	-	
EEE-47xx	Major-I Sessional	-	3	-	1.5	
EEE-47xx	Major-II	3	-	3	-	
EEE-47xx	Minor-I	3	-	3	-	
EEE-47xx	Minor-I Sessional	-	3	-	1.5	
URIH-4701	A Survey of Islamic History and Culture	2	-	1	-	-
LAW-4723	Professional Ethics and Law	2	-	2	-	
Total	(7+4) Courses	**17**	**13**	**16**	**6.5**	**Total=22.5 CH**

Viii EIGHTH SEMESTER

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-4860	Project / Thesis	-	4	-	2	
EEE-48xx	Major-III	3	-	3	-	
EEE-48xx	Major-III Sessional	-	3	-	1.5	
EEE-48xx	Major-IV	3	-	3	-	
EEE-48xx	Interdisciplinary-I	3	-	3	-	
EEE-48xx	Interdisciplinary-I Sessional	-	3	-	1.5	
EEE-48xx	Interdisciplinary -II	3	-	3	-	
EEE-48xx	Interdisciplinary -II Sessional	-	3	-	1.5	
EEE-4822	General viva-voice	1	-	1	-	
URBS-4802	Bangladesh Studies and History of the Independence	2	-	2	-	-
Total	(6+3) Courses	**15**	**13**	**15**	**6.5**	**Total=21.5CH**

Grand Total = 161 CH

18. Semester wise Elective Courses

Major-I & Major-I Sessional:

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**	Prerequisite Courses
		Theory	Practical	Theory	Practical		
EEE-4705	Power Electronics	3	-	3	-	PSE	EEE-2411
EEE-4706	Power Electronics Sessional	-	3	-	1.5	PSE	
EEE-4723	Microwave Engineering	3	-	3		CE	EEE-3601
EEE-4724	Microwave Engineering Sessional	-	3	-	1.5	CE	
EEE-4753	VLSI I	3	-	3	-	EE	EEE-3607
EEE-4754	VLSI I Sessional	-	3	-	1.5	EE	

Major-II:

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**	Prerequisite Courses
		Theory	Practical	Theory	Practical		
EEE-4707	Power Plant Engineering	3	-	3	-	PSE	EEE-2401
EEE-4713	Compound Semiconductor & Heterojunction Devices	3	-	3	-	EE	EEE-3607
EEE-4715	Digital Signal Processing II	3	-	3	-	CE	EEE-3603

Minor-I & Minor-I Sessional:

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**	Prerequisite Courses
		Theory	Practical	Theory	Practical		
EEE-4705	Power Electronics	3	-	3	-	PSE	EEE-2411
EEE-4706	Power Electronics Sessional	-	3	-	1.5	PSE	
EEE-4723	Microwave Engineering	3	-	3		CE	EEE-3601
EEE-4724	Microwave Engineering Sessional	-	3	-	1.5	CE	
EEE-4753	VLSI I	3	-	3	-	EE	EEE-3607
EEE-4754	VLSI I Sessional	-	3	-	1.5	EE	

Major-III & Major-III Sessional:

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**	Prerequisite Courses
		Theory	Practical	Theory	Practical		
EEE-4801	Power System Protection	3	-	3	-	PSE	EEE-3519
EEE-4802	Power System Protection Sessional	-	3	-	1.5	PSE	
EEE-4833	Digital Communication	3	-	3	-	CE	EEE-3601
EEE-4834	Digital Communication Sessional	-	3	-	1.5	CE	
EEE-4809	VLSI II	3	-	3	-	EE	EEE-4753
EEE-4810	VLSI II Sessional	-	3	-	1.5	EE	

Major-IV:

Course Code	Course Title	Contact Hours/Week		Credit Hours		**Discipline**	Prerequisite Courses
		Theory	Practical	Theory	Practical		
EEE-4807	High Voltage Engineering	3	-	3	-	PSE	EEE-3519
EEE-4837	Telecommunication Engineering	3	-	3	-	CE	EEE-3601

EEE-4811	Opto-Electronics	3	-	3	-	EE	EEE-2411

Interdisciplinary-I & Interdisciplinary-I Sessional:

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-4827	Measurement and Instrumentation	3	-	3	-	EEE-2411
EEE-4828	Measurement and Instrumentation	-	3	-	1.5	
EEE-4825	Biomedical Instrumentation	3	-	3	-	EEE-4701
EEE-4826	Biomedical Instrumentation Sessional	-	3	-	1.5	
EEE-4841	Antenna & Propagation	3	-	3	-	EEE-
EEE-4842	Antenna & Propagation Sessional	-	3	-	1.5	

Interdisciplinary-II & Interdisciplinary-II Sessional:

Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
EEE-4843	Renewable Energy System	3	-	3		
EEE-4844	Renewable Energy System Sessional	-	3	-	1.5	
EEE-4845	Embedded System	3		3		EEE-3505
EEE-4846	Embedded System Sessional		3		1.5	
EEE-4847	Optical Fiber Communication	3	-	3	-	EEE-3601
EEE-4848	Optical Fiber Communication Sessional	-	3	-	1.5	

19. Synopsis of the Courses
A. Basic Science Courses

Course Code: **MATH-1107** **Course Title:** **Mathematics I (Differential and Integral Calculus)**
Contact Hours: **3** **Credit Hours:** **3 per Week**

Objectives: 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.
Outcome: Upon the successful completion of the course, students will be able to generate a framework for a model in which there is change, and a way to deduce the predictions of such models. Applying the concept of integration the areas bounded by curves can be evaluated and real world problems can be solved through calculus.

Section-A (Mid-term: 30 Marks)

1. **Functions**, Limit, Continuity and Differentiability, Physical meaning of derivative of a function, Indeterminate Forms.
2. **Differentiation**, Successive differentiation and Leibniz theorem
3. **General Theorems** and Expansions: Rolle's Theorem, Mean Value Theorem, Taylor's Theorem and Maclaurian's Theorem.

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

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

Group-B (30 Marks)

6. **Definite integral**: Fundamental theorem, general properties, and evaluations of definite integral and reduction formula, definite integral as the limit of a sum, Integration by method of successive reduction, Gamma and Beta Function.
7. **Multiple Integral**: Jacobian theorem, Double Integral, Change of order of integration, triple Integral, Physical Application of double and triple integral. Quadrature, Determination of length of curves, Finding Area of a region,
8. **Integration by Revolution**: Areas of surfaces of revolution, Volumes of solids of revolution. Solving Real world problems through calculus.

Reference Books:

1.	Thomas, Finey	Calculus and analytic geometry
2.	Sherman K. Stein	Calculus and analytic geometry
3.	K.A. Stroud	Engineering Mathematics
4.	P. K. Bhattacharjee	Differential Calculus
5.	P. K. Bhattacharjee	Integral Calculus
6.	Howard Anton	Calculus A New Horizon
7.	Erwin Kreyszig	Advanced Engineering Mathematics
8.	Abu Yusuf	Differential Calculus
9.	Das & Mukherjee	Differential Calculus

Course Code: MATH-1207 **Course Title: Mathematics-II (Geometry & Differential Equations)**

Credit Hours: 3 **Contact Hours: 3 per Week**

[Pre requisite: MATH-1107]

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.

Outcomes: 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.

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) problemsusing 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

Recommended Books: (Geometry)

1. Thomas, Finey :Calculus and analytic geometry
2. K.A. Stroud :Engineering Mathematics
3. P. K. Bhattacharjee :Co-ordinate geometry and vector analysis
4. M. L. Khanna :Solid geometry
5. JT bell :Coordinate Geometry

Recommended Books: (Differential Equations)

1. Merle C Potter : Advanced Engineering Mathematics
2. K.A. Stroud : Engineering Mathematics
3. F Ayrs : Differential Equation
4. K.A.Stroud : Further Engineering Mathematics

5. BhuDev.Sharma : Differential Equations
6. Gupta,Kumar,Sharma : Differential Equations
7. Schaum's easy Outlines : Differential Equations

Course Code : MATH-2309 **Course Title: Mathematics III (Linear Algebra, Matrices and Vector Analysis)**

Credit Hours: 3 **Contact Hours: 3 per Week**

[Pre requisite: MATH-1207]

Objectives: In this course student will learn about 'Mathematics' in regards to vector spaces and subspaces, basis and dimension and linear mappings, inner product spaces, matrix and linear system of equations, characteristic equation and diagonalization, vector analysis, del operator, vector integration and vector's theorem.

Section-A

(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 non-singular mappings, Linear mapping and systems of linear equations.
3. **Inner Product Spaces:** Inner product spaces, Cauchy-Schwarz inequality, Orthonormal sets, Gram-Schmidt orthogonalization process, Application of Linear algebra in electric network.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. **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.
5. **Characteristic equation and Diagonalization:** Eigen values and eigenvectors, characteristic polynomial, Caley-Hamilton theorem, Diagonalization of matrices and symmetric matrices, Characteristics roots.

Group-B (30 Marks)

6. **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.
7. **Del operator and Vector Integration:** Del operator, gradient, divergence and curl and their physical significance, Line Integrals, physical significance of Vector integration and Problems.
8. **Vector's Theorem:** Greens, Gauss & Stocks theorem and their applications, Vector components in spherical and cylindrical systems.

Recommended Books:

1	Seymour Lipschutz (SOS)	Linear Algebra
2	Murray R. Spiegel (SOS)	Vector Analysis
3	P.N. Chattarjee	Matrices
4	Seymour Lipschutz (SOS)	Linear algebra
5	P.N. Chattarjee	Matrices
6	Richard Bronson	Linear algebra
7	Schaum's Outline Series	Matrices

Course Code: MATH-2409 **Course Title: Mathematics IV (Complex Variable, Lap laces and Fourier Analysis, Z-transform)**

Credit Hours: 3 **Contact Hours: 3 per Week**

[Pre requisite: MATH-2309]

Objectives: In this course student will learn about 'Mathematics' in regards to complex variable, complex transformations, complex integration, residue and contour integration, Laplace transforms, convolution, Fourier series and transform**.**

Outcome: On completion of this course students will be expected to :

1. understand the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations
2. evaluate integrals along a path in the complex plane and understand the statement of Cauchy's Theorem
3. compute the Taylor and Laurent expansions of simple functions
4. Identify the isolated singularities of a function and determine whether they are removable, poles, or essential
5. use the Cauchy Residue Theorem to evaluate integrals
6. Calculate the Laplace transform of standard functions both from the definition and by using tables
7. Select and use the appropriate shift theorems in finding Laplace and inverse Laplace transforms.
8. Select and combine the necessary Laplace transform techniques to solve ordinary differential equations
9. Analyze and synthesize signals using Fourier series and transform
10. analyze and solve problems related to engineering applications such as the wave equation, heat equation ,diffusion using Fourier transform
11. obtain the complex exponential Fourier series of a function and know how the complex Fourier coefficients are related to the Fourier cosine and sine coefficients
12. Recognize even and odd functions and use the resulting simplifications for Fourier series and transforms.
13. to understand the discrete transform applied to Engineering problems
14. Compute the Z transform of elementary sequences both from the definition and by using tables
15. Analyze continuous-time and discrete-time systems with z-transform express a convolution mathematically and explain its function and relationship to measurement processes

Section-A

(Mid-term Exam: 30 Marks)

1. **Complex variable:** Complex numbers and their properties, functions of a complex variable, DeMoivre's Theorem and its applications**,** Limit, Continuity and differentiability, Differentiation of a complex function, Analytic function, Necessary and sufficient condition to analytic, Cauchy-Riemann Equation.
2. **Complex Transformations:** Orthogonal curves, Harmonic functions, Method of finding conjugate functions, Milne Thomson method, Transformations, Conformal transformations, Bilinear transformations.
3. **Complex Integration:** Complex Integration, Cauchy's integral theorem, Cauchy integral formula, Liouville's theorem, Taylor's theorem.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. **Residue and Contour Integration:** Singular point, Residue, Method of finding residue, Residue theorem, Contour integration.
5. **Laplace transforms**: Definition, Laplace transforms of different functions, inverse Laplace transforms, shifting and change of scale property, Laplace transforms of derivatives.

Group-B (30 Marks)

6. **Convolution:** Unit Step Function, Impulse Function, Periodic functions, Ramp Function, Sketch Waveform, convolution theorem.

7. **Fourier series**: Fourier series, Trigonometric form and Complex form of Fourier series and Fourier Integral, Physical Application of Fourier Series.
8. **Transform:** Fourier transforms, Z transforms.

Recommended Books:

1	Glyn James	Advanced Modern Engineering Mathematics
2	Michael D. Greenberg	Advanced Engineering Mathematics
3	K.A.Stroud	Further Engineering Mathematics
4	H. K Das	Advanced Eng. Mathematics
5	M. R Spigel	Advanced Calculus
6	M. R. Spigel	Complex Variable
7	Laplaces Transformation	(SOS)

Course Code: STAT-2303 **Course Title: Probability & Statistics**
Credit Hours: 2 **Contact Hours: 2 per Week**

Objectives: The objective of 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.

Outcome: By completing this course the student will learn to perform the following:
- Identify the role that statistics can play in the engineering problem-solving process.
- How variability affects the data collected and used for making engineering decisions.
- Be able to compute and interpret the results of correlation and regression.
- How to apply probability and its distributions to various engineering problems.
- Understand the hypothesis testing and estimation

Section –A (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.

Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)

4. **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.
5. **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.

Group-B (30 Marks)

6. **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.
7. **Probability Distributions:** Binomial distribution, Poisson distribution and Normal distribution – Their properties, uses, Theorems & Problems.
8. **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.

Recommended Books:

1	Douglas C. Montgomery	Applied Statistics and Probability for Engineers
2	R.N. Shill & S.C. Debnath	An introduction to the theory of Statistics
3	M.G. Mostafa	Methods of Statistics
4	Walpole and Myers	Probability & Statistics for Engineers & Scientists
5	M.K. Roy and J.C Paul	Business Statistics
6	Alberto Leon-Garcia	Probability, Statistics, and Random Processes for Electrical Engineering
8	M.K.Roy	Fundamentals of Probability and Probability Distribution

Course Code: PHY-1101 **Course Title: Physics I (Mechanics, Waves and Thermodynamics)**
Credit Hours: 3 **Contact Hours: 3 per Week**

Objectives: In this course student will learn about 'Physics' in regards to the dynamics of rigid body, gravity and gravitation, elasticity, surface tension, fluid dynamics and viscosity, waves and oscillations, thermodynamics and optics.

Outcome: Upon completion of a Course of Study, students should be able to demonstrate:

- an ability to apply knowledge of mathematics, science and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to identify, formulate, and solve physics and engineering problems.
- the board education necessary to understand the impact of physics and engineering solution in a global, economic, environmental, and societal context.
- An ability to use the techniques, skills and modern tools necessary for physics and engineering careers.

Section –A (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.

Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)

4. **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.

5. **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.

Group-B (30 Marks)

6. **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.
7. **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.
8. **Optics:** Theories of light, interference of light, Young's double slit experiment, Fresnel and Fraunhoffer diffraction, diffraction of single slit, polarization of light, Production and analysis of polarized light, Brewster's law, Malu's law.

Recommended Books:

[1] R. Resnick and D. Halliday, K. S. Krane, *Physics (Volume I), 5th edition,* New Delhi: Wiley Eastern Private Ltd., 2014, p. 546.
[2] Brij Lal & Subrahmanyam, *Properties of matter,* 15th edition, Eurasia publishing house (Pvt.) Ltd, New Delhi, 2007, p. 574.
[3] Brij Lal & Subrahmanyam, *Heat and Thermodynamics,* 9th edition, S. Chand & Company Ltd, New Delhi, 2007, p. 453.
[4] Brij Lal & Subrahmanyam, *A text book of Optics,* 11th edition, S. Chand & Company Ltd, New Delhi, 2003, p. 668.
[5] D.S Mathur, *Elements of Properties of matter,* 27th edition. Shyamlal Charitable Trust, New Delhi, 2009, p.413.
[6] Dr. G. Ahmed, *Physics for Engineers-I,* 1st ed. Dhaka: Hafiz Book Centre, 2009, p. 910.

Course Code: PHY-1201 **Course Title: Physics II (Electromagnetism, Optics and Modern Physics)**

Credit Hours: 3 **Contact Hours**: **3 per Week**

[Pre requisite: PHY-1101]

Objectives: In this course student will learn about 'Physics' in regards to charge and electric potential, magnetic field, electromagnetic induction, current and resistance, structure of matter, relativity, modern physics and radioactivity

Outcome: Upon completion of Physics-II accredited program in Electrical and Electronics Engineering, the graduate should be able to:

- apply general math, science and engineering skills to the solution of engineering problems.
- design and conduct experiments, as well as to analyze and interpret data.
- identify, formulate, and solve engineering problems.
- understand of professional and ethical responsibility.
- communicate effectively while speaking, employing graphics and writing.
- understand the importance of life-long learning.
- use techniques, skills, and modern engineering tools necessary for engineering practice.
- communicate scientific ideas concisely, accurately and informatively both in writing and orally.

Section –A (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 and its application in CRT.
3. **Electromagnetic Induction:** Faraday's law of electro-magnetic induction, Lenz's law, self and mutual induction, energy density in the magnetic field.

Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)

4. **Current and Resistance:** Current and current density, Ohm's law, potential difference, RC circuits, generation of alternating current and e.m.f.
5. **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.

Group-B (30 Marks)

6. **Relativity:** Postulates of special theory of relativity, Lorentz transformation, time dilation and length contraction, relativity of mass, energy-mass relation, energy- momentum relation**.**
7. **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.
8. **Radioactivity:** Definition, radioactive decay laws, half-life, mean life, alpha decay, beta decay, gamma decay, cross section, nuclear fission & fusion.

Recommended Books:

[1] M.C.Saxena, V.P. Arora, and S. Prakash, *Electricity and Magnetism,* 15th ed. Meerut: Progoti Prokashon, 1972, p. 554.
[2] A.K. Rafiqullah, M.S. Huq, and A. K. Roy, *Concept of Electricity and Magnetism,* Dacca: Student's Publications, 1969, p. 482.
[3]B. Lal and N. Subrahmanyam, *Atomic and Nuclear Physics,* New Delhi: S. Chand and Company Ltd., 1984, p. 265.
[4] B. Lal and N. Subrahmanyam, *A text book of Optics,* New Delhi: S. Chand and CompanyLtd., 1966, p. 668.
[5]R. Resnick and D. Halliday, *Physics (Part II),* New Delhi: Wiley Eastern Private Ltd., 1960, p. 1214.
[6]A. Beiser, *Concepts of Modern Physics,* 6th ed. New Delhi: TATA Mc.GR-HILL EDITION, 1963, p.542.
[7] B.L Theraja ,*Modern Physics*, New Delhi: S. Chand and Company Ltd., 1985.
[8]G. Ahmed, *Physics for Engineers-II,* 1st ed. Dhaka: Hafiz Book Centre, 2009, p. 910.
[9]S. Prakash, *Relativistic Mechanics,* Meerut: PragatiPrakashan, 2000.

Course Code: PHY-1204 **Course Title: Physics Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: In this students will perform experiments to verify practically the theories and concepts develop in PHY1201.

Course Code: CHEM-2301 **Course Title: Chemistry**
Credit Hours: 3 **Contact Hours: 3 per Week**

Objectives: The objective of this course is

1. To classify matter by its state and bonding behavior using the Periodic Table as a reference.
2. To make predictions about the atomic structure and chemical properties of the elements based in their position in the periodic table.

3. To identify the patterns in bonding, molecular geometry, and chemical reactions.
4. To understand the principles of kinetics and thermodynamics as applied to the rates and equilibrium positions of chemical reactions.
5. To use quantitative measures of solution concentration in describing colligative, acid-base, solubility, and electrochemical principles of aqueous solutions.
6. To apply quantitative reasoning skills to determine quantities of matter and energy involved in physical and chemical changes.
7. To explain the physical properties of solids, liquids, gases, and solutions.

Outcomes: After studying this course, students will be able to

1. Compare and contrast the chemical behavior and physical properties of common substances.
2. Substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
3. Design economically and new methods of synthesis nano-materials.
4. Apply their knowledge for protection of different metals from corrosion.
5. Explain the behavior of, and interactions between, matter and energy at the atomic and molecular levels.
6. Differentiate between pure substances (elements and compounds) and mixtures (homogeneous and heterogeneous)
7. Define colloid and give examples of colloids: foams, gels, smoke
8. Classify common elements as metals, non-metals and semi-metals and describe the properties of each class

Section –A (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.

Section-B (Final Exam-50 Marks)

Group-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.

Group-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,

Recommended Books:

1	R. D. Madan	: Modern Inorganic Chemistry
2	M.M. Haque and M.A. Nawa	: Principles of Physical Chemistry
3	E.S Gilreath	: Fundamental Concepts in Inorganic Chemistry.

Course Code: Chem-2304 **Course Title: Chemistry Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

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.

B. Core Courses

Computer Science (CSE)

Course Code: CSE-1105 **Course Title: Computer Programming I**
Credit Hours: 2 **Contact Hours: 2 per Week**

Objectives:

1. To gain experience about structured programming
2. To help students to understand the implementation of C language
3. To understand various features in C

Outcome: At the end of the course students will be able to

1. Solve the given problem using the syntactical structures of C language
2. Develop, execute and document computerized solution for various problems using the features of C language
3. To read and write C program that uses pointers, structures and files

Section-A (Mid-term Exam: 30 Marks)

1. **Introduction to digital Computers:** Basic organization and functional units of computer – Input, Output, Memory and Central Processing Unit ; Different number systems & their conversion ; Basic concepts of logic gates, truth table.
2. **Computer Programming**: Definition of software, its classification; Problem solving steps; Flow charts;
   Introduction of C: history and Characteristics of C, Identifiers and keywords, data types, constants, variables, statements, symbolic constant
3. **Operators:** arithmetic, unary, relational, logical, assignment, conditional operators; precedence of operators, expressions, type conversions, bitwise operations.
   Input and Output: Managing data input (scanf, getchar, gets etc), Managing data output (printf, putchar, puts etc), formatted input and output

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. **Control statements:** Branching- *If* and *if… else* statements, nested if, *switch statement* ; Looping- *while*, *do…while* and *for* looping statements, Jumps in loops, g*oto* statement, *break* and *continue statement.*
5. **Function:** defining a function, accessing a function, function prototypes, passing arguments to a function, Recursions, Storage class

Group-B (30 Marks)

6. **Array:** defining an array, processing an array, passing arrays to functions, Multidimensional array, String, Array of Strings;
7. **Structure**: defining a structure, processing a structure, structure and pointers, passing structures to functions, self referential structure, Union, Enumeration
8. **Pointers**: pointer declarations, operations on pointers, Pointers and arrays, Pointers and functions, Dynamic memory allocation
   File: opening and closing a file, creating a file, processing a file

Recommended Books:

[1] Gottfried, B. Schaum's Outline of theory and problems of programming with C. New York: Mcgraw-Hill, 2007.
[2] Kernighan, B. and Ritchie, D. (2011). The C programming language. Englewood Cliffs, N.J.: Prentice-Hall
[3] Schildt, H. Turbo C/C++. Berkeley: McGraw-Hill, 1992.
[4] Deitel, P. C How to Program. Pearson Education Limited, 2006.
[5] Balagurusamy, E. Programming in ANSI C. Tata McGraw-Hill Education, 2002.
[6] Schildt, H. Teach Yourself C. Tata McGraw-Hill Education, 1998.
[7] Lafore, R. C Programming using Turbo C++. Sams Publication, 1993. p. 778.
[8] Summit, S. C Programming FAQs. Pearson Education India, 2007. p.376.

Course Code: CSE-1106 **Course Title: Computer Programming I Sessional**
Credit Hour: **1** **Contact Hour: 2 per week**

Objectives: In this course students will learn programming using basic "C programming software" and perform the applications of the theories learned in CSE-1105 course.

Course Code: CSE-1205 **Course Title: Computer Programming II**
Credit Hours: 2 **Contact Hours: 2 per Week**
[Pre requisite: CSE-1105]

Course Objectives:

1. Be familiar with basic techniques of algorithm analysis.
2. Be familiar with writing recursive methods.
3. Master the implementation of linked data structures such as linked lists and binary trees.
4. Be familiar with advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure.
5. Be familiar with several sub-quadratic sorting algorithms including quicksort, mergesort and heapsort.
6. Be familiar with some graph algorithms such as shortest path and minimum spanning tree.
7. Master analyzing problems and writing program solutions to problems using the above techniques

Course Learning Outcome:

1. Gain the basic knowledge on Object Oriented concepts.
2. Ability to develop applications using Object Oriented Programming Concepts.
3. Ability to implement features of object oriented programming to solve real world problems.
4. an understanding of the concepts of inheritance and polymorphism.

5. an ability to overload operators in C++.
6. an understanding of the difference between function overloading and function overriding.
7. an ability to incorporate exception handling in object-oriented programs.

Section-A (Mid-term: 30 Marks)

1. Introduction: Definition of OOP, Introduction to Classes and Objects, Basic concept of Object Oriented Programming, Difference between Structured Programming and Object Oriented Programming, Benefits of OOP, Characteristics of Object Oriented Programming and Application of Object Oriented Programming.

2. Class & Object: Constructor and Destructor, Constructors with parameters, In-line functions, Automatic in-line functions, Passing objects to functions, Returning objects from function, Friend functions.

3. Function Overloading: Overloading function, Constructor Overloading, Copy constructor, Default arguments, Overloading ambiguity

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. Operator Overloading: Binary operator overloading, Unary operator overloading, Operator overloading using friend functions, Limitations of operator overloading.

5. Inheritance: Defining derived classes, Single inheritance, multiple inheritance, multilevel inheritance, Hierarchical inheritance, Virtual base classes.

Group-B (30 Marks)

6. C++ I/O System: Streams, Unformatted I/O, formatted I/O, I/O manipulators, File I/O streams, Opening and closing files.

7. Virtual Functions: Applying Polymorphism using virtual functions, Pure Virtual functions, Abstract classes, early binding, and late binding.

8. Template, Exception Handling and Standard Template Library: Generic functions, Generic classes, Exception handling, Structure of STL, Generic Containers (C++ string class, vector, deque, list, stack, queue, priority_queue, pair, map etc.), Generic Algorithms (find, binary_search, sort etc.).

Recommended Books:

[1] Lafore, R. Object Oriented Programming in C++. Sams Publication, 2002. p. 1012.
[2] Schildt, H. Teach yourself C++. Tata McGraw-Hill Education, 2008.
[3] Balagurusamy, E. Object-Oriented Programming with C++. McGraw-Hill Education India. 2013.
[4] Irvine, K. R. C++ and Object-oriented Programming. Prentice Hall, 1997. p. 526.
[5] Eckel, B. Thinking in C++. Prentice Hall, 2000. p. 814.
[6] Stroustrup, B. The C++ Programming Language. Addison-Wesely, 2013.
[7] Schildt, H. C++: The Complete Reference. McGraw-Hill Education, 2012. p. 1200.
[8] Hubbard, J. Programming with C++. McGraw-Hill Education, 2000. p. 432.
[9] Horton, I. Beginning C++ - The Complete Language. Apress, 2004.

Course Code: CSE-1206 **Course Title: Computer Programming II Sessional**
Credit Hours: 1 **Contact Hours: 2per week**

Objective: In this course students will learn programming using advance programming software and perform the use of the concepts learned in CSE-1205 course.

Mechanical Engineering and Drawing

Course Code: ME-2301 **Course Title: Fundamental of Mechanical Engineering**
Credit Hours: 2 **Contact Hours: 2 per Week**

Objectives:

1. To familiarize with fuels and Calculate Calorific Value.
2. To understand basic functions of Steam Generator and its safety measure.
3. Introducing different parts and types of IC engine along with maintenance factors.
4. Design different combinations of gas turbine.
5. To familiar and design Refrigeration & Air conditioning System with applications.
6. To learn different Turbines functions and principles.
7. Understanding the basic principles of Pumps, fans, blowers and compressors.

Outcome: After Completing the course, the students will be able to:

1. Provide current knowledge, ideas and the conceptual framework of Mechanical engineering.
2. Identifying good fuel by calculating Calorific Value and other properties.
3. Select right Steam Generator based on size, power generate and demand with proper handling technique.
4. Differentiate IC Engine based on stroke, fuel use, cycle operate & purpose along with functions and maintenance.
5. Calculate Gas Turbine capacity & efficiency over another engine.
6. Customize refrigerator on the basic of Refrigerant and cycle used.
7. Design Air Conditioning unit according to purpose.
8. Read Psychosomatics chart for solving problems.
9. Differentiate between Impulse and Reaction Turbine.
10. Evaluate basic principles & function of Pumps, fans, blowers and compressors.

Section –A (Mid-term Exam: 30 Marks)

1. Study of fuels: Steam generation units with accessories and mountings.
2. Study of steam generators and steam turbines. Introduction to internal combustion engines and their cycles.
3. Study of SI engines, CI engines and gas turbines with their accessories.

Section-B (Final Exam-50 Marks)

Group-A (20 Marks)

4. Refrigeration and air conditioning with their applications. Study of different refrigeration methods, refrigerants.
5. Refrigeration equipments: compressors, condensers, evaporators, expansion devices, other control and safety devices.

Group-B (30 Marks)

6. Psychosomatics. Study of air conditioning systems with their accessories.
7. Types of fluid machinery. Study of impulse and reaction turbines. Pelton wheel and Kaplan turbines.
8. Sstudy of centrifugal and axial flow machines; pumps, fans, blowers and compressors. Study of reciprocating pumps.

Recommended Books:

1. **R.S Khurmi** **:** A Text Book of Thermal Engineering.
2. Md. Quamrul Islam : Hydraulic Machines.

Course Code: CE-1204 **Course Title: Engineering Drawing Sessional**
Credit Hours: 1 **Contact Hours: 2 per Week**

Objectives: In this course student will learn to sketch (technical) the different view of an object and also learn CAD.

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.

Recommended Books:

1. F. Giesecke, A. Mitchell, H.C. Spencer, I. L. Hill, Robert O: .Engineering Graphics 3rd Edn.

Electrical & Electronic Engineering (EEE)

Course Code: EEE-1101 **Course Title: Electrical Circuits I**
Credit Hours: 3 **Contact Hours: 3 per Week**

Objectives: In this course student will learn about 'Electrical Circuit' in regards to comprehensive idea of circuit variables and elements, simple resistive circuits, techniques of circuit analysis, network theorems, maximum power theorem, energy storage elements, magnetic quantities and magnetic circuits.

Outcome:

Section-A (Mid-term Exam: 30 Marks)

1. **Circuit variables and elements:** Voltage, current, power, energy, independent and dependent sources, and resistance., Kirchhoff's current and voltage laws. Ammeter, Voltmeter, Wattmeter & Other meters.
2. **Simple resistive circuits**: Series and parallel circuits, voltage and current division, wye-delta transformation.
3. **Techniques of circuit analysis**: Mesh and node circuit analysis including super node and super mesh. Reduction of complicated networks.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Network theorems:** Source transformation, Thevenin's, Norton's ,Superposition and Millman'stheorems with applications in circuits having independent and dependent sources.
5. **Maximum power Theorem**: Statement, Prove and Condition (both AC and DC), Reciprocity and Substitution theorems.

Group-B (30-Marks)

6. **Energy storage elements**: Inductors and capacitors, series parallel combination of inductors and capacitors. Responses of RL and RC circuits: Natural and step responses.
7. **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.
8. **Magnetic circuits:** Series, Parallel and series-parallel circuits analysis.

Recommended Books:

1	Boylestad	**:**Introductory Circuit Analysis
2	Alexan and -Sadiku	**:**The fundamentals of Electric Circuit
3.	B.Grob	**: Basic Electronics**
4.	J.A. Edminister	**: Electric Circuits**

Course Code: EEE-1102 **Course Title: Electrical Circuit I Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objective: In this course students will perform experiments to verify practically about the theories learned in the course **EEE-1101**.

Course Code: EEE-1201 **Course Title: Electrical Circuits II**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-1101]

Objectives: In this course student will learn about 'Electric Circuit' in regards to comprehensive idea about alternating current, magnetically coupled circuits, three phase balanced and unbalanced load, resonance, filter, a.c. transients and two port analysis

Section-A (Mid-term Exam: 30 Marks)

1. **Sinusoidal functions**: AC theory, instantaneous current, voltage, power, effective current and voltage, average power, Use of complex quantities in AC circuits
2. **Phasors and complex quantities**: Impedance, real and reactive power, power factor, Vector diagram.
3. **Analysis of single-phase AC circuits:** Series and parallel RL and RC circuits. nodal and mesh analysis, application of network theorems.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Resonance and Passive filters**: Series and parallel RLC resonance circuits'-value and band width, Properties of Symmetrical networks, Filter fundamentals, Low, High, Band pass and Band stop Filters. Band width and cut-off frequency, Double tuned filter, Design conditions and Uses. Bode plots.
5. **Transients and Magnetically coupled circuits:** Transient in RC, RL and RL circuits. Conductive, Capacitive and Magnetic Coupling, Coefficient of Coupling.

Group-B (30-Marks)

6. **Polyphase systems**: The three phase generator, The Y-connected generator and load, the Wye-Delta system, The Delta connected generator and load, Delta-Delta and Delta-Wye three phase system.
7. **Balanced and unbalanced three phase circuit analysis**: The three and two wattmeter methods, unbalanced three –phase four-wire Y-connected load, unbalanced three-phase three wire Y-connected load.
8. **Two-port analysis**: Impedance parameters, Voltage gains, Current gains, Cascaded systems, admittance parameters, Hybrid parameters.

Recommended Books:

1	Alexander &Sadiku	**:** Fundamental of Electric Circuits
2	Kerchner& Corcoran	**:** Alternating Current Circuits, 4th Edition
3	J.D.Ryder	: Networks, line and Fields.
4.	J.A.Edminister	: Electric Circuits
5	R.L.Boylestad	: Introductory Circuit Theory, Prentice-Hall India Pvt. Ltd.

Course Code: EEE-1202 Course Title: Electrical Circuit II Sessional and Electrical workshop
Credit Hours: 1.5 Contact Hours: 3 per week

Objective: In this course students will perform experiments to verify practically about the theories learned in the course **EEE-1201.**

Course Code: EEE-2301 **Course Title: Electronics I**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-1201]

Objectives: In this course student will learn about 'Electronics' in regards to the working principle and characteristics of semiconductor diodes and transistors, BJT, MOSFET, Differential and multistage

amplifiers.

Outcome:

1. An ability to understand the essence of the diode functions, grasp the techniques for the analysis of diode circuits through modeling the diode characteristics, use diodes for various applications, including in design of rectifier circuits.
2. An ability to develop a high degree of familiarity with the MOSFET: its physical structure and operation, terminal characteristics, circuit models, single - stage amplifier configurations and basic circuit applications, analyze and design the basic discrete MOSFET circuits.
3. An ability to analyze the BJT terminal characteristics, utilize the circuit models to perform the small signal analysis of BJT circuits and to design single-stage BJT amplifiers.

Section-A (Mid-term Exam: 30 Marks)

1. **Semiconductor Diodes**: Intrinsic and extrinsic semiconductors, N and P type semiconductor, current-voltage characteristics of a PN junction diode. Simplified dc and ac diode models, dynamic resistance and capacitance.
2. **Diode Circuits**: Half wave and full wave rectifiers, rectifiers with filter capacitor, Voltage doubler, Clippers and clampers circuits. Zener diode and Voltage regulators.
3. **Bipolar Junction Transistors**: Working principle of PNP and NPN transistor, Input and output characteristics of CB,CE, and CC configuration, Load line analysis, Operating point, cutoff and saturation points, Transistor as an amplifier, BJT as a switch. Transistor biasing and stability factor, design of transistor biasing circuit.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Single Stage Transistor Amplifier**: Transistor equivalent circuits (both D.C and A.C). Modeling of Transistor: r_e-model and Hybrid equivalent Model. Small-signal analysis of BJT: Fixed biased, voltage-divider biased and Emitter-Follower Configuration.
5. **Differential and multistage amplifiers**: Description of differential amplifiers, Small-signal operation, differential and common mode gains, RC coupled, Transformer coupled, and Direct Coupled amplifier.

Group-B (30-Marks)

6. **Field-Effect Transistors (FET)**: Construction and classification, Principle of operation, Characteristic curves, Channel conductivity, Channel ohmic and pinch-off region, Characteristic parameters of the FET, Effect of temperature on FET, Common source amplifier, Common drain amplifier,
7. **Metal-oxide-semiconductor field-effect-transistor(MOSFET)**: MOSFET as circuit element, structure and physical operation of an enhancement MOSFET, threshold voltage, Body effect. Current- voltage characteristics of an enhancement MOSFET, MOSFET as a switch.
8. **Biasing and Application of MOSFET**: Biasing discrete and integrated MOS amplifier circuits. VMOS, CMOS inverter. UJT.

Recommended Books:

1	Robert L. Boylestad & Louis Nashelsky	Electronics devices and circuit theory
2	V.K.Mehta & A.K.Mehta	Principle of electronics
3	B.L.Thereja & A.K.Thereja	Basic Electronics solid state
4	Streetman & Banarjee	Solid State electronic device
5	J. J. Milman and C.C.Halkias	Electronics Devices and Circuits

Course Code: EEE-2302 **Course Title: Electronics I Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objective: This course consists of two parts. In the first part, students will perform experiments to verify

practically the theories and concepts develop in EEE-2301. In the second part, students will design simple systems using the principles learned in EEE-2301.

Course Code: EEE-2303 **Course Title: Electrical Machine I**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-1201]

Objectives: In this course students will learn about 'Electric Machine' in regards to working principle, construction, characteristics and maintenance of different types of transformers and motors.

Outcome: On completion of the course students will be expected to:

- Have a good understanding of the fundamental construction and operation of machines.
- Have an understanding of the strengths and weaknesses of many popular machines.
- Understand the mathematical relationships between voltages, current, torque, speed etc of different machines.
- Be able to design and implement various machine learning algorithms in a range of real-world applications.

Section-A (Mid-term Exam: 30 Marks)

1. Transformer: Working principle, Construction, Types- (core type & shell type), Elementary theory for ideal transformer, E.M.F. equation, Transformation ratio, three phase transformer- (Operating principle, Different types of connection).
2. Vector diagram and Equivalent circuit: Transformer with losses but no magnetic leakage, Transformer with winding resistance but no magnetic leakage, Transformer with resistance and leakage reactance, Equivalent circuit of a transformer.
3. Transformer test & Performance: Voltage regulation, Transformer tests- (open-circuit & short-circuit test), Losses in a transformer, Efficiency & condition for maximum efficiency, Instrument transformer- (current & voltage Transformer).

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

4. **DC generators**: Working Principle of generators, Different types of DC generators, General Voltage Equation, no-load voltage characteristics and Application of DC generators. Build-up of a self-excited shunt generator, critical field resistance, load-voltage Characteristic.
5. DC generator characteristics: Effect of speed on no-load and load characteristics and voltage regulation. Shunt generator and compound generator. Parallel operation, winding connection of DC generator

Group-B (30-Marks)

6. DC motors: Operating differences between motors and generators, Torque, counter emf, speed and torque-speed characteristics, starting and speed regulation, Uses of DC motors.
7. Induction motor: Theory of operation, Advantage, Disadvantage, Construction, Production of rotating field- (two-phase & three-phase supply) & mathematical proof, Rotation principle, Slip, Frequency of rotor current.
8. Equivalent circuit: Induction motor as a generalized transformer, Equivalent circuit of the rotor, Equivalent circuit of the motor, Determination of G_0 & B_0, No load test, Blocked rotor test.

Recommended Books:

[1] B.L. Theraja & A.K Theraja, A Text Book of Electrical Technology (Volume II), S Chand, Twenty Third edition (1 January 1959), Pages-1568.

Course Code: EEE-2305 **Course Title: Numerical Techniques**
Credit Hours: 1 **Contact Hours: 1 per Week**
[Pre requisite: CSE-1105]

Objectives: In this course student, will learn about 'Numerical Methods' numerical errors calculation, solution of non-linear equation, interpolation, numerical differentiation and integration curve fitting and solution of differential equation.

Section-A (Mid-term: 30 Marks)

1. **Numerical Method:** What is numerical methods, Numerical Methods and Engineering Practice. Accuracy and Precision, Error definitions- Error Estimates for Iterative Methods.

2. Roots of non-linear equations- Bracketing Method: roots of a non-linear equation, Graphical method of determining roots, Bisection method, False position method.

3. Roots of non-linear equations- Open Method: Simple fixed-point iteration, Newton-raphson method, Secant Method.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. System of linear equations: Definition, Review of Matrix, Matrix inversion method, Gauss Elimination method, Gauss-Jordan method.

5. Linear Curve fitting: Definition, importance of curve fitting, Least square regression- linear regression.

Group-B (30 Marks)

6. Numerical differentiation: Definition, Derivatives using Newton's Forward and Backward difference and Central difference interpolation formulas.

7. Numerical Integration: Definition, General Quadrature formula, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule.

8. Numerical Solution of ordinary differential equations: Review of Differential equation, Taylor's series method, Euler's method.

Recommended Books:

1	S. S. Sastry.	Introductory Methods of Numerical Analysis
2	V. Rajaraman	Computer Oriented Numerical Methods
3	J. B. Scarborough	Numerical Mathematical Analysis
4	K. Sankara Rao	Numerical Methods for Scientists and Engineers
5	Steven C. Chapra & Raymond P. Canale	Numerical Methods for Engineers

Course Code: EEE-2306 **Course Title: Numerical Techniques Sessional**
Credit Hours: 1 **Contact Hours: 2 per Week**

Objectives: In this course students will perform experiments to verify practically about the theories learned in the course **EEE-2305.**

Course Code: EEE-2401 **Course title: Electrical Machine II**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-2303]

Objectives: In this course student will learn about 'Electric Machine' in regards to working principle, construction, operation of AC Machine along with their characteristics and stability.

Outcome: After finishing this course the students will have elaborated theoretical knowledge, ideas and information about all kind of AC machines including their construction, working principles, operations, characteristics, pros & cons and their applications.

Section-A (Mid-term Exam: 30 Marks)

1. Torque and speed: Relation between torque and rotor power factor, Starting torque, Effect of supply

voltage on starting torque, Rotor EMF, reactance & torque under running condition & condition for maximum torque, Relation between torque and slip, Effect of change in supply frequency on torque and speed, Torque/Speed curve, Shape of Torque/Speed curve, Relation between starting and full load torque.

2. Power output : Power stages in an Induction motor, Equation of shaft torque, Equation of gross torque, mechanical power & rotor output,

3. Starter and Speed Control induction motor: General principle, Double field revolving theory, Starting of Induction motor- (direct switching, primary resistors & star-delta starter), Making it self-starting (split phase & capacitor start), Equivalent circuit (with & without Cu loss), Speed control of Induction motors.

Section-B (Final Exam : 50 Marks)

Group-A (20 Marks)

4. Synchronous generator: Construction, rotor speed & frequency, EMF generation, excitation systems, equivalent circuit, loads factors affecting voltage regulation, maximum power output. Synchronous impedance, synchronous impedance method of predicting voltage regulation and its limitations, parallel operation: Necessary conditions, synchronizing,

5. Synchronous motor: Operation, effect of loading under different excitation condition, effect of changing excitation, V-curves and starting, Circulating current and vector diagram.

Group-B (30 Marks)

6. Universal motor: Introduction, Type, Construction, Operation, Speed/Load characteristics, Applications, Reversal of rotation, Speed control. **Permanent Magnet DC motor:** Introduction, Construction, Operation, Properties of Permanent magnets, Types of permanent magnets used for motor, Performance, Speed control, Advantage, Disadvantage, Application, Elementary theory, Equation for Maximum power. **Brushless DC motor:** Introduction, Disadvantage of Brush, Advantage of BLDC, Disadvantage, Application, Comparison of conventional and brushless DC motor, Drive circuit:- (unipolar & bipolar).

7. Stepper motor: Introduction, Advantage, Step angle, Resolution, Speed, Application, Types: - (variable reluctance, permanent magnet, hybrid), Variable reluctance stepper motor: - (construction, full-step operation, 2-phase on mode, half-step operation).**Permanent Magnet Synchronous motors:** Introduction, Types of magnets used, Classification, Advantage, Application.

8. Synchros: Introduction, Types, Application: - (torque transmission, error detection), Control differential transmitter, Control differential receiver. **Linear motor and traction:** Introduction, Linear induction motor: - (construction, operation, types, disadvantage, application); Magnetic levitation.

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Recommended Books:

1	B.L. Thereja & A.K.Thereja	: A text book of Electrical technology (Vol-II)-
2	Rosenblat & Friedman	: Direct & Alternating current Devices
3	Stephen J. Chapman	: Electric Machinery Fundamentals

Course Code: EEE-2402 **Course Title: Electrical Machine Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: In this course students will perform experiments to verify practically about the theories learned in the course **EEE-2303 & EEE-2401.**

Course Code: EEE 2407 **Course Title: Digital Electronics**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-2301]

Objectives: In this course student will learn about ‘ Digital Electronics’ in regards to introduction to number systems, minimization of Boolean functions, implementation of basic static logic gates in CMOS and BiCMOS, power optimization of basic gates and combinational logic circuits, combinational logic with MSI and LSI, sequential Logic, counter design and register and memory unit.

Outcome: This course will provide a fundamental knowledge of designing and analysis of digital systems. Student will be familiar with number system, Boolean algebra, Boolean function, logic gates, different logic families, truth table and simplification methods of Boolean function which are the fundamental tools of designing combinational circuit. Student will also learn about different flip-flops that are the basic unit of designing sequential circuit like counters, shift registers etc. Student will able to find the state table, state diagram and state equation from any sequential circuit; also they will be able to design any sequential circuit from a given state diagram. They will get a clear concept of designing shift registers, synchronous and asynchronous counters. The basic knowledge of digital circuit design will be helpful to understand the structure of microprocessor, microcomputer and microcontroller.

Section A (Mid-term Exam: 30 Marks)

1.Introduction to number systems : Binary, Octal, hexadecimal Numbers, Number Base Conversions, Complements, Binary Codes, Basic logic functions, Boolean Algebra, Canonical and standard forms, BCD numbers, Digital logic gates, Digital logic families (DTL,RTL,TTL,ECL,MOS)

2.Minimization of Boolean Functions*:* Forms of Boolean functions, Shannon's theorem, Minimization of Boolean functions using Karnaugh map, Quine Mclusky method, Iterative consensus method, Implementation of switching functions (Using various gates: NOR, NAND, AND - OR- INVERT).

3. Implementation of basic static logic gates in CMOS and BiCMOS: DC characteristics, noise margin and power dissipation; Combinational Logic: Design of combinational circuits (Adders, Subtractors, Code Conversion)

Section B (Final Exam: 50 Marks)

Group A (20 marks)

4. Power optimization of basic gates and combinational logic circuits: Modular combinational Circuit Design; pass transistor, pass gate, Half adder, Full adder, multiplexer, demultiplexer and their implementation in CMOS.

5. Combinational logic with MSI and LSI: Difference between combinational circuits and sequential circuits, Decoder, encoder, comparators, binary arithmetic elements and ALU design; Programmable logic devices: logic arrays, field programmable logic arrays and programmable read only memory.

Group B (30 Marks)

6. Sequential Logic: Difference between combinational circuits and sequential circuits, Types of sequential circuit, Flip-Flops (Basic flip-flop circuit, clocked RS flip-flop, D flip-flop, JK flip-flop, T flip-flop), Triggering of Flip-flop, Analysis of clocked sequential circuits (state table, state diagram, state equations), state reduction, state assignment.

7.Counter Design: Types of counters, Design of synchronous and asynchronous counter, MOD number, Propagation delay in Ripple counter, ,Ring counter, The Johnson Counter, Asynchronous down counter, Digital clock.

8.Register and Memory unit*:* Basic shift register, Serial In/Serial out shift registers, Serial In/Parallel out shift register, Parallel In/Serial out shift register, Bidirectional shift register, Integrated circuit memory, Magnetic-core memory.

Recommended Books:

1	M. Morris Mano	Digital Logic and Computer Design
2	Md. Mozammel Huq Azad Khan	Digital Logic Design
3	Ronald J Tocci	Digital systems principle and application
4	Stephen Brown, Zvonko Vranesic.	Fundamentals of Digital Logic with Verilog Design, 2nd Edn
5.	V.K.Jain	Switching Theory and Digital Electronics
6.	S.C.Lee	Digital Circuits and Logic Design.

Course Code: EEE-2408 **Course Title: Digital Electronics Sessional**

Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts developed in EEE-2407. In the second part, students will design simple systems using the principles learned in EEE-2407.

Course Code: EEE-2411 **Course Title: Electronics II**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-2301]

Objectives: In this course student will learn about 'Electronics' in regards to working principle, operational characteristics of operational amplifiers, oscillators, power amplifiers, feedback amplifiers, active filter , optoelectronic and microwave devices**.**

Outcome:

1. Ability to design Op-Amp circuits to perform operations such as integration, differentiation and filtering on electronic signals.
2. Ability to design different type of power amplifiers.
3. Be introduced to the concepts of both positive and negative feedback in electronic circuits.
4. Learn how negative feedback is used to stabilize the gain of an Op-Amp-based amplifier and
5. How positive feedback can be used to design an oscillator.
6. Ability to design different filters (both active and passive).

Section-A (Mid-term Exam: 30 Marks)

1. **Operation Amplifier**: Introduction to operational amplifier, Input signal modes of Op-amp, CMRR, Op-amps with negative feedback, Inverting and Non inverting Amplifier. Frequency response of Op-amp, IC- Op-amp, Application of op-amp (Summing , Differentiator and Integrator)
2. **Negative Feedback**: Properties and topologies of Negative Feedback, Effect of feedback on impedance, Gain, bandwidth, distortion and stabilization.
3. **Power Amplifiers**: Classification of power amplifiers, Collector efficiency, Transformer coupled class A amplifier; Class-B push-pull amplifier, Class-C amplifier, Tuned amplifier, class D, E & S amplifier.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. **Oscillators**: Introduction to Oscillator, Positive feedback, Condition of Oscillator, Phase Shift Oscillator, The Wein-Bridge Oscillator, Resonant circuit Oscillators. Crystal Oscillator, VCO, Introduction to 555 Timer and its operation, Waveform generator
5. **Low Frequency Amplifier Response** : Amplifier Frequency Response, Effect of Coupling, Internal Capacitances in case of BJT amplifier, Miller's Theorem, Decibel, 0dB References, Bode Plot, The Critical Frequency, Low Frequency Amplifier Response,

Group-B (30-Marks)

6. **High Frequency Amplifier Response**: High Frequency Amplifier Response, Total Frequency Amplifier Response. Amplifier noises. Gain, Bandwidth, Distortion& Stabilization.
7. **Active Filters**: Explanation of Low, High, Band Pass and Band Stop Filter Response, Response Characteristics, Damping Factor, Critical Frequency and Roll-Off Rate, Single Pole Filter, Sallen-Key Low Pass and High Pass filter, Cascaded Filter, Multiple Feedback Band-Pass and Band Stop Filter, State Variable Band-Pass and Band Stop Filter,
8. **Optoelectronic Devices:** PN photodiode, Phototransistor, Solar cell, Photoconductive cell, Photovoltaic, Sensors, LED, LCD, Alphanumeric display, Photo couplers, Photodiode, LDR.

Recommended Books:

1	Basic Electronics and Devices	M.Cirovic

2	Electronics devices and Circuits	J.J.Milman and C.C.Halkias
3	Electronic Devices and Circuits	Allen Mottershead
4	Semiconductor Physics and Devices	4Donald A Neaman
5	Solid State Radio Electronics	Krauss
6	Communication Electronics	Louis Frenzel
7	Electronic Principles	Albert Paul Malvino
8	Electronic Devices	Thomas L Floyd
9	Operational Amplifier and Integrated Circuit	Couyhlin

Course Code: EEE-2412 **Course Title: Electronics II Sessional and Electronic Workshop**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts developed in EEE-2411. In the second part, students will design simple systems using the principles learned in EEE-2411.

Course Code: EEE-2415 **Course Title: Transmission & Distribution of Electrical Power System**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-1201]

Objectives: The objective of the course is to make the student familiar with the transmission and distribution of electrical energy from the places of production to consumer areas and isolated consumers in order to be able to appreciate the relative procedures from the technical, economic and social point of view.

Outcome:
1) Students will acquire knowledge concerning the aspect of inductive and capacitive properties of conductors
2) Students will gather knowledge on power factor improvement technique to get efficient power at the consumer end.
3) They will understand the voltage sag and tension in overhead transmission line.
4) Students will learn the different types of cables faults and the application of overhead and underground cables.
5) At the end of the course, students will understand and may apply the knowledge of voltage control technique in different practical fields.
6) Finally, this course will help the student to know the D.C. and A.C. distribution system of electrical power and help them to work in different electrical industries.

Section– A (Mid-Term Exam: 30 Marks)

1. **Transmission systems:** Types of conductors, resistance, definition of inductance, inductance of conductor due to internal flux, flux linkages between two points external to an isolated conductor, inductance of a single phase two wire line.
2. **Capacitance of transmission lines:** Capacitance of a three-phase with equilateral spacing and unsymmetrical spacing, effect of earth on the capacitance of three-phase transmission lines, bundled conductors, parallel-circuit three-phase lines.
3. **Current and voltage relations on a transmission line:** Representation of lines, the short transmission line, the medium transmission line the long transmission line, solution of differential equation, interpretation of the equations, hyperbolic form of the equations, the equivalent circuit of a long line, direct current transmission.

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

4. General line equation in terms of ABCD constants, relations between constants, charts of line constants, constants of combined networks, measurement and advantages of generalized line constants. **Power circle diagram:** Receiving and sending end power circle diagrams, transmitted maximum power, universal power circle diagrams, use of circle diagrams.
5. **Voltage and power factor control in transmission systems:** Tap changing transformer, induction regulators, moving coil regulators, booster transformer, power factor control, static condensers in series or parallel, synchronous condensers, Ferranti effect.

Group-B (30-Marks)

6. **Insulate d cables:** Cables versus overhead lines, insulating materials, electrostatic stress grading, three core cables, dielectric losses and heating, modern developments, oil-filled and gas-filled cables, measurement of capacitance, cable testing.
7. **Insulator of overhead lines:** Types of insulators, their constructions and performances, potential distribution, special types of insulators, testing of insulators.
8. **Distribution:** Distributor calculation, copper efficiencies, radial ring mains and inter connections. Mechanical characteristics of transmission lines: Sag and stress analysis, ice and wind loading, supports at different elevations, conditions of erection, effect of temperature changes.

Recommended Books:

1	V.K. Mehta and Rohit Mehta	Principles of Power System
2	Ashfaq Husain(4^{th} Revised edition)	Electrical Power Systems
3	Hadi Saadat (edition-2002)	Power System Analysis
4	J.D. Glover and M.S. Sarma	Power System Analysis and Design",
5	A.R. Bergen and V.J. Vittal	Power System Analysis, Second Edn. N.Y
6	Willam D. Stevenson. Jr	Elements of power system analysis

Course Code: EEE-3501 **Course Title: Continuous Signals and Linear Systems**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: MATH-2409]

Objectives: In this course student will learn about 'Continuous Signals and Linear Systems' in regards to signals, systems and system representation, impulse response, harmonic representation, Fourier-transform, application of harmonic analysis and analogous systems.

Section-A (Mid-term Exam: 30 Marks)

1. **Signal**: Definitions -Signal, System, Size of signal, Signal Energy, Signal power. Classification of signals. Basic operations on signals. Elementary Signals.

2. **Systems:** Properties of system- Linearity, causality, time invariance, memory, stability, and invariability.
3. **System representation:** Differential Equations, Electrical and Mechanical System representation using Differential Equation, order of the system, Solution Techniques, Zero State and Zero Input Response.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Impulse response:** Convolution integral- determination of system properties; state variable - basic concept, state equation and time domain solution.
5. **Harmonic representation:** Fourier series- Trigonometric Fourier Series, Amplitude and Phase Spectrum, Symmetry Considerations, Exponential Fourier Series and Circuit Applications.

Group-B (30-Marks)

6. **Fourier transform:** Fourier Transform and Inverse Fourier Transform. Properties of Fourier Transform. Circuit Applications of Fourier Transform.

7. **Laplace Transform:** Laplace and Invers Laplace transform, Properties of Laplace Transform. Circuit Applications. Solution of system equations, system transfer function and frequency response.
8. **Applications:** System stability analysis using Laplace Transform, Amplitude Modulation and Demodulation, Time-division and Frequency-division Multiplexing.

Recommended Books:

[1] Simon Haykin, Barry Van Veen,*Signals and Systems*, 4th ed. Wiley, 2001-2002, p. 694.
[2] Alexander Sadiku, *Fundamentals of Electric Circuits*, 4th ed. McGraw-Hill, 2009-2010, p. 901.

Course Code: EEE-3505 **Course Title: Microprocessor and Interfacing**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-2407]

Objectives: In this course student will learn about' Microprocessor and Interfacing' in regards to digital computer, microprocessor ALU, Intel 8086 Microprocessor**.**

Outcome: At the end of the course, the students should be able to:

- Demonstrate the significance of 8086 microprocessor, its architecture, operation and interfacing with other ICs.
- Employ assembly language programming using instruction set.
- Identify the 8086 Microprocessor and the interfacing ICs 8255, 8254, 8259, 8284A.
- Decipher possible microprocessor based operation for the practical applications.

Section-A (Mid-term Exam: 30 Marks)

1. Introduction to microcomputer and Microprocessor: Microcomputer architecture, organization and its operation, Microprocessor and Microcontroller, Evolution of Microprocessor, General Architecture and operation of microprocessor (ALU, Control Unit, Register array, system bus), CISC and RISC structure, Instruction execution, Memory array design and memory interfacing.
2. Architecture of Intel 8086 Microprocessor and Addressing Modes: 8086 architecture, registers inside 8086, 8086 addressing modes (data addressing modes, program memory addressing modes and stack memory addressing modes).
3. Instruction Set of 8086 Microprocessor (Data Movement and Arithmetic Instruction): Operation of all data movement and arithmetic instructions, Assembly language programming using Instruction Set.

Section-B (Final Exam : 50 Marks)

Group-A (20-Marks)

4. Instruction Set of Intel 8086 Microprocessor (Logic and Program Control Instructions): Operation of all logic and program control instructions, Assembly language programming using Instruction Set.
5. Pin functions and operation of Intel 8086 Microprocessor and 8284A: Modes of operation and Pin functions of 8086 microprocessor, Pin functions and operation of 8284A.

Group-B (30-Marks)

6. Intel 8086 Interfacing with 8255 PPI: Introduction to Programmable Peripheral Interface (8255), Architecture, Operation, Programming.
7. **Intel 8086 Interfacing with 8254 PIT**: Introduction to Programmable Interval Timer (8254), Architecture, Operation, Programming.
8. Intel 8086 Interfacing with 8259 PIC, ADC0804 and Other ICs: Architecture, operation and programming of Programmable Interrupt Controller (8259), Interfacing with ADC0804, Keyboard and Display Interface (8279), DMA.

Recommended Books:

1	Douglas V Hall	Microprocessor and Interfacing Programming and Hardware
2	Mohammed Rafiquzzaman	Microprocessors and Microcomputer-Based System Design
3	R. Gaonkar	Microprocessors Architecture, Programming and Applications
4	Myke Predka	Programming and customizing 8051 microcntroller

Course Code: EEE-3506 **Course Title: Microprocessor and Interfacing Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE-3505. In the second part, students will design simple systems using the principles learned in EEE-3505.

Course Code: EEE-3508 **Course Title: Circuit Simulation Sessional**
Credit Hours: 1 **Contact Hours: 3 per Week**
[Pre requisite: EEE-2301]

Objectives: In this course students will learn about electrical and electronic circuit simulation**.**
A. In the simulation laboratory based on EEE-1101 and EEE-1201 theory courses, students will verify the theories and concepts learned in EEE-1101 and EEE-1201 using simulation software like pspice and Matlab. Students will also perform specific design of dc and ac circuits theoretically and by simulation.

B. In Simulation laboratory based on EEE-2301 and EEE-2411 theory courses, students will verify the theories and concepts learned in EEE-2301 and EEE-2411 using simulation software like Pspice and Matlab. Students will also perform specific design of electronic circuits theoretically and by simulation.

Course Code: EEE-3515 **Course Title: Electrical Properties of Materials**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-2301]

Objectives; **:** In this course student will learn about 'Electrical Properties of Materials' in regards to crystal structures, classical theory of electrical and thermal conduction, introduction to quantum mechanics, band theory, modern theory of metals, dielectric and magnetic properties of materials, introduction of superconductivity.

Section A (Mid-term Exam: 30 Marks)

1. **Crystal Structures**: Types of Crystals, lattice and basis, Bravias lattice and Miller indices.
2. **Classical theory of electrical and thermal conduction**: Scattering, mobility and resistivity, temperature dependence of metal resistivity, Mathiessen's rule, Hall effect and thermal conductivity.
3. **Introduction to Quantum mechanics**: Wave nature of electrons, Schrodinger equation, one dimentional quantum problems-infinite quantum well, potential step and potential barrier; Heisenberg's uncertainty principle and quantum box, Band theory of solids.

Section- B (Final Exam: 50 Marks)

Group A (20 marks)

4. **Band theory**: Band theory from molecular orbital, Bloch theorem, Kronig-Penny model, effective mass, density of states; carrier Statistics: Maxwell-Boltzmann and Fermi-Dirac distributions, Fermi energy.
5. **Modern theory of metals**: Determination of Fermi energy and average energy of electrons, classical and quantum mechanical calculation of specific heat.

Group B (30 Marks)

6. **Dielectric properties of Materials**: Dielectric constant, polarization-electronic, ionic and oriental; internal field, Clausius-Mosotti equation, spontaneous polarization, frequency dependence of dielectric constant, dielectric loss and piezoelectricity.

7. **Magnetic Properties of Materials**: Magnetic moment, magnetization, relative permittivity, different types of magnetic materials, origin of ferromagnetism and magnetic domains.
8. **Introduction of superconductivity**: Zero resistance and Meissner effect, Type I and Type II superconductors and critical current density.

Recommended Books:

1	A.J. Dekker	Electrical Engineering Materials
2	S .O. Kasap	Electrical Engineering Materials

Course Code: EEE-3519 **Course Title: Power System Analysis**
Credit Hours: 3 **Contact Hours: 3 per wee**k
[Prerequisite course: EEE-2415]

Objectives: In this course student will learn about 'Power system' in regards to underground **t**ransmission lines cables, power system stability, flexible ac transmission system, overhead transmission lines cables, series impedance of transmission lines, line parameters, factors affecting stability and power quality.

Section– A (Mid-Term Exam: 30 Marks)

1. **System modeling:** Review of synchronous machine, the effect of synchronous machine excitation, per unit quantities, changing the base of per unit quantities, per unit impedance in single phase transformer and three phase transformer circuits, per unit impedance of three winding transformers, one-line diagram, impedance and reactance diagram, per unit and percentage method of calculations, advantages and disadvantages of per unit computations.
2. **Network calculations:** Node equation, matrix partitioning, node elimination by matrix algebra, bus admittance and impedance matrices, modification of an existing bus impedance matrix, direct determination of a bus impedance matrix.

Section- B (Final Exam: 50 Marks)

Group A (20 marks)

3. **Load flow solution and control:** Classification of buses, specification of bus voltage-power etc, Gauss-Seidel method and Newton-Raphson method of load flow solutions, some principles of load flow control.
4. **Symmetrical three phase faults:** Short circuit currents and the reactance of synchronous machines, internal voltages of loaded machines under transient conditions, bus impedance matrix in fault calculations, bus impedance matrix equivalent network, percentage reactance and short-circuit MVA, reactor control of short-circuit currents and location of reactors and their advantages and disadvantages.
5. **Symmetrical components:** Symmetrical components of unsymmetrical phasors, sequence impedance and sequence networks, sequence network of unloaded generators, positive and negative sequence networks, zero-sequence networks.

Group B (30 Marks)

6. **Unsymmetrical faults:** Unsymmetrical short-circuits on an unloaded generator, single line-to-ground fault, line-to-line fault, double line-to-ground fault, unsymmetrical faults of power systems, faults through impedance, unsymmetrical open circuits and series impedances.
7. **Power system stability:** The stability problem of power system, swing equation, power-angle equation, equal area criterion of stability.
8. **Multi-machine stability studies:** Classical representation, step-by-step solution of the swing curve, factors affecting stability, techniques for improving stability.

Recommended Books:

1	V.K. Metha and Rohit Metha	Principle of power system
2	Ashfaq Hussain	Electrical power systems
3	Willam D. Stevenson. Jr	Elements of power system analysis

Course Code: EEE-3520 **Course Title: Power System Analysis Sessional**
Credit Hours: 3 **Contact Hours: 3 per week**

Objectives: In this course students will perform experiments to verify practically the theories and concepts learned in EEE-3519.

Course Code: EEE-3601 **Course Title: Communication Theory**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-3501]

Objectives: In this course student will learn about 'Communication Theory' in regards to communication systems at a glance, noise, communication systems ,angle and pulse modulation, digital communication system, satellite communication, microwave link & radar.

Outcome: A student who successfully completes Communication Theory will
1. Understand the basic concept of Communication.
2. Have detailed understanding of amplitude and frequency modulation and demodulation
3. Have an understanding of design considerations for multiple accesses
4. Have detailed understanding of digital communication basics

Section A (Mid Term Exam: 30 Marks)

1. **Communication Systems at a glance:** Basic Principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types, and bandwidth and transmission capacity.
2. **Noise:** Source, characteristics of various types of noise and signal to noise ratio, Measure of information, source encoding, error free communication over noisy channel, channel capacity of a continuous system and channel capacity of a discrete memory less system.
3. **Communication systems:** Transmission types-base-band transmission, carrier transmission, AM (information given by the amplitude of the signal), DSB-FC (Double side band - full carrier), Envelope detector DSB-SC (Double side band - suppressed carrier), SSB (single side band), VSB (vestigial side band), spread spectrum, SS7 system. TV-transmitter & Receiver.

Section B (Final Exam: 50 Marks)

Group A (20 Marks)

4. **Angle modulation**: FM-Frequency modulation, PM – phase modulation, Bandwidth calculation (frequency components), 1% bandwidth, Carson's rule, spectral Analysis, Power in FM & PM signals, Demodulation of FM & PM- Phase locked loop, Time domain. Locked loop with loop gain and static phase error, Super heterodyne receiver
5. **Pulse Modulation:** - sampling theorem, Nyquist criterion, aliasing, instantaneous and natural sampling; pulse amplitude modulation- principle, bandwidth requirements; pulse code modulation (PCM)- quantization principle, quantization noise, non-uniform quantization, signal to quantization error ratio, differential PCM, demodulation of PCM; delta modulation (DM)- principle, adaptive DM; line coding- formats and bandwidths..

Group B (30 Marks)

6. **Digital Communication System:** Digital modulation technique, Amplitude-shift keying- principle, ON-OFF keying, PSK, FSK- continuous & discontinuous phase FSK, minimum shift keying., DPSK & QAM, Quadrature PSK, noise performance, M-array modulation techniques, spectrum of digital signals, Digital carriers system, Sources of error in digital communication systems, Error control coding,

7. **Satellite Communication:** Introduction, Satellite construction, Orbits; Station keeping, Satellite altitude, Transmission path, Noise considerations, Satellite system, Effective isotropic radiated power. Low orbit satellites for mobile communication, Earth station, Satellite link analysis.

8. **Multiplexing technique**- Time-division multiplexing (TDM), FDM, CDM,WDM Multiple Access System- TDMA, FDMA, CDMA- principle, benefits, Time-division multiple-access (TDMA), frequency-division multiple access (FDMA); code-division multiple- access (CDMA) - spread spectrum multiplexing, coding techniques and constraints of CDMA.

Recommended Books:

1. B.P. lathi, Modern Digital and Analog Communication Systems, 3rd Edition, New York Oxford University Press, 1988.
2. Wayne Tomasi, Advanced Electronic Communications Systems, 6th Edition, 1993
3. Jeffrey S. Beasley, Gary M. Miller, Modern Electronic Communication, 9th Edition, Prentice Hall, 2007.
4. Gorge Kennedy, Bernard Devis, Electronic Communication Systems, 4th Edition, New York McGraw-Hill, 1992.

Course Code: EEE-3602 **Course Title: Communication Theory Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE-3601. In the second part, students will design simple systems using the principles learned in EEE-3601.

Course Code: EEE-3603 **Course Title Digital Signal Processing I**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Prerequisite: EEE-3501]

Objectives: In this course student will learn about ' Digital Signal Processing' in regards to introduction to digital signal processing (DSP), impulse response, solution of difference equation, Z-transform, discrete time harmonic analysis, discrete Fourier transform, digital and IIR filters.

Section-A (Mid-term Exam: 30 Marks)

1. **Discrete time signal and system**: signal representation, concept of filter, convolution, stability and causality, random signal
2. **Sampling of signal**: nyquist theorem, aliasing, D/A conversion, ideal sampling/reconstruction, real world system, discrete time decimation and interpolation**, Interpolation and decimation**: seen as a filter design problem, role of FIR filter

3. **DTFT:** Power density spectrum, relationship to Z transform, concept of bandwidth, frequency range of natural signal, properties of DTFT, the wiener-Khintchine theorem

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **The Z transform**: uses, definition, region of convergence, inverse z transform, linearity, shift, convolultion, multiplication, complex conjugation, parsevals relation Input output relationship: System function, pole and zeros, frequency response, filter example, state variables
5. **Discrete time network**: signal flow graph, cascade and parallel network, transpose network stability, linear phase, more filter example

Group-B (30-Marks)

6. **Discrete Fourier Transform**: definition, properties, zero padding, linear convolution, windows, **FFT algorithm:** decimation in time, real valued data, radix 4 FFT, prime factor algorithm,2 decimal DFT, fast convolution, convoluation of a long sequence, overlap and overlap save method

7. **IIR Filter**: mathematical structure, impulse invariance, bilinear transform, design by transform, butterworth, chebyshev, cauer design, recursive implementation, ladder and lattice structure
8. **FIR Filter**: mathematical structure ,filter design by pole zero placement, design by windowning, park-meclellan algorithm, frequency domain design, non recursive implementation Other application in medical imaging, sppech processing, use of dsp in radar

Recommended Books:

1.	J. G. Proakis& D. G. Manolakis	Digital Signal Processing, 4th Edition
2.	Lawrence R. Rabiner& Bernard Gold	Theory and Application of Digital Signal Processing
3.	Alan V. Oppenheim & Ronald W. Schafer	Digital Signal Processing
4	Richard G. Lyons	Understanding Digital Signal Processing
	William D. Stanley	Digital Signal Processing

Course code: EEE-3604 **Course Title: Digital Signal Processing I Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE-3603. In the second part, students will design simple systems using the principles learned in EEE-3603.

Course Code: EEE-3607 **Course Title: Solid State Devices**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-3515]

Objectives: In this course student will learn about 'Solid State Devices in regards to energy bands in solids, carrier transport processes and excess carrier, PN junction:, forward and reverse bias, bipolar junction and junction field effect transistor, metal –semiconductor, FET and MOS FET

Section-A (Mid-term Exam: 30 Marks)

1. **Energy Bands in Solids and Carrier Concentrations**: Energy bands, Metals, Semiconductor and Insulators, Electrons and Holes, Effective mass, intrinsic and Extrinsic Semiconductors, The Fermi Level, Electron and Hole concentrations of Equilibrium.
2. **Carrier transport processes and excess carriers**: Conductivity and mobility, Drift and Resistance, The Hall-Effect, Diffusion processes, Diffusion and Drift Carriers, Built -in -field, Diffusion and Recombination, Einstein relations, The continuity and diffusion equations for holes and electrons.;.
3. **PN Junction: Fabrication of PN Junction**: The Contact Potential, Equilibrium Conditions, Equilibrium Fermi Level, Space charge at a junction, Carrier injection, minority and majority carrier currents, Reverse Bias, Zener and Avalanche Breakdown , Time variation of stored charge, Capacitance of PN Junction, Varactor Diode.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Bipolar Junction Transistor**: Basic Principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, Solution of the diffusion equation in the base, Terminal currents, The coupled diode model , Ebers-Moll equations, frequency limitation of transistors.
5. **FET**: Introduction, qualitative theory of operation, Pinch-off and Saturation, Gate Control, Current-Voltage Characteristics, The GaAs MESFET, HEMET, Energy band diagram of metal semiconductor junction, rectifying and ohmic contact, The Metal –Insulator –Semiconductor FET Basic Operation.

Group-B (30-Marks)

6. **MOS FET**: The Ideal MOS Capacitor, MOS Output and Transfer Characteristics, Short Channel I-V Characteristics, Threshold Voltage, Qualitative theory of MOSFET operation , Equivalent Circuit of a MOSFET. MOSFET Scaling and Hot Electron Effects.
7. **Optical Devices**: Optical Absorption, Solar cell- The PN junction solar cell, conversion efficiency

and solar concentration, the hetrojunction solar cell, amorphous silicon solar cells, Light Emitting diode, materials for light LED, Laser diodes, Materials for laser diodes

8. **Semiconductor Device Simulation**: Tools: Introduction and operation of Matlab Device and AMPS-1D Simulation.

Experiment using Matlab:

I. Program to compute Number of atoms/cm3 in cubic crystals of silicon Atom
II. Program to plot f(E) versus Energy for different temperatures
III. Compute & plot Vbi as a function of doping (NA or ND)
IV. Program to generate an energy band diagram of a pn junction
V. Program to construct a plot of a square law relationship (IDsat/IDO versus VG/VP) of FET
VI. Program to construct a plot of the depletion width versus the impurity Concentration

Experiment Using AMPS-1D Simulation

I. Simulation of silicon solar cell
II. Simulation of hetaaro junction solar cell

Recommended Books:

1	Ban G Streetmen & Sanjay Banerjee	Solid State Electronic Devices
2	H.P. Myers. Physics	Introduction to Solid State Physics
3	Floyd	Electronic Devices
4	J. Millman & C.C Halkias	Electronic Devices and Circuit.

Course Code: EEE-3612 **Course Title: Electrical Service Design Sessional**
Credit Hours: 1 **Contact Hours: 2 per Week**

Objectives: In this course students will learn about domestic and industrial electrical services.Wiring system design, drafting, and estimation. Design for illumination and lighting. Electrical installations system design: substation, BBT and protection, air-conditioning, heating and lifts.

Experiment list:

1) Familiarization with different types of tools and their use.
2) Familiarization with different kinds of wire, wire joint
3) To learn about wire size estimation and calculation.
4) To learn about different types of installation of wiring system.
5) To learn about different types of lighting accessories.
6) To learn about different types of protective devices and their working principle.
7) To learn about electrical earthling and neutral wiring system.
8) Familiarization with the symbol of electrical wiring, fitting and fixture and conduit layout.
9) To learn about a system drawing and load calculation -1
10) To learn about a system drawing and load calculation -2
11) Final project drawing concepts and working schedule.

Course Code: EEE-3621 **Course Title: Engineering Electromagnetism**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-1201]

Objectives: In this course student will get comprehensive idea about electromagnetism ,Maxwell equation, static electric fields, magneto statics, time varying electric fields, wave guide ,transmission line, behavior of materials in space.

Outcome:

Section-A (Mid-term Exam:30 Marks)

1. **Electrostatic Fields**: Gauss's Law- Maxwell's Equation, Application of Gauss's Law, Electric Potential, An Electric Dipole & Flux Lines, Energy Density in Electrostatic Fields.
2. **Electric Fields in Materials Space**: Polarization in Dielectrics, Dielectric Constant and strength, Linear & Isotropic and Homogeneous Dielectrics, Continuity Equation and Relaxation Time, Boundary Conditions.
3. **Electrostatic Boundary Value Problems**: Poisson's and Laplace's Equations, Uniqueness Theorem, General Procedures for solving Poisson's or Laplace's Equation, Method of Images.

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

4. **Field Equations**: Field equations based on laws of Coulomb, Ampere and Faraday; Displacement current, Maxwell's equations, Units and dimensions of field vectors, E-H symmetry, Lorenz's lemma, Scalar and vector potentials, Retarded potentials.
5. **Propagation of Electromagnetic Waves**: Wave equations, Plane Wave concept, Plane electromagnetic waves in Free space, Conducting, Dielectric and Ionized media, Poynting vector.

Group-B (30 Marks)

6. **Reflection and Refraction of Electromagnetic Waves:** Boundary conditions, The laws of reflection and Snell's law of refraction, Reflection from dielectrics and conductors, Fresnel's equations, The Brewster angle, Total reflection, Skin effect, Phase and group velocities.
7. **Propagation of Electromagnetic wave in the guided media:** Rectangular wave guides, TM and TEmodes, Wave Propagation in the Guide, Cut-off wave length of a rectangular waveguide, Relation between cut-off wavelength, guide wavelength and free space wavelength.
8. **Transmission Lines:** Transmission line equations and parameters, Input Impedance, Standing Wave Ratio, Smith Chart, Impedance matching, Distortion less line.

Recommended Books:

1. Matthew N. O. Sadiku, Elements of Electromagnetics, 5th Edition, Oxford University Press, 2010.
2. W.H Hayt, J.A.Buck, Engineering Electromagnetics, 6th Edition, McGraw-Hill, 2001.

Course Code: EEE-4701 **Course Title: Control System I**
Credit Hours: 3 **Contact Hours: 3 per week**
[Pre requisite: EEE-3501]

Objectives: In this course student will learn about 'Control System' in regards to linear system models, system block diagrams and signal flow graphs, stability, time response, steady-state error, dynamic compensation, root locus analysis and design, frequency response analysis and design

Section-A (Mid-term Exam: 30 Marks)

1. **Linear System Models**: Introduction to control systems, Design process of feedback control system, Mathematical Models of Systems: transfer function and state-space models, conversion between transfer function and state-space models, Linearization.
2. **Block Diagrams and Signal Flow Graphs**: Block diagrams of systems block diagram reduction, signal flow graphs of systems, Mason's formula, Signal flow graphs of state equations. Effect of adding poles and zeros,
3. **Stability**: Bounded-input bounded-output (BIBO) stability, Routh-Hurwitz stability criterion, Stability in State Space

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Time Response**: Pole-zero plots, first and second order transient responses, higher order system approximation, Laplace transform and time domain solution of State equations.
5. **Steady-state Error**: Steady-state Error for feedback systems, System Type, Sensitivity, and Steady-stat error for Systems in State Space.

Group-B (30-Marks)

6. **Dynamic Compensation**: Feedback compensation, lead-lag compensation.
7. **Root Locus Analysis and Design**: Definition of root locus, Properties of root locus, sketching of root locus plots. Effect of open-loop zeros and poles. Root locus design concepts the root locus method, rules for root locus plotting and construction of root locus, root locus design.
8. **Frequency Response Analysis and Design**: Frequency response, polar plots, Bode plots and Nyquist diagrams, stability criterion, gain and phase margins, compensator design in the frequency domain. Digital Control System

Recommended Books:

1. Norman S. Nise, Control System Engineering,6th Edition, Wiley, 2010

Course Code: EEE-4702 **Course Title: Control System I Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE-4701. In the second part, students will design simple systems using the principles learn in EEE-4701.

MATLAB Software

MATLAB is a popular computation and visualization software package developed by the MathWorks, Inc. In this course, MATLAB will be used together with its Control System Toolbox. The best way to learn MATLAB in the control context is through the web-based Control Tutorials for MATLAB (*http://www.engin.umich.edu/class/ctms/*). The tutorials combine explanatory text with sample MATLAB commands and illustrative plots and graphics. The outline of the tutorials closely follows that of most undergraduate control textbooks, and should be a useful on-line tool for all control stream courses.

Course Code: EEE-4709 **Course Title: Research Methodology & Seminar**
Credit Hours: 1 **Contact Hours: 1 per Week**

Objective: The aim of the course is to teach students the systematic approach to doing any research and how to present the results obtained from it in a convincing way.

1. Introduction: Research motivation, research objective, contribution, methodology and research outlines

2. Literature Reviews: Element of research, reviewing of related works, choosing of methodology, comparative method, proposed method
3. Design of Research Methodology: Designing of proposed method
4. Concept of Measurement: Data Collection, data analyzing, compression and discussion
5. Discussion
6. Conclusion
7. Scientific Paper Writing: Abstract, introduction, materials and methods, results, discussion, table, figures, citations, references, format, conference paper, journal paper
8. Seminar and presentation

Reference Books:

1.	Kothari, C.R.	Research Methodology, Methods and Techniques (Vishwa Prakashan, New Delhi, 1985)
2.	Jerrold H. Zar	Biostatistical Analysis. Pearson education

Course Code: EEE-4860 **Course Title: Project / Thesis**
Credit Hours: **3**

Objective: Study of problems in the field of Electrical & Electronic & Engineering

C. Elective Courses

Power Systems Engineering

Course Code: EEE-4705 **Course Title: Power Electronics**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-2411]

Objectives: In this course student will learn about ‘ Power Electronics’ in regards to power semiconductor switches and triggering devices, uncontrolled, single-phase controlled and three-phase controlled rectifiers, 2 DC-DC converters, pulse-width-modulated and resonant pulse inverters , AC voltage controllers**.**

Objectives:
1. Articulate the basics of power electronic devices.
2. Ability to express characteristics of SCR, BJT, MOSFET and IGBT.
3. Express the design and control of rectifiers, inverters.
4. Ability to design AC voltage controller and Cyclo Converter.
5. Ability to design Chopper circuits.
6. Ability to design power electronic converters in power control applications.

Section-A (Mid-term Exam: 30 Marks)

1. **Power Semiconductor Switches and Triggering Devices:** BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC
2. **Uncontrolled Rectifiers:** Single-Phase Half-Wave rectifier, Performance parameters, Single-Phase Full-Wave Rectifiers with R load and RL load, Three-Phase Full-Wave Rectifiers with R load and RL load.
3. **Single-Phase Controlled Rectifiers:** Thyristor Characteristics and Applications, Two Transistor model of Thyristor, Thyristor Turn-On and Turn-Off, Thyristor types. Phase Controlled Converter operation, Single-Phase Full Converters with R Load and RL load, Single-Phase Dual Converters

and Semiconverters**.**

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Three-Phase Controlled Rectifiers:** Three-Phase Half-wave Converters, Three-Phase Full Converters with R load and RL load, Three-Phase Dual Converters and Semiconverters, Power Factor Improvements, Twelve-Pulse Converters.
5. **2 DC-DC Converters:** Generation of Duty Cycle, Step-Down Converter, Step-Up Converter, Converter Classification, Switching-Mode Regulators: Buck regulators, Boost Regulators. Buck-Boost Regulators, Cuk Regulators.

Group-B (30-Marks)

6. **Inverters**: Principle of Operation, Single-Phase Bridge Inverters, Three-Phase Inverters: 180-Degree Conduction, 120-Degree Conduction, Resonant Pulse Inverters : Series and Parallel Resonant Inverters,
7. **AC voltage Controllers**: Principle of On-Off Control, Principle of Phase Control, Single Phase Controllers with Resistive and Inductive load, Three-Phase Full-Wave Controllers, Three Phase Full-Wave Controllers, Three Phase Bidirectional Delta-Connected Controllers, Single-Phase and Three-Phase Cycloconverters.
8. **AC and DC Drives**: Basic characteristics of DC motors, Single phase drives, Three phase drives, Chopper drives, Induction Motor Drives, Synchronous motor drives.

Recommended Books:

Muhammad H. Rashid	Power Electronics, Circuits, Devices and Applications.(Third Edn.)

Course Code: EEE-4706 **Course Title: Power Electronics Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE-4705. In the second part, students will design simple systems using the principles learned in EEE-4705

Course Code: EEE-4707 **Course Title: Power Plant Engineering**
Credit Hours: 3 **Contact Hours: 3 per week**

Objectives: In this course student will learn about 'Power Plant Engineering' in regards basic principle of power plant, steam turbine power plant, gas turbine power plant, hydroelectric power plant, nuclear power plant, magneto hydro dynamic generator, power plant economics and economical problems.

Outcomes: By learning this course, Students will involve properly and efficiently one selves into different types of power plants in home and abroad without any nervousness. As a result, they can improve their future career in the power sector over the world.

Section-A (Mid-term Exam: 30 Marks)

1. **Introduction:** Importance of Electrical Energy, Basic principle of power plant, Brief introduction of various Energy sources, Present situation of power plants in Bangladesh, Power station design, **Steam Turbine Power Plant:** Operating principle, Site selection, Advantages & disadvantages.
2. **Steam Turbine Power Plant:** Pulverized Coal, Main Accessories, Automatic boiler control, Boilers: Water tube and Fire tube boilers, Boiler furnace, Types of Condensers: Surface and Jet Condensers, Super Heater, Economizer, Water treatment Plant, Steam Engine VS Steam turbine.
3. **Gas Turbine Power Plant (GTPP):** Operating principle, Classification, Constituents of GTPP, Gas turbine cycles, Compressors, combined cycle gas turbine power plant, Advantages & disadvantages of GTPP, Steam turbine VS Gas turbine, Starting of GTPP. **Diesel Power Station:** basic operation,

advantage and disadvantage.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Hydro Electric Power Plant (HEPP):** Operating principle, Constituents of HEPP, Site selection, Types of HEPP, Water hammer & cavitations, Advantages and disadvantages, Application, Performance of water turbine, Turbine governing, Choice of water turbine.
5. **Nuclear Power Plant (NPP):** Basic idea of nuclear fission and chain reaction, Operating principle of NPP, Details of plant equipments, Fuel of NPP, Types of nuclear reactor, Uranium enrichment, Nuclear waste management, Site selection, Advantages and Disadvantages.

Group-B (30-Marks)

6. **Magneto Hydro Dynamic (MHD) Generator:** Operating principle, Types of MHD generator, Advantages and disadvantages, Terms and definitions, Combination of MHD power plant and steam power plant. **Power station performance:** Connected load, demand factor, load factor, capacity factor, utilization factor, diversity factor etc. and impact of different factors over the cost analysis of power generation and utilization.
7. **Power Plant performance and operating characteristics:** efficiency, heat rate, Input-output curve, Heat rate curve, Incremental rate curve. Generation scheduling, Variable load problems, load curve and load duration curve, Base load and peak load plants, method of meeting the load, interconnected grid system.
8. **Power Plant Economics:** Economic load sharing, Economics of power generation, cost of electrical energy: Analysis of fixed cost and running/operating cost, Choice of power station. **Energy Tariffs:** description, types and tariff in Bangladesh. **Private generation:** industrial co-generation, capacity generation; Power Plant Instruments.

Recommended Books:

1. G.R.Nagpal — Power Plant Engineering
2. V.K.Mehta & Rohit Mehta — Principles Of Power Systems
3. William A Vopat,Bernhardt G.A. Skrotzki. — Power Station Engineering & Economy

Course Coode: EEE-4801 **Course Title: Power System Protection**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-3519 Power System Analysis]

Objectives: In this course student will learn about 'Power System Protection' in regards to switchgear, fuse & relay, circuit breakers and breaker ratings; transformer, generator, motor, bus and transmission line protection; static, digital and numerical relay.

Outcome: By learning this course, student can develop their concepts about protective devices which can be applied at different industries, power stations, substation and transmission line.

Section-A

(Mid-term Exam:30 Marks)

1. Introduction to Switchgear: Purpose of power system protection, Introduction to Switchgear, circuit interruption and protection. Criteria for detecting faults and requirements of protective devices, Terminologies and general characteristics of relays and circuit breaker, Different types of protective devices used in Switchgear.
2 Fuse: Fuse, Characteristics of fuse, terms related to fuse, types of fuse, current carrying capacity of fuse.
3. Protective Relay: Fundamental requirements, basic relay, terms related to relay, over-current, differential, directional, distance relay, types of protection.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. Circuit breakers: Circuit breaker, Arc Phenomenon, arc extinction method, term related to circuit breaker, Air blast, Oil, SF6, vacuum circuit breaker, switchgear components, problems of circuit interruption, resistance switching, circuit breaker ratings.
5. Transformer protection: Different types of faults in Transformer, different types of protection scheme in transformer, Buocholz Relay etc. Integrated HV transmission line protection, Combined Transformer and Bus bar protection.

Group-B (30-Marks)

6. Generator and Motor protection: Introduction, Different types of faults in Generator and motor, different types of protection scheme.
7. **Bus and Transmission line protection**: Bus bar arrangement, Pilot-wire and carrier current protection, different types of Bus and Transmission line protection scheme, Over voltage protection, lightning and lightning arresters, Grounding
8. Static and digital/numerical relay : definition, features, Operation, application, Block diagram and types, Microcontroller and Microprocessor based protection.

Recommended Books

[1] V.K. Mehta, Principles of Power System, Revised Edition, India, S Chand.
[2] J. Lewis Blackburn, Protective Relaying: Principles and Applications, 4th Edition, US, Marcel Dekker Incorporated, 1987.
[3] Sunil S. Rao, Switchgear and Protection, Khanna Publishers, 1992.

Course Code: EEE-4802 **Course Title: Power System Protection Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE-4801.

Course Coode: EEE-4805 **Course Title: Power System Operation and Control**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-3519]

Objectives: In this course student will learn about 'Power System Operation and Control' in regards to evaluation of small network, SCADA, power market, economic operation of power generation, control of voltage and frequency, conventional and competitive electricity market and Power system control.

Section-A (Mid-term Exam: 30 Marks)

1. **Principles of power system operation**: State evaluation of small network, Phasor diagram Method, summation of losses method, two port equation.
2. **State estimation**: Underlying assumption, solution method, SCADA,
3. **Power market**: conventional and competitive environment. Overview of power system operation

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Economic Operation**: Economic Load Dispatch (ELD) with the objective being cost minimization as well as environmental emission minimization.
5. **Unit Commitment** with the objective being cost minimization as well as environmental emission minimization.

Group-B (30-Marks)

6. **Overview of optimum power** flow and its application. Static security analysis, dynamic security analysis.

7. **Power system control:** Control of frequency, control of active power generation, spinning reserve.
8. **Automatic generation** control and control of reactive power and Voltage

Recommended Books:

1	Leonard L. Grigsby	Power System Stability and Control", CRC Press, 2007
2	Wood, B.F. Wollenberg	Power Generation Operation and Control", Second Edition, John Wiley and Sons, 1996
3	P. Kundur,	EPR! Power System Engineering Series, MacGraw-Hill Inc., 1994
4	J.D. Glover and M.S. Sarma	Power System Analysis and Design", Third Edition, Brooks/Cole, 2002
5	M. Shahidehpour, H. Yamin, Z. Li,	Market Operations in Electric Power Systems", John Wiley and Sons, 2002
6	Stuart A. Boyer	"SCADA: Supervisory Control and Data Acquisition"

Course Code: EEE-4807 **Course Title: High Voltage Engineering**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-3519]

Objectives: In this course student will learn about 'High Voltage Engineering' in regards to high voltage generators, transformer, insulators, high voltage measuring, testing and switching.

Outcome: Upon completion of the course, students will learn:

1. Knowledge of the high voltage applications and general knowledge about the high voltage engineering.
2. Knowledge of the basic gaseous dielectrics, liquid dielectrics and basic solid dielectrics, their properties and behavior under high voltage stressesand their breakdown phenomenon.
3. Knowledge of the high voltage testing equipment and methods, requirements for high voltage testing procedures.
4. They will be able to analyze and understand the electrical insulation condition in different types of applications, also able to learn the lightning phenomenon and switching surges.

Section –A (Mid-term Exam: 30 Marks)

1. **High voltage dc**: Rectifier circuits, voltage multipliers, Van-de-Graaf and electrostatic generators.
2. **High voltage ac**: Cascaded transformers and Tesla coils.
3. **Impulse voltage**: Shapes, mathematical analysis, codes and standards,

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

4. **Single and multi-stage impulse generators**, tripping and control of impulse generators.
5. **Breakdown in gas**, liquid and solid dielectric materials.

Group-B (30 Marks)

6. **Corona;** High voltage measurements and testing.
7. **Insulation:** Over-voltage phenomenon and insulation coordination.
8. **Lightning** and switching surges, basic insulation level, surge diverters and arresters.

Electronic Engineering

Course Code: EEE-4753 **Course Title: VLSI I**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-3607]

Objectives: In this course student will learn about VLSI design technique and modeling as well as CMOS circuit design, characteristics and applications.

Outcomes: The learning outcomes for this course are as follows:
1. To be aware about the trends in semiconductor technology, and how it impacts scaling and Performance.
3. To understand MOS transistor as a switch and able to design digital systems using MOS circuits.
4. Be able to use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.
5. Be able to describe Enhancement and Depletion mode transistors and the fabrication steps.
6. Analyze the CMOS layout levels, how the design layers are used in the process sequence, and resulting device structures (i.e. cross-sectional views).
7. Illustrate circuit diagrams, stick diagrams and layouts for nMOS, CMOS circuits. Explain design rules. Compare different technologies.
8. Understand the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes.

Section A (Mid Term: 30 Marks)

1. Introduction: Integrated Circuits trends, choice of technology, design approaches, the design process, Mooer`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.

3.CMOS Inverter Design: The CMOS inverter, Transfer characteristics, noise merging, Resistance, capacitance, rise and fall times, delay, switching characteristics, gate transistor sizing and power consumption. [4 lecture]

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks

4. 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.

5. Design Rule: CMOS Process Layers, Intra-Layer Design Rules (λ), Inter-Layer Design Rules - Transistor Layout (λ), Inter-Layer Design Rules - Contact and Via (λ), Select Layer (λ), CMOS Inverter Layout.

Group B (30 Marks)

6. **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

7. 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.

8. **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.

Recommended Books:

1.	Design of VLSI System	Linda E.M Brackenbury
2.	Basic VLSI Design	Douglas A. Pucknell, Kamran Eshraghian
3.	Modern VLSI Design	Wayne Wolf

4.	Principles of CMOS VLSI Design	Weste&Eshraghian
5.	VHDL	Douglas Perry

Course Code: EEE-4754 **Course Title: VLSI I Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE-4753. In the second part, students will design simple systems using the principles learned in EEE-4753.

Course Code: EEE-4713 Course Code: Compound Semiconductor and Hetero-junction Devices
Credit Hours: 3 Contact Hours: 3 per week
[Prerequisite course: EEE-2411]

Objectives: In this course student will learn about 'Compound Semiconductor and hetro-junction devices' in regards to the structure of compound semiconductors and characteristics of hetero-junction dvices and their preparation.

Section A (Mid Term: 30 Marks)

1. **Compound semiconductor**: Zinc-blend crystal structures, growth techniques, alloys, band gap, and density of carriers in intrinsic and doped compound semiconductors.
2. **Hetero-Junctions**: Band alignment, band offset, Anderson's rule,
3. **Single and double sided hetero- junctions**,

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. **Quantum wells and quantization effects**, lattice mismatch and strain and common hetero-structure material systems.
5. **Hetero-junction diode:** Band banding, carrier transport and I-V characteristics.

Group B (30 Marks)

6. **Hetero-junction field effect transistor**: Structure and principle, band structure, carrier transport and I-V characteristics.
7. **Hetero-structure bipolar transistor (HBT**): Structure and operating principle, quasi-static analysis,
8. **Different Models**: Extended Gummel-Poon model, Ebers-Moll model, secondary effects and band diagram of a graded alloy base HBT.

Recommended Books:

1	Donald A. Neamen	Semiconductor Physics and Devices, 3rd Ed., McGraw Hill
2	M.N. Horenstein	Solid State Electronic Device, 3rd Ed., McGraw Hill
3	S. M. Sze	Semiconductor Devices Physics and Technology, John Wiley & Sons

Course Code: EEE-4809 **Course Title: VLSI II**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-4753]

Objectives: In this course students learn about Integrated VLSI fabrication process, design layout, floor planning and routing**.**

Section A (Mid Term: 30 Marks)

1.**VLSI MOS system design layout ex**traction: Fabrication Process, Wires and Bias, Design rules and tools
2.VLSI MOS system design layout verification,

3. Full and semi-full custom design styles and logical and physical positioning.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks.)

4. **Design entry tools**: Schematic capture and HDL.
5. Logic and switch level simulation. Static timing. Concepts and tools of analysis,

Group B(30 Marks)

6 .**Floor planning**: solution techniques for floor planning,
7. Placement, global routing and detailed routing.
8. Application specific integrated circuit design including FPGA.

Recommended Books:

1	Jan M. Rabaey	Digital Integrated Circuits: A Design Perspective, Prentice Hall
2	Abdellatif Bellalaouar, Mohamed I. Elmasry	Low-Power Digital VLSI Design: Circuits and Systems, Kluwer Academic Publishers

Course Code: EEE-4810 **Course Title: VLSI II Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4809. In the second part, students will design simple systems using the principles learned in EEE 4809.

Course Code: EEE-4811 **Course Title: Optoelectronics**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-2411]

Objectives: In this course student will learn about '**Optoelectronics' in regards to** optical properties in semiconductor, LED, Laser, Photo-detectors and solar cells.

Section A (Mid Term: 30 Marks)

1. Optical properties in semiconductor: Direct and indirect band-gap materials, radiative and non-radiative recombination, optical absorption, photo-generated excess carriers, and minority carrier lifetime, luminescence and quantum efficiency in radiation.
2. Properties of light: Particle and wave nature of light, polarization, interference, diffraction and blackbody radiation.
3. Light emitting diode (LED): Principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers.

Section B (Final Examinaton-50 Marks)

Group-A (20 Marks)

4. Stimulated emission and light amplification: Spontaneous and stimulated emission, Einstein relations, population inversion, and absorption of radiation, optical feedback and threshold conditions.
5. Semiconductor Lasers: Population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, hetero-junction lasers, optical and electrical confinement. Introduction to quantum well lasers.

Group-B (30 Marks)

6. Photo-detectors: Photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes and phototransistors.
7. Solar cells: Solar energy and spectrum, silicon and Schottkey solar cells.
8. Modulation of light: Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto-optic devices. Introduction to integrated optics.

Recommended Books:

1	O.Kasap	Optoelectronics and Photonics, Prentice Hall
2	M. A. Parker	Physics of Optoelectronics, CRC, 2005
3	E. Rosencher, B. Vinter, and P. G. Piva	Optoelectronics, Cambridge University Press
4	G. Cardinale	Optoelectronics: Introductory Theory & Experiments, Delmar Cengage Learning

Course Code: EEE-4813 **Course Title: Semiconductor Device Theory**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-3607]

Objectives: In this course student will learn about 'Semiconductor Device Theory' in regards to band theory of solid, energy bands, lattice vibrations, band structure of semiconductor, scattering theory**.**

Section A (Mid Term: 30 Marks)

1. Band Theory of Solid: Bloch Theorem, Kronig Penny model, Brillouin zones, Fermi energy, Fermi surfaces,
de Haas-Van Alphen effect,
2. Energy bands: Formation energy bands, Density of states, Origin of band gaps, Application of zone theory.
3. Lattice Vibrations: Vibrations of Lattices, Organization of lattice vibrations, acoustic and optical phonons, phonon momentum, lattice heat capacity, thermal expansion and thermal conductivity.

Section B (Final Examinaton-50 Marks)

Group-A (20 Marks)

4. Band structure of semiconductor: Isotropic and anisotropic crystals, band diagrams and effective masses of different semiconductors and alloys.
5. Scattering theory: Review of classical theory, Fermi-Golden rule, scattering rates of different processes, and scattering mechanisms in different semiconductors, mobility.

Group-B (30 Marks)

6. Different carrier transport models: Drift-diffusion theory, ambipolar transport, hydrodynamic model, Boltzman transport equations, quantum mechanical model, and simple applications.
7. **Charge transfer devices**: Dynamic effects in MOS capacitors,, the basic CCD and Application of CCD's.
8. **IC Testing, Bonding and Packaging**: Testing, Wire bonding, Flip-Chip Techniques and Packging.

Recommended Books:

1	Donald A. Neamen	Semiconductor Physics and Devices, 3rd Ed., McGraw Hill
2.	M.N. Horenstein	Solid State Electronic Device, 5th Edition, Prentice Hall
3,	S. M. Sze	Semiconductor Devices Physics and Technology, John Wiley & Sons
4.	B. G. Streetmen &S.Kumer Banerjee.	Solid State Electronic Devices.

Communication Engineering

Course Code: EEE-4723 **Course Title: Microwave Engineering**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-3601]

Objectives: In this course the student will learn about '**Microwave Engineering' in regards to**

generation and. transmission of microwave energy and microwave devices.

Section- A (Mid-term: Marks 30)

1. **Transmission Lines*:*** Transmission line equations and parameters; Transmission line configuration and formulae, Transmission line at radio and audio frequency,
2. **Impedance matching**: Line termination, Smith chart, S. W. R. Q and band width, Balanced and unbalanced feeder from transmitter to antenna, Distortion less line.
3. **Wave Guides:** Rectangular and cylindrical wave guides, Cavity resonators, Microstrip lines and their characteristics,

Section –B (Final Examinaton-50 Marks)

Group-A (20 marks)

4. **Microwave Components:** Microwave hybrid circuits, scattering parameters, Wave guide Tees, Directional couplers, Circulators and Isolators, Phase shifter and attenuator,
5. **Solid state microwave devices**. Gunn diode, IMPATT Diode, TRAPATI Diode,

Group-B (30 marks)

6. **Microwave Tubes:** Klystron, Magnetron, TWT.
7. **Microwave Antenna:** Hertzian and half wave dipoles. Mono pole, horn, rhombic and parabolic reflector, array, and Yagi-Uda antenna.
8. **Microwave Link:** Microwave link and its advantage, Frequency assignment and modulation methods, Transmitting and receiving equipment, Base band repeater, IF repeater, Microwave carrier supply, Auxiliary channels

Recommended Books:

1	D. Raddy & Coolen	Electrical Communication
2	J. D .Ryder	Networks, Lines and Fields
3	Bronwell and Beam	Theory and Application for Microwave
4	J.B.Kraus	Antennas
5	J Reich	Microwave Principle
6	Y. Liao	Microwave Devices and Circuits Devices

Course Code: EEE-4724 **Course Title: Microwave Engineering Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4723. In the second part, students will design simple systems using the principles learned in EEE 4723.

Course Code: EEE-4715 **Course Title: Digital Signal Processing II**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-3603]

Objectives : In this course student will learn about Digital Signal Processing in regards to spectral estimation, periodogram, adaptive signal processing, IR filters, multirate DSP and wavelets**.**

Section- A (Mid-term: Marks 30)

1. **Spectral estimation**: Nonparametric methods – discrete random processes, autocorrelation sequence,
2. **Periodogram**; parametric method – autoregressive modeling, forward/backward linear prediction,
3. **Algorithm**: Levinson-Durbin algorithm, minimum variance method and Eigen-structure method I and II.

Section –B (Final Examinaton-50 Marks)

Group-A (20 marks)

4. **Adaptive signal processing**: Application, equalization, interference suppression, noise cancellation,
5.**Filters**: IR filters, minimum mean-square error criterion, least mean-square algorithm and recursive

least square algorithm.

Group-B (30 marks)

6. **Multirate DSP:** Interpolation and decimation, poly-phase representation and multistage implementation.

7. **Perfect reconstruction filter banks**: Power symmetric, alias-free multi-channel and tree structured filter banks.

8. **Wavelets**: Short time Fourier transform, wavelet transform, discrete time orthogonal wavelets and continuous time wavelet basis.

Recommended Books:

1	Alan V. Oppenheim, Ronald W. Schafer	Digital Signal Processing.
2	Rabiner and Gold. A	Theory and Application of Digital Signal Processing
3	William D. Stanley	Digital Signal Processing –
4	J. G. Proakis and D. G. Manolakis.	Digital Signal Processing: Principles, Algorithms, and Applications
5	Richard G. Lyons.	Understanding Digital Signal Processing

Course Code: EEE-4833 **Course Title: Digital Communication**
Credit Hours: 3 **Contact Hours: 3 per week**

[Prerequisite course: EEE 3601 Communication Theory]

Objectives: In this course student will learn about " Digital Communication' in regards to sampling, multiplexing, information theory, source coding, error control coding, video transmission and storage, system noise as regard to digital communication.

Section- A (Mid-term: Marks 30)

1. Digital Communication Overview: Electronic Communications; Sources and sinks of information; ADC, Digital Communication; Radio receivers; Signal transmission, Switching and networks; Advantages of digital communication over analogue communication.

2. Sampling, Multiplexing: Introduction, Pulse modulation, Sampling, Analogue pulse multiplexing, Quantised pulse amplitude modulation, Signal to quantisation noise ratio (SNqR), Pulse code modulation, Bandwidth reduction techniques.

3. Baseband Transmission: Introduction, Baseband centre point detection, Error accumulation over multiple hops, Line coding, Multiplex telephony, Digital signal regeneration, Symbol timing recovery, Repeater design.

Section –B (Final Examinaton-50 Marks)

Group A-(20 marks)

4. Information Theory and Source Coding: Introduction, Information and entropy, Conditional entropy and redundancy, Information loss due to noise, Source coding, Variable length coding, Source coding examples.

5. Error Control Coding: Introduction, Hamming distance and codeword weight, (n,k) Block codes, Syndrom decoding, Cyclic codes, Encoding of convolutional codes, Practical coders.

Group B-(30 marks)

6. Video transmission and storage: Introduction, Color representation, Conventional TV transmission systems, High definition TV, Digital video, Video data compression, Compression standards, Packet video**.**

7. Queuing theory and its application in communication: Introduction, The arrival process, the simple server queue, Packet speech transmission.

8. System noise and communications link budgets: Introduction, Physical aspects of noise, System noise calculations, Radio communication link budgets.

Recommended: Books:

1	Ian Glover&Peter Grant	Digital Communications, Prentice-Hall Inc.

2	J.F. Kuross & K. W. Ross	Computer Networking
3	William Stallings	Data & Computer Communication
4	Andrew S. Tanenbaum	Computer Networks

Course Code: EEE-4834 **Course Title: Digital Communication Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per week**
Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE-4833. In the second part, students will design simple systems using the principles learned in EEE-4833

Course Code: EEE-4835 **Course Title: Mobile Cellular Communication**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-3601]

Section- A (Mid-term: Marks 30)

1. 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.
2. 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,
3. Large scale path loss: Path loss and Path loss models in Mobile Wireless Communications, Foliage loss, Loss due to atmospheric conditions,

Section –B (Final Examinaton-50 Marks)
Group A-(20 marks)

4. Small Scale Path loss: Different types of Fading in Mobile Wireless Communications,
5. 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

Group B-(30 marks)

6. 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,
7. Advanced Cellular: Enhancement of GSM for Data transmission, GPRS and EDGE, Brief introductions to 3G and 4G Cellular Mobile Communications Systems.
8. AMPS and CDMA: Introduction to AMPS system. channel assignment, An introduction to CDMA in mobile communication and CDMA 2000,

Recommended Books:

1	Theodor S. Rappaport	Wireless Communications; Principle and Practice
2	WCY Lee	Cellular communication
3	Schiller	Mobile Communication

Course Code: EEE-4837 **Course Title: Telecommunication Engineering**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-3601]

Objectives: In this course student will learn about 'Telecommunication Engineering' in regards to telephone apparatus, telephone signal and switching, concepts of TDM, traffic engineering, modern telephone services and network as well as cellular mobile telephone

Section- A (Mid-term: Marks 30)

1. **Introduction and Telephone apparatus:** Principle, evolution, networks, exchange and international

regulatory bodies.microphone, speakers, ringer, pulse and tone dialing mechanism, side-tone mechanism, local and central batteries and advanced features.

2. **Switching system**: Principles of common control touch tone dial telephone, Cross point technology, No. 1 ESS, Japanese D-10, Metaconta. digital switching systems – space division switching, blocking probability and multistage switching, time division switching and two dimensional switching.
3. **Signal Switching**: Stored program control, Centralized SPC, Distributed SPC, Software architecture, Application software, Enhanced services, Two-stage network, Three-stage network, n-stage network.

Section –B (Final Examinaton-50 Marks)

Group A-(20 marks)

4. **Concepts of TDM**: Basic time division space switching, Basic time division time switching, Time multiplexed space switching, Time-multiplexed time switching, Combination switching, Three-stage combination switching, n-stage combination switching.
5. **Traffic Engineering:** Network traffic load and parameters, Grade of service and blocking probability, Modeling switching systems, Incoming traffic and service time characterization, Blocking models and loss estimation, Delay system and queuing.

Group B-(30 marks)

6. **Telephone Networks:** Subscriber loop systems, Switching hierarchy and routing, Transmission plan, Transmission systems. numbering plan Charging plan, Signaling techniques, In channel signaling, Common channel signaling.
7. **Modern telephone services and network**: Internet telephony, facsimile, integrated services digital network, asynchronous transfer mode and intelligent networks. Introduction to cellular telephony and satellite communication
8. **Cellular Mobile Telephone:** Mobile telephone systems, Trunking efficiency, Basic cellular system, Performance criteria, Mobile radio environment, Operation of cellular systems, Planning a cellular systems, Analog and digital cellular systems.

Recommended Books:

1	N.N. Biswas	Principles of Telephony
2	M.T. Hills	Telecommunication Switching Principles
3	T. Viswanathan	Telecommunication Switching Systems and Networks
4	W.C.Y. Lee	Mobile Cellular Telecommunication
5	J.Y. Bryce	Using ISDN
6	J.C. Bellamy	Digital Telephony

Interdisciplinary Fields

Course Code: EEE-4825 **Course Title: Biomedical Instrumentation**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-2411]

Objectives: In this course student will learn about 'Biomedical and Analytical Instrument' in regards to human body, measurement of Bio-signals, blood flow measurement and operation and working principles of different types of biological instruments.

Section –A (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.

Section-B (Final Exam: 50 Marks)

Group-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.

Group 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.

Recommended Books:

1	C. J. Casey	Biophysics concept and mechanism
2	Joseph J Carr & John M Brown	Introduction to Biomedical equipment technology
3	John G Webster	Medical Instrumentation
4	Physical principles of medical imaging	Physical principles of medical imaging
5	J. G. Skofronick	Medical Physics :

Course Code: EEE-4826 **Course Title: Biomedical Instrumentation Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 4825. In the second part, students will design simple systems using the principles learned in EEE 4825.

Course Code: EEE-4827 **Course Title: Measurement and Instrumentation**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-2411]

Objectives: In this course students will learn about 'Measurement and Instrumentation' in regards to measurement system, measuring instruments, measurement of electrical non-electrical quantities, transducers and data transmission.

Outcome: After successful completion of the course, student will be able to

- Understand and respond to the need for rigorous and formal metrology concepts in designing and using measurement systems.
- Understand the construction and working principle of different measuring instruments.
- Understand the operating principles of a range of widely used instrumentation techniques and appreciate how to use them in the design of measurement systems.
- Select appropriate passive or active transducers for measurement of physical phenomenon.
- Understand different type of interferences, its causes and methods for its reduction.

Section-A (Mid-term Exam: 30 Marks)

1. **I**ntroduction: Applications, Methods, functional elements of a measurement system and classification of instruments.
2. Measurement of electrical quantities:
3. Current and voltage, power and energy measurement. Instrument Transformer: Current and Potential Transformer.
4. Transducer: Mechanical, Electrical and Optical.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

5. Measurement of non-electrical quantities: Temperature, pressure, flow, level, strain, force and torque.
6. Data Transmission and Telemetry: Methods of data transmission, dc/ac telemetry system and digital data transmission.

Group-B (30-Marks)

7. Basic elements of dc and ac signal conditioning: Instrumentation amplifier, noise and source of noise, noise elimination compensation, function generation and linearization.
8. Converters: A/D and D/A converters, sample and hold circuits.

Recommended Books:

: 1	B.C.Nakra & K.K. Choudhury	:Instrumentation Measurement and Analysis
2	A. K. Sawhney	Electrical and Elec. Measurement and Instruments
3	J. L. Hunter	Applied Acoustics
4	W. D. Cooper	:Electronic Instrumentation & Measurement Technique
5	S. Wolf & R. M. Smith	Student Reference Manual
6	C. S. Rangan, G. R.Sarma, & V. S. Vmani	Instrumentation devices and systems.

Course Code: EEE-4828 **Course Title: Measurement and Instrumentation Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE-4827. In the second part, students will design simple systems using the principles learned in EEE-4827.

Outcome: After successful completion of the course, student will be able to

- Measure various electrical parameters with accuracy, precision, resolution.
- Appreciate how to identify and specify sensors (or complete instruments) for controlling machines and processes.
- Design different type of system for home and industrial application using various sensors.
- Maintain various types of test and measuring instruments.
- Test and troubleshoot electronic circuits using various measuring instruments.

Course Code: EEE-4843 **Course Title: Renewable Energy System**
Credit Hours: 3 **Contact Hours: 3 per week**

Objectives: In this course student will learn about ' Renewable Energy System' in regards to solar constants, solar collectors and their characteristics, solar cells, wind energy and other non-conventional energy**.**

Outcome: After completing this course student will be able to design a standalone, grid connected PV

system completely, that is the largest renewable energy source respect of Bangladesh. They also will be able to design PV pumping as well as to design solar thermal power system and wind turbine power generation system that are also important renewable sources respect of Bangladesh. Thus they will be expert on future energy

Section- A (Mid-term: Marks 30)

1. Introduction: Importance of Renewable energy, Sustainable energy and sustainable development, World energy scenario: demand and reserve, Future energy solution, Source of non-Conventionalenergy, Energy scenario of Bangladesh, Introduction to different renewable energy sources, Statistics regarding solar radiation and wind speed, Solar geometry: Solar constant, Azimuth, Zenith angle, clearness index, Declination, Day length, hour angle, Air mass, solar radiation etc.,Topics include environmental benefits of solarenergy.

2. Solar energy conversion: Measurement and calculation of Solar radiation, Different types of Pyranometer: ThermopilePyranometer , PhotovoltaicPyranometer etc., Different methods of solar energy conversion system, Solar thermal power generation, Active and passive solar design.

3. Solar energy collectors: Flat plate collectors, Concentrating collectors, Evacuated tube collector, collector, enclosed trough type collector, CSP, Solar pumping, collector efficiency factor, heat removal factor and flow ratefactor.

Section –B (Final Examinaton-50 Marks)

Group-A (20 marks)

4. Solar Cells: Principle of operation, characteristics and constructionof a solar cell, factors affecting conversion efficiency, maximum power output, Optimization of cell design, MIS Solar cells, Amorphous silicon-material properties, hybrid photovoltaic/thermal systems, PV modules and arrays:stationary and tracking; urban/rural applications.

5. PV system, Energy storage and Radiation characteristics:PV systems: stand alone, battery storage: different types of battery; Types of energy storage, sensible heat storage, latent heat storage; Absorption, transmittance, reflectance, selectivesurfaces.

Group -B (30 marks)

6. Wind Energy: wind energy conversion systems, Introduction to wind turbine systems including wind energy potential and application topower generation. Topics include wind energy principles, wind site assessment, wind turbinecomponents, power generation machinery, control systems, connection to the electric grid andmaintenance, Site selection for wind mill units.

7. Renewable Energy Penetration on the Power Grid: Introduction to the basic definitions of electrical power, interfacing primary sources, generator/load characteristics, and renewable energy resources. Topics include solar energy grid interfacing, wind energy grid interfacing, battery charging/management, Harmonic distortion, voltage sags, and national standards.

8. **Other non-conventional energy**: Biomass, source of biomass, water power, tidal energy conversion, geothermal energy, wave energy generator, Bio-fuel etc.

Books Recommended:

1.	G. D. Rai	Solar energy utilization
2	G. D. Rai	Non-conventional source of energy
3	D. Rapp	Solar energy
4	J. A. Duffiee	Solar engineering of thermal process
5	M. A. Green	Solar Cell
6	Magal	Solar Power Engineering
7	Neville	Solar energy conversion: Solar cell
8	Andersion	Fundamental of Solar energy conversion
9	Godfrey Boyle	Renewable energy
10	David Craddock	Renewable energy made easy: free energy from solar, wind,

11	Dan Chiras	Dan Chiras The Homeowner's Guide to Renewable Energy: Achieving Energy Independence Through Solar, Wind, Biomass, and Hydropower

Course Code: EEE-4844 **Course Title: Renewable Energy System Sessional**
Credit Hours: 3 **Contact Hours: 3 per week**

Objectives: In this course students will perform experiments to verify practically the theories and concepts learned in EEE-4843.

Outcome: After completing this lab student will be able to construct charge controller, inverter, investigating PV characteristics, thus designing complete solar system and also able to design wind, tidal and wave based power system

Course Code: EEE-4841 **Course Title: Antenna & Propagation**
Credit Hours: 3 **Contact Hours: 3 per Week**
[Pre requisite: EEE-3601]

Objectives: The *objective* of this *course* is to introduce the fundamental ideas of the antenna and propagation.

Section –A (Mid-term Exam: 30 Marks)

1) Antenna Basics: Radiation fields of elemental dipoles. Antenna patterns and antenna parameters: beamwidth, directivity, gain, side-lobes, linear polarization, circular polarization, radiation resistance.
2) Antenna Basics: equivalent circuit of receiving antenna, effective length, capture area, Friis transmission formula. Reciprocity theorem. Radiation by dynamic currents and charges, retarded potentials, isotropic source. Half-wave dipole, loop antenna.
3) Antenna Arrays: Two-element array, N-element linear array, phased array, uniform spacing and amplitude, non-uniform amplitude, planar array.

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

4) Analysis of Different types of Antennas: Biconical antenna, cylindrical dipole, folded dipole, Monopole antenna, V Antennas, Inverted V Antennas, J-pole antenna, rhombic antenna, helical antenna, Yagi-Uda arrays,
5) Analysis of Different types of Antennas: log-periodic antenna, slot, micro strip antenna, rectangular horn Antenna, circular horn antenna, Cassegrain Antenna, parabolic reflectors, lenses.

Group-B (30 Marks)

6) Radio Wave Propagation: Electromagnetic waves, wave front, characteristic impedance of free space, reflection, refraction and diffraction. Ground waves and sky waves.
7) Radio Wave Propagation: The ionospheric layers, refractive index, virtual height, critical frequency and angle, maximum usable frequency, skip zone, skip distance, fading.
8) Radio 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. VHF and microwave point-to-point link.

Course Code: EEE-4842 **Course Title: Antenna & Propagation Sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: In this course students will perform experiments to verify practically the theories and concepts learned in EEE-4841.

Course Code: EEE-4845 **Course Title: Embedded system**
Credit Hours: 3 **Contact Hours: 3 per Week**

Objectives: In this course students will learn the basics of designing, interfacing, configuring, and programming embedded systems. They will make use of the PIC microcontroller, which is an inexpensive, popular embedded microcontroller used by hobbyists, researchers, and in industry, to implement the techniques learned in class.

Section- A (Mid-term: Marks 30)

(1) Introduction of Embedded System and Microcontroller Architecture: Definition, characteristics, application and challenges in embedded system design, use of microprocessor in embedded system, embedded system design process, inside the embedded system, Microcontroller, Microcontroller architecture, inside the microcontroller, Commercial microcontroller devices, and selection of microcontroller.

(2) Embedded Microcontroller and Programming: Block diagram, pin functions and features of 8051/PIC16F887 (or any other) microcontroller, Programming language (Machine, Assembly and high level language), Basics of C (data type, variable, constants, operator, conditional operator, loop, array and functions), Assembly language Instructions.

(3) Parallel I/O ports: Parallel Ports (Simple parallel and multifunctional parallel I/O ports), Use of parallel ports, Pull-up resistor, I/O Ports of PIC16F887 (or any other) microcontroller, Interfacing microcontroller with switch, LED, Single &multiple LED segment display, matrix display and digital sensors.

Section –B (Final Examinaton-50 Marks)

Group-A (20 marks)

(4) Some important I/O interface and Interrupt System: LCD display, Key pad, electromagnetic relay, DC motor and servo motor interfacing, Interfacing with digital sensors (Ultrasonic, IR, motion, sound sensor etc.) ,Interrupt definition and sources, recognizing an interrupt, Interrupt System of PIC16F887 (or any other) microcontroller, Application of interrupt in real time system.

(5) Timer/Counter: Purpose and application of timer/counter, Timer counter in PIC16F887 (or any other) microcontroller, operation in timer mode and counter mode, use of prescaler and interrupt in timer operation, Application of timer/counter in real time system.

Group -B (30 marks)

(6) Interfacing to analog world: Analog to digital conversion techniques, quantization error, sampling rate, A/DConverter inside PIC16F887 (or any other) microcontroller,Sensor interfacing (LDR, thermistor, Gas sensor etc.), Applications such as digital voltmeter, light intensity measurement etc.

(7) Serial Communication: BasicSerial Port operation, USART, Serial peripheral interface (SPI), inter-IC (I2C) serial interface,Serial communication modules of PIC16F887 (or any other) microcontroller, Application of serial communication in real time system.

(8) FPGA:FPGA definition and application, FPGA Vs ASICs and ASSPs, History of FPGA, FPGA architecture,FPGA programming language, Verilog HDL, Structural Verilog coding, RTL Verilog coding for combinational and sequential digital circuit, Design of RAM and bi directional I/O ports in FPGA.

Reference Books:

	Author Name	Book Name
1.	Milan Verle, 1st edition, mikroElectrica, 2009.	PIC Microcontroller
2.	Steve Heath.	Embedded System Design
3.	Wayne Wolf	Computer as components
4.	Md. Liakot Ali	Verilog HDL: An easy approach for beginners

Course Code: EEE-4846 **Course Title: Embedded system sessional**
Credit Hours: 1.5 **Contact Hours: 3 per Week**

Objectives: In this course students will perform experiments to verify practically the theories and concepts learned in EEE-4845.

Course Title: EEE-4847 **Course Title: Optical Fiber Communication**
Credit Hours: 3 **Contact Hours: 3 per week**
[Prerequisite course: EEE-3601]

Objectives: In this course student will lean about 'Optical fiber Communication' in regards to characteristics optical fiber, light sources and detectors for optical communication, noises, receiver analysis , optical amplifier and multi-channel optical system.

Section- A (Mid-term: Marks 30)

1. **Introduction**: Principle of light transmission in a fiber, propagation of light in an optical fiber, ray model and wave model.
2. **Optical fiber**: Types and characteristics, transmission characteristics, fiber joints and fiber couplers.
3. **Losses in fibers,** Dispersion, Power and rise time budget, SNR and BER calculations,

Section –B (Final Examinaton-50 Marks)

Group-A (20 marks)

4. **Light sources and detectors**: Light emitting diodes and laser diodes. PIN photo-detector and avalanche photo-detectors, Photo detector connector and splices.
5. **Coherent optical communication**: Introduction, WDM systems, Devices for coherent optical communication, Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises.

Group-B (30 marks)

6. **Receiver analysis**: Direct detection and coherent detection, noise and limitations.
7. **Optical amplifier**: Laser and fiber amplifiers, applications and limitations. Introduction to high speed long distance fiber optic links.
8. **Multi-channel optical system:** Frequency division multiplexing, wavelength division multiplexing and co-channel interference.

Recommended Books:

1	S.E.Miller & A.G. Chynoweth	Optical Fiber Telecommunication
2	Barnoski	Fundamentals of Optical Fiber Communication
3	Chrin	An Introduction to Optical Fiber
4	J. M. Senior	Optical Fiber Communication

Course Title: EEE-4848 **Course Title: Optical Fiber Communication Sessional**
Credit Hours: 3 **Contact Hours: 3 per week**

Objectives: In this course students will perform experiments to verify practically the theories and concepts learned in EEE-4847.

D. University Requirement Courses

Course Title: Text of Ethics and Morality **Course Code:** UREM-1101
Credit Hours: 01 (One) Hour **Contact Hours:** 02 (Two) Hours **(per week)**

Objectives:

- 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.
- 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.
- 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.
- To make students familiar with *Ayats* of *Ahkam* of the Holy *Qur'an* so that they can lead their life being enlightened with them.
- To go towards achieving the motto of the university – to combine quality with morality.

Outcome:

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

Section- A (Mid-term: Marks 30)

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 (25m+20m).
    A. Selected text on the introductory chapter of the holy Qur'an (*suratulFatihah*).
    B. Writing of the forms of Arabic alphabet with example. **(Assignment).**
4. Text of ethics, and Arabic language lesson (25 m+20m).
    A. Selected text on procreation of the creation of humankind: 22:5
    B. The sun letters and the moon letters.
5. Text of ethics, and Arabic language lesson (25 m+20m).
    A. Selected text on *iman*: 2: 1-5
    B. Arabic numbers (10-100).

Text of ethics, and Arabic language lesson (25 m+20m).

    C. Selected text on *twheed*: 112: 1-4
    D. Some common Arabic words used in daily life (20 words).

6. Text of ethics, and Arabic language lesson (25 m+20m).
    A. Selected text on *resalah*: 4: 163-165.
    B. The name of days in Arabic.
7. Text of ethics, and Arabic language lesson (25 m+20m).
    A. Selected text on *akhirah*: 39: 68-74.
    B. The name of months in Arabic.

8. Text of ethics, and Arabic language lesson (25 m+20m).
   A. Selected text on *taharah:* 5:6.
   B. The formation of Arabic word; noun, verb and particle.
9. Text of ethics, and Arabic language lesson (20 m+20m).
   A. Selected text on *salah*: 11: 114, 24: 68.
   B. Exercise of Damaaer(**اَلضَّمَائِر**): pronouns.

10. Text of ethics, and Arabic language lesson (25 m+20m).
    A. Selected text on Zakat: 9: 34-35.
    B. Exercise of Arabic relative pronouns.
11. Text of ethics, and Arabic language lesson (25 m+20m).
    A. Selected text on Sawm : 2: 184-185.
    B. Exercise of demonstrative pronouns. **(إسم الاشارة**)

Section –B (Final Examinaton-50 Marks)

12. Text of ethics, and Arabic language lesson (25 m+25m).
    A. Selected text on hajj and Ka'ba 2: 127-128; 3: 96-97.
    B. Practice of *huruf al-jarr* **(حروف الجار**): prepositions.
13. Text of ethics, and conversation (25 m+20m).
    A. Text on ensuring social peace by removing bad behavior 49:5-12
    B. Conversation: myself and my family members.
14. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Selected text on duties and obligations towards family and relatives = 4: 34-36.
    B. Exercise of adverb of time and place **(ظرف الزمان والمكان**).
    C. Conversation: at the house.
16. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Selected text on the operation of creatures in the universe. 2:164.
    B. Exercise of simple nominal sentence **(الجملة الإسمية)**
    C. Conversation: at the university
17. Text of ethics, Arabic language lesson and conversation (25 m+15m +10 m).
    A. Selected text on the transition of human life: 10:24
    B. Subject of a sentence (**المبتدأ**)
    C. Conversation: about the weather.
18. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Selected text on the rule of livelihood = 2: 172- 174, 5:3-5
    B. Predicate of a sentence (**)الخبر**
    C. Conversation. At masjid.
19. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Selected text on the rule of al-*riba* = 2: 275-279.
    B. Exercise of interrogative pronoun **إسم الاستفهام**
    C. Conversation : at library
20. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Selected text on the rule of loan =2: 282**.**
    B. Exercise of possessive phrase**المركب الاضافي**
    C. Conversation : at kitchen
21. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Selected Text on the rules of drug and gambling =5: 90-91
    B. Exercise of descriptive phrase**المركب التوصيفي**
    C. Conversation : at market.
22. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).

A. Selected Text on the rule of veil and *mahram* (unmarriageable persons) : 24: 30-31,33:59
B. Formation of Verb **الفعل** -1
C. Conversation: at stadium.

23. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Selected Text on the rule of marriage and *ma*hr: 4: 2-4
    B. Formation of Verb **الفعل** -2
    C. Conversation: the visiting to a sick man.
24. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Text on the rule of divorce 2:227-230
    B. Formation of Verb **الفعل** -3.
    C. Conversation: at relative's house.
25. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Selected text on *kufr,*shirk and *nifaq*=5:72, 9:68
    B. Formation of Verbal sentence **الجملة الفعلية**
    C. Conversation: performing salat.
26. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Selected text on the sermon of a father to his son =31:13-19.
    B. Exercise of Verbal sentence **الجملة الفعلية**-1
    C. Conversation: giving *zakah* and *sadakah.*
27. Text of ethics, Arabic language lesson and conversation (20 m+15m +10 m).
    A. Selected text on characteristics of Allah's servants who are inheritors of *Jannah*= 23:1-11
    B. Exercise of Arabic imperative sentence.
    C. Conversation: Conversation: Eidfestival andperforming hajj.
28. Text of ethics, Arabic language lesson and conversation (25m+20m).
    A. Selected text on characteristics of ideal servants of Allah ('IbadurRahman) as depicted in the Qur'an= 25: 63-76
    B. Formation and exercise of Arabic negative imperative sentence.

References

1. Abbott, N., Studies in Arabic literary papyri II, Qur'anic commentary and tradition ,Chicago: University of Chicago, 1967.
2. Dr. M. FazlurRahman, Everyday Arabic Conversation, RiyadProkashani, Dhaka, 2005.
3. Haleem, M. A., Understanding the Qur'an: themes and Style, London: I. B. Tauris, 1999.
4. IzzathUroosa, 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 Title: Advanced English **Course Code:** UREL -1106
Credit Hours: 2 (two) Hours. **Contact Hours:** 3 (three) Hours. **(Per week)**

Objectives

- Helping the students to know the basics of English language
- Helping the students overcome the fear of English
- Developing confidence about the correctness of their language
- Enabling them to write accurately
- Enabling them to understand sentence patterns while they read
- Making them capable to comprehend English texts
- Providing the students some moral teachings

Outcome By the end of this course students are expected to be able to –

- Make sentence of their own on the basis of their knowledge about grammar.

- Identify their own mistakes in their writing and speaking and correct the same.
- Write accurate sentences with full confidence of their correctness
- Develop ideas about some ethical values.

Section- A (Mid-term: Marks 30)

Chapter: 1 (Basics of Grammar)

1. Kinds of sentences
    i. Structures of assertive, imperative , imperative with let, interrogative (Y/N & WH question) optative & exclamatory
    ii. Basic sentence patterns of assertive sentence
    iii. Affirmative & negative structures
    iv. Simple, complex &compund
2. Parts of speech
    i. Introducing each part of speech
    ii. Showing use of same words as different parts of speech
    iii. Changing words into different parts of speech and formation of sentences with them
3. Pre modifier and post modifier
    i. Introducing adjectives, participles, noun, noun adjective, compounds, possessive and adverb as pre modifier
    ii. Introducing infinitive phrase, present participle phrase, past participle phrase, prepositional phrase, appositive, adjective, relative clause, adverb as post modifier
4. Preposition
    i. Introducing simple, compound, phrase and participle prepositions
    ii. Showing and practicing the meaning and use of phrase prepositions
    iii. Showing difference in use of some common preposition
    iv. Discussing appropriate preposition
5. Verbs
    i. Introducing transitive and intransitive verbs
    ii. Introducing strong and weak verbs and conjugation of common verbs
    iii. Causative verbs
    iv. Group verbs

Chapter: 2 (Reading-1, for general topics)- Seen passages from-

- 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

Activities:

- Vocabulary (synonym/antonym/formation of sentences with words/filling in the gaps)
- Comprehension (short question to be answered in one sentence/true/false)

- Grammar: (identifying parts of speech/writing own sentence following certain structure/identifying grammar points taught in chapter-1)

Chapter- 3 (Reading -2 –reading for inculcating moral values)- Unseen
Some passages on 'honesty, truthfulness, God fearing, helping the distressed people, refraining from bad conducts' will be given and students after reading the passages will-

- Work in pairs and groups to discuss the content
- Make a speech on the content
- Write an e-mail to friend/relative on the topic

Section –B (Final Examinaton-50 Marks)

Chapter- 1 (Basics of Grammar)

6. Conjunction
    i. Discussing the difference between preposition and conjunction
    ii. Showing the meaning and use of compound conjunctions like, in order that, on condition that, even if, so that, provided that, as though, as well as, as soon as, as if.
    iii. Introducing coordinating conjunctions like, and, but, for, or, nor, also, either----or, neither----nor
    iv. Use of subordinating conjunctions like, after, because, if, that, though, although, till, before, unless, as, when, where, while.
7. Subject and verb agreement
8. Idioms and phrases
9. Voice
    i. Discussing the difference between active subject and passive subject.
    ii. Discussing ways of transforming active into passive and passive into active.
    iii. Showing the right use of verb with active and passive subject
10. Narration
11. Formation of WH question
12. Tenses
    i. Introducing use of 'to be' and 'to have' in three tenses with affirmative, negative, interrogative (both Yes/No and WH) structures.
    ii. Discussing structures and uses of different tenses with action verbs like 'read, write, play, discuss' etc.
    iii. Discussing ways of identifying different forms of tenses and showing right use of verbs
    iv. Exploring students' difficulties in the use of tense, correcting and discussing tense based errors.

Chapter: 2 Writing:

- Writing academic applications
- Writing e-mail, Face Book status, WhatsApp/Imo/Vibermessages
- Writing story on the basis of theme/ completing story
- Writing news casts
- Describing pie/column chart/graphs
- Guided paragraphs
- Agreeing/disagreeing on some opinion
- Amplification of ideas
- Writing dialogue from a passage

Chapter- 3 Speaking

- Making speech
- Pair work
- Group work

- Debate

Chapter-4 (Listening & Speaking) To let the students listen various recorded dialogues or part of English movies to develop their listening skills.
To arrange classes to let the students describe pictures or Cartoons, different topics.
Extempore speech & Set speech to accelerate their fluency in English.

Books Recommended

1. Raymond Murphy, *Intermediate English Grammar*, Foundation Books, 2/19 Ansari Road, Daryaganj, New Delhi-110002, ManasSaikia, 1995. (Published by arrangement with Cambridge University Press, The Edinburgh Building, and Shaftsbury Road, Cambridge CB2 2RU, U.K.).
2. Wren & Martin, *High School English Grammar and Composition*-, New Delhi, S. Chand & Company Ltd. 2002.
3. Thomson & Martinet, *Practical English Grammar*, Oxford University Press, Walton Street, Oxford OX2 6DP, 1993 (reprinted in India by arrangement with Oxford University Press).
4. Michael A. Pyle and Mary Ellen Munoz, *Cliffs TOEFL Preparation Guide*, New Delhi, BPB Publications, B-14, Connaught Place, New Delhi-110001, 1992.
5. Bruce Rogers, *Peterson's TOEFL Success*, Princeton, New Jersey, Peterson's, 2000.
6. AS Hornby, *Oxford Advanced Learner's Dictionary of Current English*, Oxford University Press, 2002-2003.
7. Chowdhury&Hossain, *Advanced English*, Dhaka, SaymaChowdhury and Halima Chowdhury, 2004
8. Build up Your English, A.J. Glover, The English Language Book Society and J.M. Dents and Sons Ltd. London

Course Title: Basic Principles of Islam
Credit Hour: 02 C.H.

Course Code: URED – 1201
Contact Hour: 02 C.H. (per week)

Objectives

This *course* is designed:

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 wide spread impacts of '*Ibadah* on their lives and to inspire them to follow Islam in all walks of life.

Outcomes

After completion of this course:

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.

Section-A (Midterm 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.*

Section-B (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 *'Ibadah* and 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.

Reference **Basic Principles of Islam (Pillars of *Iman*):**

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, Baitul Mukarram, Dhaka, 1995.*

Basic Principles of Islam (Pillars of Islam):

1. Mohammad Amimul Ahsan and others, Towards Understanding *`Ibadah* in Islam, Bangladesh Institute of Islamicthought (BIIT), Humanscience Series-06, First Eddithion, May-2015.
2. Abdalati, Hammudah, *Islam in Focus,* The Dept. of Islamic Affairs, The Ministry of Awqaf and Islamic Affairs, State of Qatar, 1995/ Islamic Teaching Course. Vol.-1
3. Al-Quardawi, Dr. Yousuf, *Al-'Ibadah in Islam,*Wahba publication, Etypt, 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: 01 C.H. **Contact Hour:** 02 C.H.(per week)

Objectives The main objectives of this course are:
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.

Outcomes After completion of this course:
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.

Section-A (Midterm 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 classification 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.

Section-B (Final Exam: 50 Marks)

Chapter# 04 **Makki&MadaniRevelations:** (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'an Sunnah 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.

Reference **Sciences of Qur'an:**

1. Denffer, Ahmad, vol. 'Ulum Al-Qur'an:An Introduction to the Sciences of the Qur'an, The Islamic Foundation, UK, reprinted by – A.S. Noordeen, Kuala Lumpur. 1983.
2. Ushama, Dr. Thameem, Sciences of the Qur'an: An Analytical Study, International Islamic University Malaysia, Cooperative Limited, Kuala Lumpur. 1998.
3. Bucaille, Dr. Maurice, The BibleThe Qur'an & Science, Thinkers Library, Selangor Darul Ehsan. Malaysia, 1996.
4. Badruddin Muhammad bin Abdullah Al-Badruddin Al- Zarkashi, Al-Burhan Fi Ulumil Qur'an, Dar Al-Marifah, Bairuth, Vl. 01.
5. A Study of the Holy Qur'an and its Teachings, First edition, IQRA International Education Foundation, Chicago, April-1999.

Sciences of Hadith:

1. Al-Azami, Dr Mohammad Mustafa, Studies in Early Hadith Literature, American Trust publication, Indiana, 1978.
2. Hasan, Dr. Suhaib, An Introduction to the Science of Hadith,London, AL-Qur'an Society, 1994.
3. Marhribi, Al-Hassan, Introduction to the Study of the Hadith, Roshmee, South Africa, 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 Title: Introduction to Comparative Religion **Course Code:** URED-2305
Credit Hours: 3 (three) C.H. **Contact Hours:** 3 (three) C.H. (per week)

Objectives 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.

Outcome

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 Islamophobia among the non-Muslim community and increase mutual relationship among them.

Section-A (Midterm 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).

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).

Holy books and sacred texts of major religions.

Section-B (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.

References:

1. Sharpe, E. J. (1989). Comparative religion: A history.
2. Eliade, M. (1996). *Patterns in comparative religion*.U of Nebraska Press.
3. Eastman, Roger (1999) *The Ways of Religion: An Introduction to the Major Traditions.* Oxford University Press, US; 3 edition.

Course Code: URBL-2401 **Course Title:** Functional Bengali Language and Literature
Credit Hours: 02 (two) C.H. **Contact Hours:** 02 (two) C.H. **(per week)**

Objective 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.

Outcome 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.

প্রায়োগিকবাংলা : ৫০

১. বাংলাভাষার উদ্ভব ও সাধারণপরিচয়।
২. বাংলাবর্ণ ও ধ্বনিপরিচয়।
৩. বাংলাবানান : ণ-ত্ব বিধান, ষ-ত্ব বিধান ও প্রমিতবাংলাবানানেরনিয়ম।
৪. শব্দপ্রকরণ।
৫. সমাস ও প্রকৃতি-প্রত্যয়।
৬. বাক্য প্রকরণ।
৭. পরিভাষা।
৮. প্রতিবর্ণীকরণ (IPA) পরিচিতি।
৯. সারাংশ, সারমর্ম, ভাবসম্প্রসারণ।
১০. পত্রলিখন।

বাংলাসাহিত্য : ৩০

১. বাংলাসাহিত্যেরইতিহাস (প্রাচীন, মধ্য ও আধুনিকযুগ)
২. গদ্য : (ক) পোস্ট মাস্টার, মুসলমানীগল্প (রবীন্দ্রনাথ ঠাকুর)
(খ) তরুনেরসাধনা, যৌবনেরগান (কাজীনজরুলইসলাম)
৩. কবিতা : (ক) বঙ্গ ভূমিরপ্রতি (মধুসূদন দত্ত)
(খ) সোনারতরী (রবীন্দ্রনাথ ঠাকুর)
(গ) সাম্যবাদী (কাজীনজরুলইসলাম)
(ঘ) আজান (কায়কোবাদ)

Midterm 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) তরুনেরসাধনা, যৌবনেরগান (কাজীনজরুলইসলাম)

Final Exam :50 Marks

প্রায়োগিকবাংলা : ৩০

১. শব্দপ্রকরণ।
২. সমাস ও প্রকৃতি-প্রত্যয়।
৩. বাক্য প্রকরণ।
৪. প্রতিবর্ণীকরণ (IPA) 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 (কাজীনজরুলইসলাম)
(ঘ) আজান (কায়কোবাদ)

Reference

১. রবীন্দ্রনাথ ঠাকুর, গল্পগুচ্ছ, বিশ্বভারতী, কলকাতা।
২. কাজীনজরুলইসলাম, অগ্নিবীনা, সর্ব্বহারা, সঞ্চিতা, ইসলামীকবিতা, গজল ও প্রবন্ধএবংকাব্য আমপারা।
৩. মুহাম্মদ শহীদুল্লাহ, বাঙ্গালা ভাষারইতিবৃত্ত, শহীদুল্লারচনাবলী 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. এাহবুবুলহক, 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:** Introduction to Political Thoughts and Social Behavior
Credit Hour: 01 C.H. **Contact Hour:** 02 C.H.(per week)

Objectives 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.

Outcomes After completion of this course:
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.

Section-A (Midterm 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.

Section-B (Final Exam: 50 Marks)

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.

Reference **Introduction to Political Thoughts:**

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2. Asad, Mohammad, *Basic principles of state and Government in Islam* (California; Southern California University Press.
3. Matin, Abdur Rashid and Sirajul Islam, *Introduction to Political Science.*
4. Sherwani, H.K. *Studies in Muslim Political Thought and Administration*, Muhammad Ashraf, 1945, Lahore.
5. Mohammad Shafiul Alam Bhuiyan, *The Government and Politics in Islam*, Noor Publications,4th edition, 2016, Dhaka-1000.

Social Behavior:

1. Abdul Hannan, Shah, *Social Laws of Islam*, BIIT, Dhaka, 1995.
2. Abdalati, Hammudah, (1977), "*The Family Structure in Islam*", American Trust Publications. USA.
3. Al-Minawi, Kawther M, *The Child Rights in Islam.* Riyadh: Dar al-Amal Publishing

House, 1993.
4. Umer, Chapra, *Islam and the Economic Challenge*. Leicester, UK: Islamic Foundation and Virginia, USA: the International Institute of Islamic Thought, 1992.
5. Taqi, Usmani, M., *An Introduction to Islamic Finance.* Karachi, Pakistan: Idaratul Ma'arif, 1998.

Course Code: URED-3604 **Course Title:** Life and Teachings of the Prophet Muhammad *(SAAS)*
Credit Hour: 01 C.H. **Contact Hour:** 02 C.H.(per week)

Objectives This course is designed:
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.

Outcomes After completion of this course:
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).

Section-A (Midterm 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 Quraysh begin, Qur'anic approach towards Quraysh Oppositions.
Migration to Abyssinia.

Section-B (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.

Reference
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: 01 C.H. **Contact Hour:** 02 C.H.(per week)

Objective 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 *AbbasidsKhilafah.* The contributions include the advancement of administration, society, civilization, different branches of science such as geography, mathematics, history, medical science, philosophy etc.

Outcome 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.

Section A (Midterm Examination: 30 Marks):

Chapter One: *Khilafah*: Definition, Origin and Development of *Khilafah*, Difference between *Khilafah* in general sense and *Khilafah'Ala-minhajal- Nabuwwah*, election to the office of the *Khilafah*, *Khilafah*vs*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.

Section B (Final Examination: 50 Marks):

Chapter Four: The Umayyad *Khilafah* (661 A.D-750 A.D):A brief discussion on Umayyad*Khilafah*, Administrative reforms of AbdulMalik*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 ofUmayyad *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 ofAbbasid *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.

Reference

P.K. Hitti, *History of the Arabs*, Macmillan edition, 1970, London.
S.A.Q. Hussaini, *The Arab Administration*, 1956, Lahore.
SyeedAmeer Ali, *A Short History of Saracens*, Macmillan edition, 1916, London.
T.I. Arnold, *The Caliphate*, Oxford, 1924, London.
Muhammad Ali, *The Early Caliphate*, Cambridge, 1936, London.
W.Muir, *Caliphate, Its Rise, Decline and fall*, Edinburg, 1934.
B, Lewis, & P.M. Holt(ed.), *Cambridge History of Islam*, 1947.
SyeedAmeerAli, *The Spirit of Islam*, Christophers, 1891, London.
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Hamilton GibbA.R. *Studies on the Civilization of Islam*, Princeton, 1982, London.
R. Levy, *The Social Structure of Islam*, Cambridge 1979, London.
R.A. Nicholson, *A Literary History of the Arabs*, Cambridge 1930, London.
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S.M.Imamuddin, *Arab Muslim Administration*, 1976, Karachi.
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H.K.Sherwani, *Studies in Muslim Political Thought and Administration*, Muhammad Ashraf, 1945, Lahore.
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M.Iqbal, *The Reconstruction of Religious Thought in Islam*. 1986, Institute of Islamic

Culture, Lahore.
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MusaAnsari, *Moddhojuger Muslim Sovvota o Sonskriti*, Bangla Academy, 1999, Dhaka.
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R.M.Savory, *Introduction to Islamic Civilization*, Cambridge University Press, 1977, London.
FranzRosenthal, *A History of Muslim Historiography*, Leiden, 1952.
CobbS., *Islamic Contributions to Civilization*, Avalon Press, Washington, 1963.
ZiauddinSardar, *Science, Technology and development in the Muslim World*, Croom Helm, 1977, London.
M. AkborAli, *BigghaneMusalmanderObodan (Muslim Contribution to science)* Volume 1-12, 1936, Dhaka.

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

Credit Hour: 02 C.H. **Contact Hour:** 02 C.H.(per week)

Objective 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 ideasthat are significantly related to the people and society of Bangladesh with a view to develop patriotism among the learners.

Outcome 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.

Section A (Midterm Examination: 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.

Section B (Final Examination: 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.

Reference

Sirajul Islam (ed.), *Banglapedia: National Encyclopedia of Bangladesh,*Vol- 1-14, Asiatic Society of Bangladesh, Dhaka, 1998.

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MosharrafHossain, *Graphoman World Atlas*, 7th edition, Graphosman, Dhaka, 2012.

Mohar Ali, *History of the Muslims of Bengal.*Vol – 1-3, Islamic Foundation Bangladesh, Dhaka, 2003.

Abdul Karim, *Social History of the Muslims of Bengal*, BaitushSharaf Islamic Research Institute, Chittagong, Bangladesh, 1985.

Dr. EnamulHuq, *A History of Sufism in Bengal*, Bangla Academy, Dhaka, 1975.

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M.A. Rahim, *The Muslim Society and Politics in Bengal*, University of Dhaka, Bangladesh, 1978.

Prof. Dr. Muinuddin Ahmed Khan, *Islamic Revivalism*, Bangladesh Institute of Islamic Thought (BIIT), 2010.

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Dr. Muhammad InamulHuq, *VaroterMusalman O ShwadinotaAndolan*, Bangla Academy, Dhaka, 1995.

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Dr. M.A. Rahim, and others, *BangladesherItihash*, NowrozKitabistan, Dhaka, Bangladesh, 1994.

Md. Thowhidul Islam and others, *Bangladesh Studies.* Bangladesh Institute of Islamic Thought (BIIT), 2017.

Abbas Ali, Khan, *BanglarMusalmanderItihash*, Bangladesh Islamic Center, Dhaka, 2002.

Sirajul Islam, *History of Bangladesh*, Vol – 1-3, Asiatic Society of Bangladesh, Dhaka, 2008.

AbulAsad, *EkshobochorerItihas*, Bangladesh Co-operative Book Society, Dhaka, 1997.

M.A. Barnik, *RasthraBhashaAndolonerItihas*, AHDPH.
OliAhad, *JatiyoRajniti 1945-1975*, Bangladesh Co-operative Book Society, Dhaka, 2004.
Abul Mansur Ahmad, *Amar DekhaRajniteerPoncashBochor*, SrijonProkashoni Ltd. Dhaka, 1988.
Kamruddin Ahmed, *Social History of East Pakistan*, Dacca, Crescent Book Center, 1967.
SiddiqSalik, *Witness to Surrender*, The University Press Ltd., 1997.
Moudud Ahmed, *Bangladesh: Constitutional Quest for Autonomy*, The University Press Ltd., 2003.
Akbar Ali Khan, *Discovery of Bangladesh*, The University Press Ltd., 2009.
TalukdarManiruzzaman, *Bangladesh Revolution and its Aftermath*, University Press Ltd., 1992
Shamsul I. Khan, *Political Culture, Political Parties and the Democratic Transition in Bangladesh*, The University Press Ltd., 2008.
The Constitution of the People's Republic of Bangladesh.
Md. Abdul Halim, *Constitution, Constitutional Law and Politics: Bangladesh Perspective*, Dhaka, 1998.

Useful web links:

http://www.bangladesh.gov.bd
http://www.bangladesh.com
http://www.banglapedia.org
http://www.ru.ac.bd/ibs/
http://www.bbs.gov.bd

E. Interdisciplinary Courses

Course Code: ACC-2401 **Course Title: Financial and Managerial Accounting,**
Credit Hours: **2** **Contact Hours: 2 per week**

Objectives: In this course student will learn about 'Financial and Managerial Accounting' in regards to accounting and financial statement. book keeping system ,errors correction in the trial balance, bank reconciliation statement, budget and planning.

Section –A (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.

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

4. **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.
5. **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.

Group-B (30 Marks)

6. **Cost In General: C**ost in general: objectives & classifications; Costing Journals; Job order costing, Process costing & Overhead costing, cost sheet; Cost of goods sold statement.
7. **Marginal & Relevant costing**: Marginal costing tools and techniques, cost-volume-profit analysis.
8. **Guidelines for Decision-Making**: Budget, Capital budgeting; Planning, evaluation & control of capital expenditures.

Recommended Books:

1	Charles T. Horngren & walter T. Harrison	Accounting.
2	Adolph Matz & Milton F. Usry	Cost Accounting- Planning and Control
3	Sankar Prasad Basu & Monilal Das.	Practice in Accountancy
4	Jerry J. Weygandt, D E. Kieso & Paul D. Kimmel.	Accounting Principles :
5	Jay M Smith & K Fred Skousen	Intermediate Accounting.

Course Code: ECON-3501 **Course Title: Principles of Economics**
Credit Hours: 2 **Contact Hours:** 2 per week

Objectives: In this course student will learn about 'Principle of Economics' in regards to the basic idea in micro and macroeconomics, production and market , economic policy, economics of development and planning.

Section –A (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.

Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)

4. Market: Concepts of market and market structure. Cost analysis and cost function. Small scale production and large-scale production, Optimization, Theory of distribution.

5. Macroeconomics: Savings, investment, employment, National income analysis, Inflation.

Group-B (30 Marks)

6. Economic Policy: Monetary policy, Fiscal policy and trade policy with reference to Bangladesh.

7. Economics of development: Dimensions of development, Relevance of theory, the employment problem, Human resource development

8. Economics of planning: Planning and market, Policy models, Planning experience.

Recommended Books:

1.	Richard Leftwich	The Price System and Resource Allocation
2.	P.A. Samuelson	Economics
3.	P.A. Samuelson & Nordhaus	Economics
4.	G.J. Stigler	The Theory of Price
5.	McConnell & L.Brue	Economics(Principles, Problems and Policies)

Course Code: MGT-3601 **Course Title: Industrial Management**
Credit Hours: 2 **Contact Hours: 2 per week**

Objectives: In this course student learn about 'Industrial Management' in regards to the importance of management, manpower planning and development, cost & financial management, marketing and production management, industrial law and professional practice**.**

Outcome:

- After completing the course the students will be able to:
- Comprehend how an organization is formed and managed.
- Understand the different roles of the owners, employees, board of directors and other stakeholders in an organization.
- Make plan and budget in different functional area of the organization i.e. marketing, production etc.
- Understand the legal rights and duties of the workers in a workplace.
- Know about the copyright, patent right and validity, different aspect of quality assurance etc.

Section –A (Mid-term Exam: 30 Marks)

1. Preliminaries: Definition, Importance of management, Evolution, Functions of management, Introduction to Industry & organizational management.

2. Organization and it's 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.

Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)

4. Cost & Financial Management: Investment analysis, benefit-cost analysis & it's implications in decision making. Cost planning & Price Control, budget &budgetary control, development planning process.

5. Marketing management: Concepts, strategy, sales promotion, Transportation & Storage. Technology management: Management of innovation & changes, technology lifecycle.

Group-B (30 Marks)

6. 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.

7. 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.

8. Professional Practice: Tender documentation, General conditions of tender, Tech. Specification, Purchase & procurement rules-2004, Technical evaluation, Copyright, Intellectual property right.

Recommended Books:

1	Ricky W. Griffin	Management
2	Heinz Weihrich & Harold Koontz	Management A Global Perspective
3	W.J. Stevenson	Management Science
4	Terry & Frankin	Principle of Management
5	Edwin B. Flippo	Personnel Management.
6	Arun Monappa	Industrial Relations
7	Naceur Jabnoun	Islam & Management
8	F.R. Faridi	Islamic Principles of Business Organization and Management
9	Leon G. Schiffman & L.L. Kanuk	Consumer Behavior
10	W.J. Stevenson	Management Science
11	Herold Koontz	Management

Course Code: LAW-4721 **Course Title: Law and Professional Ethics**
Credit Hours: 2 **Contact Hours: 2 per week**

Objectives: In this course student learn about ' Law and Professional Ethic' in regards to nature and concept of law, company law, labour law, history and development of engineering ethics, ethical expectations and cyber law.

Section-A (Mid-term Exam: 30 Marks)

1. Law Basics: Nature and concept of law. Schools of Jurisprudence: Analytical, Historical, Philosophical, Sociological & Natural. Administration of Justice: Theories of punishment. Sources of Law: Custom, Precedent and Legislation. Rights and Duties. Legal Personality. Ownership and Possession. Definition and theories of Law, Principles of law of contract, agency, partnership, sale of goods negotiable instruments, insurance and insolvency.

2. Company law: The companies act with special reference to the amendments and ordinances applicable to Bangladesh. Law regarding formation, Incorporation, Management and winding up of companies.

3. Labor Law: The scope and sources of labor law. Law in relation to wages, hours, health, safety and other condition to work. The legislation effecting employment in factories. The trade union legislation arbitration, the policy of the state in relation to labor. Elementary principles of labor law.

Section-B (Final Exam: 50 Marks)

Group-A (20-Marks)

4. History and Development of Engineering Ethics: Study of Ethics in Engineering. 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.

5. Ethical Expectations: Employers and Employees inter-professional relationship, maintaining a commitment of Ethical standards. Desired characteristics of a professional code. Institutionalization of Ethical conduct.

Group-B (30-Marks)

6. Cyber Law Introduction : The need for Cyber Law , Regulation of Technology and Internet , The

Internet and the Problems of Geography and Sovereignty , Freedom of Expression on the Internet,
7. The Relationship between Legal and Technological Regulation: Intellectual Property: Copy rights, Trade Marks, Industrial Designs. Electronic and Digital Signature. Embedding Law into Technology. Electronic Contract.
8. Liability of Internet Intermediaries: Defamatory Content, Privacy, Copy right, Infringement. Liabilities relating to electronic financial transaction. Nature and scope of cybercrime, Regulation of Cyber Crime. Offences and Punishment of Technology Crimes. B

Recommended Books:

1	A. K. Sen	A Hand Book of Commercial Law.
2	A. A. Khan	Labour and Industrial Law.
3	J. D. Mabboth	An Introduction to Ethics
4	Stacey L. Dogan	Copyright in Cyberspace: An Introduction
5	A. B.Siddique	The Law of Contract.
6	Emile Durkheim	Professional Ethics and Civics Morals
7	Jonathan L. Zittrain,	Internet Law: Technological Complements to Copyright
8	Coopers	Outline of Industrial Law.
9	A. Zulfiquar	V A Text Book on the Bangladesh Labour Act-2006.
10	P. Narayanan	Intellectual Property Law.
11	A. R. Khan	Business Ethics
12	G. E. Moore:	Principia Ethicia
13	*M. Radar*	Ethics and the Auman Community