

# International Islamic University Chittagong

## Department of Computer Science and Engineering (CSE)



**Syllabus for 4 Years B. Sc. Engineering Degree in  
Computer Science and Engineering (CSE)**

**Semester: Autumn 2019**

*As per Recommendations made in the  
169th CSE Departmental Academic Committee held on: 16.10.2019*

*As per Recommendations made in the  
CSE Committee of Courses & Studies meeting held on: 16.10.2019*

*As per Recommendations made in the meeting of the  
Faculty of Science and Engineering Committee held on: 05.11.2019*

*As per recommendation of the 42nd Academic Council meeting held on 06.11.2019 and  
duly approved in the \_\_\_\_\_ Syndicate meeting held on: \_\_\_\_\_*



**International Islamic University Chittagong**  
**Faculty of Science and Engineering**  
**Department of Computer Science and Engineering**  
**Syllabus for B. Sc. Engineering in CSE**  
**Spring 2019 and Autumn 2019**

**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). In the year **2000**, Islamic University Chittagong (IUC) was upgraded into **International Islamic University Chittagong (IIUC)**.

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 The 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 (COI) 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 and the Department of Computer Science and 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:

<b>F1:</b>	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.
<b>F2:</b>	Enable graduates to keep on self- development throughout their careers.
<b>F3:</b>	Produce graduates with the necessary background and technical skills to work professionally and fulfill the need of industry.
<b>F4:</b>	Organize, in collaboration with stakeholders, conferences, symposia and workshops to



	upgrade technical and scientific levels in Electrical and Electronic Engineering.
<b>F5:</b>	Carry out and publish academic knowledge.
<b>F6:</b>	Activities to promote research innovation, commercialization and Entrepreneurship Increase.

### 3.4. Vision and Mission of the Department of Computer Science and Engineering:

#### 3.4.1 Vision:

Inspired by the mission of the university, the department of Computer Science and Engineering is striving to create a breed of students who can imagine boldly, think clearly, argue precisely and implement efficiently. Our mission is to perform high impact research leading to sustainable innovation in the area of computer science and engineering thus contributing to the economic growth of the country through a meaningful partnership between the Community, the Industry and the University.

#### 3.4.2 Mission:

At the very heart of science and technology education lie comprehension, imagination and implementation. The objective of our programs is to contribute in creating a globally recognized and locally sustainable knowledge eco-system through which students will graduate to provide leadership in industry, enterprise, public service and welfare; to encourage and support innovative research; create enthusiasm in learning through hands on training; while creating knowledge throughout the process. We also provide a platform for lifelong learning through graduate programs and continuing education endeavors.

The curriculum objectives for the undergraduate education are to teach communicative skills (oral and written communication) with a strong humanities background through a thorough liberal arts foundation. To have students have a comprehensive understanding of Computer Science and Engineering related subjects (i.e. a major), and a sub-specialization (minor) in a subject of student's own interest and appreciate their inter-connectivity with founding principles. Focus is maintained on outcome based learning. Outcome is quantifiable through students' enhanced skill in comprehension, analytical capability and decision making skill.

The undergraduate programs equip students with the tools needed to become innovators and global leaders in computing and equip them with the background necessary to pursue higher studies. Consequently our programs are designed to have a high impact outcome of contributing to the sustainable development of knowledge-based economy of our nation.

### 4. The Program Educational Objectives (PEO) of B. Sc. in Computer Science and Engineering are as follows:

#### 4.1 Program Educational Objectives (PEOs) of B. Sc. in CSE Program:

Graduates of the B. Sc. in Computer Science and Engineering (CSE) program are expected to attain the following Program Educational Objectives (PEO) within few years, such as 3-5 years, of graduation.

<b>PEO1</b>	Graduates will establish themselves as leading computational professionals and continue to learn and address evolving challenges in Computer Science and Engineering.
<b>PEO2</b>	Graduates will engage in lifelong pursuit of knowledge and interdisciplinary learning for industrial, research, and academic careers.
<b>PEO3</b>	Graduates will contribute to sustainable development and the well-being of society through the use of Computer Science and Engineering principles, practices and tools in an ethical and responsible manner.



### Program Outcomes (POs) of B. Sc. in CSE Program

Graduates of the B. Sc. in Computer Science and Engineering (CSE) program are expected to attain the following Program Outcomes (POs) by the time of graduation.

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



### Mapping of Program Outcomes (POs) to Program Educational Objectives (PEOs)

Program Outcomes (POs)	Program Educational Objectives (PEOs)		
	PEO1	PEO2	PEO3
PO1: Engineering Knowledge	X		
PO2: Problem Analysis	X		
PO3: Design/Development of Solutions	X		
PO4: Investigation		X	
PO5: Modern Tool Usage		X	
PO6: The Engineer and Society			X
PO7: Environment and Sustainability			X
PO8: Ethics			X
PO9: Individual Work and Teamwork		X	
PO10: Communication	X		
PO11: Project Management and Finance			X
PO12: Life-Long Learning		X	

### 5. 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. Engineering:

- 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.
- For 'O' level & 'A' level system an applicant must have completed 6 papers in 'O' 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 'O' level and 'A' level shall be 'C'. An applicant must submit his/her results during the application. Provisional admission for appeared students should not be allowed.
- 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.

### 6. Duration of Program

To complete the B. Sc. Engineering in Computer Science and Engineering program at the International Islamic University Chittagong, normally takes four academic years (i.e. 8 Semesters). Each academic year is divided into 2 Semesters (Spring Semester: January-June and Autumn Semester: July-December), each having a duration of 15 weeks ( $5 \times 15 = 75$  working days). There shall be a Mid-term Examination after conducting 6 weeks classes. 9 Weeks of classes will be conducted after Mid-term examination and after that Final Examination will take place at the end of each semester. In order to graduate, total 162 credit hours has to be undertaken and completed by a student during 8 semesters. By registering more number of courses in regular semesters, students may also complete their graduation studies within at least three academic years (i.e. 6 Semesters) of regular studentship. However a student may be allowed to complete their graduation studies in the University within maximum of six academic years (i.e. 12 semesters). No student shall ordinarily be admitted after the class starts.



**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 80% 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 80% but not below 60% in any **course** may be allowed to appear at the final examinations as **non-collegiate student**. A student, appearing the examination under the benefit of this provision shall have to pay in addition to the fees, the requisite fee prescribed by the authority for the purpose. Students having **less than 60% attendance** in lecture/tutorial/ laboratory of **any course will be declared dis-collegiate. They will not allow appearing in that course** at the final examinations of the semester. They will get 'F' grade in the semester result. The basis for awarding marks for class participation and attendance is shown in Table-1

**Table-1 (Ref. FSEO article 14.1.4)**

Attendance	Marks/Unit
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 3.1): The letter grade system for assessing the performance of the students is shown in the Table-2:

**Table-2**

<u>Numerical grade</u> <u>Marks%</u>	<u>Letter Grade</u> <u>(LG)</u>	<u>Grade Point</u> <u>(GP/unit)</u>	<u>Remarks/</u> <u>Status</u>
80-100	A+	4.00	Excellent
75-79	A	3.75	Very good
70-74	A-	3.50	
65-69	B+	3.25	Good
60-64	B	3.00	
55-59	B-	2.75	Satisfactory
50-54	C+	2.50	Pass
00-39	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 average of the grades obtained in all semesters. To obtain B. Sc. Engineering in CSE degree a student must have CGPA of at least 2.5.

**9. Earned Credit** (Ref. FSEO article 3.6): The courses in which a student has obtained minimum 'D' 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. Grade Point Average (GPA):** The Grade Point Average (GPA) of a semester is computed by dividing the total grade points earned by the number of credit hours attempted in a given semester. The Cumulative Grade Point Average (CGPA) is computed by dividing the total grade points earned by the total number of credit hours attempted at the University up to a particular semester.



**11. Distribution of Courses (Ref. FSEO article 6):** The study program for the B. Sc. Engineering in CSE shall carry a total of 163 credit hours. Distribution of courses is shown in Table-3.

Table-3

Course Type	Theoretical Cr. Hrs.	Practical Cr. Hrs.	Total
University Required General Education and Language Courses	13	0	13
Interdisciplinary Courses	6	0	6
Core Courses	Mathematics and Statistics Courses	14	14
	Basic Science Courses	9	12
	Other Engineering Courses	8	13
	Computer Science and Engineering Courses	71	99
	Field Work	0	1
	Project / Thesis	0	4
General Viva Voce	1	1	
<b>Total</b>	122	41	163

**12. Semester Work load:** 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):

Table 4

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

**13. 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 'C+' 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 1<sup>st</sup> & 2<sup>nd</sup> Semester within the 4<sup>th</sup> Semester he/she would not be allowed to get promoted/registered in the 5<sup>th</sup> Semester and students who will not clear all prescribed courses of 3<sup>rd</sup> & 4<sup>th</sup> Semester within the 6<sup>th</sup> Semester he/she would not be allowed to get promoted/registered in the 7<sup>th</sup> Semester. Student can go for internship in the 7<sup>th</sup> / 8<sup>th</sup> 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 remain unregistered or not repeated due to removal of the courses from syllabus or has not been offered in the last a few semesters, the course may be completed under special arrangement. To get approval of special arrangement/Independent Study, the incumbent has to apply to the Pro-Vice-Chancellor through the Head of the concerned Department and Controller of Examination subject to the availability of course teacher. The application period will be immediate after publication of Semester result. After getting approval, the incumbent has to complete registration by paying **the tuition fee double than that of the normal fees (based on credit hour). There is no scope of special arrangement for the course /s which are offered by the department or center.**

### 12.3 Criteria for Repeating Courses

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

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

### 12.4 Criteria for Failing in a Course:

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

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

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

### 12.5 Criteria for Improvement of Grade:

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

12.5.2 That an application must be submitted to the Controller of Examination through the Head of the Department in order to repeat the course for the purpose of improvement at least two weeks prior to the 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.

#### 14. Eligibility for Examination:

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

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

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

13.2 **Barring from examination:**

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

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

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

13.3 **Cheating in Examination:**

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

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

13.3.3 Student receives the expulsion from the university for cheating in examination 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.

#### 15. Graduation Requirements:

14.1 **Pre-Graduate Requirements:**

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

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

14.2 **Academic Requirements:**

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

14.2.2 Be an acceptable academic standing with a 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 Certificate** 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.

## 16. Course Identification Plan:

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

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

## 17. Programs of Study:

The B. Sc. (Engineering) program in the department of Computer Science and Engineering consist of 75 courses carrying 163 Credit Hours. There are 9 University Requirement Courses (URC) carrying 13 credit hours, 3 Interdisciplinary Courses carrying 6 credit hours, Theory Courses carrying 122 credit hours and practical courses carrying 41 credit hours. Total 163 credit hours have to be undertaken and completed by a student during 8 semesters. Duration of each semester is 6 months. Each course carries 100 marks. Of the total marks allotted to each course, 10 marks are for class tests/assignments/oral tests, 10 marks for attendance, 30 marks for mid-term examination and 50 marks for the final examination. Out of 100 marks for Laboratory courses, 50 marks is allotted for continuous assessment and 50 marks is for practical exam, viva, quiz etc. at the end of semester final examination.

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

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



### Summary of Courses

Course Type		Theoretical Cr. Hrs.	Practical Cr. Hrs.	Total
University Required General Education and Language Courses		13	0	13
Interdisciplinary Courses		6	0	6
Core Courses	Mathematics and Statistics Courses	14	0	14
	Basic Science Courses	9	3	12
	Other Engineering Courses	8	5	13
	Computer Science and Engineering Courses	71	28	99
	Field Work	0	1	1
	Project / Thesis	0	4	4
General Viva Voce		1	0	1
<b>Total</b>		<b>122</b>	<b>41</b>	<b>163</b>

Semester	No. of Courses	Contact Hours / Week			Credit Hours		
		Theory	Practical	Total	Theory	Practical	Total
1 <sup>st</sup>	8	17	6	23	15	3	18
2 <sup>nd</sup>	10	17	11	28	17	5.5	22.5
3 <sup>rd</sup>	10	16	12	28	15	6	21
4 <sup>th</sup>	11	15	11	26	15	5.5	20.5
5 <sup>th</sup>	9	17	8	25	16	4	20
6 <sup>th</sup>	11	16	10	26	15	5	20
7 <sup>th</sup>	12	14	10	26	13	6	19
8 <sup>th</sup>	11	16	12	28	16	6	22
<b>Total</b>	<b>82</b>	<b>128</b>	<b>80</b>	<b>210</b>	<b>122</b>	<b>41</b>	<b>163</b>

#### A. List of University Requirement Courses

Serial No	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	UREL-1106	Advanced English	3		2		
2	URTE-1101	Text of Ethics and Morality	2		1		
3	URED-1201	Basic Principles of Islam ('Aqidah + 'Ibadah))	2		2		
4	URED-2302	Sciences of Quran and Hadith	2		1		
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 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 Independence	2		2		
	<b>Total</b>	<b>9 Courses</b>	<b>19</b>		<b>13</b>		



## B. List of Interdisciplinary Courses

Serial No	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1	ACC-2401	Financial and Managerial Accounting	2		2		
2	ECON-3501	Principles of Economics	2		2		
3	MGT-3601	Industrial Management	2		2		
<b>Total</b>			<b>3 Courses</b>		<b>6</b>		

## C. List of Core Courses

Serial No	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
1.	MATH-1107	Mathematics I (Differential and Integral Calculus)	3		3		
2.	MATH-1207	Mathematics II (Geometry and Differential Equations)	3		3		MATH-1107
3.	MATH-2307	Mathematics III (Matrices, Linear System of Equations and Vector Analysis)	3		3		MATH-1207
4.	MATH-2407	Mathematics IV (Complex Variable, Fourier Analysis and Z-transform)	3		3		MATH-2307
5.	STAT-2311	Probability and Statistics	2		2		
6.	PHY-1101	Physics I (Mechanics, Waves, Heat and Thermodynamics)	3		3		
7.	PHY-1201	Physics II (Electromagnetism, Optics and Modern Physics)	3		3		PHY-1101
8.	PHY-1204	Physics II Lab (Electromagnetism, Optics and Modern Physics)		3		1.5	
9.	CHEM-2301	Chemistry	3		3		
10.	CHEM-2304	Chemistry Lab		3		1.5	
11.	EEE-1121	Basic Electrical Engineering	3		3		
12.	EEE-1122	Basic Electrical Engineering Lab		3		1.5	
13.	EEE-1221	Electronics	3		3		EEE-1121
14.	EEE-1222	Electronics Lab		3		1.5	
15.	EEE-2421	Electrical Drives and Instrumentation	2		2		EEE-1221
16.	EEE-2422	Electrical Drives and Instrumentation Lab		2		1	
17.	ME-2412	Engineering Drawing Lab		2		1	
18.	CSE-1121	Computer Programming 1	3		3		
19.	CSE-1122	Computer Programming 1 Lab		3		1.5	
20.	CSE-1221	Computer Programming 2	3		3		CSE-1121 CSE-1122
21.	CSE-1222	Computer Programming 2 Lab		3		1.5	
22.	CSE-1223	Discrete Mathematics	3		3		
23.	CSE-1230	Competitive Programming 1		2		1	
24.	CSE-2321	Data Structures	3		3		CSE-1121
25.	CSE-2322	Data Structures Lab		2		1	
26.	CSE-2323	Digital Logic Design	3		3		EEE-1121
27.	CSE-2324	Digital Logic Design Lab		3		1.5	
28.	CSE-2340	Software Development 1		4		2	CSE-1221 CSE-1222
29.	CSE-2421	Computer Algorithms	3		3		CSE-2321



Serial No	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
30.	CSE-2422	Computer Algorithms Lab		2		1	
31.	CSE-2423	Database Management Systems	3		3		
32.	CSE-2424	Database Management Systems Lab		3		1.5	
33.	CSE-2425	Theory of Computing	2		2		
34.	CSE-2430	Competitive Programming 2		2		1	
35.	CSE-3521	Computer Architecture	3		3		CSE-2323
36.	CSE-3523	Microprocessors, Microcontrollers and Embedded Systems	3		3		
37.	CSE-3524	Microprocessors, Microcontrollers and Embedded Systems Lab		2		1	
38.	CSE-3525	Data Communication	3		3		
39.	CSE-3527	Compiler	3		3		CSE-2425
40.	CSE-3528	Compiler Lab		2		1	
41.	CSE-3529	Systems Analysis and Design	3		3		
42.	CSE-3532	Tools and Technologies for Internet Programming		4		2	CSE-1222
43.	CSE-3631	Operating Systems	3		3		CSE-3521
44.	CSE-3632	Operating Systems Lab		2		1	
45.	CSE-3633	Computer Networks	3		3		CSE-3525
46.	CSE-3634	Computer Networks Lab		3		1.5	
47.	CSE-3635	Artificial Intelligence	3		3		
48.	CSE-3636	Artificial Intelligence Lab		2		1	
49.	CSE-3637	Software Engineering	3		3		CSE-3529
50.	CSE-3638	Software Engineering Lab		1.5		0.75	
51.	CSE-3640	Software Development 2 Lab		1.5		0.75	CSE-3532
52.	CSE-4741	Computer Graphics	3		3		MATH-2307
53.	CSE-4742	Computer Graphics Lab		2		1	
54.	CSE-4743	Computer Security	2		2		
55.	CSE-4744	Computer Security Lab		2		1	
56.	CSE-4745	Numerical Methods	2		2		CSE-1121
57.	CSE-4746	Numerical Methods Lab		2		1	
58.	CSE-4747	Mathematical Analysis for Computer Science	3		3		STAT-2311
59.	CSE-4750	Technical Writing and Presentation		2		1	
60.	CSE-4708	Field Work		3 weeks		1	
61.	CSE-4805	Social, Professional and Ethical Issues in Computing	2		2		
62.	CSE-48xy	Option 1	3		3		
63.	CSE-48xy	Option 1 Lab		2		1	
64.	CSE-48xy	Option 2	3		3		
65.	CSE-48xy	Option 2 Lab		2		1	
66.	CSE-48xy	Option 3	3		3		
67.	CSE-48xy	Option 3 Lab		2		1	
68.	CSE-4800	Project / Thesis		8		4	
69.	CSE-4822	General Viva	1		1		
	<b>Total</b>	<b>69 Courses</b>	<b>103</b>	<b>80</b>	<b>103</b>	<b>41</b>	


**D. List of Optional Courses** (*three courses to be taken from the optional courses*)

Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
CSE-4819	Special Topic on Computer Science and Engineering	3		3		
CSE-4820	Special Topic on Computer Science and Engineering Lab		2		1	
CSE-4823	Fault Tolerant System	3		3		CSE-3521
CSE-4824	Fault Tolerant System Lab		2		1	
CSE-4825	Basic Graph Theory	3		3		CSE-2321
CSE-4826	Basic Graph Theory Lab		2		1	
CSE-4827	Simulation and Modeling					MATH-3501
CSE-4828	Simulation and Modeling Lab		2		1	
CSE-4839	Digital System Design	3		3		CSE-3501
CSE-4840	Digital System Design Lab		2		1	
CSE-4843	Decision Support System and Expert System	3		3		CSE-4705
CSE-4844	Decision Support System Expert System Lab		2		1	
CSE-4845	Distributed Database	3		3		CSE-2407
CSE-4846	Distributed Database Lab		2		1	
CSE-4847	Software Project Management	3		3		CSE-3505
CSE-4848	Software Project Management Lab		2		1	
CSE-4849	Software Quality Assurance	3		3		CSE-3505
CSE-4850	Software Quality Assurance Lab		2		1	
CSE-4851	Wireless and Mobile Communication	3		3		CSE-4701
CSE-4852	Wireless and Mobile Communication Lab		2		1	
CSE-4853	Optical Fiber Communication	3		3		CSE-3601
CSE-4854	Optical Fiber Communication Lab		2		1	
CSE-4855	Communication Engineering	3		3		CSE-3601
CSE-4856	Communication Engineering Lab		2		1	
CSE-4857	VLSI Design	3		3		CSE-2305
CSE-4858	VLSI Design Lab		2		1	
CSE-4859	Real Time Embedded Systems	3		3		CSE-3501
CSE-4860	Real Time Embedded Systems Lab		2		1	
CSE-4861	Multimedia Theory	3		3		
CSE-4862	Multimedia Theory Lab		2		1	
CSE-4863	Digital Signal Processing	3		3		
CSE-4864	Digital Signal Processing Lab		2		1	
CSE-4865	Bioinformatics	3		3		
CSE-4866	Bioinformatics Lab		2		1	
CSE-4867	Speech and Language Processing	3		3		
CSE-4868	Speech and Language Processing Lab		2		1	
CSE-4869	Geographical Information System	3		3		
CSE-4870	Geographical Information System Lab		2		1	
CSE-4871	Neural Network and Fuzzy System	3		3		CSE-4705
CSE-4872	Neural Network and Fuzzy System Lab		2		1	
CSE-4873	Computer Vision and Robotics	3		3		CSE-4705 CSE-4703
CSE-4874	Computer Vision and Robotics Lab		2		1	
CSE-4875	Pattern Recognition and Image Processing	3		3		CSE-4703



CSE-4876	Pattern Recognition and Image Processing Lab		2		1	
CSE-4877	Machine Learning and Data Mining	3		3		CSE-4705
CSE-4878	Machine Learning and Data Mining Lab		2		1	
CSE-4879	Computer Interfacing	3		3		CSE-3501
CSE-4880	Computer Interfacing Lab		2		1	



**International Islamic University Chittagong**  
**Faculty of Science and Engineering**  
**Department of Computer Science and Engineering**

(Semester wise Courses offered to the Undergraduate Students)

**FIRST SEMESTER**

Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
CSE-1121	Computer Programming 1	3		3		
CSE-1122	Computer Programming 1 Lab		3		1.5	
EEE-1121	Basic Electrical Engineering	3		3		
EEE-1122	Basic Electrical Engineering Lab		3		1.5	
MATH-1107	Mathematics I (Differential and Integral Calculus)	3		3		
PHY-1101	Physics I (Mechanics, Waves, Heat and Thermodynamics)	3		3		
UREL-1106	Advanced English	3		2		
URTE-1101	Text of Ethics and Morality	2		1		
<b>Total</b>	<b>8 Courses</b>	<b>17</b>	<b>6</b>	<b>15</b>	<b>3</b>	

**SECOND SEMESTER**

Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
CSE-1221	Computer Programming 2	3		3		CSE-1121
CSE-1222	Computer Programming 2 Lab		3		1.5	
CSE-1223	Discrete Mathematics	3		3		
EEE-1221	Electronics	3		3		EEE-1121
EEE-1222	Electronics Lab		3		1.5	
MATH-1207	Mathematics II (Geometry and Differential Equations)	3		3		MATH-1107
PHY-1201	Physics II (Electromagnetism, Optics and Modern Physics)	3		3		PHY-1101
PHY-1204	Physics II Lab (Electromagnetism, Optics and Modern Physics)		3		1.5	
CSE-1230	Competitive Programming 1		2		1	
URED-1201	Basic Principles of Islam ('Aqidah + 'Ibadah)	2		2		
<b>Total</b>	<b>10 Courses</b>	<b>17</b>	<b>11</b>	<b>17</b>	<b>5.5</b>	

**THIRD SEMESTER**

Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
CSE-2321	Data Structures	3		3		CSE-1121 CSE-1122
CSE-2322	Data Structures Lab		2		1	
CSE-2323	Digital Logic Design	3		3		EEE-1221
CSE-2324	Digital Logic Design Lab		3		1.5	
MATH-2307	Mathematics III (Matrices, Linear System of Equations and Vector Analysis)	3		3		MATH-1207
STAT-2311	Probability and Statistics	2		2		
CHEM-2301	Chemistry	3		3		
CHEM-2304	Chemistry Lab		3		1.5	
CSE-2340	Software Development 1		4		2	CSE-1221
URED-2302	Sciences of Quran and Hadith	2		1		
<b>Total</b>	<b>10 Courses</b>	<b>16</b>	<b>12</b>	<b>15</b>	<b>6</b>	

**FOURTH SEMESTER**

Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
CSE-2421	Computer Algorithms	3		3		CSE-2321
CSE-2422	Computer Algorithms Lab		2		1	
CSE-2423	Database Management Systems	3		3		
CSE-2424	Database Management Systems Lab		3		1.5	
CSE-2425	Theory of Computing	2		2		
MATH-2407	Mathematics IV (Complex Variable, Fourier Analysis and Z-transform)	3		3		MATH-2307
EEE-2421	Electrical Drives and Instrumentation	2		2		EEE-1221
EEE-2422	Electrical Drives and Instrumentation Lab		2		1	
ME-2412	Engineering Drawing Lab		2		1	
CSE-2430	Competitive Programming 2		2		1	
URBL-2401	Functional Bengali Language	2		2		
<b>Total</b>	<b>11 Courses</b>	<b>15</b>	<b>11</b>	<b>15</b>	<b>5.5</b>	

**FIFTH SEMESTER.**

Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
CSE-3521	Computer Architecture	3		3		
CSE-3523	Microprocessors, Microcontrollers and Embedded Systems	3		3		
CSE-3524	Microprocessors, Microcontrollers and Embedded Systems Lab		2		1	
CSE-3525	Data Communication	3		3		
CSE-3527	Compiler	3		3		
CSE-3528	Compiler Lab		2		1	
CSE-3529	Systems Analysis and Design	3		3		
CSE-3532	Tools and Technologies for Internet Programming		4		2	
URED-3503	Introduction to Political Thoughts and Social Behavior	2		1		
<b>Total</b>	<b>9 Courses</b>	<b>17</b>	<b>8</b>	<b>16</b>	<b>4</b>	

**SIXTH SEMESTER**

Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
CSE-3631	Operating Systems	3		3		CSE-3521
CSE-3632	Operating Systems Lab		2		1	
CSE-3633	Computer Networks	3		3		CSE-3525
CSE-3634	Computer Networks Lab		3		1.5	
CSE-3635	Artificial Intelligence	3		3		
CSE-3636	Artificial Intelligence Lab		2		1	
CSE-3637	Software Engineering	3		3		CSE-3529
CSE-3638	Software Engineering Lab		1.5		0.75	
CSE-3640	Software Development 2 Lab		1.5		0.75	CSE-3532
ACC-2401	Financial and Managerial Accounting	2		2		
URED-3604	Life and Teachings of Prophet Muhammad (SAAS)	2		1		
<b>Total</b>	<b>11 Courses</b>	<b>16</b>	<b>10</b>	<b>15</b>	<b>5</b>	

**SEVENTH SEMESTER**

Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	



CSE-4741	Computer Graphics	3		3		MATH-2307
CSE-4742	Computer Graphics Lab		2		1	
CSE-4743	Computer Security	2		2		
CSE-4744	Computer Security Lab		2		1	
CSE-4745	Numerical Methods	2		2		CSE-1121
CSE-4746	Numerical Methods Lab		2		1	
CSE-4747	Mathematical Analysis for Computer Science	3		3		STAT-2311
CSE-4750	Technical Writing and Presentation		2		1	
ECON-3501	Principles of Economics	2		2		
CSE-4708	Field Work		3 weeks		1	
CSE-4800	Project / Thesis		2		1	
URIH-4701	A Survey of Islamic History and Culture	2		1		
<b>Total</b>	<b>12 Courses</b>	<b>14</b>	<b>10</b>	<b>13</b>	<b>6</b>	

**EIGHTH SEMESTER**

Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
		Theory	Practical	Theory	Practical	
CSE-4805	Social, Professional and Ethical Issues in Computing	2		2		
CSE-48xy	Option 1	3		3		
CSE-48xy	Option 1 Lab		2		1	
CSE-48xy	Option 2	3		3		
CSE-48xy	Option 2 Lab		2		1	
CSE-48xy	Option 3	3		3		
CSE-48xy	Option 3 Lab		2		1	
MGT-3601	Industrial Management	2		2		
CSE-4800	Project / Thesis		6		3	
CSE-4822	General Viva	1		1		
URBS-4802	Bangladesh Studies and History of Independence	2		2		
<b>Total</b>	<b>11 Courses</b>	<b>16</b>	<b>12</b>	<b>16</b>	<b>6</b>	



# **Synopsis of the Courses**

## **A. University Requirement Courses**



<b>Course Code</b>	<b>UREL-1106</b>		
<b>Course Title</b>	<b>Advanced English</b>		
<b>Status</b>	<b>University Requirement</b>		
<b>Level</b>	<b>1</b>		
<b>Credit Hours</b>	<b>2</b>		
<b>Contact Hour</b>	<b>3</b>		
<b>Course Assessment</b>	<b>Attendance &amp; Class test/Assignment</b>	<b>20%</b>	
	<b>Mid-term Examination</b>	<b>30%</b>	
	<b>Final Examination</b>	<b>50%</b>	

<i>Objectives of the University</i>	<p>The objectives of the University are:          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.</p>
<i>Objectives of the Department/ Center</i>	<p>The aims and objectives of the Center are as follows:</p> <ol style="list-style-type: none"> <li>To develop the courses and curricula of the University Requirement Courses (URC) and syllabi thereof keeping pace with needs of the day from time to time.</li> <li>To ensure quality education of the University Requirement Courses through continuous supervision of performance of the teachers of CENURC.</li> <li>To promote and provide facilities for Islamization of Knowledge with a view to developing the morality of the students and ensuring conducive environment at IIUC.</li> <li>To undertake research projects in co-operation with public or private organizations as and when necessary under mutual agreement.</li> <li>To popularize the Program of Islamization of Knowledge in and outside the University through Seminars, Conferences and Publication; and</li> <li>To conduct such other activities as may facilitate attainment of the objectives of IIUC, that is, combining morality with quality.</li> </ol>
<i>Objectives</i>	<ol style="list-style-type: none"> <li>Helping the students to know the basics of English language</li> <li>Helping the students overcome the fear of English</li> <li>Developing confidence about the correctness of their language</li> <li>Enabling them to write accurately</li> <li>Enabling them to understand sentence patterns while they read</li> <li>Making them capable to comprehend English texts</li> <li>Providing the students some moral teachings</li> </ol>
<i>Outcome</i>	<p>By the end of this course students are expected to be able to –</p> <ol style="list-style-type: none"> <li>Make sentence of their own on the basis of their knowledge about grammar.</li> <li>Identify their own mistakes in their writing and speaking and correct the same.</li> <li>Write accurate sentences with full confidence of their correctness</li> <li>Develop ideas about some ethical values.</li> </ol>
<i>Course outlines</i>	<b>Midterm (30 marks)</b> <b>Grammar-10</b> <b>Reading-1 (Seen-10)</b> <b>Reading-2 (Unseen-10)</b>
	<p>Chapter: 1 (Basics of Grammar)</p> <ol style="list-style-type: none"> <li>Kinds of sentences             <ol style="list-style-type: none"> <li>Structures of assertive, imperative, imperative with let, interrogative (Y/N &amp; WH question) optative &amp; exclamatory</li> <li>Basic sentence patterns of assertive sentence</li> <li>Affirmative &amp; negative structures</li> <li>Simple, complex &amp; compound</li> </ol> </li> <li>Parts of speech             <ol style="list-style-type: none"> <li>Introducing each part of speech</li> </ol> </li> </ol>



	<p>ii. Showing use of same words as different parts of speech</p> <p>iii. Changing words into different parts of speech and formation of sentences with them</p> <p>3. Pre modifier and post modifier</p> <p>i. Introducing adjectives, participles, noun, noun adjective, compounds, possessive and adverb as pre modifier</p> <p>ii. Introducing infinitive phrase, present participle phrase, past participle phrase, prepositional phrase, appositive, adjective, relative clause, adverb as post modifier</p> <p>4. Preposition</p> <p>i. Introducing simple, compound, phrase and participle prepositions</p> <p>ii. Showing and practicing the meaning and use of phrase prepositions</p> <p>iii. Showing difference in use of some common preposition</p> <p>iv. Discussing appropriate preposition</p> <p>5. Verbs</p> <p>i. Introducing transitive and intransitive verbs</p> <p>ii. Introducing strong and weak verbs and conjugation of common verbs</p> <p>iii. Causative verbs</p> <p>iv. Group verbs</p> <p>Chapter: 2 (Reading-1, for general topics)- Seen passages from-</p> <ul style="list-style-type: none"> <li>• Exercises in Reading Comprehension Edited by: E.L. Tibbits Longman Group Limited, Longman House Burnt Mill, Essex, UK</li> <li>• Build up Your English, A.J. Glover, The English Language Book Society and J.M. Dents and Sons Ltd. London</li> <li>• The Pilgrim's Progress (selected passages) John Bunyan William Collins Sons &amp; Co. Ltd. London (part one)</li> <li>• The Old Man and the Sea (selected passages) Earnest Hemingway Peacock Books B-2, Vishal Enclave, New Delhi-110027</li> </ul> <p>Activities:</p> <ul style="list-style-type: none"> <li>• Vocabulary (synonym/antonym/formation of sentences with words/filling in the gaps)</li> <li>• Comprehension (short question to be answered in one sentence/true/false)</li> <li>• Grammar: (identifying parts of speech/writing own sentence following certain structure/identifying grammar points taught in chapter-1)</li> </ul> <p>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-</p> <ul style="list-style-type: none"> <li>• Work in pairs and groups to discuss the content</li> <li>• Make a speech on the content</li> <li>• Write an e-mail to friend/relative on the topic</li> </ul>
	<p><b>Final (50 marks)</b></p> <p><b>Grammar:20</b></p> <p><b>Writing: -15</b></p> <p><b>Speaking-10</b></p> <p><b>Listening -05</b></p>
	<p>Chapter- 1 (Basics of Grammar)</p> <p>6. Conjunction</p> <p>i. Discussing the difference between preposition and conjunction</p> <p>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.</p> <p>iii. Introducing coordinating conjunctions like, and, but, for, or, nor, also, either----or, neither----nor</p> <p>iv. Use of subordinating conjunctions like, after, because, if, that, though, although,</p>



	<p>till, before, unless, as, when, where, while.</p> <ol style="list-style-type: none"> <li>7. Subject and verb agreement</li> <li>8. Idioms and phrases</li> <li>9. Voice       <ol style="list-style-type: none"> <li>i. Discussing the difference between active subject and passive subject.</li> <li>ii. Discussing ways of transforming active into passive and passive into active.</li> <li>iii. Showing the right use of verb with active and passive subject</li> </ol> </li> <li>10. Narration</li> <li>11. Formation of WH question</li> <li>12. Tenses       <ol style="list-style-type: none"> <li>i. Introducing use of 'to be' and 'to have' in three tenses with affirmative, negative, interrogative (both Yes/No and WH) structures.</li> <li>ii. Discussing structures and uses of different tenses with action verbs like 'read, write, play, discuss' etc.</li> <li>iii. Discussing ways of identifying different forms of tenses and showing right use of verbs</li> <li>iv. Exploring students' difficulties in the use of tense, correcting and discussing tense based errors.</li> </ol> </li> </ol> <p>Chapter: 2 Writing:</p> <ul style="list-style-type: none"> <li>• Writing academic applications</li> <li>• Writing e-mail, Face Book status, WhatsApp/Imo/Viber messages</li> <li>• Writing story on the basis of theme/ completing story</li> <li>• Writing news casts</li> <li>• Describing pie/column chart/graphs</li> <li>• Guided paragraphs</li> <li>• Agreeing/disagreeing on some opinion</li> <li>• Amplification of ideas</li> <li>• Writing dialogue from a passage</li> </ul> <p>Chapter- 3 Speaking</p> <ul style="list-style-type: none"> <li>• Making speech</li> <li>• Pair work</li> <li>• Group work</li> <li>• Debate</li> </ul> <p>Chapter-4 ( Listening &amp; Speaking ) To let the students listen various recorded dialogues or part of English movies to develop their listening skills.</p> <p>To arrange classes to let the students describe pictures or Cartoons, different topics. Extempore speech &amp; Set speech to accelerate their fluency in English.</p>
<p><b>Books Recommended</b></p>	<ol style="list-style-type: none"> <li>1. Raymond Murphy, <i>Intermediate English Grammar</i>, Foundation Books, 2/19 Ansari Road, Daryaganj, New Delhi-110002, Manas Saikia, 1995. (Published by arrangement with Cambridge University Press, The Edinburgh Building, and Shaftsbury Road, Cambridge CB2 2RU, U.K.).</li> <li>2. Wren &amp; Martin, <i>High School English Grammar and Composition-</i>, New Delhi, S. Chand &amp; Company Ltd. 2002.</li> <li>3. Thomson &amp; Martinet, <i>Practical English Grammar</i>, Oxford University Press, Walton Street, Oxford OX2 6DP, 1993 (reprinted in India by arrangement with Oxford University Press).</li> <li>4. Michael A. Pyle and Mary Ellen Munoz, <i>Cliffs TOEFL Preparation Guide</i>, New Delhi, BPB Publications, B-14, Connaught Place, New Delhi-110001, 1992.</li> <li>5. Bruce Rogers, <i>Peterson's TOEFL Success</i>, Princeton, New Jersey, Peterson's, 2000.</li> <li>6. AS Hornby, <i>Oxford Advanced Learner's Dictionary of Current English</i>, Oxford University Press, 2002-2003.</li> <li>7. Chowdhury &amp; Hossain, <i>Advanced English</i>, Dhaka, Sayma Chowdhury and Halima Chowdhury, 2004</li> <li>8. Build up Your English, A.J. Glover, The English Language Book Society and J.M. Dents and Sons Ltd. London</li> </ol>



<b>Course Code</b>	<b>URTE -1101</b>	
<b>Course Title</b>	<b>Text of Ethics and Morality</b>	
<b>Status</b>	<b>University Requirement</b>	
<b>Level</b>	<b>1</b>	
<b>Credit Hours</b>	<b>1</b>	
<b>Contact Hour</b>	<b>2</b>	
<b>Course Assessment</b>	<b>Attendance</b>	<b>10%</b>
	<b>Class test/Assignment</b>	<b>10%</b>
	<b>Mid-term Examination</b>	<b>30%</b>
	<b>Final Examination</b>	<b>50%</b>
<b>Course Synopsis</b>	<p>The course deals with fundamental text of ethics along with Arabic language. Ethics – moral principles– governs a person's behavior in all spheres of life. The success of all branches of education including literature, science, mathematics, law, pharmacy, journalism, economics, politics, and so on are deeply related to ethics. The Holy Qur'an is the main and basic book of ethics. It is written in Arabic language. This language is an international language, and about 250 million people use Arabic as first language and another 200 million people use it as second language. It is used as official language in more than 20 countries especially in the Middle East. It stands in fourth position in six official languages of United Nations and ranks a remarkable place in labor market. There are many books of science; medicine, mathematics etc. written in modern standard Arabic language. The course, therefore, is an essential one for all novices to attain their goal successfully obtaining ethical knowledge along with being skilled with an international and an influential language.</p>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> <li>• To inspire students and make them interested in reading the Holy <i>Qur'an</i>, the basic ethical book, the</li> </ul>	



	<p>last divine scripture and the complete code of life.</p> <ul style="list-style-type: none"> <li>To make students familiar with <i>Ayats</i> of <i>Ahkam</i> of the Holy <i>Qur'an</i> so that they can lead their life being enlightened with them.</li> <li>To go towards achieving the motto of the university – to combine quality with morality.</li> </ul>
<b>Learning Outcome</b>	<ul style="list-style-type: none"> <li>The recitation of the Holy Qur'an properly following the rules of recitation.</li> <li>The meaning of the significant words &amp; expression mentioned in the text.</li> <li>Understanding the formation of Qur'anic verses as per Arabic language.</li> <li>Central theme and subject matter of the text.</li> <li>General meaning of the text.</li> <li>Teachings and implication of the text.</li> <li>Comparison between the requirements of <i>Ayats</i> and the reality of our life.</li> <li>Understanding basic formation of Arabic sentences.</li> <li>Obtaining the capability of Arabic conversation.</li> </ul>

<b>Course Code</b>	URED-1201		
<b>Course Title</b>	<b>Basic Principles of Islam</b>		
<b>Status</b>	<b>University Requirement</b>		
<b>Level</b>	<b>2</b>		
<b>Credit Hours</b>	<b>2</b>		
<b>Contact Hour</b>	<b>2</b>		
<b>Course Assessment</b>	<b>Attendance</b>	<b>10%</b>	
	<b>Class test/Assignment</b>	<b>10%</b>	
	<b>Mid-term Examination</b>	<b>30%</b>	
	<b>Final Examination</b>	<b>50%</b>	

<i>Objectives of the University</i>	<p>The objectives of the University are:</p> <ol style="list-style-type: none"> <li>To create a new generation of competent youths, who will be equipped with academic excellence, professional expertise and adorned with moral height.</li> <li>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.</li> </ol>
<i>Objectives of the Department/ Center</i>	<p>The aims and objectives of the Center are as follows:</p> <ol style="list-style-type: none"> <li>To develop the courses and curricula of the University Requirement Courses (URC) and syllabi thereof keeping pace with needs of the day from time to time.</li> <li>To ensure quality education of the University Requirement Courses through continuous supervision of performance of the teachers of CENURC.</li> </ol>



	<ol style="list-style-type: none"> <li>3. To promote and provide facilities for Islamization of Knowledge with a view to developing the morality of the students and ensuring conducive environment at IIUC.</li> <li>4. To undertake research projects in co-operation with public or private organizations as and when necessary under mutual agreement.</li> <li>5. To popularize the Program of Islamization of Knowledge in and outside the University through Seminars, Conferences and Publication; and</li> <li>6. To conduct such other activities as may facilitate attainment of the objectives of IIUC, that is, combining morality with quality.</li> </ol>										
<p><b>Objectives of the Course</b></p>	<p>This <i>course</i> is designed:</p> <ol style="list-style-type: none"> <li>1. To provide the students with proper knowledge and clear conception regarding the Islamic beliefs and comprehensive concept of ‘<i>Ibadah</i> to develop their ethical understanding.</li> <li>2. To make them aware of the existing misconceptions &amp; traditional superstitions contradicting with the basic faith &amp; tenets of Islam.</li> <li>3. To enable the students to have the wide spread impacts of ‘<i>Ibadah</i> on their lives and to inspire them to follow Islam in all walks of life.</li> </ol>										
<p><b>Course Outline</b></p>	<p><b>Section-A (Midterm Exam: 30 Marks)</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"><b>Chapter# 01</b></td> <td><b>Islam: An introduction:</b> (a) Islam: Its definition and characteristic (b) Islamic ‘Aqidah: Its definition and importance.</td> </tr> <tr> <td><b>Chapter# 02</b></td> <td><b>Articles of Faith (Pillars of Iman):</b>  <b>Believe in Allah (SwT):</b> (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.  <b>Shirk:</b> (1) Definition, classifications and consequences (2) Examples of some Shirks in the contemporary society.  <b>Belief in Allah’s Angels (Malaikah):</b> (a) Belief in Angels of Allah (SWT): Its meaning, their Nature and Functions (b) Benefits of belief in Angels.  <b>Belief in the Books of Allah:</b> (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).</td> </tr> <tr> <td><b>Chapter# 03</b></td> <td><b>Belief in Allah’s Prophets:</b> (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.  <b>Belief in the Akhirah (Life After Death):</b> (a) Definition and Stages of Akhirah (b) The logic and evidence regarding Akhirah (c) Impact and benefits of belief in Akhirah.  <b>Belief in Qadr/ Taqdir (Fate) and divine decree:</b> (a) Definition of belief in Qadr/ Taqdir (b) Opinions of the scholars regarding Taqdir (c) Concept of man’s freedom of will in Islam.  <b>The nullifiers of Iman:</b> (a) Kufr and Nifaq: Definition, classifications and consequences (b) Description of the nullifiers of Iman in details.</td> </tr> </table> <p><b>Section-B (Final Exam: 50 Marks)</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"><b>Chapter# 04</b></td> <td><b>‘Ibadah: Its introduction:</b>                      (a) Meaning of ‘<i>Ibadah</i> (b) Various types of ‘<i>Ibadah</i> (c) The best ‘<i>Ibadah</i> (d) Objectives and aims of ‘<i>Ibadah</i>. (e) Conditions of ‘<i>Ibadah</i>.</td> </tr> <tr> <td><b>Chapter# 05</b></td> <td><b>Characteristics of ‘Ibadah and signs of ‘Ibadur Rahman:</b> Characteristics of ‘<i>Ibadah</i> in Islam: Free from Intermediaries, Not being confined to specific places, All-Embracing View (Scope of ‘<i>Ibadah</i>)...etc.</td> </tr> </table>	<b>Chapter# 01</b>	<b>Islam: An introduction:</b> (a) Islam: Its definition and characteristic (b) Islamic ‘Aqidah: Its definition and importance.	<b>Chapter# 02</b>	<b>Articles of Faith (Pillars of Iman):</b> <b>Believe in Allah (SwT):</b> (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. <b>Shirk:</b> (1) Definition, classifications and consequences (2) Examples of some Shirks in the contemporary society. <b>Belief in Allah’s Angels (Malaikah):</b> (a) Belief in Angels of Allah (SWT): Its meaning, their Nature and Functions (b) Benefits of belief in Angels. <b>Belief in the Books of Allah:</b> (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).	<b>Chapter# 03</b>	<b>Belief in Allah’s Prophets:</b> (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. <b>Belief in the Akhirah (Life After Death):</b> (a) Definition and Stages of Akhirah (b) The logic and evidence regarding Akhirah (c) Impact and benefits of belief in Akhirah. <b>Belief in Qadr/ Taqdir (Fate) and divine decree:</b> (a) Definition of belief in Qadr/ Taqdir (b) Opinions of the scholars regarding Taqdir (c) Concept of man’s freedom of will in Islam. <b>The nullifiers of Iman:</b> (a) Kufr and Nifaq: Definition, classifications and consequences (b) Description of the nullifiers of Iman in details.	<b>Chapter# 04</b>	<b>‘Ibadah: Its introduction:</b> (a) Meaning of ‘ <i>Ibadah</i> (b) Various types of ‘ <i>Ibadah</i> (c) The best ‘ <i>Ibadah</i> (d) Objectives and aims of ‘ <i>Ibadah</i> . (e) Conditions of ‘ <i>Ibadah</i> .	<b>Chapter# 05</b>	<b>Characteristics of ‘Ibadah and signs of ‘Ibadur Rahman:</b> Characteristics of ‘ <i>Ibadah</i> in Islam: Free from Intermediaries, Not being confined to specific places, All-Embracing View (Scope of ‘ <i>Ibadah</i> )...etc.
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	<p><b>Signs of 'Ibadur Rahman (Servent of Ar- Rahman):</b> According to the holy Qur'an.</p> <p><b>Taharah &amp; Najasah:</b> Definition of <b>Taharah</b> (purity) and <b>Najasah</b> (impurity). Ways and means of <b>Taharah: Wadu, Gusl,</b></p>
<b>Chapter# 06</b>	<p><b><u>Some Articles of Islam (Pillars of Islam) and Defense system of Islam:</u></b></p> <p><b>Salah (Prayer): Its significance, teachings &amp; some basic rules:</b> (a) Definition and kinds (b) Importance (c) Pre requisites of <b>Salah</b> (<b>Shurutus-Salah</b>) (d) Essentials/ Basic components of <b>Salah</b> (<b>Arkanus-Salah</b>) (e) How to perform the <b>Salah</b> in detail (practically)? (f) Things that invalidate the prayer (<b>Mufsidatus-Salah</b>) (g) <b>Sajdah</b> that makes prayer correct (<b>Sajdatus-Sahu</b>) (h) Friday prayer (<b>Salatul-Jumu'ah</b>) (i) The funeral prayer (<b>Salatul-Janazah</b>) (j) Prayer of the traveler (<b>Salatul-Musafir</b>) (k) 'Eid prayer (<b>Salatul-'Eid</b>) (l) Impact of <b>Salah</b>.</p> <p><b>Zakah (poor due) : Its significance, teachings &amp; some basic rules:</b> (a) Definition and types (b) Importance (c) kinds of property on which <b>Zakah</b> is obligatory (d) Who should give <b>Zakah</b> (e) Due recipients of <b>Zakah</b> (f) <b>Zakah</b> and poverty alleviation (g) Impacts/ benefits of <b>Zakah</b>.</p>
<b>Chapter# 07</b>	<p><b>Sawm (Fasting): Its significance, teachings &amp; some basic rules:</b> (a) Definition and types (b) Importance (c) Things which invalidate the fast (<b>Mufsidatus-Sawm</b>) (d) Who must fast? (e) Exemption from fasting (f) Recompense of mistake (<b>Qada'</b> and <b>Kaffarah</b>) (g) <b>Sadqatul Fitr/ Zakatul Fitr</b> (h) Impact of <b>Sawm</b>.</p> <p><b>Hajj (pilgrimage): Its significance, teachings &amp; some basic rules:</b> (a) Definition and types (b) Importance (c) How to perform <b>Hajj</b> in detail? (d) Impact of <b>Hajj</b>.</p>
<b>Chapter# 08</b>	<p><b>Defense system of Islam:</b> (a) Definition and classification of <b>Jihad</b> from various aspects (b) Importance of <b>Jihad</b> (b) Differences between <b>Jihad</b> and Terrorism.</p>
<b>Learning Outcomes</b>	<p>After completion of this course:</p> <ol style="list-style-type: none"> <li>1. <i>The students will be equipped with the knowledge and clear conception regarding the Islamic beliefs and comprehensive concept of 'Ibadah.</i></li> <li>2. They find themselves ethically developed ones.</li> <li>3. They will have inspiration to live their lives in accordance with Islamic guidance.</li> </ol>
<b>Reference</b>	<p><b>Basic Principles of Islam (Pillars of Iman):</b></p> <ol style="list-style-type: none"> <li>1. <i>Rafique Dr. Abu Bakr, Islam The Ultimate Religion (Book one) Islamic 'Aqidah', Chittagong: ABC Publications, 2002.</i></li> <li>2. Mohammad Shafiul Alam Bhuiyan, The Fundamental Beliefs of a Pure Muslim, 1<sup>st</sup> edition, 2003.</li> <li>3. <i>Sabiq, Assayed, Al-'Aqaeed Al- Islamiyah, Cairo, Al-Fathu Lil-Ielamil Arabi, 10th edition-2000.</i></li> <li>4. Bilal Philips, Dr. Abu Ameenah. The Fundamentals of Thwhid (Islamic Monotheism), International Islamic Publishing House.</li> <li>5. <i>Farid, Ahmed, An Encounter with Islam, Dhaka: Islamic Foundation, Baitul Mukarram, Dhaka, 1995.</i></li> </ol> <p><b>Basic Principles of Islam (Pillars of Islam):</b></p> <ol style="list-style-type: none"> <li>1. Mohammad Amimul Ahsan and others, Towards Understanding 'Ibadah in Islam, Bangladesh Institute of Islamic thought (BIIT), Humanscience Series-06, First</li> </ol>



	<p>Eddithion, May-2015.</p> <ol style="list-style-type: none"> <li>Abdalati, Hammudah, <i>Islam in Focus</i>, The Dept. of Islamic Affairs, The Ministry of Awqaf and Islamic Affairs, State of Qatar, 1995/ Islamic Teaching Course. Vol.-1</li> <li>Al-Quardawi, Dr. Yousuf, <i>Al-'Ibadah in Islam</i>, Wahba publication, Etypt, 24<sup>th</sup> edition, 1995.</li> <li>Alkhuli, Muhammad Ali, <i>The Light of Islam</i>, E 4, Riyad: Al Farazdak Press, 1983.</li> <li>Sarwar, Ghulam, <i>Islam: Beliefs and Teachings</i>, London: The Muslim Educational Trust, 1980.</li> </ol>
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<b>Course Code</b>	URED-2302		
<b>Course Title</b>	Sciences of <i>Qur'an</i> and <i>Hadith</i>		
<b>Status</b>	<b>University Requirement</b>		
<b>Level</b>	<b>3</b>		
<b>Credit Hours</b>	<b>1</b>		
<b>Contact Hour</b>	<b>2</b>		
<b>Course Assessment</b>	<b>Attendance</b>	<b>10%</b>	
	<b>Class test/Assignment</b>	<b>10%</b>	
	<b>Mid-term Examination</b>	<b>30%</b>	
	<b>Final Examination</b>	<b>50%</b>	
<b>Objectives of the University</b>	<p>The objectives of the University are:</p> <ol style="list-style-type: none"> <li>To create a new generation of competent youths, who will be equipped with academic excellence, professional expertise and adorned with moral height.</li> <li>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.</li> </ol>		
<b>Objectives of the Department/ Center</b>	<p>The aims and objectives of the Center are as follows:</p> <ol style="list-style-type: none"> <li>To develop the courses and curricula of the University Requirement Courses (URC) and syllabi thereof keeping pace with needs of the day from time to time.</li> <li>To ensure quality education of the University Requirement Courses through continuous supervision of performance of the teachers of CENURC.</li> <li>To promote and provide facilities for Islamization of Knowledge with a view to developing the morality of the students and ensuring conducive environment at IIUC.</li> <li>To undertake research projects in co-operation with public or private organizations as and when necessary under mutual agreement.</li> <li>To popularize the Program of Islamization of Knowledge in and outside the University through Seminars, Conferences and Publication; and</li> <li>To conduct such other activities as may facilitate attainment of the objectives of IIUC, that is, combining morality with quality.</li> </ol>		
<b>Objectives of the Course</b>	<p>The main objectives of this course are:</p> <ol style="list-style-type: none"> <li>To make the students familiar with the basic sciences of Qur'an &amp; Hadith to understand them properly.</li> <li>To provide them with proper knowledge to establish their authenticity and remove misconceptions concerning them.</li> <li>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.</li> </ol>		
<b>Course Outline</b>	<i>Section-A (Midterm Exam: 30 Marks)</i>		
	<b>Chapter# 01</b>	<b>Sciences of Qur'an:</b>	



	(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.
<b>Chapter# 02</b>	<b>Wahi (Revelation) of the Holy Qur'an:</b> (1) Meaning of <i>Wahi</i> (2) Various classifications and procedure of <i>Wahi</i> (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.
<b>Chapter# 03</b>	<b>The <i>Ayah</i> and <i>Surah</i> of the Holy Qur'an:</b> (1) The <i>Aayah</i> of the Qur'an: Definition of <i>Aayah</i> . The Number of <i>Ayah</i> , words and letters of the Holy Qur'an. The Arrangement of the <i>Ayah</i> of the Holy Qur'an (2) The <i>Surah</i> of The Qur'an: Definition of <i>Surah</i> . The Arrangement of <i>Surah</i> of the Holy Qur'an. The classification of <i>Surah</i> of the Holy Qur'an.
<i>Section-B (Final Exam: 50 Marks)</i>	
<b>Chapter# 04</b>	<b><i>Makki</i> &amp; <i>Madani</i> Revelations:</b> (1) The Definition of <i>Makki</i> and <i>Madani</i> (2) The Characteristics of <i>Makki</i> and <i>Madani</i> Revelations (3) The benefits of knowing <i>Makki</i> and <i>Madani</i> Revelations.
<b>Chapter# 05</b>	<b>Preservation, Compilation &amp; <i>Asbabunnuzul</i> (revelational background):</b> (1) Preservation & Compilation of the Holy Qur'an (2) The Causes of Revelation ( <i>Asbabunnuzul</i> ): The Definition of <i>Asbabunnuzul</i> . The classification of <i>Asbabunnuzul</i> . The benefits of Knowing <i>Asbabunnuzul</i> .
<b>Chapter# 06</b>	<b><i>Al-Naskh</i> (Abrogation) &amp; <i>I'jaz</i> (inimitability) of The Qur'an:</b> (1) <b>Abrogation (<i>Al-Naskh</i>) in the Holy Qur'an:</b> Definition of <i>Naskh</i> . The proofs of <i>Naskh</i> . The Classifications of <i>Naskh</i> . The benefits of knowing <i>Nasikh</i> (abrogating) and <i>Mansukh</i> (abrogated) verses. (2) <b>The Miraculous Nature of The Qur'an (<i>I'jaz Al-Qur'an</i>):</b> Definition of <i>I'jaz</i> . The Proofs of <i>I'jaz</i> . Various aspects of <i>I'jaz Al-Qur'an</i> .
<b>Chapter# 07</b>	<b>Sciences of Hadith:</b> (1) Definition of <i>Sunnah</i> (2) Difference among Qur'an <i>Sunnah</i> and <i>Hadith Qudshi</i> (3) The Position, importance and authority of <i>Sunnah</i> in Islamic <i>Shar'ah</i> (4) Explanation of some important terms of <i>Sunnah</i> : <i>Isnad/ Sanad, Matn, Rawee</i> and <i>Riwayah, Al-jame', Al-Musnad, Al-Sahih, Al-Sunan, Sahihayn, Muttafaqun 'Alayh, Al-kutub As-Sittah...</i> etc. (5) Collection & Compilation of <i>Sunnah</i> .
<b>Chapter# 08</b>	<b>The classification of <i>Hadith</i> and fabrication in <i>Hadith</i>:</b> (1) <b>The classification of <i>Hadith</i>:</b> (a) According to the reference to a particular authority (b) According to the links in the <i>Isnad</i> (c) According to the number of narrators involved in each stage of the <i>Isnad</i> (d) According to the reliability and memory of the narrator. (2) <b>Fabrication in <i>Hadith</i>:</b> (a) Definition of Fabrication (b) Causes and consequence of fabrication (c) Some examples of commonly used fabricated <i>Hadith</i> in our society.
<b>Learning Outcomes</b>	After completion of this course: 1. <i>The students will have knowledge of the status of Qur'anic verses and Hadiathic text.</i> 2. <i>They will be able to establish the authenticity of Qur'an and Sunnah.</i> 3. <i>To have inspiration to achieve knowledge from the Qur'an and Sunnah directly.</i>
<b>Reference</b>	<b>Sciences of Qur'an:</b> 1. Denffer, Ahmad, vol. ' <i>Ulum Al-Qur'an: An Introduction to the Sciences of the Qur'an</i> , The Islamic Foundation, UK, reprinted by – A.S. Noordeen, Kuala Lumpur. 1983.



	<p>2. Ushama, Dr. Thameem, <i>Sciences of the Qur'an: An Analytical Study</i>, International Islamic University Malaysia, Cooperative Limited, Kuala Lumpur. 1998.</p> <p>3. Bucaille, Dr. Maurice, <i>The Bible The Qur'an &amp; Science</i>, Thinkers Library, Selangor Darul Ehsan. Malaysia, 1996.</p> <p>4. Badruddin Muhammad bin Abdullah Al-Badruddin Al-Zarkashi, <i>Al-Burhan Fi Ulumil Qur'an</i>, Dar Al-Marifah, Bairuth, VI. 01.</p> <p>5. A Study of the Holy Qur'an and its Teachings, First edition, IQRA International Education Foundation, Chicago, April-1999.</p> <p><b>Sciences of Hadith:</b></p> <p>1. Al-Azami, Dr Mohammad Mustafa, <i>Studies in Early Hadith Literature</i>, American Trust publication, Indiana, 1978.</p> <p>2. Hasan, Dr. Suhaib, An Introduction to the Science of Hadith, London, AL-Qur'an Society, 1994.</p> <p>3. Marhribi, Al-Hassan, Introduction to the Study of the Hadith, Roshmee, South Africa, Roshmee Islamic School, 1994.</p> <p>4. Salih, Muhammad Adeeb, Lamahat fee Usul al-Hadeth, Damascus, 1393 AH.</p> <p>5. Siddiqi, Muhammad Zubayr, Hadith Literature: its Origin, Development &amp; Special Features, Cambridge, Islamic Texts Society, 1993.</p>
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<b>Course Code</b>	<b>URBL-2401</b>		
<b>Course Title</b>	<b>Functional Bengali Language and Literature</b>		
<b>Status</b>	<b>University Requirement</b>		
<b>Level</b>	<b>4</b>		
<b>Credit Hours</b>	<b>2</b>		
<b>Contact Hour</b>	<b>2</b>		
<b>Course Assessment</b>	<b>Attendance</b>	<b>10%</b>	
	<b>Class test/Assignment</b>	<b>10%</b>	
	<b>Mid-term Examination</b>	<b>30%</b>	
	<b>Final Examination</b>	<b>50%</b>	
<b>Objective</b>	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.		
<b>Content</b>	<p><b>প্রায়োগিক বাংলা : ৫০</b></p> <p>১. বাংলা ভাষার উদ্ভব ও সাধারণ পরিচয়।</p> <p>২. বাংলা বর্ণ ও ধ্বনি পরিচয়।</p> <p>৩. বাংলা বানান : গ-ত্ব বিধান, ষ-ত্ব বিধান ও প্রমিত বাংলা বানানের নিয়ম।</p> <p>৪. শব্দ প্রকরণ।</p>		



৫.	সমাস ও প্রকৃতি-প্রত্যয়।
৬.	বাক্য প্রকরণ।
৭.	পরিভাষা।
৮.	প্রতিবর্ণীকরণ (IPA) পরিচিতি।
৯.	সারাংশ, সারমর্ম, ভাবসম্প্রসারণ।
১০.	পত্রলিখন।
<b>বাংলা সাহিত্য : ৩০</b>	
১.	বাংলা সাহিত্যের ইতিহাস (প্রাচীন, মধ্য ও আধুনিক যুগ)
২.	গদ্য : (ক) পোস্ট মাস্টার, মুসলমানী গল্প (রবীন্দ্রনাথ ঠাকুর) (খ) তরুণের সাধনা, যৌবনের গান (কাজী নজরুল ইসলাম)
৩.	কবিতা : (ক) বঙ্গ ভূমির প্রতি (মধুসূদন দত্ত) (খ) সোনার তরী (রবীন্দ্রনাথ ঠাকুর) (গ) সাম্যবাদী (কাজী নজরুল ইসলাম) (ঘ) আজান (কায়কোবাদ)
<b>Midterm Exam : 30 Marks</b>	
<b>প্রায়োগিক বাংলা : ২০</b>	
১.	বাংলা ভাষার উদ্ভব ও সাধারণ পরিচয়।
২.	বাংলা বর্ণ ও ধ্বনি পরিচয়।
৩.	বাংলা বানান : ণ-ত্ব বিধান, ষ-ত্ব বিধান ও প্রমিত বাংলা বানানের নিয়ম।
৪.	পরিভাষা
<b>বাংলা সাহিত্য : ১০</b>	
১.	গদ্য : (ক) পোস্ট মাস্টার, মুসলমানী গল্প (রবীন্দ্রনাথ ঠাকুর) (খ) তরুণের সাধনা, যৌবনের গান (কাজী নজরুল ইসলাম)
<b>Final Exam :50 Marks</b>	
<b>প্রায়োগিক বাংলা : ৩০</b>	
১.	শব্দ প্রকরণ।
২.	সমাস ও প্রকৃতি-প্রত্যয়।
৩.	বাক্য প্রকরণ।
৪.	প্রতিবর্ণীকরণ (IPA) পরিচিতি।
৫.	সারাংশ, সারমর্ম, ভাব সম্প্রসারণ।
৬.	পত্র লিখন।
<b>বাংলা সাহিত্য : ২০</b>	
১.	বাংলা সাহিত্যের ইতিহাস (প্রাচীন, মধ্য ও আধুনিক যুগ)
২.	কবিতা : (ক) বঙ্গভূমির প্রতি (মধুসূদন দত্ত) (খ) সোনারতরী (রবীন্দ্রনাথ ঠাকুর)



	(গ) সাম্যবাদী (কাজী নজরুল ইসলাম) (ঘ) আজান (কায়কোবাদ)
<b>Learning Outcome:</b>	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.
<b>Reference:</b>	<ol style="list-style-type: none"> <li>১. রবীন্দ্রনাথ ঠাকুর, গল্পগুচ্ছ, বিশ্বভারতী, কলকাতা।</li> <li>২. কাজী নজরুল ইসলাম, অগ্নিবীণা, সর্ব্বহারা, সঞ্চিতা, ইসলামী কবিতা, গজল ও প্রবন্ধ এবং কাব্য আমপারা।</li> <li>৩. মুহাম্মদ শহীদুল্লাহ, বাঙ্গালা ভাষার ইতিবৃত্ত, শহীদুল্লা রচনাবলী ৩য় খন্ড, বা.এ. ঢাকা- ১৯৯৫।</li> <li>৪. মুহাম্মদ শহীদুল্লাহ, বাঙ্গালা ব্যাকরণ, ঐ।</li> <li>৫. নরেন বিশ্বাস, বাংলা উচ্চারণ অভিধান, বা.এ.।</li> <li>৬. জ্যোতিভূষণ চাকী, বাংলা ভাষার ব্যাকরণ, কলকাতা, আনন্দ পাবলিকেশন, ১৯৯৬।</li> <li>৭. এাহবুবুল হক, বাংলা বানানের নিয়ম।</li> <li>৮. প্রমিত বাংলা, বানানের নিয়ম।</li> <li>৯. ড. মো: মাছুউদুর রহমান, বাংলা ভাষায় ইসলামী সাহিত্য চর্চা- পি.এইচ.ডি থিসিস, ঢাকা বিশ্ববিদ্যালয়।</li> <li>১০. আ: মান্নন সৈয়দ- কাজী নজরুল ! কবি ও কবিতা।</li> </ol>

<b>Course Code</b>	URED-3503		
<b>Course Title</b>	Introduction to Political Thoughts and Social Behavior		
<b>Status</b>	University Requirement		
<b>Level</b>	5		
<b>Credit Hours</b>	1		
<b>Contact Hour</b>	2		
<b>Course Assessment</b>	<b>Attendance &amp; Class test/Assignment</b>	<b>10%</b>	
	<b>Class test/Assignment</b>	<b>10%</b>	
	<b>Mid-term Examination</b>	<b>30%</b>	
	<b>Final Examination</b>	<b>50%</b>	



<i>Objectives of the University</i>	<p>The objectives of the University are:</p> <ol style="list-style-type: none"> <li>To create a new generation of competent youths, who will be equipped with academic excellence, professional expertise and adorned with moral height.</li> <li>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.</li> </ol>		
<i>Objectives of the Department/ Center</i>	<p>The aims and objectives of the Center are as follows:</p> <ol style="list-style-type: none"> <li>To develop the courses and curricula of the University Requirement Courses (URC) and syllabi thereof keeping pace with needs of the day from time to time.</li> <li>To ensure quality education of the University Requirement Courses through continuous supervision of performance of the teachers of CENURC.</li> <li>To promote and provide facilities for Islamization of Knowledge with a view to developing the morality of the students and ensuring conducive environment at IIUC.</li> <li>To undertake research projects in co-operation with public or private organizations as and when necessary under mutual agreement.</li> <li>To popularize the Program of Islamization of Knowledge in and outside the University through Seminars, Conferences and Publication; and</li> <li>To conduct such other activities as may facilitate attainment of the objectives of IIUC, that is, combining morality with quality.</li> </ol>		
<i>Objectives of the Course</i>	<p>This <i>course</i> is designed:</p> <ol style="list-style-type: none"> <li>To provide the students with basic idea concerning the political thoughts and social justice.</li> <li>To inculcate in them Islamic manners and etiquettes for their development as a human being.</li> <li>To discharge their duties and responsibilities towards Allah (SWT) and His creatures.</li> </ol>		
<i>Course Outline</i>	<b>Section-A (Midterm Exam: 30 Marks)</b>		
	<table border="1" style="width: 100%;"> <tr> <td style="width: 15%;"><b>Chapter# 01</b></td> <td><b>Introduction to Political Thoughts:</b> <b>Government and Politics:</b> Meaning and Organs <b>Islamic Political System:</b> Meaning, Importance and Principles</td> </tr> </table>	<b>Chapter# 01</b>	<b>Introduction to Political Thoughts:</b> <b>Government and Politics:</b> Meaning and Organs <b>Islamic Political System:</b> Meaning, Importance and Principles
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	<table border="1" style="width: 100%;"> <tr> <td style="width: 15%;"><b>Chapter# 02</b></td> <td><b>Shari'ah (Islamic Law):</b> Meaning, Sources and Differences between <i>Shari'ah</i> and Manmade Law <b>Constitution:</b> Definition, Islamic Constitution and Special Features of an Islamic Constitution</td> </tr> </table>	<b>Chapter# 02</b>	<b>Shari'ah (Islamic Law):</b> Meaning, Sources and Differences between <i>Shari'ah</i> and Manmade Law <b>Constitution:</b> Definition, Islamic Constitution and Special Features of an Islamic Constitution
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<table border="1" style="width: 100%;"> <tr> <td style="width: 15%;"><b>Chapter# 03</b></td> <td><b>Islamic State:</b> Concept of Islamic State, Differences between Islamic and Secular State, Necessity of Islamic State, Main Organs of Islamic State, Principles of Islamic State <b>The Executive (Head of the state):</b> Conception, Qualifications, How to select a Head of the State, Factions of the Executive.</td> </tr> </table>	<b>Chapter# 03</b>	<b>Islamic State:</b> Concept of Islamic State, Differences between Islamic and Secular State, Necessity of Islamic State, Main Organs of Islamic State, Principles of Islamic State <b>The Executive (Head of the state):</b> Conception, Qualifications, How to select a Head of the State, Factions of the Executive.	
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<b>Section-B (Final Exam: 50 Marks)</b>			
<table border="1" style="width: 100%;"> <tr> <td style="width: 15%;"><b>Chapter# 04</b></td> <td><b>Legislative (Al-Shura):</b> Meaning, Importance, Example and Functions <b>The Judiciary (Al-Qada):</b> Meaning, Importance, Nature and Implementation, Types of Punishment <b>Citizenship (Nationality):</b> Meaning, Types, Rights <i>Hisbah:</i> Meaning, Importance, Objectives, Functions and Selection of <i>Mushtasib</i></td> </tr> </table>	<b>Chapter# 04</b>	<b>Legislative (Al-Shura):</b> Meaning, Importance, Example and Functions <b>The Judiciary (Al-Qada):</b> Meaning, Importance, Nature and Implementation, Types of Punishment <b>Citizenship (Nationality):</b> Meaning, Types, Rights <i>Hisbah:</i> Meaning, Importance, Objectives, Functions and Selection of <i>Mushtasib</i>	
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<table border="1" style="width: 100%;"> <tr> <td style="width: 15%;"><b>Chapter# 05</b></td> <td><b>Social Behavior:</b> <b>Dealings and Behavior in Islam (Mu'amalah):</b> Its Meaning, Definition and Scope.</td> </tr> </table>	<b>Chapter# 05</b>	<b>Social Behavior:</b> <b>Dealings and Behavior in Islam (Mu'amalah):</b> Its Meaning, Definition and Scope.	
<b>Chapter# 05</b>	<b>Social Behavior:</b> <b>Dealings and Behavior in Islam (Mu'amalah):</b> Its Meaning, Definition and Scope.		



		<p><b>Family life in Islam:</b> (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.</p>
	<b>Chapter# 06</b>	<p><b>Principles of Islamic Economic System:</b> (a) Earning and expenditure by <i>Halal</i> means (b) Right to own property and individual liberty (c) System of <i>Zakah</i> (d) Prohibition of interest (<i>Riba</i>) (e) Law of Inheritance (<i>Mirath</i>) (f) Various Islamic transactions.</p>
	<b>Chapter# 07</b>	<p><b>Political System:</b> Definition, Principals, Islamic State, Islamic monuments.  <b>Dress code:</b> Dress code in Islam for male and female  <b>Duties and obligations towards:</b> Relatives, Neighbors, Guests, Needy and Orphan.</p>
	<b>Chapter# 08</b>	<p><b>Basic virtues and Islam,</b> 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, enviousness, hatred ...etc.  <b>Social Manners:</b> (1) Brotherhood (2) Greetings (3) Co-operation (4) Meetings (5) Talking (6) Keeping promises (7) Asking permission before entering someone's house. Welfare.</p>
<b>Learning Outcomes</b>	<p>After completion of this course:</p> <ol style="list-style-type: none"> <li>The students will be equipped with the basic idea of political thoughts and human development in Islam.</li> <li>They will be able to establish a society on the basic of social justice and to run it according to the direction of Islam.</li> <li>They will be able to perform their duties and responsibilities towards Allah (SWT) and His creatures.</li> </ol>	
<b>Reference</b>	<p><b>Introduction to Political Thoughts:</b></p> <ol style="list-style-type: none"> <li>Ansari, Jalal, <i>Introduction to the Systems of Islam</i>, London, Al-Khilafah Publications, ISBN-1899574026.</li> <li>Asad, Mohammad, <i>Basic principles of state and Government in Islam</i> (California; Southern California University Press.</li> <li>Matin, Abdur Rashid and Sirajul Islam, <i>Introduction to Political Science</i>.</li> <li>Sherwani, H.K. <i>Studies in Muslim Political Thought and Administration</i>, Muhammad Ashraf, 1945, Lahore.</li> <li>Mohammad Shafiul Alam Bhuiyan, <i>The Government and Politics in Islam</i>, Noor Publications, 4<sup>th</sup> edition, 2016, Dhaka-1000.</li> </ol> <p><b>Social Behavior:</b></p> <ol style="list-style-type: none"> <li>Abdul Hannan, Shah, <i>Social Laws of Islam</i>, BIIT, Dhaka, 1995.</li> <li>Abdalati, Hammudah, (1977), "<i>The Family Structure in Islam</i>", American Trust Publications. USA.</li> <li>Al-Minawi, Kawther M, <i>The Child Rights in Islam</i>. Riyadh: Dar al-Amal</li> </ol>	



	<p>Publishing House, 1993.</p> <p>4. Umer, Chapra, <i>Islam and the Economic Challenge</i>. Leicester, UK: Islamic Foundation and Virginia, USA: the International Institute of Islamic Thought, 1992.</p> <p>5. Taqi, Usmani, M., <i>An Introduction to Islamic Finance</i>. Karachi, Pakistan: Idaratul Ma'arif, 1998.</p>
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<b>Course Code</b>	URED-3604		
<b>Course Title</b>	Life and Teachings of the Prophet Muhammad (SAAS)		
<b>Status</b>	<b>University Requirement</b>		
<b>Level</b>	<b>6</b>		
<b>Credit Hours</b>	<b>1</b>		
<b>Contact Hour</b>	<b>2</b>		
<b>Course Assessment</b>	<b>Attendance</b>	<b>10%</b>	
	<b>Class test/Assignment</b>	<b>10%</b>	
	<b>Midterm Examination</b>	<b>30%</b>	
	<b>Final Examination</b>	<b>50%</b>	
<b>Objectives of the University</b>	<p>The objectives of the University are:</p> <ol style="list-style-type: none"> <li>To create a new generation of competent youths, who will be equipped with academic excellence, professional expertise and adorned with moral height.</li> <li>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.</li> </ol>		
<b>Objectives of the Department/ Center</b>	<p>The aims and objectives of the Center are as follows:</p> <ol style="list-style-type: none"> <li>To develop the courses and curricula of the University Requirement Courses (URC) and syllabi thereof keeping pace with needs of the day from time to time.</li> <li>To ensure quality education of the University Requirement Courses through continuous supervision of performance of the teachers of CENURC.</li> <li>To promote and provide facilities for Islamization of Knowledge with a view to developing the morality of the students and ensuring conducive environment at IIUC.</li> <li>To undertake research projects in co-operation with public or private organizations as and when necessary under mutual agreement.</li> <li>To popularize the Program of Islamization of Knowledge in and outside the University through Seminars, Conferences and Publication; and</li> <li>To conduct such other activities as may facilitate attainment of the objectives of IIUC, that is, combining morality with quality.</li> </ol>		
<b>Objectives of the Course</b>	<p>This <i>course</i> is designed:</p> <ol style="list-style-type: none"> <li>To help the students to develop an in-depth study for clear understanding of the last Prophet's life, mission and teachings.</li> <li>To show that the Prophet Muhammad (SAAS) is only ideal mentor to follow by the entire humanity.</li> <li>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.</li> </ol>		
<b>Course Outline</b>	<i>Section-A (Midterm Exam: 30 Marks)</i>		



	<b>Chapter# 01</b>	<b>An introduction to <i>Siratunnabi</i> (SAAS):</b> A comprehensive view, <i>Sirah</i> and its literally and technical meaning, Selection of Arabia as the birthplace of the Final Prophet ( <i>SAAS</i> ), Socio-Political, Religious condition of pre-Islamic Arabia: an Overview.
	<b>Chapter# 02</b>	<b>Early life of Prophet (SAAS):</b> Birth and Childhood, Business trip to Syria with his uncle <i>Abu Talib</i> , Battle of <i>Fujjar</i> and formation of <i>Hilful-Fudul</i> , Contribution of Mohammad ( <i>SAAS</i> ) in the business of <i>Khadijah</i> , Marriage with <i>Khadijah</i> , Rebuilding of <i>Al-Ka'bah</i> , Search for the truth and receiving the truth.
	<b>Chapter# 03</b>	<b>Beginning of Islamic Movement at <i>Makkah</i>:</b> (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 <i>Safa</i> . Oppositions from the Quraysh begin, Qur'anic approach towards Quraysh Oppositions. Migration to Abyssinia.
<i>Section-B (Final Exam: 50 Marks)</i>		
	<b>Chapter# 04</b>	Prophet ( <i>SAAS</i> ) at <i>Makkah</i> : (From emigration to Abyssinia to the migration to <i>Madinah</i> ) – Boycott and Confinement of the Prophet ( <i>SAAS</i> ) and Banu Hashim by the Quraysh, The year of sorrow.
	<b>Chapter# 05</b>	<i>Ta'if</i> – the most difficult day, <i>Mi'raj</i> of the Prophet. Covenants of <i>Al-'Aqabah</i> . <i>Hijrah</i> of the Prophet ( <i>SAAS</i> ).
	<b>Chapter# 06</b>	The Prophet ( <i>SAAS</i> ) at <i>Madinah</i> : (From migration to <i>Hudaybiyah</i> ) Construction of the Mosque, The Charter of <i>Madinah</i> , Important Battles till the agreement of <i>Hudaybiyah</i> – The Battle of <i>Badr</i> , The Battle of <i>Uhud</i> , Battle of <i>Ahzab</i> , Campaigns against the Jews of <i>Madinah</i> , <i>Hudaybiyah</i> Agreement.
	<b>Chapter# 07</b>	Letters of the Prophet ( <i>SAAS</i> ) to the kings beyond Arabia, Battle of <i>Muta</i> , Battle of <i>Hunayun</i> , The conquest of <i>Makkah</i> .
	<b>Chapter# 08</b>	The Farewell Pilgrimage, The Farewell Address of the Prophet ( <i>SAAS</i> ) and its lessons, Departure of the Prophet ( <i>SAAS</i> ), Contributions of the Prophet ( <i>SAAS</i> ) as a reformer and as a nation builder and as an Ideal for the all.
<b>Learning Outcomes</b>	After completion of this course: 1. The students will have proper knowledge regarding the life and times of Prophet Muhammad ( <i>SAAS</i> ). 2. They will be able to identify the Prophet ( <i>SAAS</i> ) 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 ( <i>SAAS</i> ).	
<b>Reference</b>	1. Nadwi, Saiyid Sulaiman, <i>Muhammad The Ideal Prophet: A Historical, Practical, Perfect Model for Humanity</i> . Translated by Mohiuddin Ahmad. Islamic Book Trust K.L.N.D. 2. Guillaume, Alfred. <i>The Life of Muhammad: A Translation of Ibn Ishaq's Sirat Rasul Allah</i> . London: Oxford University Press, 1955. 3. Lings, Martin. <i>Muhammad: his life based on the earliest sources</i> . New York: Inner Traditions International, 1983.	



	<p>4. Nasr, Seyyed Hossein, <i>Muhammad: Man of God</i>. Chicago, IL: Kazi Publ., 1995.</p> <p>5. Ramadan, Tariq. <i>In the Footsteps of the Prophet: Lessons from the Life of Muhammad</i>. New York: Oxford University Press, 2009.</p> <p>6. Watt, William Montgomery. <i>Muhammad: Prophet and Statesman</i>. London: Oxford University Press, 1961.</p>
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<b>Course Code</b>	<b>URIH-4701</b>		
<b>Course Title</b>	<b>A Survey of Islamic History and Culture</b>		
<b>Status</b>	<b>University Requirement</b>		
<b>Level</b>	<b>7</b>		
<b>Credit Hours</b>	<b>1</b>		
<b>Contact Hour</b>	<b>2</b>		
<b>Course Assessment</b>	<b>Attendance</b>	<b>10%</b>	
	<b>Class test/Assignment</b>	<b>10%</b>	
	<b>Mid-term Examination</b>	<b>30%</b>	
	<b>Final Examination</b>	<b>50%</b>	
<b>Objective</b>	<p>The objective of this study is to enrich the learners with the glorious history of four pious <i>Khalifah</i> 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 <i>Ummayyads</i> and <i>Abbasids Khalifah</i>. The contributions include the advancement of administration, society, civilization, different branches of science such as geography, mathematics, history, medical science, philosophy etc.</p>		
<b>Content</b>	<p style="text-align: center;"><b><u>Section A (Midterm Examination: 30 Marks):</u></b></p> <p><b>Introduction to the course and its objectives.</b></p> <p><b>Chapter One: Khilafah:</b> Definition, Origin and Development of Khilafah, Difference between Khilafah in general sense and Khilafah ‘Ala-minhaj al- Nabuwwah, election to the office of the Khilafah, Khilafah vs Mulukiyyah, End of Khilafah, duties and responsibilities of a Khalifah.</p> <p><b>Chapter Two: Introduction to the Four Pious Khalifah:</b> 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</p>		



	<p>during his time and his other achievements.</p> <p><b>Chapter Three: Administration under the Four Pious Khalifah:</b> The Shura, Civil Administration, Sources of Revenue, Bait-al-Mal, judicial Administration, Police-Prison, Religious Administration and Military Administration.</p> <p style="text-align: center;"><b><u>Section B (Final Examination: 50 Marks):</u></b></p> <p><b>Chapter Four: The Umayyad Khilafah (661 A.D-750 A.D):</b> A brief discussion on Umayyad Khilafah, Administrative reforms of Abdul Malik bin Marwan, Conquest and expansion of Islamic empire under Walid bin Abdul Malik, Umar bin Abdul Aziz and his Administration Policies.</p> <p><b>Chapter Five: The Umayyad Administration:</b> Central and Provincial Administration, Social Condition. Umayyah's contribution towards the development of civilization &amp; education, Fall of the Umayyahs. An overall portrayal of Umayyad Khilafah.</p> <p><b>Chapter Six: The Abbasid Khilafah (750 A.D-1258 A.D):</b> Golden Prime of the Abbasids- Abul Abbas as Suffa, Abu Zafar al Mansur, Harun or Rashid, Al Amin and Al Mamun, Abbasid Society, Scientific and Literary development, Education, Development of Art and Architecture, Civil, Military, Judicial and Revenue Administration under the Abbasids. An overall portrayal of Abbasid Khilafah.</p> <p><b>Chapter Seven:</b> The Umayyad Khilafah of Spain and The Fatimid Khilafah of Egypt. A brief analysis.</p> <p><b>Chapter Eight: Society during Khilafah:</b> 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.</p> <p><b>Chapter Nine:</b> Muslim contribution to the different fields of world civilization :</p> <ol style="list-style-type: none"> <li>a) Geography,</li> <li>b) Medicine,</li> <li>c) Chemistry,</li> <li>d) Mathematics,</li> <li>e) Astronomy,</li> <li>f) Historiography,</li> <li>g) Art and literature.</li> </ol>
<p><b>Learning Outcome:</b></p>	<p>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 <i>Khalifah</i> 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</p>



	which will in turn be resulted in becoming a responsible citizen.
<b>Reference:</b>	<p>P.K. Hitti, <i>History of the Arabs</i>, Macmillan edition, 1970, London.</p> <p>S.A.Q. Hussaini, <i>The Arab Administration</i>, 1956, Lahore.</p> <p>Syed Ameer Ali, <i>A Short History of Saracens</i>, Macmillan edition, 1916, London.</p> <p>T.I. Arnold, <i>The Caliphate</i>, Oxford, 1924, London.</p> <p>Muhammad Ali, <i>The Early Caliphate</i>, Cambridge, 1936, London.</p> <p>W. Muir, <i>Caliphate, Its Rise, Decline and fall</i>, Edinburg, 1934.</p> <p>B. Lewis, &amp; P.M. Holt (ed.), <i>Cambridge History of Islam</i>, 1947.</p> <p>Syed Ameer Ali, <i>The Spirit of Islam</i>, Christophers, 1891, London.</p> <p>Thomas Arnold, <i>The Legacy of Islam</i>, Oxford, 1931, London.</p> <p>Joseph Hell, <i>The Arab Civilization</i>, W. Heffer &amp; sons, limited, 1926, London.</p> <p>Hamilton Gibb A.R. <i>Studies on the Civilization of Islam</i>, Princeton, 1982, London.</p> <p>R. Levy, <i>The Social Structure of Islam</i>, Cambridge 1979, London.</p> <p>R.A. Nicholson, <i>A Literary History of the Arabs</i>, Cambridge 1930, London.</p> <p>A.M.A. Shushtery, <i>Outline of the Islamic Culture</i>, The Bangalore Printing &amp; Publishing Co. Ltd., Bangalore, 1954, India.</p> <p>S.M. Imamuddin, <i>Arab Muslim Administration</i>, 1976, Karachi.</p> <p><i>Encyclopaedia of Islam</i></p> <p>S. Khuda Baksh, <i>Islamic Civilization</i> vol 1-2, Idara Islamiyat-e-Diniyat, or Kitab Bhavan, 1984, Delhi.</p> <p>H.K. Sherwani, <i>Studies in Muslim Political Thought and Administration</i>, Muhammad Ashraf, 1945, Lahore.</p> <p>M.A. Shabon, <i>The Abbasid Revolution</i>, Cambridge, 1970, London.</p> <p>M.A. Shabon, <i>Islamic History; A New Interpretation</i>, 1971, London.</p> <p>R.H. Turner, <i>Science in Medieval Islam: An Illustrated Introduction</i>. 1995, Austin: University of Texas Press.</p> <p>M. Iqbal, <i>The Reconstruction of Religious Thought in Islam</i>. 1986, Institute of Islamic Culture, Lahore.</p> <p>M.N. Roy, <i>The Historical Role of Islam</i>, Ajanta Publications, 1981, Delhi.</p> <p>Musa Ansari, <i>Moddhojoger Muslim Sovvota o Sonskriti</i>, Bangla Academy, 1999, Dhaka.</p> <p>Board of Researchers, <i>Scientific Indications in the Holy Quran</i>, Islamic Foundation Bangladesh, 2004, Dhaka.</p> <p>R.M. Savory, <i>Introduction to Islamic Civilization</i>, Cambridge University Press, 1977, London.</p> <p>Franz Rosenthal, <i>A History of Muslim Historiography</i>, Leiden, 1952.</p> <p>Cobb S., <i>Islamic Contributions to Civilization</i>, Avalon Press, Washington, 1963.</p> <p>Ziauddin Sardar, <i>Science, Technology and development in the Muslim World</i>, Croom Helm, 1977, London.</p> <p>M. Akbor Ali, <i>Bigghane Musalmander Obodan (Muslim Contribution to science)</i> Volume 1-12, 1936, Dhaka.</p>

<b>Course Code</b>	<b>URBS-4802</b>		
<b>Course Title</b>	<b>Bangladesh Studies and the History of Independence</b>		
<b>Status</b>	<b>University Requirement</b>		
<b>Level</b>	<b>8</b>		
<b>Credit Hours</b>	<b>2</b>		
<b>Contact Hour</b>	<b>2</b>		
<b>Course Assessment</b>	<b>Attendance</b>	<b>10%</b>	



	<table border="1"> <tr> <td><b>Class test/Assignment</b></td> <td><b>10%</b></td> </tr> <tr> <td><b>Mid-term Examination</b></td> <td><b>30%</b></td> </tr> <tr> <td><b>Final Examination</b></td> <td><b>50%</b></td> </tr> </table>	<b>Class test/Assignment</b>	<b>10%</b>	<b>Mid-term Examination</b>	<b>30%</b>	<b>Final Examination</b>	<b>50%</b>	
<b>Class test/Assignment</b>	<b>10%</b>							
<b>Mid-term Examination</b>	<b>30%</b>							
<b>Final Examination</b>	<b>50%</b>							
<b>Objective</b>	The objective of this study is to create awareness among the students about the History and Heritage, Geography and Environment, People and Society, Politics and Constitutional Development, International Relations, Economics and Natural Resources, Education and Literature, Philosophy and Religion, Art and Culture of Bangladesh and such other conceptions and ideas that are significantly related to the people and society of Bangladesh with a view to develop patriotism among the learners.							
<b>Content</b>	<p style="text-align: center;"><b><u>Section A (Midterm Examination: 30 Marks):</u></b></p> <p><b>Introduction to the course and its objectives.</b></p> <p><b><u>Chapter One: Outline study of Bangladesh Geography:</u></b> Location, Area, Boundary, Physiographical features, River System, Forest and Climate. Geographical Impact on the People and Society.</p> <p><b><u>Chapter Two: The People of Bangladesh:</u></b> Origin of the People, Population growth and composition, Literacy, Population challenges and prospects for Bangladesh.</p> <p><b><u>Chapter Three: History and Society of Ancient Bengal:</u></b> 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.</p> <p style="text-align: center;"><b><u>Section B (Final Examination: 50 Marks):</u></b></p> <p><b><u>Chapter Four: History and Society of Bengal under Muslim Rule (1204-1757):</u></b> 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.</p> <p><b><u>Chapter Five: History and Society of Bengal under British Rule (1757-1947):</u></b> 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.</p> <p><b><u>Chapter Six: Constitutional Development of Bangladesh:</u></b> Background to the constitution, characteristics, contents, constitutional organizations, amendments and administrative structure of Bangladesh.</p> <p><b><u>Chapter Seven: Political Developments of Modern Bangladesh:</u></b> 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.</p> <p><b><u>Chapter Eight: Foreign Policy and International Relations of Bangladesh:</u></b> 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.</p>							



	<p><b>Chapter Nine:</b> Economic condition of Bangladesh, minerals and natural resources of Bangladesh.</p> <p><b>Chapter Ten:</b> Socio-cultural problems and prospects of Bangladesh.</p>
<b>Learning Outcome:</b>	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.
<b>Reference:</b>	<p>Sirajul Islam (ed.), <i>Banglapedia: National Encyclopedia of Bangladesh</i>, Vol- 1-14, Asiatic Society of Bangladesh, Dhaka, 1998.</p> <p>Harun Er Rashid, <i>Geography of Bangladesh</i>, University Press Limited, Dhaka, Bangladesh, 1991.</p> <p>Mosharraf Hossain, <i>Graphoman World Atlas</i>, 7<sup>th</sup> edition, Graphosman, Dhaka, 2012.</p> <p>Mohar Ali, <i>History of the Muslims of Bengal</i>. Vol – 1-3, Islamic Foundation Bangladesh, Dhaka, 2003.</p> <p>Abdul Karim, <i>Social History of the Muslims of Bengal</i>, Baitush Sharaf Islamic Research Institute, Chittagong, Bangladesh, 1985.</p> <p>Dr. Enamul Huq, <i>A History of Sufism in Bengal</i>, Bangla Academy, Dhaka, 1975.</p> <p>Board of Researchers, <i>Islam in Bangladesh through Ages</i>, Islamic Foundation Bangladesh, 1995.</p> <p>Sufia Ahmed, <i>Muslim Community in Bengal (1884-1912)</i>, Oxford University Press, Dhaka, 1974.</p> <p>M.A. Rahim, <i>The Muslim Society and Politics in Bengal</i>, University of Dhaka, Bangladesh, 1978.</p> <p>Prof. Dr. Muinuddin Ahmed Khan, <i>Islamic Revivalism</i>, Bangladesh Institute of Islamic Thought (BIIT), 2010.</p> <p>Dr. Muinuddin Ahmed Khan, <i>Muslim Struggle for freedom in Bengal</i>, Islamic Foundation Bangladesh, 1983.</p> <p>Dr. Muhammad Inamul Huq, <i>Varoter Musalman O Shwadinota Andolan</i>, Bangla Academy, Dhaka, 1995.</p> <p>Azizur Rahman Mallick, <i>British Policy and the Muslims in Bengal</i>, Asiatic Society of Pakistan, Dhaka, 1961.</p> <p>Dr. M.A. Rahim, and others, <i>Bangladesher Itihash</i>, Nowroz Kitabistan, Dhaka, Bangladesh, 1994.</p> <p>Md. Thowhidul Islam and others, <i>Bangladesh Studies</i>. Bangladesh Institute of Islamic Thought (BIIT), 2017.</p> <p>Abbas Ali, Khan, <i>Banglar Musalmander Itihash</i>, Bangladesh Islamic Center, Dhaka, 2002.</p> <p>Sirajul Islam, <i>History of Bangladesh</i>, Vol – 1-3, Asiatic Society of Bangladesh, Dhaka, 2008.</p> <p>Abul Asad, <i>Eksho bochorer Itihas</i>, Bangladesh Co-operative Book Society, Dhaka, 1997.</p> <p>M.A. Barnik, <i>Rasthra Bhasha Andolonon Itihas</i>, AHDPH.</p> <p>Oli Ahad, <i>Jatiyo Rajniti 1945-1975</i>, Bangladesh Co-operative Book Society, Dhaka, 2004.</p> <p>Abul Mansur Ahmad, <i>Amar Dekha Rajniteer Poncash Bochor</i>, Srijon Prokashoni Ltd. Dhaka, 1988.</p> <p>Kamruddin Ahmed, <i>Social History of East Pakistan</i>, Dacca, Crescent Book Center, 1967.</p> <p>Siddiq Salik, <i>Witness to Surrender</i>, The University Press Ltd., 1997.</p>



	<p>Moudud Ahmed, <i>Bangladesh: Constitutional Quest for Autonomy</i>, The University Press Ltd., 2003.</p> <p>Akbar Ali Khan, <i>Discovery of Bangladesh</i>, The University Press Ltd., 2009.</p> <p>Talukdar Maniruzzaman, <i>Bangladesh Revolution and its Aftermath</i>, University Press Ltd., 1992</p> <p>Shamsul I. Khan, <i>Political Culture, Political Parties and the Democratic Transition in Bangladesh</i>, The University Press Ltd., 2008.</p> <p>The Constitution of the People’s Republic of Bangladesh.</p> <p>Md. Abdul Halim, <i>Constitution, Constitutional Law and Politics: Bangladesh Perspective</i>, Dhaka, 1998.</p> <p><b>Useful web links:</b> <a href="http://www.bangladesh.gov.bd">http://www.bangladesh.gov.bd</a> <a href="http://www.bangladesh.com">http://www.bangladesh.com</a> <a href="http://www.banglapedia.org">http://www.banglapedia.org</a> <a href="http://www.ru.ac.bd/ibs/">http://www.ru.ac.bd/ibs/</a> <a href="http://www.bbs.gov.bd">http://www.bbs.gov.bd</a></p>
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## **B. Interdisciplinary Courses**



**Course code : ACC-2401**

**Course title : FINANCIAL AND MENAGERIAL ACCOUNTING**

**Credit Hours: 2**

**Contact Hours: 2 per week**

[Prerequisite courses: NONE]

This course prepares the students with the knowledge in understanding the foundation of Accounting, Managerial Accounting and Financial Accounting. It familiarizes the students with the preparation of financial statement in the context of the financial industry today.

### Course Outcomes

Upon completion of this course, students will be able to do the following:

CO1	Analyze financial statement of an organization.
CO2	Develop budget and planning of an organization.
CO3	Develop and refine the bank reconciliation statement.
CO4	Create the bank reconciliation statement.
CO5	Apply the book keeping system.

### Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										X		
CO2			X								X	
CO3				X			X					
CO4					X							
CO5	X							X				X

### Course Content

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

- Preliminaries:** Introduction to Accounting, History and development of accounting thought, types of accounting, Accounting Principles & ethics, Accounting Equation & Transaction Analysis.
- Introduction to Financial Statements:** Recording Business Transactions, The Accounts & their types.
- 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)

- 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.
- 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)

- Cost In General:** Cost 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 (2nd Edition) : 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, Donald E. Kieso & Paul D. Kimmel. : Accounting Principles.
5. Jay M Smith & K Fred Skousen. : Intermediate Accounting.
6. Noreen & Garrison (11<sup>th</sup> Edition) : Managerial Accounting

**Course Code: ECON-3501**

**Course title: Principles of Economics**

**Credit Hours: 2**

**Contact Hours: 2 per week**

#### Objectives:

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

#### Course Outcomes

Upon completion of this course, students will be able to do the following:

CO1	Demonstrate knowledge of the fundamental concepts and theories of micro and macro-economics.
CO2	Identify the key indicators of economic growth and how to use the indicators for national and international comparisons.
CO3	Identify and explain the key macroeconomic policies.
CO4	Use economic theories and concepts to analyze behavior of individuals, firms and nations to act as a responsible citizen.

#### Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									×			
CO2						×						
CO3												×
CO4							×				×	



## Course Content

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

- 1. Introduction:** Definition of economics, Scope and utility of studying economics. (3 Lectures)
- 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. (6 Lectures)
- 3. Production:** Production function, types of productivity, The nature of Isoquants and Isocosts, Rational region of production of an engineering firm. Euler's theorem. (4 Lectures)

### 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. (4 Lectures)
- 5. Macroeconomics:** Savings, investment, employment, National income analysis, Inflation. (4 Lectures)

#### Group-B (30 Marks)

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

#### Recommended Books:

1. Gujarati, Damodar N. *Basic econometrics*. Fifth Edition, Tata McGraw-Hill Education, 2009. ISBN-978-0-07-337577-9
2. Paul A. Samuelson and William D Nordhaus; *Economics*, 19th Edition, McGraw.Hill Inc., 2009. ISBN- 978-0-07-351129-0
3. Stigler, George J. *The theory of price*. Macmillan Company.; New York, 1952.
4. McConnell, Campbell R., Stanley L. Brue, and Sean Masaki Flynn. *Economics: Principles, problems, and policies*. Boston McGraw-Hill/Irwin, 2009.

**Course code: MGT-3601**

**Course Title: Industrial Management**

**Credit Hours: 2**

**Contact Hours: 2 per week**

#### **Objectives:**

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



### Course Outcomes

Upon completion of this course, students will be able to do the following:

CO1	Comprehend how an organization is formed and managed.
CO2	Understand the different roles of the owners, employees, board of directors and other stakeholders in an organization.
CO3	Make plan and budget in different functional area of the organization i.e. marketing, production etc.
CO4	Understand the legal rights and duties of the workers in a workplace.
CO5	Know about the copyright, patent right and validity, different aspect of quality assurance etc.

### Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									×			
CO2									×	×		
CO3										×	×	
CO4									×			
CO5						×	×	×				

### Course Content

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

- 1. Preliminaries:** Definition, Importance of management, Evolution, Functions of management, Introduction to Industry & organizational management. (2 Lectures)
- 2. Organization and it's Environment:** Environmental context of the Organization. (3 Lectures)
- 3. Organizing & staffing:** Theory & structure, Co-ordination, Span of control, Authority delegation, Formal & Informal Groups, Committee and task force, Manpower planning & Development. (6 Lectures)

#### 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 Lectures)
- 5. Marketing management:** Concepts, strategy, sales promotion, Transportation & Storage. Technology management: Management of innovation & changes, technology lifecycle. (4 Lectures)

##### 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. (3 Lectures)
- 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. (3 Lectures)
- 8. Professional Practice:** Tender documentation, General conditions of tender, Tech. Specification, Purchase & procurement rules-2004, Technical evaluation, Copyright, Intellectual property right. (2 Lectures)

#### Recommended Books:

1. Griffin, Ricky W. *Fundamentals of management*. Cengage Learning, 2013.
2. Weihrich, Heinz, and Harold Koontz. *Management: A global perspective*. Tata McGraw-Hill, 2005.
3. Stevenson, William J., and Ceyhun Ozgur. *Introduction to management science with spreadsheets and student CD*. McGraw-Hill, Inc., 2006.



4. Terry, George Robert, and Stephen G. Franklin. *Principles of management*. RD Irwin, 1968.
5. Flippo, Edwin B. "Personnel Management. International Student Edition." (1990).
6. Monappa, Arun, Ranjeet Nambudiri, and Patturaja Selvaraj. *Industrial Relations And Labour Laws*. Tata McGraw-Hill Education, 2012.
7. Naceur Jabnoun, *Islam & Management*; 3rd edition, 2008; International Islamic Publishing House; ISBN-6035010164
8. Faridi, F. R., ed. *Islamic Principles of Business Organization and Management : ( selected Papers of the Seminar on Islamic Principles of Organizational Behavior, Held at Herndon, Virginia, USA, September, 1988)*. Qazi Publishers, 1995.
9. Schiffman, Leon G., and Leslie Lazar Kanuk. "Consumer behaviour." (2012).



## **C. Core Courses**

### **C.1. Mathematics and Statistics Courses**



**Course code : MATH-1107**

**Course Title : Mathematics I (Differential and Integral Calculus)**

**Credit Hours: 3**

**Contact Hours: 3 per Week**

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

**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.

**Learning Outcomes:** Upon 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.

#### **Recommended Books**

- |                      |                                    |
|----------------------|------------------------------------|
| 1. Thomas, Finey     | : Calculus and analytic geometry   |
| 2. Earl W. Swokowski | : Calculus with analytic geometry  |
| 3. Sherman K. Stein  | : Calculus and analytic geometry   |
| 4. K.A. Stroud       | : Engineering Mathematics          |
| 5. Howard Anton      | : Calculus A New Horizon           |
| 6. Erwin Kreyszig    | : Advanced Engineering Mathematics |



7. P. K. Bhattacharjee	: Differential Calculus
8. P. K. Bhattacharjee	: Integral Calculus
9. Abu Yusuf	: Differential Calculus
10. 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 Mathematics I]

**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.

**Learning 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) problems using differential equations such as Growth and Decay Problems, Temperature Problems, Falling Body Problems, Dilution



Problems, Electrical Circuits problems, Orthogonal Trajectories, Spring Problems, Buoyancy Problems, Classifying Solutions etc

**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. Bhu Dev.Sharma : Differential Equations
6. Gupta,Kumar,Sharma : Differential Equations
7. Schaum's easy Outlines : Differential Equations

**Course code : MATH-2307**

**Course title : Mathematics III (Matrices, Linear System of Equations and Vector Analysis)**

**Credit Hours: 3**

**Contact Hours: 3 per Week**

[Pre requisite: MATH-1207 Mathematics II]

**Course Description/ Synopsis**

Linear Algebra and Vector Calculus introduces many operations and methods that are the fundamental tools of mathematicians and applied scientists. This course will show students how to simplify many types of complex problems using matrix algebra and vector geometry. In this course, Expertise of the students will be developed in the field of Linear Algebra and analysis of vector spaces through matrix operations. The course introduces Linear Algebra (vector presentation by matrix, linear mappings, different types of matrices, Characteristic equation, rank of matrix, Eigen values, eigenvectors, Caley-Hamilton theorem, Linear System of Equations, diagonalization, Matrix Decomposition, Mathematical Analysis of Matrices using MATLAB) , vector analysis (scalar and vector fields, surfaces and space curves, Vector differentiation gradient, divergence and curl, multiple integrals, line integrals and surface integrals; integral Theorems - Green's, Gauss' divergence and Stokes' theorem)

**Course Objective**

The objectives of this course are to

- a. to provide the students with a good understanding of the concepts, methods, logical arguments and techniques of linear algebra, different factorizations of a matrix and their applications.
- b. understand the geometrical interpretation of the eigen values and eigenvectors of a given matrix and diagonalization.
- c. Integrate functions of several variables over curves and surfaces.
- d. understand the various integral theorems (Green's theorem in the plane, Gauss' divergence theorem and Stokes' theorem) relating line, surface and volume integrals
- e. develop rational thinking patterns in terms of problem solving skills through logical reasoning and the axiomatic method as applied to linear algebra.



- f. provide the student with the critical thinking skills of vector calculus operations which are needed to solve problems in engineering
- g. provide a physical interpretation of the gradient, divergence, curl and related concepts
- h. carry out differentiation and integration of vector valued functions in cartesian, cylindrical and spherical geometry.
- i. transform vector valued functions between different coordinate systems.
- j. use nabla operations for simplification of vector analytical expressions.
- k. demonstrate matrix analysis using MATLAB.

### Course Learning Outcomes (CLO)

Upon successful completion of the course, students will be able to

CO 1: Perform standard operations on linear algebra and vectors in two-dimensional space and three-dimensional space and Interpret and analyze numerical data, mathematical concepts, and identify patterns to formulate and validate reasoning.

CO 2: Apply the knowledge of linear algebra to model and solve linear systems that appear in engineering sciences which are helpful in signal processing, image processing and compression, gene expression analysis, control theory, etc.

CO 3: Have an insight into the applicability of linear algebra by using the computer to visualize scalar and vector fields and to do numerical computations of fields.

CO 4: Capable to employ the concepts of line integral, double integral and triple integral, Green's theorem, Stokes' theorem and Gauss' theorem in solving engineering problems.

CO 5: Develop a solid understanding of the course by implementing the key concepts in MATLAB environment

### MAPPING OF CLOS TO PLOs (PROGRAM LEARNING OUTCOMES):

PLOs		CLOs				
		CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
PLO 01	Engineering Knowledge	√				
PLO 02	Engineering Problem Analysis		√	√		
PLO 03	Designing and Development				√	
PLO 04	Investigation		√	√		
PLO 05	Modern tool usage					√
PLO 06	Engineer and Society					
PLO 07	Environment and sustainability					
PLO 08	Professionalism and Ethics					
PLO 09	Communication					
PLO 10	Individual and Team Work					
PLO 11	Life-long learning					
PLO 12	Project Management					

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

1. **Matrix Terminology:** Vector presentation by matrix, different types of matrices, algebraic operations on matrices, Transpose of a Matrix, Adjoint and inverse of a matrix, augmented matrix, row operation method, rank of Matrices, Mathematical Problems using Matrix, distinguish between determinant and matrix, Normal Vector, Ortho-normal Vectors, Orthogonality, Gram-Schmidt Ortho-normalization Process, co-variance matrix,



2. **Linear System of Equations & Vector Spaces:** Echelon form, consistency and inconsistency, solution of homogeneous and non-homogeneous linear system of equations, Vector Spaces, subspaces, basis and dimension, linearly dependent and independent vectors
3. **Characteristic equation:** Eigen values, eigenvectors, Graphical presentation of Eigen vectors, Caley-Hamilton theorem, and similar matrices, diagonalization, and Characteristics roots. Adjacency Matrix with graphical representation, Geometrical Application of Matrices.

### Section-B (Final Exam: 50 Marks)

#### Group-A (20 Marks)

4. **Matrix Decomposition:** Eigen Decomposition Theorem, Singular Value Decomposition (SVD), LU Decomposition, QR decomposition, Cholesky decomposition, Physical application of Matrix Decomposition Theorem, Mathematical Analysis of Matrices using MATLAB
5. **Vector analysis:** Scalar and vectors, operation of vectors, vector addition and multiplication - their applications. Vector components in spherical and cylindrical systems, Scalar Field, Vector Field, Derivative of vectors and mathematical problems

#### Group-B (30 Marks)

6. **Del operator:** Del operator, gradient, divergence and curl and their physical significance.
7. **Vector Integration:** Line Integrals, physical significance of Vector integration and Problems, Plane Polar Coordinates, Cylindrical Polar Coordinates, Spherical Polar Coordinates
8. **Vector's Theorem :** Greens, Gauss & Stocks theorem and their applications, Vector Analysis using MATLAB

### Recommended Books

- |                                    |  |
|------------------------------------|--|
| 1. Seymour Lipschutz (SOS)         | : Linear Algebra                               |
| 2. Glyn James                      | : Advanced Modern Engineering Mathematics      |
| 3. Richard Bronson                 | : Linear algebra                               |
| 4. Roger A. Horn and Charles R     | : Matrix Analysis                              |
| 5. Rao V. Dukupati                 | : Engineering Mathematics                      |
| 6. Murray R. Spiegel(SOS)          | : Vector Analysis                              |
| 7. P.E. Lewis and J.P. Ward        | : Vector Analysis for Engineers and Scientists |
| 8. Isac Mulolani and Matiur Rahman | : Applied Vector Analysis                      |
| 9. P.N. Chattarjee                 | : Matrices                                     |
| 10. Schaum's Outline Series        | : Matrices                                     |

**Course code : MATH-2407**

**Course Title : Mathematics IV (Complex Variable, Fourier Series, Laplace Transform & Fourier Transform)**

**Credit Hours: 3**

**Contact Hours: 3 per Week**

[Pre requisite: MATH-2307, Mathematics III]

### Course Description/ Synopsis

This is the fourth course of mathematics for the students of computer science and engineering. Topics include Complex function, Demoivre's Theorem, Complex mapping from one plane to another, Poles, Residue, Complex differentiation and integration, Cauchy's Theorem, Singularities, the Cauchy-Riemann Equations, Analytic Function, Harmonic Function, Fourier series, Fourier



transform, Laplaces transform, Inverse-Laplace transform, Convolution, Unit Step Function, Ramp Function, Impulse Function, set theory, relation & function, Z-transform etc

**Course Objective**

The objectives of this course are to

- a. acquire the knowledge of the complex number system, understand the fundamental theories and principles of complex analysis and their application in finding transformation, complex integration, singularities, residue and contour integration
- b. familiarize the concept of Fourier series expansion of periodic signals and harmonic analysis
- c. learn how to derive amplitude spectrum of a given aperiodic signal by Fourier Transform.
- d. browse how to analysis the unstable signals by means of Laplace transform
- e. to achieve the concept of Z-transform
- f. demonstrate harmonic analysis using MATLAB

**Course Learning Outcomes (CLO)**

Upon successful completion of the course, students will be able to

CO 1: explain how to transform of an object through a complex system and create a mapping between input and output image

CO 2: find out the Fourier coefficients and state their frequency spectrum graphically

CO 3 : demonstrate harmonic analysis through MATLAB

CO 4 : analyze and solve problems related to engineering applications such as astronomy, acoustics, optics, and cryptography, the wave equation, heat equation ,diffusion using Fourier transform

Mapping

No	Course Learning Outcomes (CLO)	Program Outcome (PO)										Delivery (Teaching Methods)	
		Ability to acquire and apply knowledge	Ability to identify problems and formulate solutions	Ability to analyze and design computing systems	Ability to conduct, evaluate, and interpret experiments	Team work and Leadership	Ability to communicate	Ability to understand the impact of engineering decisions	Professional and ethical responsibility	Lifelong learning	Contribute beyond professional careers		
1.	CLO 1	√	√	√									Lecture
2.	CLO 2		√	√	√								



3.	CLO 3							√				
4.	CLO 4							√			√	
	<b>Overall</b>	√	√	√	√			√			√	

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

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

### Section-B (Final Exam: 50 Marks)

#### Group-A (20 Marks)

- Fourier Series:** Physical Significance of Fourier series, Periodic Signal, Trigonometric form and Complex form of Fourier series, Fourier Integral, Frequency Spectrum, Piecewise Continuous waveforms, Even symmetry, Odd symmetry, Half-wave symmetry, Phase Spectrum, Sketch different types of Periodic Signals, Application of Fourier Series
- Convolution:** convolution theorem, convolution sum, convolution Integral

#### Group-B (30 Marks)

- Laplace transforms:** Unit Step Function, Impulse Function, Ramp Function, Sketch Waveform, Derive Laplace transform from Fourier transform, the Laplace transforms of different functions, shifting and change of scale property, Laplace transforms of derivatives, Solution of Differential Equations by Laplace Transforms, inverse Laplace transforms
- Fourier Transform:** A-periodic Signal, Fourier transforms, Inverse Fourier Transform
- Fourier Analysis** using MATLAB

### Recommended Books

- Merle C Potter : Advanced Engineering Mathematics
- Rao V. Dukkupati : Engineering Mathematics
- Joel L. Schiff : The Laplace Transform and Applications
- Glyn James : Advanced Modern Engineering Mathematics
- Michael D. Greenberg : Advanced Engineering Mathematics
- K.A. Stroud : Further Engineering Mathematics
- H. K Das : Advanced Eng. Mathematics
- M. R Spiegel : Advanced Calculus
- M. R. Spiegel : Complex Variable
- MURRAY R. SPIEGEL, Ph. D : Theory and Problems of Laplace Transformation

**Course Code : STAT-2311**

**Course Title : Probability and Statistics**

**Credit Hours: 2**

**Contact Hours: 2 per Week**



**Course Description:** 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.

### Specific Course Objective/Outcomes

On the successful completion of the course, students will be able to:

COs	Course Outcome	Content	Bloom's Level
CO1	Demonstrate understanding of descriptive statistics by practical application of quantitative reasoning and to the solution of engineering problems with data visualization.	Chapter 1 to 3	Understand
CO2	Be able to compute and interpret the results of correlation and regression.	Chapter 4 to 5	Analyse
CO3	Probability and its distributions to various engineering problems.	Chapter 6 to 7	Apply
CO4	Perform hypothesis testing using statistical methods and estimation.	Chapter 8	Create

### Mapping with Program Outcomes

COs	Programme Outcome (POs)											
	Engineering Knowledge	Problem Analysis	Design/ development of solutions	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team work	Communication	Project Management and Finance	Lifelong learning
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√											
CO2		√										
CO3			√									
CO4					√							

### Section-A (Mid-term: 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:**

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



## **C.2. Basic Science Courses**



Course code : PHY-1101

Course Title :Physics I (Mechanics, Waves, Optics, Heat and Thermodynamics)

Credit Hours: 3

Contact Hours: 3 per Week

### Objectives:

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

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

### Learning Outcome:

Course outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. These outcomes relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program. The ultimate goal of the course outcomes is to encourage achievement of the course educational objectives.

### 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 broad education necessary to understand the impact of physics and engineering solutions in a global, economic, environmental, and societal context.
- an ability to use the techniques, skills, and modern tools necessary for physics and engineering careers.
- an ability to analyze the engineering concepts based on fundamental physical concepts.

### Section –A

(Mid-term Exam: 30 Marks)

#### Mechanics :

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. **Introductory quantum mechanics:** Wave function, Uncertainty principle, Postulates, Schrodinger time independent equation, Expectation value, Probability, Particle in a zero potential, Calculation of energy.

### Section- B (Final Exam: 50 Marks)

Group- A (20-Marks)

#### Waves & Oscillations:

**Waves:** Waves in elastic media, Differential equation of a progressive wave, Power and intensity of wave motion, standing waves , Sound waves, beats and Doppler's effect in sound, Group velocity and phase velocity.

**Oscillation:** Differential equation of a simple harmonic oscillator, Total energy and average energy, Combination of simple harmonic oscillations, Lissajous figures, Spring mass system, Calculation of time period of torsional pendulum, Damped oscillation, Forced oscillation, Resonance.



### Group-B (30 Marks)

**Heat and 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, Entropy, Thermodynamics functions, Maxwell relations, Third Law of thermodynamics.

#### Optics:

**Interference:** Defects of images: spherical aberration, astigmatism, coma, distortion, curvature, chromatic aberration. Theories of light; Interference of light: Young's double slit experiment, interference in thin films, Newton's rings, interferometers;

**Diffraction & Polarization:** Diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit and N-slits, diffraction grating; polarization: Production and analysis of polarized light, Brewster's law, Malus law, polarization by double refraction.

#### Recommended Books

- |                                      |                                |
|--------------------------------------|--------------------------------|
| 1. Dr. Giasuddin Ahmad               | : Engineering Physics (Part-1) |
| 2. David Halliday and Robert Resnick | : Physics part-I.              |
| 3. Young and Fredman                 | : University Physics,          |
| 4. D.S. Mathur                       | : Properties of matter         |
| 5. Brij lal and N. Subrahmanyum      | : A textbook of sound          |
| 6. Brij lal and N. Subrahmanyum      | : Heat and thermodynamics      |
| 7. Brij lal and N. Subrahmanyum      | : Properties of matter         |
| 8. F.W.Sears                         | : Thermodynamics               |
| 9. F.W.Constan                       | : Theoretical Physics          |
| 10. Modern Physics                   | : Arthur Beiser                |

**Course code :** PHY-1201

**Course Title :** Physics II (Electromagnetism, Structure of matter and Modern Physics)

**Credit Hours:** 3

**Contact Hours:** 3 per Week

#### Objectives:

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

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

#### Learning Outcome:

Course outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. These outcomes relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program. The ultimate goal of the course outcomes is to encourage achievement of the course educational objectives.

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

- Explain the techniques, skills, and modern tools necessary for physics and engineering careers.



- Explain the fundamental physical laws for better understanding of electromagnetism, Structure of matter and modern physics and their properties, for engineering application.
- Explain the development of analytical and mathematical skills that will be applicable to identify, formulate, and solve physics and engineering problems.
- Explain the broad education necessary to understand the impact of physics and engineering solutions in a global, economic, environmental, and societal context.

No.	Course Learning Outcomes (CLO)	Programme Outcome (PO)											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1.	Explain the techniques, skills, and modern tools necessary for physics and engineering careers.	√	√	√									
2.	Explain the fundamental physical laws for better understanding of electromagnetism, Structure of matter and modern physics and their properties, for engineering application.		√	√	√					√			
3.	Explain the development of analytical and mathematical skills that will be applicable to identify, formulate, and solve physics and engineering problems.							√	√			√	
4.	Explain the broad education necessary to understand the impact of physics and engineering solutions in a global, economic, environmental, and societal context.							√			√		√
	<b>Overall</b>	√	√	√	√			√	√	√	√	√	√

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

**Electricity & Magnetism:**

**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.

**Magnetic field:** Magnetic induction, Magnetic force on a current carrying conductor, Torque on a current carrying loop, Hall effect, Faraday's Law of electromagnetic induction, Lenz's Law, Self induction, Mutual induction; Magnetic properties of matter: Hysteresis curve,

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

**Section- B (Final Exam: 50 Marks)**

**Group- A (20-Marks)****Structure of matter:**

Crystalline and non-crystalline solid, single crystal and polycrystalline solids, unit cell, Crystal systems, Coordination number, NaCl and CsCl structure, Packing fraction, Crystal planes and directions, Miller indices, calculation of inter-planar spacing for cubic system, Relation between inter-planar spacing & Miller indices.

**Defects & Bond in Solid:** Different types of defects; Different types of bonds in solids, calculation of cohesive and bonding energy, Distinction between metal, insulator and semiconductor in terms of energy band.

**Group-B (30 Marks)**

**Relativity:** Postulates of special theory of relativity, Lorentz transformation, time dilation and length contraction, relativity of mass, energy-mass relation, energy- momentum relation.

**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.

**Radioactivity:** Definition, radioactive decay laws, half-life, mean life, alpha decay, beta decay, gamma decay, cross section, nuclear fission & fusion.

**Recommended Books:**

- |                                      |                                |
|--------------------------------------|--------------------------------|
| 1. Dr. Giasuddin Ahmad               | : Engineering Physics (Part-1) |
| 2. David Halliday and Robert Resnick | : Physics part-I.              |
| 3. Young and Fredman                 | : University Physics,          |
| 4. D.S. Mathur                       | : Properties of matter         |
| 5. Brij lal and N. Subrahmanyum      | : A textbook of sound          |
| 6. Brij lal and N. Subrahmanyum      | : Heat and thermodynamics      |
| 7. Brij lal and N. Subrahmanyum      | : Properties of matter         |
| 8. F.W.Sears                         | : Thermodynamics               |
| 9. F.W.Constan                       | : Theoretical Physics          |

**Course code : PHY-1204**

**Course title : Physics II Lab (Electromagnetism, optics and Modern Physics)**

**Credit Hours: 1**

**Contact Hours: 2 per Week**

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

1. Determination of the end corrections for a meter bridge.
2. Determination of specific resistance of the material of a wire by a meter bridge.
3. Determination of the resistance of a wire by means of post office box.
4. Experimental verification of the laws of series and parallel connections of resistance by means of a post office box.
5. Calibration of a meter bridge wire.
6. Determination of the value of low resistance by the method of fall of potential (Mathiesen and Hockins Method)
7. Determination of the resistance of a galvanometer by half deflection method.
8. Determination of the current sensitivity (figure of merit) of a galvanometer.
9. Calibration of an ammeter by potential drop method with the help of a potentiometer.
10. Calibration of a voltmeter by potentiometer.
11. To perform other experiments relevant to this course.

**Course Code: CHEM-2301**

**Credit Hours: 3**

**Course Title: Chemistry**

**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**

**Credit Hours: 1.5**

**Course Title: Chemistry Sessional**

**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.

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

1. Compare and contrast the chemical behavior and physical properties of common substances.
2. Demonstrate effective laboratory procedures such as transfer of solids, weighing of solids, pouring of liquids, measurement of liquid volume.
3. Demonstrate the careful recording of observations and data in the laboratory.
4. Calculate the molarity, normality and molality of solutions.
5. Solve quantitative problems (stoichiometric) involving chemical formulas and equations.
6. Record, graph, chart and interpret data obtained from experimentation.
7. Summarize the results of experimental observations and data.



## **C.2. Engineering Courses**



**Course Code: EEE-1121**

**Course Title: Basic Electrical Engineering**

**Credit Hours: 3**

**Contact Hours: 3 per Week**

### **Course Outcome (CO) of Basic Electrical Engineering:**

CO1: Explain the fundamentals and details of electrical circuits

CO2: Analyze complex engineering problems related to electrical DC and AC circuits.

CO3: Investigate an electrical circuit to collect related data.

CO4: Design an electrical circuit to solve a problem.

CO4: Work in a team and communicate effectively to solve circuit related problems.

### **CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	×											
CO2		×										×
CO3				×								
CO4		×	×	×	×	×	×	×				
CO5									×	×	×	

#### **Section-A (Mid-term: 30 Marks)**

**1. Circuit Elements and Basic Laws:** D.C voltage, current, resistance and power; dependent and independent sources, active and passive elements, networks definitions, conversion between Y and  $\Delta$  networks, Reduction of complicated networks, KVL & KCL.

**2. Network Analysis:** Elementary network topology, network constraints, network equilibrium equations. Nodal and mesh network analysis, Supernode, Supermesh, Source Transformation.

**3. Network Theorems:** Superposition theorem, the reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.

#### **Section-B (Final Exam: 50 Marks)**

##### **Group-A (20 Marks)**

**4. Signal and Waveforms:** Signal waveforms: d.c., step, impulse, square pulse, sinusoidal, triangular, exponential. General description of signals: time constant, rms value, duty cycle, crest factor, form factor.

**5. A.C Circuits:** Instantaneous, Average and R.M.S. values of current, voltage and power, Real, Reactive and Apparent power, Volt-ampere, Phase and Phase difference, Power Factor, Impedance, Determination of Average and R.M.S values of different sinusoidal and non-sinusoidal waves, power calculation of RL, RC and RLC circuits, Nodal and Mesh Analysis.

##### **Group-B (30 Marks)**

**6. Phasor Algebra:** Use of complex quantities in AC circuits, Phasor Diagram, Nodal and Mesh Analysis using Phasor, resonant circuits, Q value and band width, frequency response.



**7. Filters:** Different types of filters, Fundamental concepts of RL and RC filter, Properties of symmetrical networks filter fundamentals.

**8. 3- $\phi$  Circuits:** Introduction to Polyphase Circuits, three-phase three wire system, Y and  $\Delta$  connected system, Power calculation in balanced 3- $\phi$  systems.

**Recommended Books:**

1. Alexander and Sadiku : Fundamental of Electric Circuits
2. Nielson : Electrical Circuits
3. Boylestad Introductory Circuit Analysis
4. Hayt, Kemmerly, Durbin : Electrical Circuit Analysis
5. B. L. Theraja : Electrical Technology
6. Corcoran : Alternating Current circuits.

**Course code : EEE-1122**

**Course title : Basic Electrical Engineering Lab**

**Credit Hours: 1.5**

**Contact Hours: 3 per Week**

Laboratory works based on EEE-1121

1. To familiar with the operation of different electrical instruments.
2. To verify the following theorems:
  - i. KCL and KVL theorem,
  - ii. Superposition theorem,
  - iii. Thevenin's theorem,
  - iv. Norton's theorem and
  - v. Maximum power transfer theorem
3. To design and construct of low pass and high pass filter and draw their characteristics curves.
4. To investigate the voltage regulation of a simulated transmission network.  
Study the characteristics of Star-Delta connection
5. Study the frequency response of an RLC circuit and find its resonant frequency.
6. To perform also other experiments relevant to this course.

**Course code: EEE-1221**

**Course title: Electronics**

**Credit Hours: 3**

**Contact Hours: 3 per Week**

**[Pre requisite: EEE-1121 Basic Electrical Engineering]**

**Course Outcome (CO) of Electronics:**

CO1: Explain the fundamentals and details of solid state electronics

CO2: Analyze complex engineering problems related to analog electronic circuits.

CO3: Investigate analog electronic circuits to collect related data.

CO4: Design analog electronic circuits to solve a problem.

CO5: Work in a team and communicate effectively to solve circuit related problems.



### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	×											
CO2		×										×
CO3				×								
CO4		×	×	×	×	×	×	×				
CO5									×	×	×	

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

**1. Fundamentals of Semiconductor Devices:** Electronic structure of the elements, N and P type semiconductor, carrier densities, generation and recombination of excess carriers, carrier life time, and continuity equation. The PN junction, biasing and V-I characteristics of diodes, rectifier concept, half wave and full wave rectifiers, Zener diode and voltage regulators.

**2. Bipolar Junction Transistor and Biasing Techniques:** Transistor current components, Common-base configuration, Common-emitter configuration, Common-collector configuration, operating point, Fixed bias, Emitter bias, bias stability, thermal stability.

**3. Wave shaping & Op-amp circuit applications:** Linear wave shaping, Wave shaping techniques, High pass and low pass RC circuits (sinusoidal, step voltage, pulse, square wave, exponential and ramp inputs). Clipping and clamping circuits, Design of different Clipping and Clamping circuits according to application.

#### Section-B (Final Exam: 50 Marks)

##### Group-A (20 Marks)

**4. Field Effect Transistor:** JFET, Pinch-off voltage, Drain characteristics, MOSFET, Biasing FET devices, FET Small-signal model, FET amplifier analysis, FET as voltage-variable resistor.

**5. Switching Circuits and Multivibrator:** Transistor Switches, Schmitt Triggers, Transistor monostable multivibrator, Switching speed improvements, Solid-State Multivibrators.

##### Group-B (30 Marks)

**6. Operational Amplifier Fundamentals:** Ideal Op-Amp, Virtual Ground Concept, Basic Op-Amp Circuits, Op-Amp applications: current-to-voltage converters, voltage-to-current converters, Difference amplifier, Instrumentation amplifier, integrator, differentiator

**7. OP-Amp Applications:** Oscillators, Timers (555), function generators, Phase locked loop (PLL), analog switches

**8. Nonlinear Circuit Applications:** Comparators, Schmitt Triggers, Precision Rectifiers, Peak Detectors, Log/Antilog Amplifiers, Analog Multipliers

#### Recommended Books:

- |                                     |   |
|-------------------------------------|---|
| 1. V. K Metha                       | : Principles of Electronics.            |
| 2. Malpino                          | : Electronic Principles.                |
| 3. R. L. Boylestad, Louis Nashelsky | : Electronic Device and circuit theory. |
| 4. J. Millman and C. C. Halkias     | : Electronic Device and circuits.       |
| 5. Sedra Smith                      | : Microelectronics Circuits             |
| 6. B.L. Theraja                     | : Basic Electronics - Solid State       |



**Course code : EEE-1222**

**Course title : Electronics Devices and Circuit Lab**

**Credit Hours: 3**

**Contact Hours: 3 per Week**

1. To familiar with electronic devices and Laboratory Equipments.
2. To study of V-I Characteristics curve of P-N junction diode.
3. To study of V-I Characteristics curve of a Zener diode.
4. To study of Half-Wave Rectification circuit.
5. To study of Full-Wave Rectification circuit (Bridge & Cente- tap)
6. To familiar with NPN and PNP Transistors.
7. To study of Full-Wave filter circuit.
8. To study of Common Emitter (CE) Transistor Amplifier circuits.
9. To study of Clipping and clamping circuit.
10. To study of output characteristics of an FET.
11. To study of JFET as an amplifier.
12. To study of output characteristics of a JFET.
13. To perform other experiments related to this course.

**Course code: EEE-2421**

**Course title: Electrical Drives and Instrumentation**

**Credit Hours: 2**

**Contact Hours: 2 per Week**

**Objectives:**

This course is designed to provide students. The material will be presented using the normal mix of lectures and laboratory experiments and demonstrations. This course objective is also to

- To provide technical knowledge to solve industrial problems related to AC and DC Drives systems
- To introduce the students to electrical measurement and instrumentation techniques.
- To introduce the basic concepts and working principles of electrical machines

**COURSE OUTCOMES:**

After undergoing this course, students should be able to:

- i. Understanding principles of AC and DC machines.
- ii. Evaluate measurement techniques for instrumentation.
- iii. Carry out analysis of different electrical machines and controlling of the machine.
- iv. Application of knowledge to solve problems relating to AC and DC machines.
- v. Choose a suitable electrical machine for specific applications.
- vi. Analyzing and comparing systems and their components/factors.
- vii. Attempt experiments relating to AC and DC machine using laboratory equipment. ix. Work in a team to build a laboratory project



No.	Course Learning Outcomes (CLO)	Program Outcome (PO)									
		Ability to acquire and apply knowledge	Ability to identify problems and formulate solutions	Ability to analyze and design systems	Ability to conduct, evaluate, and interpret experiments	Team work and Leadership	Ability to communicate	Ability to understand the impact of engineering decisions	Professional and ethical responsibility	Lifelong learning	Contribute beyond professional careers
1.	Understanding principles of AC and DC machines.	√		√				√			√
2.	Carry out analysis of different electrical machines and controlling of the machine.	√	√	√	√					√	√
3.	Evaluate measurement techniques for instrumentation.	√	√					√	√		√
4.	Application of knowledge to solve problems relating to AC and DC machines.		√								
5	Choose suitable electrical machine for specific applications.	√		√				√			√
6	Analyzing and comparing systems and their components/factors.			√				√			
7	Attempt experiments relating to AC and DC machine using laboratory equipment.				√		√	√			
8	Work in a team to build laboratory project.				√	√	√			√	√
	<b>Overall</b>	√	√	√	√	√	√	√	√	√	√

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

#### 1. Introduction to Electrical Drives

Introduction to electrical machines. Rotational motion, Newton's law, and power relationships. Magnetic field, Faraday's law, induced voltage on a conductor moving in a magnetic field, production of force on a wire in a magnetic field, Classification of Load torques, Mechanical and Electrical Power Calculation, Sizing of electric motors for given load system, Classes of Motor Duty, De-rating factor for electric motor sizing, Energy Efficient Motors, Motor name plate.

2. **Transformers:** Single-phase transformers: Construction, principle of operation and equivalent circuit, phasor diagram, efficiency and regulation. Short and open circuit tests. Three-phase transformers: Construction and connections.
3. **DC Motor Drives:** Principles of operation and construction of DC machines, Emf equation and principle of commutation. Controlled rectifier fed dc drives, Power factor, supply harmonics and ripple in motor current, Chopper controlled dc drives, Closed loop control of DC Drives, Two and four quadrant controls.

### Section-B (Final Exam: 50 Marks)

#### Group-A (20 Marks)



4. **Induction Motor Drives:** Principles of operation and basic construction of three-phase induction motor. Slip equation, equivalent circuit, determination of equivalent circuit parameters by no-load and blocked-rotor tests. Volts per Hertz drives, Flux vector control drives, Direct torque control drives, Soft-Starters, Selection of speed drives and soft starters, Line reactors, Troubleshooting of AC Drives system, Drives parameter programming.
5. **Synchronous Motor Drives:** Stepper Motor Drives, Switched reluctance motor drives, Permanent Magnet Synchronous Motor (Interior Permanent Magnet and Surface Permanent Magnet, Brushless DC motor). Thyristor and microprocessor based speed control of motors.

**Group-B (30 Marks)**

6. **General Concepts of Measurements and instrumentations**  
Variables and measurement signals, the three stages of generalized measurement system, some common terms used in the measurement system, mechanical loading, impedance matching, and frequency response. Factors considered in selection of instruments - Measurement accuracy and precision. Error analysis and classification, sources of error.
7. **Instrumentation amplifiers:** Differential, logarithmic and chopper amplifiers; Frequency and voltage measurements using digital techniques; Recorders and display devices, spectrum analyzers and logic analyzers
8. **Measurement of Non Electrical Quantities: Transducers-** terminology, types, principles and application of photovoltaic, piezoelectric, thermoelectric, variable reactance and optoelectronic transducers; Measurement of Temperature: Resistance thermometer, and thermo couples.

**Reference Books:**

1. Malaric, R., "Instrumentation and Measurement in Electrical Engineering", Brown Walker Press, 2011. (textbook)
2. Sawhney, A.K., "A Course in Electrical and Electronic Measurement and Instrumentation", Dhanpat Rai & Sons, New Delhi, 2001
3. Ernest, O. Doebelin., "Measurement Systems: Applications and design", Mc-Graw Hill, 2004.
4. Beckwith, T.G and Buck, N.L., "Mechanical Measurements", Addison Wesley, 2007.
5. Golding, E.W., and Widdis, F.C., "Electrical Measurements and Measuring Instruments", A H Wheeler & Company, Calcutta, 1993.
6. B.L. Theraja & A.K. Theraja : A textbook of Electrical Technology
7. Stephen J. Chapman : Electric Machinery Fundamentals

**Course code: EEE-2422      Course title: Electrical Drives and Instrumentation Lab**

**Credit Hours: 1**

**Contact Hours: 2 per Week**

Laboratory works based on CSE-2421

1. To study the characteristics of motor
2. To study the characteristics of chopper amplifier
3. To construct a multimeter.
4. To perform also other experiments relevant to this course.



## **C.2. CSE Courses**



**Course code : CSE-1121**

**Course title : Computer Programming I**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Prerequisite courses: None]

The purpose of this course is to introduce the students to computer programming using structured language. The students will be able to enhance their analyzing and problem-solving skills and use the same for writing programs using C language. Knowledge of this course will be needed as prerequisite knowledge for future courses such as CSE-1221 Computer Programming 2, CSE-1230 Competitive Programming 1, CSE-2321 Data Structures, CSE-2421 Computer Algorithms and many others.

### Course Outcomes (COs):

After completion of this course students will be able to:

CO1	<b>Explain</b> the fundamentals of programming and basic structure of C programming language.
CO2	<b>Use</b> an integrated programming environment to write, compile, and execute a C program as well as <b>apply</b> debugging techniques to locate and resolve errors.
CO3	<b>Compare</b> and <b>apply</b> the appropriate decision making and control statements, arrays and functions to solve computational problems.
	<b>Apply</b> appropriate data structures like pointers, structures, unions, user defined data types, and dynamic memory to solve computational problems.
CO4	<b>Apply</b> different programming elements such as variables, simple data structures (arrays/strings), selection structures, repetition structures, functions, structure, pointer, file manipulation, etc. to solve different problems.
CO5	<b>Design</b> a simple information management system that requires using array of structures, function, and file processing.

### Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	X											
CO2	X	X	X									
CO3	X	X	X									
CO4		X	X						X	X		X
CO5		X			X							

### Course Content

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

1. Basic organization of computer, 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.

2. Operators: arithmetic, unary, relational, logical, assignment, conditional operators; precedence of operators, expressions, type conversions, library functions.

Input and Output: Managing data input (scanf, getchar, gets etc), Managing data output (printf, putchar, puts etc), formatted input and output.

3. Control statements: Branching- if and if... else statements, nested if, switch statement; Looping- while, do...while and for looping statements.



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

4. Nested Looping, break and continue statement, goto 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: string basics, string library functions, string copy, string concatenation, string comparison, Array of Strings.

7. Pointers: pointer declarations, operations on pointers, Pointers and arrays, Pointers and functions, Dynamic memory allocation.

Structure: defining a structure, processing a structure, structure and pointers, passing structures to functions, self-referential structure; Union.

8. File: opening and closing a file, creating a file, processing a file, Low level programming – bitwise operations, bit fields; Some additional features of C (Enumerations , Command line parameters, Header files, Preprocessors, Macros etc.).

**Recommended Books**

1. Byron S. Gottfried: *Schaum's Outline of Theory and Problems of Programming with C*, 3/e, McGraw-Hill, 2011.
2. Herbert Schildt: *Teach Yourself C*, 3/e, Osborne McGraw-Hill, 1997.
3. Stephen G. Kochan: *Programming in C*, 4/e, Sams Publishing, 2014.
4. E. Balagurusamy: *Programming in ANSI C*, 7/e, Tata McGraw-Hill Publishing Company Limited, 2016.
5. C Kernighan & D.M. Ritchie: *The C Programming Language*, 2/e, Prantice-Hall of India, 1994.
6. J Hanly and E Koffman, *Problem Solving and Program Design in C*, 8/e, Pearson, 2016.
7. Yashavant Kanetkar, *Let us C*, 16/e, BPB Publications, 2017.
8. Herbert Schildt: *C: The Complete Reference*, 4/e, Osborne McGraw-Hill, 2000.
9. Paul Deitel, Harvey Deitel: *C How to Program*, 7/e, Pearson Education, Inc, 2013.
10. Steve Summit: *C Programming FAQs*, Pearson Education, Inc, 2001.

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Course Code: CSE 1122 Course Title: Computer Programming 1 Lab  
Credit Hours: 1.5 Contact Hours: 3

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**Course Objectives:**

1. The purpose of this course is to introduce to students to the field of programming using C language.
2. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

**Course Outcomes:**

After Completion of the course student should able to



1. Know concepts in problem solving
2. To do programming in C language
3. To write diversified solutions using C language

**Syllabus:** Laboratory works based on CSE-1201

**Reference language:** C

**Reference Books:**

1. Byron S. Gottfried: *Schaum's Outline of Theory and Problems of Programming with C*, 3/e, McGraw-Hill, 2011.
2. Herbert Schildt: *Teach Yourself C*, 3/e, Osborne McGraw-Hill, 1997.
3. Robert Lafore: *The Waite Group's C programming Using Turbo C++*, 2/e, Techmedia, 2002.
4. E. Balagurusamy: *Programming in ANSI C*, 2/e, Tata McGraw-Hill Publishing Company Limited, 1992.
5. C Kernighan & D.M. Ritchie: *The C Programming Language*, 2/e, Prantice-Hall of India, 1994.
6. Herbert Schildt: *Turbo C / C++: The Complete Reference*, 2/e, Osborne McGraw-Hill, 1992.
7. H. M. Deitel, P. J. Deitel: *C How to Program*, 3/e, Pearson Education Asia, 2001.
8. Steve Summit: *C Programming FAQs*, Pearson Education, Inc, 2001.

Course code : CSE-1221 Course title : Computer Programming 2  
Credit Hours: 3 Contact Hours: 3 per Week

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**Objectives:**

Object Oriented Programming is an approach to program using Objects and Classes. This course equip the students with in-depth knowledge of different features and techniques of Object Oriented Paradigm and hence able them to program in Object Oriented Approach using language like C++.

**Student Learning Outcomes:**

Upon completion of the course, students will be able to:

1. Design, compile and execute C++ programs to solve basic problems.
2. Understand basic data management in C++ programs.
3. Understand basic C++ control structures
4. Understand Object Oriented Design

Reference Language: C++

**Course Outcomes (COs):**

Upon Successful completion of this course, students will be able to:

#	CO Description
1.	<b>Explain</b> difference between procedure oriented and object oriented paradigm, the basic syntax of C++ programming language and different features of OOP ,difference between C and C++ etc.
2.	<b>Use</b> an integrated development environment(Code Blocks IDE) or dev c++ and Turbo C++ Editor or Netbean IDE to write, compile, and execute a C+ program as well as <b>apply</b> debugging techniques to locate and resolve logical errors.
3.	<b>Apply</b> different features of OOP such as polymorphism, encapsulation, inheritance, method overloading and overriding, class, object as well as structure template library(STL), variables, simple data structures (arrays/strings), selection structures, repetition structures, functions, structure, pointer, file manipulation, etc. to solve different problems.



4.	<b>design</b> a simple student information management system that requires using polymorphism, encapsulation, inheritance, class, object, STL array of structures, function, and file processing.
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#### Mapping of CO-PO:

Sl.	CO Description	POs	Bloom's taxonomy domain/level	Delivery methods and activities	Assessment tools
CO1	<b>Explain</b> difference between procedure oriented and object oriented paradigm, the basic syntax of C++ programming language and different features of OOP ,difference between C and C++ etc.	<b>PO1</b>	Cognitive/ Apply	Lectures, Notes	Quiz/Exam/Viva
CO2	<b>Use</b> an integrated development environment(Code Blocks IDE) or dev c++ and Turbo C++ Editor or Netbean IDE to write, compile, and execute a C+ program as well as <b>apply</b> debugging techniques to locate and resolve logical errors.	<b>PO5</b>	Psychomotor/ Manipulation	Lab classes	Lab work/ project/Assignment
CO3	<b>Apply</b> different features of OOP such as polymorphism, encapsulation, inheritance, method overloading and overriding, class, object as well as structure template library(STL), variables, simple data structures (arrays/strings), selection structures, repetition structures, functions, structure, pointer, file manipulation, etc. to solve different problems.	<b>PO1</b>	Cognitive/ Analyze	Lectures, Notes, Lab classes	Quiz/Exam/Assignment
CO4	<b>Design</b> a simple student information management system that requires using polymorphism, encapsulation, inheritance, class, object, STL array of structures, function, and file processing.	<b>PO3</b>	Cognitive/ Create	Lectures, Notes, Lab classes	Exam/Lab project

#### 8 Stanza Syllabus:

Stanza	Topics
1	Introduction: Definition of OOP, C++ Console I/O, Introduction to Classes and Objects, Basic concept of Object Oriented Programming, Difference between Structured Programming and Object Oriented Programming, Difference between C/C++, Benefits of OOP, Characteristics of Procedure Oriented Programming, Characteristics of Object Oriented Programming and Application of Object Oriented Programming.
2	Introducing Classes, Arrays, Pointers and References: Access Specifiers, Constructor and Destructor, Constructors with parameters, Object Pointers, Relation between Classes, Structures and unions, In-line functions, Automatic in-line functions, Assigning objects, Passing objects to functions, Returning objects from function, Friend functions, Static



	member functions. Array of objects, Pointer to objects, the pointer, using new and delete, passing references, returning references,
3	Function Overloading: Overloading function, Constructor Overloading, Copy constructor, Default arguments, Overloading ambiguity, Address of overloaded function.
4	Operator Overloading: Binary operator overloading, Unary operator overloading, Relational and logical 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, Constructors in derived classes, Nesting of classes.
6	C++ I/O System: Streams, Stream classes, Unformatted I/O, Binary I/O, formatted I/O, I/O manipulators, Inserters, Extractors, File I/O streams, Opening and closing files, Random access files, I/O status checking, Customized I/O and files.
7	Virtual Functions: Pointers to derived classes, Applying Polymorphism using virtual functions, Polymorphic class, Pure Virtual functions, Abstract classes, early binding, and late binding.
8	Template Exception Handling and Standard Template Library: Generic functions, Generic classes, Exception handling, Throwing mechanism, Catching mechanism, Rethrowing mechanism, Specifying exceptions Templates; 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.), Function object, Iterators

### Recommended Books:

1. Robert Lafore : “Object Oriented Programming in C++”
2. Herbert Schildt : “Teach yourself C++”
3. E Balagurusamy : “Object-Oriented Programming with C++”
4. Irvine : “C++ Object Oriented Programming”
5. Bruce Eckel : “Thinking in C++”
6. Bjarne Stroustrup : “The C++ Programming Language”

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Course code : CSE-1222 Course Title : Computer Programming 2 Lab  
Credit Hours: 1.5 Contact Hours: 3 per Week

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### Objectives:

- To implement the object oriented concepts to solve problems
- To develop an application applying the object oriented concepts
- Implementing the theoretical concepts of different features of object oriented programming into practice
- Understand how the features aid in modeling real world problems by doing simple projects

### Expected Outcomes:



Upon successful completion, students will be able to:

1. Design object oriented concepts to solve problems.
2. Translate a specified algorithm into correct self-documented C++ code using generally accepted programming style. In accomplishing this translation, the student shall be able to apply the structured programming mechanisms of C++ including sequence, selection, iteration, recursion, pointers and arrays.
3. Acquire an understanding of basic object-oriented concepts and the issues involved in effective class design.
4. Code and understand how the real world objects are modeled in object oriented paradigm
5. How the features of object oriented programming works
6. How STL ease programming

**Syllabus:**

Problems related to creation of classes generating output; Experiments related to Introducing Inheritance and verification; Problems using array of objects, pointers and references; Problems related to creation of Overloaded functions; Problems related to overloading relational and logical operators; Inheriting classes and sharing base classes functions; Performing various C++ I/O operations; Using random access files for solving problems; Test of achieving runtime polymorphism; Problems related to sharing common algorithms and procedures for different data type; Problems on ACM. To perform also other experiments relevant to this course.

**Reference Language:** C++

**Hardware Requirements:** PC [with latest Configuration]

**Software Requirements:** Windows 7 or above, CodeBlocks (13.12 or above IDE),

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Course No.: CSE-1223 Course Title: Discrete Mathematics  
Credit Hours: 3 Contact Hours: 3

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**Course Objectives:**

1. To obtain general knowledge about the areas of discrete mathematics and algebra
2. To understand a variety of methods used to construct mathematical proofs
3. To acquire an insight into applications such as coding and design

**Course Outcomes:**



On completion of this course student should be able to:

1. Identify and apply basic concepts of set theory, arithmetic, logic, proof techniques, binary relations, graphs and trees
2. Produce convincing arguments, conceive and/or analyse basic mathematical proofs and discriminate between valid and unreliable arguments.
3. Apply the knowledge and skills obtained to investigate and solve a variety of discrete mathematical problems
4. Communicate both technical and non-technical information in a range of forms (written, oral, electronic, graphic,) and work as an effective team member.
5. Make effective use of appropriate technology.
6. Reflect on your own learning and that of peers.

### **8 Stanza Syllabus:**

<b>Stanza</b>	<b>Topics</b>
1.	<b>Set:</b> Introduction to Set, Set operation, Representation of Sets, Algebraic Properties of Set, Computer representation of set.
2.	<b>Logic:</b> Introduction to Logic, Prepositional Calculus, propositional equivalences, Predicate and quantifier, Translating sentence into logical expressions.
3.	<b>Function &amp; Relation:</b> Introduction to function, Some important functions, Properties of function, Rate of Growth: Big O Notation, Sequence and summation. Introduction to Relation, Representation of Relation, Properties of Relation, Composition of Relation, Equivalence Relations, Partition, Closures of Relation.
4.	<b>Number Theory:</b> Theorem of Arithmetic, Modular Arithmetic, GCD, LCM, Prime Number, Congruence, Application of Congruence, Application of Number Theory, Chinese Remainder Theory.
5.	<b>Mathematical reasoning:</b> Methods of Proof, Mathematical Induction, Recursion.
6.	<b>Counting:</b> Basic Counting principle, Inclusion-Exclusion principle, Application of Sum rule and Product rule, Pigeon hole principle, Permutation and Combination, Binomial coefficients, Recurrence relations.
7.	<b>Graph:</b> Graph terminology, Representation of graph, Graph Isomorphism, Graph connectivity, Euler and Hamilton paths, Shortest Path Problems, Planner Graphs, Graph coloring.
8.	<b>Tree:</b> Definition of Trees, Application of trees, Tree Traversal, Trees and sorting, Spanning trees, Minimum spanning trees.

### **Reference Books:**

1. Kenneth H. Rosen: *Discrete Mathematics and Its Applications*, 7/e, McGraw-Hill, 2012.
2. Seymour Lipschutz and Marc Laris Lipson: *Schaum's Outline of Theory and Problems of Discrete Mathematics*, 2/e, McGraw-Hill, 1997.
3. J. P. Tremblay and R. P. Manohar: *Discrete Mathematical structures with applications to Computer Science*, McGraw-Hill, 1975.
4. Donald F. Stanat and David F. McAllister: *Discrete Mathematics in Computer Science*, Prentice-Hall, 1977.
5. B. Kolman, R.C. Busby and S. Ross: *Discrete Mathematical Structures*, 3/e, Prentice- Hall, 1996.
6. C. L. Liu: *Elements of Discrete Mathematics*, 2/e, McGraw-Hill, 1985.
7. Olymphia Nicodemi: *Discrete Mathematics*, CBS Publishers, 1993.

### **Course code : CSE-2321**

**Course title : Data Structures****Credit Hours:** 3**Contact Hours:** 3 per Week

[Pre requisite: CSE-1121 Computer Programming 1]

**Objectives**

- Be familiar with basic techniques of algorithm analysis
- Be familiar with writing recursive methods
- The implementation of linked data structures such as linked lists and binary trees
- Be familiar with several sub-quadratic sorting algorithms including quicksort, mergesort and heapsort
- Be familiar with some graph algorithms such as shortest path and minimum spanning tree

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

**1. Introduction:** Elementary Data organization, Information; Data types; Data Structure, Data Structure operations; Algorithm; Time-Space tradeoff of Algorithms. Mathematical notation & Functions; Algorithmic Notation; Control structures; Sub-algorithms. String; String operations; Pattern matching algorithms

**2. Linear Array:** Linear Array & its representation in memory; Traversing LA, Insertion & Deletion in LA, Bubble Sort, Linear Search & binary Search. 2D Array & its representation in memory; Matrices; Algebra of matrices; Sparse matrices

**3. Stack:** its representation & applications; PUSH and POP operation on stack. Polish Notation, reverse polish notation; Evaluation of a postfix expression; Transforming infix expression into postfix expression.

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

**4. Queue** – its representation; Insertion & deletion in Queue; Deques; Priority Queues. Recursion [Factorial function, Fibonacci sequence, Ackermann function, Towers of Hanoi]

**5. Linked list** - Linked list & its representation in memory; Traversing, Searching, Insertion & Deletion operation on Linked list; Header linked lists; Two way lists.

**Group-B (30 Marks)**

**6.** Complexity of algorithms, Rate of growth: Big O,  $\Omega$  and  $\Theta$  notations; Complexity of Linear Search, Binary search & Bubble sort algorithm. **Sorting** - Insertion sort, selection sort, quick sort, merge sort; **Searching** & data modification; Hashing: Hash function, collision resolution

**7. Tree-** Tree terminology; representation of binary trees in memory; Traversing binary tree; Binary search tree; Insertion & deletion on binary search tree; Heap; Insertion & deletion on heap; Heapsort; B trees; General tree; Balanced binary search tree (AVL tree, red-black tree)

**8. Graph** – graph terminology; representation of graphs – adjacency matrix, path matrix, adjacency list; Traversing a graph – BFS & DFS

**Recommended Books:**

- |  |  |
|--|--|
| 1. Seymour Lipschetz                       | : Data Structure                         |
| 2. Y. Langsam, Augenstein, A. M. Tanenbaum | : Data Structures Using C and C++        |
| 3. Edward M. Reingold                      | : Data structures                        |
| 4. Robert Sedgwick                         | : Algorithms in C                        |
| 5. Niklaus wirth                           | :Algorithms and Data Structures Program. |

**Course code : CSE-2323**



**Course title : Data Structures Lab**

**Credit Hours: 1**

**Contact Hours: 2 per Week**

Lab based on CSE-2321

**Course code : CSE-2323**

**Course title : Digital Logic Design**

**Credit Hours: 3**

**Contact Hours: 3 per Week**

[Pre requisite: EEE-2422 Electrical Drives and Instrumentation Lab]

**Objectives:** This course is concerned with the logic design of digital electronic circuits. Digital circuits are employed in the design of digital systems such as digital computers, control systems, data communications, and many other applications that required electronic digital hardware. The course covers the basic tools for designing digital circuits and teaches methods and procedures suitable for a variety of digital applications.

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

**1. Bynary Systems, Bollean Algebra and Logic Gates:** Number system, binary codes, binary logics, logic gates, boolean algebra, canonical and standard forms.

**2.Simplification of Boolean Functions:** The Map Method. Two-, Three-, Four-, Five And Six-variable Maps, Product of Sum Simplification, NAND And NOR Implementation, Don't Care Conditions, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive-or and Equivalence Functions.

**3. Combinational Logic:** Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure, designing various types of combinational circuit using logic gates.

**Section-B (Final Exam: 50 Marks)**

**Group-A (20 Marks)**

**4. Combinational logic with MSI and LSI:** MSI and LSI, Binary Parallel Adder, look ahead carry, decimal Adder, Magnitude Comparator, decoder, encoder, multiplexer & demultiplexer.

**5. Sequential Logic:** Flip-flops, triggering of flip-flops, analysis of clocked Sequential circuits, state reduction and Assignment, design procedure, design with state equations, designing various types of sequential circuits.

**Group-B (30 Marks)**

**6. Digital Integrated Circuits:** Bipolar transistor characteristics, RTL, DTL, Integrated-Injection logic, emitter couple logic, metal-oxide semiconductor, complementary MOS.

**7. Registrars, Counters, and the Memory:** Registers, shift registers, ripple counters, asynchronous counter, synchronous counter, memory, read only memory, programmable logic array, random access memory, memory unit.

**8. Register Transfer and Processor Logic Design:** Interregister transfer, arithmetic-logic and shift-operations, design a simple computer, processor organization, arithmetic logic unit, design of arithmetic logic unit, design of accumulator.

Recommended Books:

1. Digital Logic and Computer Design : M. Morris Mano
2. Digital logic design : Md. Mozammel Huq Azad Khan
3. Digital Fundamentals : Thomas L. Floyd
4. Digital Systems : Tocci-widmer



## 5. Digital Electronics and Microprocessors : R P Jain

**Course code : CSE-2324****Course title : Digital Logic Design Lab****Credit Hours: 1****Contact Hours: 2 per Week**

**Objectives:** This course is concerned with the practical aspects of designs based on the course CSE-2323, Digital logic design theory.

1. To construct and study the following logic gates
  - AND , OR, NOT
  - NAND, NOR, EXOR
2. Verify the Demorgans Law : Law(I) and Law(II)
3. To Verify different kind of applications of Boolean algebra.
4. To construct an AND gate by diode resistors and observe its characteristics.
5. To verify the characteristics of Exclusive OR and Exclusive NOR using basic logic gate.
6. To be familiar with demultiplexer using the 74138 IC.
7. Design and implement various sequential logic circuits.
8. Experiment on synchronous up counter and down counter.
9. To perform other experiments relative to this course.

**Course code : CSE-2421****Course title : Computer Algorithms****Credit Hours: 3****Contact Hours: 3 per week**

[Prerequisite courses: CSE-2321 (Data structures)]

This course introduces students to the general tools and techniques for analyzing and designing computer algorithms. Initially necessary mathematical preliminaries required for analyzing and designing computer algorithms are taught. Then this course familiarizes students with several algorithmic approaches and corresponding problems. To take this course, students should be able to program in a standard programming language preferably in C/C++. They should have familiarity with basic data structures. Some mathematical maturity also is expected; students should have some idea of what constitutes a mathematical proof and how to write one. Some knowledge of basic probability will also be helpful. Knowledge of this course will be needed as prerequisite knowledge for future courses such as Artificial Intelligence, Computer Networks and Compiler.

**Course Outcomes**

Upon completion of this course, students will be able to do the following:

CO1	<b>Write</b> rigorous correctness proofs for algorithms
CO2	<b>Analyze</b> the asymptotic performance of algorithms
CO3	<b>Demonstrate</b> a familiarity with major algorithms and data structures
CO4	<b>Apply</b> important algorithmic design paradigms and methods of analysis
CO5	<b>Synthesize</b> efficient algorithms in common engineering design situations



### Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	X											
CO2	X											
CO3	X											
CO4	X	X										
CO5		X			X							

### Course Content

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

**1. Algorithm and Data structure:** Introduction to algorithm; Properties of good algorithm; Correctness proof and techniques for time and space complexity analysis of algorithms (using insertion-sort as an example); Application areas of algorithm; Growth of functions and asymptotic notations

**2. Divide and Conquer approach Sorting and Heaps:** Divide and Conquer approach; Asymptotic bound of recursive algorithm by solving recurrence, substitution method, recursion tree method, master method; Maximum subarray problem; Merge-sort and complexity analysis; Quick-sort, Randomized Quick-sort and complexity analysis; Heap, Heap construction algorithm, Heap-sort, Priority queue, complexity analysis of related algorithms; Sorting in Linear Time, Lower bound of sorting, Counting sort, Radix sort.

**3. Dynamic Programming:** Dynamic programming, Elements of dynamic programming, Memoization, Matrix-chain multiplication and longest common subsequence problems as examples, Complexity analysis of the algorithms.

#### Section-B (Final Exam: 50 Marks)

##### Group-A (20 Marks)

**4. Greedy Algorithms and String Matching Algorithms:** Greedy algorithms, Activity selection problem, Elements of greedy strategy, Huffman codes and its application; String Matching Algorithms, Naive string-matching algorithm, Rabin-Karp algorithm; Complexity analysis of the algorithms

**5. Graphs Basic & Traversal Techniques:** Representation of Graphs, Breadth First Search, Depth First Search, Algorithm of BFS and DFS, Application of BFS and DFS, Minimum Spanning Tree, Kruskal's and Prim's Algorithm, Complexity analysis of the algorithms

##### Group-B (30 Marks)

**6. Shortest Path Algorithms:** Single-source shortest path, Dijkstra's Algorithm, Bellman-Ford's Algorithm; All-pairs shortest path, Floyd-Warshall's Algorithm; Complexity analysis of the algorithms

**7. Computational Geometry & Number Theory:** Computational Geometry, Line Segment Properties, Convex Hull, Graham Scan Algorithm of Convex Hull, Number Theory, GCD, Modular Arithmetic, Prime Number generation, Complexity analysis of the algorithms

**8. Theory of NP-Completeness and Coping with Hardness:** Theory of NP-Completeness, P, NP, NP-Complete and NP-Hard Problems; Backtracking, N-Queen Problem; Branch and Bound; Approximation algorithms

### Recommended Books



11. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, 3rd Edition, MIT Press, 2009, ISBN-13: 978-0262033848
12. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, 1st Edition, Orient Black Swan, 2008, ISBN-13: 978-8173716126
13. Robert Sedgewick, Algorithms, 4th Edition, Addison-Wesley Professional, 2011, ISBN-13: 978-0321573513
14. Steve Skiena, The Algorithm Design Manual, 2nd Edition, Springer, 2008, ISBN-13: 978-1849967204
15. Robert L. Kruse, Alexander J. Ryba, Data Structures and Program Design in C++, 1st Edition, Prentice Hall, 1998, ISBN-13: 978-0137689958
16. Mark Allen Weiss, Data Structure and Algorithm analysis in C++, 4th Edition, Pearson, 2013, ISBN-13: 978-0132847377
17. Jeff Edmonds, How to Think About Algorithms, 1st Edition, Cambridge University Press, 2014, ISBN-13: 978-1107439887
18. Steven Halim and Felix Halim, Competitive Programming 3, 3rd Edition, Lulu.com, 2013
19. Donald Ervin Knuth, The Art of Computer Programming, Volume 1, Addison-Wesley Professional, 3rd edition, 1997, ISBN-13: 978-0201896831
20. Donald Ervin Knuth, The Art of Computer Programming, Volumes 1, 2, 3, 4A, Addison-Wesley Professional, 1st edition, 2011, ISBN-13: 978-0321751041

**Course code : CSE-2422**

**Course title : Computer Algorithms Lab**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

[Prerequisite courses: CSE-2321 (Data structures)]

Laboratory works based on CSE-2421

Implementation and Analysis of Insertion sort, Merge sort, Quick sort, Heap sort, Counting sort, Radix sort, Matrix Chain Multiplication, Longest Common Subsequence, Job selection problem, Breadth First Search, Depth First Search, Bellman-Ford's Algorithm, Dijkstra's Algorithm, Floyd-Warshall Algorithm, Random Number Generation, Backtracking Algorithm, N-Queen Problem, Huffman Algorithm, Knapsack Problem, Minimum Spanning Tree.

To perform also other experiments relevant to this course.

**Course code : CSE-2423**

**Course title : Database Systems**

**Credit Hours: 3**

**Contact Hours: 3 per Week**

**Learning Outcomes/Objectives:**

After undergoing this course, students should be able to:

1. Understand and analyze different types of DBMS
2. Understand and demonstrate different concept related to Database management system such as ER model, Integrity, Security, Normalization, Indexing, Transaction, Recovery system, Distributed system.
3. Ability to demonstrate the Design and development of database applications



No.	Course Learning Outcomes (CLO)/Objectives	Programme Outcome (PO)										Delivery (Teaching Methods)
		Ability to acquire and apply knowledge	Ability to identify problems and formulate solutions	Ability to analyze and design computing systems	Ability to conduct, evaluate, and interpret experiments	Team work and Leadership	Ability to communicate	Ability to understand the impact of engineering decisions	Professional and ethical responsibility	Lifelong learning	Contribute beyond professional careers	
1.	Understand and analyze different types of DBMS	√	√	√								Lecture
2.	Understand and demonstrate different concept related to Database management system such as ER model, Integrity, Security, Normalization, Indexing, Transaction, Recovery system, Distributed system.	√	√	√								
3.	Ability to demonstrate the Design and development of database applications		√	√	√	√			√			
<b>Overall</b>		√	√	√	√	√			√		√	

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

- 1. Introduction:** Database, data, database management system, Database system versus file system, Data model, Database language, Database user administration, Database system structure, Storage manager, Overview of Physical storage medium.
- 2. Entity-Relationship Model:** Entity sets, Relationship sets, Mapping Cardinalities, Keys, Attributes, Entity relationship diagram, Weak entity sets, Specialization, Generalization, Structure of Relational databases, Database Schema.
- 3. The Relational Algebra and SQL:** Selection, projection, Union, Set difference, Cartesian-product, Rename, Set-intersection, Natural-join, Division, Assignment, projection, Aggregate functions, Deletion, Insertion, Updating, Views, Nested sub-queries, Set membership, Set comparison.

### Section-B (Final Exam: 50 Marks)

#### Group-A (20 Marks)

- 4. Integrity, Security and Relational Database Design:** Domain constraint, Integrity, Assertions, Triggers, Authorization, Authentication, Security, Privileges, Roles, Audit trails, Encryption-Decryption Algorithm, Decomposition etc.
- 5. Functional Dependency and Normalization:** Functional Dependencies, Closure of a set of Functional dependencies. Un-normal Form (UNF), First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF), Boyce and Code Normal Form (BCNF).

#### Group-B (30 Marks)

- 6. Indexing and Hashing:** Ordered indices, Hash indices, Hash function, Primary index, Secondary index, Dense, sparse, Multilevel indices, B+ tree index files, Handling Bucket Overflows, Overflow Chaining, Closed Hashing, Open Hashing, Linear probing, Hash indices, Dynamic Hashing.



**7. Transaction:** ACID Properties, Transaction state diagram, Implementation of Atomicity and Durability, Shadow copy technique, Concurrent Execution, Serializability, Recoverability, Recoverable schedule, Cascade-less Schedules, Implementation in Isolation, Testing of Serializability.

**8. Concurrency control, Recovery System and Distribute databases:** Lock-Based Protocols, Granting of locks, Two-phase locking protocol, Graph based protocol, Tree protocol, Timestamp based protocols, Deadlock detection and recovery. Failure classification, Storage types, Checkpoints. Distributed data, Replication and Fragmentation.

**Recommended Books:**

- |                                  |  |
|----------------------------------|--|
| 1. H. F. Korth                   | : “Database System Concept”              |
| 2.. Oracle                       | : “SQL Star International Limited”       |
| 2. Thomas Connolly, Carolyn Begg | : “Database Systems- Practical Approach” |
| 3. Ramez E. Marsi                | : “Fundamentals of Database Systems”     |
| 4. Jeffry                        | : “Fundamentals of Database”             |
| 5. Kock and Loney                | : “Oracle 8i the Complete Reference”     |
| 6. Kelvin Loney                  | : “Oracle DBA Handbook”                  |

**Course code : CSE-2424**

**Course title : Database System Lab**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

1. Introduction to SQL, Relational Database Management System.
2. Oracle8: Object Relational Database Management System, SQL statements, about PL/SQL and its environments.
3. Writing Basic SQL statements, Capabilities of SQL SELECT Statements, Restricting and sorting data.
4. Single-Row-Functions, Displaying Data from multiple tables, aggregating data using Group Functions.
5. Sub queries, Multiple-Column Sub queries, Producing Readable output with SQL \*Plus.
6. Manipulating Data, Creating and Managing Tables including constraints.
7. Other Database Objects, Controlling User Access.
8. SQL Workshop.
9. Declaring Variables, writing Executable Statements.
10. Interacting with the Oracle Server, Writing Control Structures.
11. Working with Composite Data types.
12. Writing Explicit Cursors, Advanced Explicit Cursors Concepts.
13. Handling Exceptions.
14. PL/SQL Workshop.
15. To perform also other experiments relevant to this course.

**Recommended Books:**

- |                   |                                      |
|-------------------|--------------------------------------|
| 1. H. F. Korth    | : “Database System Concept”          |
| 2. Oracle         | : “SQL Star International Limited”   |
| 3. BOU            | : “Database Management Systems”      |
| 4. Ramez E. Marsi | : “Fundamentals of Database Systems” |
| 5. Jeffry         | : “Fundamentals of Database”         |
| 6. Kock and Loney | : “Oracle 8i the Complete Reference” |
| 7. Kelvin Loney   | : “Oracle DBA Handbook”              |

**Course code : CSE-2425**

**Course title : Theory of Computing**

**Credit Hours: 2**

**Contact Hours: 2 per Week**

This course covers the theoretical computer science areas of formal languages and automata, computability and complexity.



**Course Objective:**

At successful completion of the course, students should:

1. Learn several formal mathematical models of computation along with their relationships with formal languages.
2. Distinguish different computing languages and classify their respective types.
3. Recognize and comprehend formal reasoning about languages.
4. Understand that there are limitations on what computers can do, and learn examples of unsolvable problems.
5. Show a competent understanding of the basic concepts of complexity theory. They will learn that certain problems do not admit efficient algorithms, and identify such problems.

**Learning Outcomes:**

1. Define and describe formal models of computation, such as finite automata, pushdown automata, and Turing machines.
2. Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design.
3. Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, PDA's, Turing machines, and Grammars.
4. Be able to design FAs, NFAs, Grammars, languages modelling.
5. Give examples of languages and computational problems appropriate for different models of computation.
6. Create proofs for statements regarding formal models of computation.
7. Describe class-based resource usage models, including time complexity.
8. Apply NP-completeness concepts to create proofs regarding the computational complexity of novel problems.

Regular Languages, finite automaton, Examples of finite automata, Designing finite automata, Equivalence of NFAs and DFAs, The regular operations - Closure under the regular operations. Regular Expressions. Equivalence with finite automata. Non-regular Languages - The pumping lemma for regular languages.

Context-Free Languages: Formal definition of a context-free grammar - Examples of context-free grammars.

Ambiguity - Chomsky normal form. Pushdown Automata, Formal definition of a pushdown automaton - Examples of pushdown automata, Equivalence with context-free grammars.

Computability Theory: the Church-Turing Thesis. Turing machine, Nondeterministic Turing machines, Hilbert's problems.

Decidability : Decidable languages, The halting problem – the diagonalization method..

Complexity Theory: The Classes P, NP, Examples of problems in these classes. The P versus NP question. NP-Completeness, Polynomial time reducibility, The Cook-Levin Theorem. Examples of NP-Complete Problems: The vertex cover problem - The Hamiltonian path problem - The subset sum problem. Approximation algorithm, Probabilistic Algorithms.

**Recommended Books :**

1. Michael Sipser: Introduction to the theory of computation
2. Hopcroft, Motwani, Ullman: Introduction to Automata Theory, Languages and Computation
3. Lewis, Papadimitriou: Elements of the theory of computation
4. Peter Linz: An introduction to formal languages and automata
5. Zvi Kohavi: Switching and Finite Automata Theory

**Course code : CSE-3521**

**Course title : Computer Architecture**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre - Requisites Courses: CSE-2305 (Digital Logic Design)]

This course provides an overview of the architecture and organization of a computer hardware system and how it is built. It includes a discussion of the CPU, memory, I/O organization and peripherals. Then this course introduces students to the contemporary design and implementation of microprocessors. In particular, students will demonstrate an understanding of micro architecture concepts and features employed by contemporary microprocessors, such as pipelining, data forwarding, superscalar, branch predictors, trace cache, binary translation, in-order execution, out-



of-order execution, re-order buffer and cache coherence protocols. Additionally, students will also demonstrate a competence of basic skills in optimizing assembly programs.

### Course Outcomes

Upon completion of this course, students will be able to do the following:

CO1	<b>Understand</b> the basic organization of computer and <b>apply</b> different instruction formats and addressing modes.
CO2	<b>Analyze</b> the concept of pipelining, segment registers and pin diagram of CPU.
CO3	<b>Understand</b> and <b>analyze</b> various issues related to memory hierarchy.
CO4	<b>Evaluate</b> various modes of data transfer between CPU and I/O devices.
CO5	<b>Examine</b> various inter connection structures of multi processors.

### Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	X	X			X							
CO2	X	X										
CO3	X	X										
CO4	X	X	X	X								
CO5		X	X	X								

### Course Content

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

1. Computer architecture Basic, History, Different terminologies of computing device, Types of Computer Architecture, Understanding Program Performance, Defining Performance, Measuring Performance, CPU Performance and its factor, Evaluating performance, MIPS as a performance Measure
2. Instruction and data access methods, Instruction Set, Stored-Program Concept, Operations of the computer Hardware, Operands of the computer Hardware (Design Principles of Computer Hardware) Representation of Instructions in the Computer, Logical Operations, Instructions for decision making, MIPS Addressing for 32-Bit Immediate and Addresses
3. Arithmetic and logical operations, floating point operations, ALU design Signed and Unsigned numbers, Number Conversion and representation, Arithmetic Operations and Representation. Matrix-chain multiplication and longest common subsequence problems as examples, Complexity analysis of the algorithms. Multiplication, Division and Floating point Hardware

#### Section-B (Final Exam: 50 Marks)

##### Group-A (20 Marks)

4. The control unit (Single cycle Data path) : hardwired and micro programmed, Logic Design Convention, Clocking Methodology, Data path Basic, State Element of Data path Building a single Data path (R-Type, I-Type and J-type Instructions) Designing the main control unit (with control signals effect), Operation of the data path



5. The control unit (Multiple cycle Data path): hardwired and micro programmed, Multi-cycle implementation Basic. Necessity of multi-cycle implementation, Details of Control Signal Breaking the Instruction Execution into Clock Cycles, Exceptions

**Group-B (30 Marks)**

6. Pipelining: Overview of Pipelining, Pipelining Hazard, Pipeline Data Path (R-Type, I-Type and J-type Instructions) Pipeline Control, Exception, Exception Handling

7. Memory organization: Introduction to memory, memory Hierarchy, Basic on Cache, Accessing a cache, Handling cache miss and writes, Flexible placement of cache block. Introduction to virtual Memory, Virtual to physical, Handling page Fault TLB, Integrating Virtual Memory, TLBs and Caches

8. I/O systems, channels, interrupts, DMA, I/O Devices basic, Disk Storage and dependability, RAID, Buses and other connections between processors, Memory and I/O Devices, Interfacing I/O devices with processors.

**Recommended Books**

1. John Hennessy, David Patterson, Computer Organization, 3rd edition, 2013 [text book]
2. Dr. M. Rafiquzzaman "Fundamentals of Digital Logic and Microcomputer Design: Includes Verilog and VHDL", 4th Edition, 2003, Rafi Systems, Inc. [text book]
3. Romesh S. Gaonkar, Microprocessor, Architecture, Programming and Application with 8085, 5th Edition [text book]
4. Computer Organization and Architecture designing for performance, William Stallings, 8<sup>th</sup> edition, Library of Congress Cataloguing-in-Publication Data On File.[text book]

Course Code: CSE-3523

Course Title: Microprocessors, Microcontrollers and Embedded Systems

Credit Hours: 3 Contact Hours: 3

**Course Objectives:**

- Understand fundamental operating concepts behind microprocessors and microcontrollers.
- To learn and understand architecture and programming of 8086 processor.
- To learn and understand interfacing techniques like memory and I/O Interfacing with 8086.
- To learn and understand architecture and programming of 8051 microcontroller.
- To learn and understand generation of time delay, serial communication and interrupts.
- To learn and understand the development of microprocessor and microcontroller based system.

**Outcome:**

After complete the course the students will be able to

- Understand the theory and basic architecture of microprocessor
- Program a microprocessor system using assembly language
- Understand and capable of interfacing the microprocessor to the I/O devices.
- Develop simple applications on microprocessor and microcontroller -based systems.

**8 Stanza Syllabus:**

Stanza	Topics
1	Introductory Concept: Evaluation of microprocessor, Types of microprocessor, system bus, hardware of a microprocessor, memory-addressing technique.
2	8086 Microprocessor: properties, architecture, registers, FLAGS register, physical



	address calculation, addressing modes, Addressing Techniques of 8086 Microprocessor.
3	Instruction: Instruction set, Instruction format, Fetch-decode-Execution cycle.
4	Interrupt System: Sources of interrupt, Types of interrupt, handling interrupt request, interrupt vector and table, 8259A priority interrupt controller, Daisy chain.
5	An overview of Intel 80186, 80286, 80386, 80486 and Pentium microprocessor; Advanced microprocessor: Embedded microprocessor, Bit slice microprocessor, arithmetic processor, Multitasking, Itanium and Merced Microprocessor.
6	I/O operation: Isolated and memory mapped I/O, 8255A Programmable peripheral Interface, DMA technique, I/O ports, I/O processor
7	Micro controller: Architecture of 8051, Signals, Operational features, Memory and I/O addressing, Interrupts, Instruction set, Applications.
8	Embedded Systems: Introduction to Embedded Systems, Characteristics, Components, Hardware-Software Partitioning, Specification and Modeling, Optimizing Design, SOC, Application Domains.

### Recommended Books:

1. Dr. M. Rafiquzzaman :Microprocessors & Microcomputer -Based System Design
2. T. Hanley :Microprocessor and microcomputer
3. John F. wakerly :Micro Computer architecture and programming
4. John P. Hayes :Compute architecture and organization
5. Bary B Brey :The INTEL Microprocessors 8086/8088
6. Douglas V. :Hall, Microprocessor and Interface.
7. Ramesh Gaonker :Microprocessor Interfacing
8. Mohamed Ali Mazidi, Janice Gillispie Mazidi :The 8051 microcontroller and embedded systems

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Course Code: CSE-3524

Course Title: Microprocessors, Microcontrollers and Embedded Systems Lab

Credit Hours: 1 Contact Hours: 2

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### **Course Objectives:**

This course introduces the assembly language programming of 8086 and 8051 microcontroller. It gives a practical training of interfacing the peripheral devices with the 8086 microprocessor. The course objective is to introduce the basic concepts of microprocessor and to develop in students the assembly language programming skills and real time applications of microprocessor as well as microcontroller.

### **Outcome:**

After complete the course the students will be able to:

- Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller.
- Familiarize the architecture of 8086 processor and interfacing with various modules.
- Understand of 8051 Microcontroller concepts, architecture, programming and application of Microcontrollers.
- Do any type of embedded systems, industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.

### **Syllabus:**

Exp. No.	Name of Experiment
1	Arithmetic operations in 8086 trainer KIT: Multi-byte Addition, Subtraction, Multiplication, Division
2	Finding Arithmetic mean of given numbers, and Searching for smallest and largest number from the array of given numbers using 8086 KIT
3	Running Program Code in 8086 KIT using Serial Monitor



4	Experiments with Interrupt System
5	Experiments with 8253 Interface
6	Controlling LED with 8255A Interface
7	Controlling 8x8 Dot-Matrix LED using 8255A Interface
8	Controlling 7 Segment display using 8255A Interface
9	Experiment with Speaker Interface
10	Experiments with 8251A Interface
11	Interfacing D/A Converter
12	Interfacing A/D Converter
13	Stepping Motor Control
14	Interfacing LCD Display

Reference Books: See Lab Manual

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Course Code: CSE-3525 Course Title: Data Communication  
Credit Hours: 3 Contact Hours: 3

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### Course Objectives:

- Understand about the different types policy-making organizations of the communication world.
- Grasp concepts of LANs, MANs, and WANs.
- Understand and explain underlying network concepts.
- Understand the signals using in communication.
- Understand and compare among the various types of modulation techniques.
- Understand interfacing and modem's functions.
- Understand the properties of the transmission media both the guided and unguided and its effect on the signals.
- Understand switching, multiplexing and error handling of signals
- Understand how the frames are constructed to have reliable and efficient communications.
- Understand and classify among the well established different types of DataLink Control Protocols.

### Learning outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

- Independently understand basic computer network technology.
- Understand and explain Data Communications System and its components.
- Identify the different types of network topologies and protocols.
- Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
- Identify the different types of network devices and their functions within a network.
- Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

### 8 Stanza Syllabus:

Stanza	Topics
1	Data Communication fundamentals and Network Model: Trend of data communication, Data communication's components, Network criteria, Protocols and Standards, Standards Organizations, Basic concepts of line configuration, Topology, Transmission modes and Categories of Networks, Introduction to network standards and protocols, Layered approach of communication study, OSI model and function of its seven layers, TCP/IP protocol suite and addressing.
2	Signal and system, Transmission media, interfaces: Analog signal, digital signals, periodic signal, Time and Frequency domain, Composite Signals, Decomposition of



	digital signal, bandwidth, throughput, transmission impairment: attenuation, distortion and noise. Nyquist bit rate, Shannon capacity and performance analysis, Electromagnetic wave, Electromagnetic spectrum, Guided media: twisted pair cable, coaxial and fiber optic cable. Unguided media: radio wave, microwave and Infrared. Standard connectors, NIC, HUB, bridge, router, gateway and modems, antenna.
3	Digital Transmission: Digital to digital conversion, Line encoding schemes, block coding, scrambling, Analog to digital conversion, PAM, PCM, and DM, Transmission modes: parallel, serial, synchronous, and asynchronous.
4	Analog Transmission: Digital to analog conversion: ASK, FSK, PSK, QAM, MSK, GMSK etc., Bandwidth utilization, Analog to digital conversion: AM, FM and PM.
5	Multiplexing, Spreading and switching: Multiplexing – FDM, WDM, TDM (Synchronous and statistical) spread spectrum FHSS & DSSS, packet-switched data networks, circuit switched data networks, Virtual Circuit networks.
6	Error-Recovery and Link-Control: Data link layer and control, Error detection and correction, framing, flow and error control, Stop-and-Wait protocol, Automatic Repeat Request (ARQ), Go-Back-N, Selective Repeat, HDLC, PPP
7	Multiple Access: Wired LAN, Wireless LAN, Connecting LAN, Backbone networks and virtual LAN.
8	Wireless WANS and Optical Networks: Cellular Telephone, Sattelite Networks, SONET/SDH.

#### Recommended Books

1. Behrouz A Forouzan: Data Communications and Networking. (4th Edition)
2. William Stallings: Data and computer communication, Seventh edition.
3. Andrew S Tanenbaum: Computer Networks
4. F. Halsall : Data communication Computer Network and open systems

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Course Code: CSE-3527 Course Title: Compiler  
Credit Hours: 3 Contact Hours: 3

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#### **Course Objectives:**

- Grasp of compiler construction.
- To introduce the major concept areas of language translation and compiler design.
- To enrich the knowledge in various phases of compiler and its use, code optimization techniques, machine code generation, and use of symbol table.
- To extend the knowledge of parser and understand the theory and practice of compiler implementation.
- To provide practical programming skills necessary for constructing a compiler
- Utilize tools to automate compiler construction.
- Develop a large, complex, but well-structured software system that implements various phases of a compiler such as the scanner, parser, code generator, and optimizer.
- Identify the similarities and differences among various parsing techniques and grammar transformation techniques
- Over a series of experiments and project, you will create an extremely simple compiler, c-, as a project in this course. The projects are Parsing, Scanning, Semantic Analysis, and Code Generation. The text provides a good deal of the structure and the best solutions for each project will be available for all students in succeeding projects.

#### **Learning outcomes:**

After complete the course the students will be able to:

- Ability of a compiler construction
- Apply the knowledge of LEX tool and YACC tool to develop a scanner and parser.
- To design & conduct experiments for Intermediate Code Generation in compiler.
- To design & implement a software system for backend of the compiler.



- To deal with different translators.
- To develop program to solve complex problems in compiler
- To learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
- To acquire the knowledge of modern compiler & its features.
- To learn & use the new tools and technologies used for designing a compiler
- To use the knowledge of patterns, tokens & regular expressions for solving a problem in the field of data mining.

### **8 Stanza Syllabus:**

Stanza	Topics
1	Structure of compiler: Translator, Basic principles of compilers and compiler design, types of compilers, applications, phases of a compiler.
2	Grammars & expressions: Concepts of languages and Grammars, Terminals and non-terminals, Useless non-terminals and Inaccessible tokens, Context-Sensitive Grammars, Context-Free Grammars, Right linear grammar, left linear grammar, Derivations and Parse trees, Ambiguous grammar.
3	Automata: Lexical analysis, Regular expressions, finite automata, Non-deterministic Finite-State Automata, Minimization of Finite-State Automata, DFA, Symbol table management.
4	Syntax Analysis: Parser, Error-Recovery, Left recursion, Left factoring, Top-Down Parsers, FIRST and FOLLOW, Recursive-Descent and Predictive Parsing, LL(1) parsing.
5	Parsing: Bottom-Up Parsing, Operator Precedence parsing, LR Parsers, Construction of SLR, CLR, LALR Parse Tables, Shift-Reduce Parsing.
6	Syntax-Directed Translation: Syntax-Directed definitions, Semantic Rules, Dependency Graph, Attributes, Construction of Syntax trees, Type checking, Type expressions, Translation Scheme, Type checking of expressions, statements and functions, Type conversions.
7	Intermediate code generation: Run time environments, Activation tree, Control stack, rRun time storage organization, Storage allocation strategies, Intermediate languages, three address statements, quadruples, triples, indirect triples and polish notations.
8	Code Generation and Optimization: Code generation issues, Instruction costs, Basic blocks, Flow graphs, DAG representation, Next use information, Transformations of Basic Blocks, Peephole optimization, Function preserving transformations, Optimization of Basic Blocks, Different models of code generation, error detection and error handling.

### **Recommended Books:**

1. William A Barret, R. M. Bates : Compiler Construction theory and practice
2. Compiler principles, technique and tools : Alfred V. Aho, Ravi Sethi
3. A.J Holub : Compiler Design in C.
4. Trembly and Sorensen : Theory and Practices of Compiler Writing.

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Course Code: CSE-3528 Course Title: Compiler Lab  
Credit Hours: 1 Contact Hours: 2

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### **Course Objectives:**

- To implement the Lexical Analyzer by using various Lexical Analyzer tools and C programming language
- Design and implementation of Syntax Analyzer and parser



- Experiments for NFA, DFA, CFG from given regular expression
- Develop the program to solve complex problems in compiler
- Design and implement the frontend of the compiler by means of generating Intermediate codes.
- To implement code optimization techniques.
- To implement the backend of the compiler
- To provide an Understanding of the language translation peculiarities by designing complete translator for a simple language
- Construction of the compiler for C programming language

#### Learning outcomes and competences:

- After complete the course the students will be able to:
- Apply the knowledge of lexical analyzer tools to develop a scanner, tokenizer and parser.
- Design and conduct experiments for NFA, CFG and DFA from a given regular expression
- Design and implement a front end of the compiler.
- Develop program for implementing symbol table.
- Programming implementation to solve the parser problems.
- Program writing for intermediate code generation.
- Learn the new code optimization techniques and apply it to improve the performance of a program in terms of time and space.
- Learning and use of the new tools and technologies for designing a compiler
- Professional Skills: The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.
- Problem-Solving Skills: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
- Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.

Lab No.	Name of Experiments
1	Introduction to compiler sessional, basic C programming structures, Basic compiler construction tools (LEX, YACC etc.)
2	Implementation of comments remover of C program in C programming language
3	Implementation of identifier and number checker of C program in C
4	Implementation of tokenizer by using C programming language
5	Implementation of Lexical analyzer using by LEX tool
6	Implementation of Syntax analyzer using by YACC tool
7	<b>Mid-term Examination</b>
8	Implementation of FIRST and FOLLOW of non-terminals from a CFG grammar
9	Implementation of left factoring and Left recursion remover in C
10	Implementation of Predictive Parsing Table using FIRST and FOLLOW from a grammar
11	Implementation of Shift-reduce Parser from a CFG
12	Construction of Calculator using LEX and YACC (Project)
13	Implementation of intermediate code generation using C programming
14	Lab report and project submission. Preparation for semester final examination



**Text Books:**

- 1) **Compilers, Principles Techniques and Tools**, Alfred V Aho, Ravi Sethi, Jeffrey D. Ullman, 2<sup>nd</sup>ed, Pearson, 2005

**Recommended Books:**

1. **Compiler Construction theory and practice**, William A Barret, R. M. Bates, 2<sup>nd</sup> Ed.
2. **Compiler Design in C**, A.J Holub

**Flex and Bison: Text Processing Tools**, Levine. O’Reilly Media. 2009. ISBN: 0596155972

Course Code: CSE-3529 Course Title: Systems Analysis and Design  
Credit Hours: 3 Contact Hours: 3

**Course Objectives:**

The student who completes this course should know:

1. The traditional systems/software development methodologies.
2. Traditional analysis and design techniques: entity-relationship diagrams, data flow diagrams, and data dictionaries.
3. How to use prototyping in the analysis and design phases of systems development.
4. Project planning: defining the scope, purpose and activities of a project; setting up a project management web page.
5. PERT/CPM project management techniques, including the use of Microsoft Visio.
6. What a CASE tool is and how it is used in software development.
7. How Object Oriented methodology techniques work.

**LEARNING OUTCOMES:**

- Upon successful completion of this course, the student will be able to:
- Define and describe the five phases of the system development life cycle.
- State at least five expected benefits from systems projects.
- Explain at least three ways in which information systems support business requirements.
- Describe how systems analysts interact with users, management, and other information systems professionals.
- Develop data flow diagrams and decision tables.
- Perform a feasibility study.
- Evaluate systems development alternatives.
- Solve realistic systems analysis problems.
- Determine methods for evaluating the effectiveness and efficiency of a system.
- Work as an effective team member on assigned projects.

**8 Stanza Syllabus:**

Stanza	Topics
1	Concepts of system and its environment: Information, Types of information, Quality of information, System, Types of systems, Components of system, Source of information.
2	Information gathering: strategy, Information searching methods, Interviewing technique, System development methodologies and life cycle.
3	Feasibility study & Cost/Benefit analysis: Feasibility considerations, steps in feasibility analysis, feasibility report, Cost and Benefit categories, procedure for cost and benefit determination, classification of cost and benefit, cost and benefit evaluation methods.
4	Tools of analysis and design: Data Flow Diagram(DFD), DFD symbols, Constructing



	DFD; Data Dictionary; Decision Tree, Structured English, Decision Tables.
5	System Design and Construction: The process of design, System design phases, Design methodologies; Structured design; Form-Driven methodology; Input design, Output design, File and database design
6	Testing and Quality Assurance: Testing, Types of system tests; White-Box testing; Black-box testing; Quality factors specifications.
7	Implementation and Maintenance: Types of implementation, Documenting the system, Training and supporting users, Factor models of implementation success; The process of maintaining information system, Types of maintenance, Cost of maintenance, Reducing maintenance cost.
8	Hardware/ Software selection, control and security: Phases in selection, Criteria for software selection, Hardware selection, Financial considerations in selection; Security definitions, Threats to system security, Control measures, system failures and recovery.

### **Recommended Books:**

- |                                       |  |
|---------------------------------------|--|
| 1. System Analysis and Design         | : Alan Dennis, Barbara Haley Wixom                         |
| 2. System Analysis and design         | : Elias M. Awad  |
| 3. System Analysis and Design Methods | : Jeffrey L. Whitten, Lonnie D. Bentley                    |
| 4. Modern System Analysis and Design  | : Jeffrey A. Hoffer, Joey F. George and Joseph S. Valacich |

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Course Code: CSE-3532

Course Title: Tools and Technologies for Internet Programming

Credit Hours: 2 Contact Hours: 4

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### **Course Objectives:**

- To understand the concept of Web Application Development and its Architecture.
- To understand the Essentials of Web Application Development.
- To understand and practice web page designing techniques.
- To understand and practice embedded dynamic scripting on client side Internet Programming.
- To understand the differences between client side & server side technologies to develop Web Application.

### **Course Outcomes:**

- Able to design and implement Internet systems for enhancing practical knowledge.
- Able to understand functionality of Internet system.
- Able to design a system according to customer needs using the available Internet technologies.
- Able to Design and develop interactive, client-side, server-side executable web applications.

### **Syllabus:**



<b>List of Experiments</b>
<b>HTML:</b> Basic, Elements, Attributes, Headings, Paragraphs, Formatting, Links, Head, Images, Tables, Lists, Blocks, Layout, Forms, Colors, Colornames, CSS, JavaScript, Entities, URL Encode, Quick List
<b>CSS:</b> Introduction, Syntax, Id & Class, <u>Styling Backgrounds</u> , Text, Fonts, Links, Lists, Tables, Box Model, Border, Outline, Margin, Padding, Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Navigation Bar, Image Gallery
<b>JavaScript:</b> Introduction, Output, Statements, Comments, Variables, Data Types, Objects, Functions, Operators, Comparisons, Conditions, Loop, Errors, <u>DOM</u> Introduction, <u>Number</u> , <u>String</u> , <u>Date</u> , <u>Array</u> , <u>Window</u> , <u>Screen</u> , <u>Location</u> , <u>History</u> , <u>Navigator</u> , <u>Popup Alert</u>
<b>PHP part 1:</b> <u>Syntax</u> , <u>Variables</u> , <u>String</u> , <u>Operators</u> , <u>If...Else</u> , <u>Switch</u> , <u>Arrays</u> , <u>While</u> Loops, <u>For Loops</u> , <u>Functions</u> , <u>Forms</u> , <u>\$ GET</u> , <u>\$ POST</u>
<b>PHP part 2:</b> <u>Date</u> , <u>Include</u> , <u>File Upload</u> , <u>Cookies</u> , <u>Sessions</u> , <u>E-mail</u> , <u>Error</u> , <u>Exception</u> , PHP Database, <u>PHP ODBC</u>
<b>MySQL part 1:</b> Select, Distinct, Where, And & Or, Order By, Insert, Update, Delete, Like, In, Between, Alias, Joins, Union, Create DB, Create Table, Primary Key,
<b>MySQL part 2:</b> Foreign Key, Drop, Alter, Increment, Views, Dates, Functions- avg(),count(),max(),Group By, Having, format()

### **Recommended Books:**

1. Deitel, Deitel, and Nieto "Internet & World Wide Web How to Program", Third Edition.
2. Marty Hall and Larry Brown "Core Web programming", Second Edition.
3. Jackson, "Web Technologies", Pearson Education, 2008.
4. B. Patel & Lal B. Barik, " Internet & Web Technology ", Acme Learning Publishers
5. Leon and Leon, "Internet for Everyone", Vikas Publishing House.

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Course Code: CSE-3631 Course Title: Operating Systems  
Credit Hours: 3 Contact Hours: 3

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### **Course Objectives:**

The student will be taught principles of modern operating systems. In particular, the course will cover details of concurrent processes, multi-threads, CPU scheduling, memory management, file system, storage subsystem, and input/output management, The course will integrate theory and practice through coordinated lecture and lab hours.

### **Learning Outcomes:**

The students who succeeded in this course will be able to;

1. learn the principles operating systems
2. understand relationship between subsystems of a modern operating system
3. develop multi-process and multi-threaded applications
4. Evaluate the efficiency aspect of using system resources (processor, memory, and disk)

### **8 Stanza Syllabus:**



Stanza	Topics
1	Principle of operating systems and Operating system structure: Definition of operating system, Different kinds of operating systems (Desktop, Multiprocessor, Distributed, Clustered, Real time, Handheld systems), Operating-System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Virtual Machines
2	Process: process management, inter- process communication, Process scheduling, Process Concept, Operations on Processes, Inter process Communication, Communication in Client-Server Systems, Basic Concepts of Process Scheduling, Scheduling Criteria and Scheduling Algorithms
3	Multiprocessing and time sharing, Process coordination: Multiple-Processor Scheduling, Thread Scheduling, Algorithm Evaluation, Control and scheduling of large information processing systems, Resource allocation; Dispatching; Processor access methods; Job control languages
4	Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery From Deadlock.
5	Memory management: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation,
6	Virtual memory: The idea and advantage of virtual memory, Demand Paging, Page Replacement, Page Replacement Algorithms (FIFO, Optimal page replacement, LRU), Thrashing
7	File systems: File Concept, Access Methods, Directory Structure, File-System Mounting, File Sharing, File-System Implementation, Directory Implementation, Allocation Methods
8	Protection and security: Protection, Principles of Protection, Domain of Protection, Access Matrix, Access Control, Revocation of Access Rights, The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Fire walling to Protect Systems and Networks

### Recommended Books:

- |   |                                 |
|---|---------------------------------|
| 1) Abraham Silberschatz, Peter Baer Galvin, Greg Gagne. | :Operating System Concepts.     |
| 2) Andrew S. Tanenbaum,                                 | : Modern Operating Systems.     |
| 3) Andrew S. Tanenbaum,                                 | : Distributed Operating Systems |
| 4) Denis,   | :Mastering LINUX                |

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Course Code: CSE-3632 Course Title: Operating Systems Lab  
Credit Hours: 1 Contact Hours: 2

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### **Course Objectives:**

- Understanding the operating system.
- Understanding the how the operating system abstractions can be used in the development of application programs.
- Develop basic resource management techniques.

### **Outcome:**

After complete the course the students will be able to:

- Develop small sized operating system
- Develop secured system

Serial	Name of Experiments
1	Process scheduling



2	Algorithm evaluation of job scheduling
3	Inter process communication
4	Time sharing system
5	Applying system calls
6	Deadlock handling
7	Deadlock handling
8	Apply swapping technique
9	Paging structure implementation
10	Paging structure implementation
11	Understanding segmentation
12	Understanding segmentation
13	File sharing implementation
14	File sharing implementation

### **Recommended Books:**

1. E. Balagurusamy : “ANSI C”
2. Herbert Schildt : “Complete reference C++”
3. Any book of advanced assembly language

**Course code : CSE-3633**

**Course title : Computer Networks**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Prerequisite courses: CSE-3525 (Data Communication)]

The subject of computer networking is enormously complex, involving many concepts, protocols, and technologies. To cope with the scope and complexity these protocols and technologies are woven together in an intricate manner in what is called the layered protocol stack (or suite). The layered organization allows breaking down complex functions required for computers networking into manageable tasks. The course uses the Internet’s architecture and protocols as the primary vehicle for studying fundamental computer networking concepts. More than often, the course will also include concepts and protocols from other network architectures. But the main focus is on the Internet, a fact reflected in organizing the course around the Internet’s five-layer architecture.

Computer network and the Internet have grown from a research curiosity to something as essential as the ubiquitous telephone and utility networks. It has been able to withstand rapid growth fairly well and its core protocols have been robust enough to accommodate applications (e.g., the World Wide Web) that were unforeseen by the original Internet designers. Networking is becoming an essential component of many systems.

In this course, along with its associated laboratory works, we will study the design, implementation, analysis, and evaluation of this global network. We will start with the design principles and the architecture of this global network infrastructure. We will follow the Internet architecture and study the major protocols in detail.

Topics include: layered network architectures, applications, transport, congestion, routing, data link protocols, local area networks, performance analysis, multimedia networking, and network security. An emphasis will be placed on the protocols used in the Internet.



As a side note, most of the issues of physical layer and much of the issue of data link layer have been covered in a previous course named Data Communication, which is the prerequisite for this course.

### Course Outcomes

Upon completion of this course, students will be able to do the following:

CO1	<b>Understand and analyze architectures</b> of different types of computer complex networks
CO2	<b>Design and analyze protocols</b> of different types of computer complex networks
CO3	<b>Identify applications</b> of computer networks with determining suitable alternatives of the networks
CO4	<b>Recognize security threats</b> of computer networks and their countermeasures

### Mapping of COs to POs

CO	PO1: Engineering Knowledge	PO2: Problem Analysis	PO3: Design/Development of Solutions	PO4: Investigation	PO5: Modern Tool Usage	PO6: The Engineer and Society	PO7: Environment and Sustainability	PO8: Ethics	PO9: Individual and Teamwork	PO10: Communication	PO11: Project Management and Finance	PO12: Life-Long Learning
CO1				X		X						
CO2	X	X	X	X								
CO3	X						X	X				X
CO4	X	X				X		X				X

### Section-A (Mid-term: 30% Marks)

- 1. Introduction to networks:** Overview of the Internet, Some History of the Internet, Design principles and the architecture of the global network infrastructure and Internet, Heterogeneity and convergence of Computer Networks, comparative study of various network models TCP/IP, OSI, ATM etc.
- 2. Data link layer:** Design and analysis of the Link layer and multiple access protocols of wired and wireless networks. Throughput analysis of Pure Aloha, slotted Aloha, CSMA, CSMA/CD and CSMA/CA. Discussion on loop free network and collision avoidance network. Hidden node and exposed node problem of wireless network. Introducing and discussing the architectures of different types networks: IEEE802.11, Bluetooth, WPAN, WBAN, WSN.
- 3. Network Layer:** Designing issues of Network layer. Routing and forwarding, Circuit switching, Packet switching, datagram and virtual circuit approach, Introduction to IP,



IPv4 addressing: Classful IP addressing, Subnetmask, CIDR, Subnetting, VLSM, Private and Public IP addressing, Network address translation (NAT), Introduction to IPv6: representation, address space, address space allocation, Mapping EUI-64, advantages of IPv6.

**Section-B (Final Exam: 50% Marks)**

**Group-A (20% Marks)**

4. **Network Layer:** Congestion control algorithms in network layer, Quality of service, ICMP, Routing algorithms: link state and distant vector, Broadcast routing, Unicast routing, Multicast routing, Anycast routing, ARP, RARP, Routing protocols RIP, OSPF, BGP etc.
5. **Transport Layer:** Design Issues of Transport Layer, Transport layer services, Transport service primitives, Connectionless and connection oriented transport layer service, Elements of transport protocols: Port address, Connection establishment, Connection release, Multiplexing, Transmission Control Protocol (TCP), TCP services, TCP buffers, TCP features, TCP segments, A TCP connection: connection establishment, data transfer, connection termination.

**Group-B (30% Marks)**

6. **Transport Layer:** Flow, Error and Congestion control in TCP, Applications of TCP. User datagram protocol: datagram format, UDP services, Applications of UDP, SCTP services, RTP, RTCP, MPLS etc.
7. **Applications:** Introduction to Application layer, Application layer paradigms: Client-server paradigm, Introduction to network programming, Peer-to-Peer paradigm, Standard client-server protocols: WWW and HTTP, DNS, Email.
8. **Network Security:** Introduction to Network Security, Introduction to cryptography, Substitution ciphers, Transposition ciphers, Fundamental cryptographic principles, Symmetric-key and Asymmetric-key algorithm, Symmetric-key algorithms: DES, AES, Cryptanalysis, Public Key algorithm: RSA, Communication security: IPsec, Firewalls, Virtual Private Networks.  
Intrusion detection system, Denial of Service (DoS) attacks (SYN flooding, SMURF, Distributed attacks), TCP Attacks, Packet Sniffing, prevention techniques for these attacks.

**Recommended Books**

21. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5th Edition, Prentice Hall, ISBN-13: 978-0-13-212695-3
22. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw-Hill Education, ISBN-13: 978-0073376226
23. William Stallings, Cryptography and network Security Principles and Practice, 6th Edition, Pearson Education, Inc., ISBN 13: 978-0-13-335469-0
24. James Kurose and Keith Ross, Computer Networking: A Top-Down Approach, 7th Edition, Pearson, ISBN-13: 978-0133594140



**Course code : CSE-3634**

**Course title : Computer Networks Lab**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

[Corequisite courses: CSE-3633 (Computer Networks)]

This course is designed focusing the following objectives:

- ✓ The greater goal of this course is to introduce students a software tool for doing research as well as to enable them doing elementary works in the industry of computer networks
- ✓ Analyze the performance of some link layer protocols to match the results with that of the theory
- ✓ Introduce a simulation tool to show and implement the way existing communication protocols work
- ✓ Show some of the communication protocols at work.

Upon completion of this course, students will be able to do the following:

CO1	Have a fair <b>command over Discrete Event Network simulator</b> for performance analysis.
CO2	Have a fair <b>command over Network simulator</b> for configuring different types of Networks.
CO3	<b>Implementing and Investigating</b> the existing communication protocols to improve the efficiency of those protocols
CO4	<b>Design and Developing</b> elementary things that might need in future research in the telecommunication industry

### Mapping of COs to POs

CO	PO1: Engineering Knowledge	PO2: Problem Analysis	PO3: Design/Development of Solutions	PO4: Investigation	PO5: Modern Tool Usage	PO6: The Engineer and Society	PO7: Environment and Sustainability	PO8: Ethics	PO9: Individual and Teamwork	PO10: Communication	PO11: Project Management and Finance	PO12: Life-Long Learning
CO1					X					X		
CO2					X							
CO3		X		X					X		X	
CO4	X	X	X						X	X		X

Laboratory works	
1.	Install and introduce different parts of a network simulator. Implementing a simple network of two nodes using the simulator.
2.	Enhancing the two-node network with additional features.
3.	Develop the simple network into a simple real-world network.



4. Analyze results (throughput, delay etc.) of the simple network.
5. Implement pure ALOHA using the simulator and measure its performance
6. Implement slotted ALOHA using the simulator and measure its performance
7. Implement IEEE 802.11 using the simulator and measure its performance
8. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
9. Introducing Packet tracer software and study of basic commands of networked devices and network configuration commands.
10. Construct a simple LAN using packet tracer; apply VLSM in IP planning.
11. Configure and analysis a network using Distance Vector Routing Protocol
12. Configure and analysis a network using Link State Routing Protocol
13. Configure and analysis a network using Adhoc Routing Protocol
14. Team Project works

**Hardware and software requirements:**

1. Computers with minimum 4 GB RAM
2. OMNet++ Discrete Event Simulator
3. CISCO packet Tracer

**Reference books/websites:**

1. Omnet++ reference manual (available at [www.omnetpp.org](http://www.omnetpp.org))
2. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 5th Edition, PRENTICE HALL, ISBN-13: 978-0-13-212695-3
3. Cisco Certified Network Associate study guide by Todd Lammle 5<sup>th</sup> edition

**Course code : CSE-3635****Course title : Artificial Intelligence****Credit Hours: 3****Contact Hours: 3 per week**

[Pre requisite: None]

**Course Objectives:**

- **Understand** strong foundation of fundamental concepts in Artificial Intelligence.
- **Demonstrate** basic exposition to the goals and methods of Artificial Intelligence.
- **Apply** these techniques in applications which involve perception, reasoning and learning.
- Knowledge of methods of blind as well as informed search and ability to practically apply the corresponding techniques.
- General understanding of major concepts and approaches in knowledge representation, planning, learning, robotics and other AI areas.
- Developing programming skills for AI applications.
- Exposure to logic programming with Prolog.

**Course Outcomes(COs) :**

After completion of this course students will be able to:

CO1	<b>Analyze</b> the modern view of AI as the study of agents that receive precepts from the environment and perform actions.
CO2	<b>Demonstrate</b> awareness of informed search and exploration methods.
CO3	<b>Demonstrate</b> about AI techniques for knowledge representation, planning and uncertainty management.
CO4	<b>Develop</b> knowledge of decision making and learning methods.
CO5	<b>Implement</b> the use of AI to solve English Communication problems.

**Mapping of COs to POs:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√											
CO2	√	√										
CO3	√	√										
CO4	√	√	√									
CO5	√	√	√									

**Course Content:****Section-A (Mid-term: 30 Marks)**

**1. Concepts of Artificial Intelligence:** Introduction, The Foundations of AI, The History of AI, AI technique, The State of the Art; **Problems and Problem Solving:** Problems, Example of Problems, Problem Formulation, Problem-solving methods.

**2. Various Searching Techniques:** Search Strategies, Uninformed (blind) search strategies like Breadth-First search, Uniform cost search, Depth-First Search etc. and Informed or Heuristic Search Strategies like Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-End Analysis etc.

**3. Propositional and First-Order logic:** Knowledge Representation, Reasoning and Logic; Propositional Logic: Syntax, Semantics, Validity and Inference, Rules of Inference for Propositional logic; First-Order Logic: Syntax and Semantics, Using first-order logic.

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

**4. Inference in first order logic:** Inference Rules Involving Quantifiers, Example Proof, Generalized Modus Ponens, Forward and Backward Chaining, Completeness, Resolution.

**5. Game playing:** Introduction, Perfect Decisions, Imperfect Decisions, Alpha-Beta Pruning; **Natural language processing:** Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing.

**Group-B (30 Marks)**

**6. Planning:** Basic Plan-Generating Systems, Forward Production System, Representation for Plans, Backward Production System, STRIPS, Examples with problem domain;

**7. Learning:** Introduction to Learning, Inductive Learning, Learning Decision Trees, Neural Net Learning;

**8. Probabilistic Reasoning:** Probability and Bayes' Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Fuzzy Logic; **Some Expert Systems:** Representation and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

**Recommended Books:**

Elaine Rich and Kevin Knight: *Artificial Intelligence*, 2<sup>nd</sup> Edition, Tata McGraw-Hill Publishing Company Limited.



Stuart Russell and Peter Norvig: *Artificial Intelligence A Modern Approach*, 3<sup>rd</sup> Edition, Pearson Education asia.

Nils J. Nilsson : *Principles of Artificial Intelligence*, 5<sup>th</sup> Edition ,Narosa Publishing house.

L. H. Tsoukalas and R. E. Uhrig: *Fuzzy and Neural Approches in Engineering.*, 1<sup>st</sup> Edition, New York, USA

**Course code : CSE-3636**

**Course title : Artificial Intelligence Sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

[Pre requisite: None]

**Course Objectives:**

- **Understand** strong foundation of fundamental concepts in Artificial Intelligence.
- **Demonstrate** basic exposition to the goals and methods of Artificial Intelligence.
- **Apply** these techniques in applications which involve perception, reasoning and learning.
- Knowledge of methods of blind as well as informed search and ability to practically apply the corresponding techniques.
- General understanding of major concepts and approaches in knowledge representation, planning, learning, robotics and other AI areas.
- Developing programming skills for AI applications.
- Exposure to logic programming with Prolog

**Course Outcomes(COs) :**

After completion of this course students will be able to:

CO1	Demonstrate working knowledge in Prolog in order to write simple Prolog programs and explore more sophisticated Prolog code on their own.
CO2	Recognize appropriate AI methods to solve a given problem using Prolog .
CO3	Discuss a given problem in the language/framework of different AI methods using Prolog.
CO4	Develop basic AI algorithms and their implementation in Prolog.
CO5	Model an empirical evaluation of different algorithms on a problem for mail sation, and state the conclusions that the evaluation supports.

**Mapping of COs to POs:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√		√			√	√			√
CO2	√	√	√		√			√	√			√
CO3	√	√	√		√			√	√			√
CO4	√	√	√		√			√	√			√
CO5	√	√	√		√			√	√			√

Lab No.	List of Experiments
Lab 1	<b>Various Uninformed Searching Techniques:</b> Implementing different Uninformed (blind) search strategies like Breadth-First search, Uniform cost search, Depth-First Search etc.



<b>Lab 2</b>	<b>Various Informed Searching Techniques:</b> Implementing different Informed or Heuristic Search Strategies like Generate-and-test, Hill Climbing, Best-First Search etc.
<b>Lab 3</b>	Using Turbo Prolog: Starting Turbo Prolog, Creating a sample program, Editing, Getting help, Exiting the editor, File operations: Saving and Loading, Compiling and executing, Changing the default windows etc. <b>Facts, Objects and Predicates:</b> Expressing facts, Turbo Prolog objects, objects in knowledge representation theory, objects in procedural programming,
<b>Lab 4</b>	<b>Prolog Variables:</b> The Prolog variables, Bound and free variables. Anonymous Variables, Compound Goals, Backtracking, Variable rules. <b>Using Rules:</b> Rules, Using rules to solve problems, variables in rules, Using the trace, Unification, Execution control, The built-in predicates, The not predicate. <b>Simple Input and Output</b> Input predicates: The readln predicate, The readchar predicate, The readint predicate, The readreal predicate, The inkey and keypressed predicates, Output predicates: The write predicate, The writef predicate.
<b>Lab 5</b>	<b>Recursion:</b> The concept of recursion, The repeat predicate, Basic rules of recursion, unwinding, practical applications of recursion. <b>Arithmetic Operations:</b> A simple example, The equal operator, Comparison operators, Turbo Prolog's built-in mathematical functions, Testing for binding, Using the arithmetic predicates, Counters, Type conversions, Random-Number Generation.
<b>Lab 6</b>	<b>Using Compound Objects:</b> Compound objects, Applying compound objects, Reducing the number of rules in a program, Treating related information as a single object, Distinguishing among several kinds of objects, Entering data in a compound object.
<b>Lab 7</b>	<b>Midterm Exam</b>
<b>Lab 8</b>	<b>Using Lists</b> Declaring list domains, Unification using lists, Lists of list, Programming with lists, List operation, Writing lists, Appending a list, Reversing a list , Finding the last element of a list , Finding the nth element of a list, Multiple domain types in a list.
<b>Lab 9</b>	<b>String Operation</b> Turbo Prolog strings, String operations, Concatenation, The frontstr, Predicate, Determining string length, The frontchar predicate, The fronttoken predicate, The isname predicate, The upper_lower predicate.
<b>Lab 10</b>	<b>File Operations with Turbo Prolog:</b> Introduction to files, Opening and closing files, Random file access.
<b>Lab 11</b>	<b>Adversarial Search:</b> Implementing MiniMax Algorithm and Alpha-Beta Pruning.
<b>Lab 12</b>	<b>Building an Expert System</b> Build an expert system for medical diagnostic system.



<b>Lab 13</b>	Construct a neural network that computes the OR function of two inputs.													
<b>Lab 14</b>	Consider the following set of examples, each with six inputs and one target output													
I1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
I2	0	0	0	1	1	0	0	1	1	0	1	0	1	1
I3	1	1	1	0	1	0	0	1	1	0	0	0	1	1
I4	0	1	0	0	1	0	0	1	0	1	1	1	0	1
I5	0	0	1	1	0	1	1	0	1	1	0	0	1	0
I6	0	0	0	1	0	1	0	1	1	0	1	1	1	0
T	1	1	1	1	1	1	0	1	0	0	0	0	0	0
	a) Run the perceptron learning rule on these data and show the final weights. b) Run the decision tree learning rule and show the resulting decision tree.													

**Minimum System Requirements:**

To use Turbo Prolog, you should have the following:

- IBM PC or compatible computer
- 384K RAM internal memory
- PC-DOS or MS-DOS operating system, version 2.0 or later

**Other Software Requirement:**

- C/C++ or Python

**Recommended Books:**

1. Introduction to Turbo Prolog - Carl Townsend
2. The Art of Prolog – Leon Sterling, Ehud Shapiro

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Course Code: CSE-3637 Course Title: Software Engineering  
Credit Hours: 3 Contact Hours: 3

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**Course Objectives:**

- Be able to identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
- Be able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of a software development project
- Be able to understand of professional, ethical and social responsibility of a software engineer
- Be able to understand of different software architectural styles.
- Be able to understand of implementation issues such as modularity and coding standards.
- Be able to understand of approaches to verification and validation including static analysis, and reviews.
- Be able to convey technical material through written reports which satisfy accepted standards for writing style

**Couse Outcomes:**

After undergoing this course, students should be able to:

- Be able to identify, formulate, and solve software engineering problems
- Be able to analyze and specify software requirements
- Identify professional, ethical and social responsibility of a software engineer.
- Be able to evaluate the impact of potential solutions to software engineering problems in a global society.



No.	Course Learning Outcomes (CLO)													Delivery (Teaching Methods)	
		1	2	3	4	5	6	7	8	9	10	11	12		
1.	Identify, formulate, and solve software engineering problems		√	√											Lecture
2.	Analyze and specify software requirements				√										
3.	Identify professional, ethical and social responsibility of a software engineer.								√						
4.	Evaluate the impact of potential solutions to software engineering problems in a global society						√								
	Overall		√	√	√		√			√					

### 8 Stanza Syllabus:

#### **Section-A (Mid-term: 30 Marks)**

**1. Introduction:** Software, nature and problems of software, engineering vs. software engineering, state of the art of software engineering, characteristics of software, basic elements of engineering Software, software process model, costs of software engineering, software engineering methods, professional and ethical responsibility of a software engineer.

**2. Software Processes:** Software process and software process model, different software process models: linear sequential, water fall, prototyping, incremental, spiral, advanced software development life cycle and other appropriate models.

**3. Software Requirements:** Requirement definition, Functional and non-functional requirements, requirement specification, software Prototyping, Basic concepts of different formal software specification techniques

#### **Section-B (Final Exam: 50 Marks)**

##### **Group-A (20 Marks)**

**4. Requirement Engineering Processes:** requirement engineering process, software requirements document, requirement validation and evolution, requirement analysis process model, system context, social and organisational factors, data-flow models, semantic data models, object models, Data dictionaries,

**5. Software Design:** Context of software design, design process, design quality and strategies, system structuring, control models, modular decomposition, domain-specific architecture, data-flow design, structural decomposition, detailed design, JSP, Coupling and Cohesion, attributes of design, object-oriented design and Component-level design, design principles, user-system interaction, information presentation, user guidance, interface evaluation, design for reuse.

##### **Group-B (30 Marks)**



**6. Software Validation and Verification:** Verification and validation planning, testing fundamentals, including test plan creation and test case generation, black-box and white-box testing techniques, unit, integration, validation, and system testing, object-oriented testing, inspections

**7. Software Evolution:** Software maintenance, characteristics of maintainable software, re-engineering, legacy systems, Software reuse and configuration.

**8. Software Management:** Cognitive fundamentals, management implications, project staffing, software cost estimation techniques, different models (COCOMO, tree, PNR curve, statistical and Delphi), process quality assurance, Software and documentation standards, software metrics and product quality metrics, Zipf's law, Halstead formula, Fan in/Fan out, information Fan in/Fan out, Henry and Kafura's metric, Card and Glass's Systems Complexity, process and product quality, process (analysis, modeling, measurement, SEI process maturity model and classification).

**Others:** Software reliability metrics, software reliability specification, statistical testing and reliability growth modeling, Use of CASE tools and technological support in engineering software, introduction to unified modeling language–UML

Recommended Books:

- |                      |  |
|----------------------|--|
| 1. Ian Sommerville   | : Software Engineering                           |
| 2. Roger S. pressman | : Software Engineering –A practitioner Approach. |

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Course Code: CSE-3638 Course Title: Software Engineering Lab  
Credit Hours: 0.75 Contact Hours: 1.5

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**Course Objectives:**

At the end of the course students should know how writing programs with tough assurance targets, in large teams, or both, differs from the programming exercises they have engaged in so far. They should appreciate the waterfall, spiral and evolutionary models of software development and be able to explain which kinds of software project might profitably use them. They should appreciate the value of other tools and the difference between incidental and intrinsic complexity. They should understand the software development life cycle and its basic economics. They should be prepared for the organizational aspects of their Part IB group project.

**Learning Outcomes:**

Students will be capable to acquire the generic software development skill through various stages of software life cycle. He will also be able to ensure the quality of software through software development with various protocol based environment. After completion of course student will be able to generate test cases for software testing. Students will also be able to handle software development models through rational method. Rataional Rose Enterprise Edition software is used to serve the objectives. The courses contains Basic Structural Modeling, Advance Structural Modeling, Basic Behavioral Modeling, Advance Behavioral Modeling, Architectural Modeling, UML Notation, UML Stranded Elements, Designing Test cases, Test Suits, Rational Unified Process etc.

**Syllabus:**

Students have to develop a larger piece of software in the Software Engineering Lab. The main objective is to learn group work and to gain practical experience with some software engineering methodologies, methods and supporting tools. The lab is organized into four phases:

1. System design and specification (3 weeks)  
Students are given a larger problem to solve. Groups of up to 5 students develop a design document which identifies key components, the interfaces between those components, and the integration tests that can be used later to verify that the system is working correctly. The resulting design document will be graded in the 3rd week of the lab. Grading criteria:
  - o Design quality and correctness (20%)
  - o Usability of the design document (10%)



- Organization of the design document (10%)
- Structural UML diagrams (e.g., class diagrams) (10%)
- Behavioral UML diagrams (e.g., sequence or collaboration diagrams) (10%)
- Description and completeness of test cases (20%)
- Presentation of the design during the lab (20%)

Several groups will develop independent design solutions for the same problem. The designs will be presented and the best designs will be selected for further development.

2. Component development using extreme programming (8 weeks)

In the second phase, students will exercise extreme programming cycles in order to develop components identified by the overall system design. Each cycle lasts two weeks (since students only work part-time on the lab). After each cycle, the progress will be discussed and plans will be fixed for the next cycle. Students work in teams of two students in each cycle and groups will change every cycle. The results produced in each cycle will be graded. Grading criteria:

- Challenge and degree of achievement of negotiated task (25%)
- Code quality (proper use of language, information hiding, makefiles, ...) (25%)
- Test cases (executable, sufficient in number and quality, ...) (25%)
- Adequate code documentation, consistency with design documentation (25%)

3. System integration and system testing (2 weeks)

The third phase is concerned with the integration of the components and the testing of the overall system. The integration test cases identified in phase 1 should be exercised (or updated and complemented as needed). Students work now again in larger groups. The system integration and testing phase must be documented appropriately and the documentation will be graded.

4. Tournament and wrap up (1 week)

In the last phase, there will be a tournament where students can let bugs play against each other. Students who write smart bugs may get some bonus points.

**Recommended Books:**

1. Ian Sommerville :Software Engineering
2. Roger S. pressman :Software Engineering –A practitioner Approach.

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Course Code: CSE-3640 Course Title: Software Development 2  
Credit Hours: 0.75 Contact Hours: 1.5

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**Course Objectives:**

The goal of this course is to develop software in application level by the knowledge of previous knowledge such as database system, software engineering, data structure etc. The software will mainly database oriented. In daily life we feel different problem that may be solved by automated system. At the start of the semester students will have to prepare to development on a particular topics. They also have to mention the reason to development such software. They are also required to follow the procedure of software such as collection of user requirements by visiting different organization/institution or company.

They will use any of the following high label programming such as Java, Visual C++ or Visual Basic, Web pages with ASP/JSP/PHP as front-end Oracle, SQL Server, My SQL, Ms Access as back-end.

Some examples of software are:

1. House hold accounting- for budgeting of a particular family.
2. Library management system-to run a library.
3. Payroll system.
4. Lubricating oil management system.
5. Super shop management system.
6. To perform other experiments relevant to this course.

**Learning Outcomes:**

1. At the end of this course, students should be able to:
2. Independently design programs



3. Produce professional-quality code
4. Implement large programs of greater than 2.5k lines of code
5. Design and execute tests to identify software bugs
6. Repair software bugs, redesigning and refactoring code when necessary
7. Utilize, analyze, and critique code written by others

**Syllabus:**

Week	Topic
<b>Week 01:</b>	Course Introduction
<b>Week 02:</b>	File IO, Exception Handling
<b>Week 03:</b>	Data Structures, Iteration, Object-Oriented Programming
<b>Week 04:</b>	Inheritance, Interfaces
<b>Week 05:</b>	Debugging, Logging
<b>Week 06:</b>	Multithreading Basics
<b>Week 07:</b>	<b>MIDTERM EXAM</b>
<b>Week 08:</b>	<i>Spring Break – No Classes</i>
<b>Week 09:</b>	Advanced Multithreading
<b>Week 10:</b>	Regular Expressions, Unit Testing
<b>Week 11:</b>	Web, Sockets, HTML, HTTP
<b>Week 12:</b>	Servlets, Jetty, Cookies, Sessions
<b>Week 13:</b>	Databases, SQL, and JDBC
<b>Week 14:</b>	<b>FINAL EXAM</b>
<b>Week 15:</b>	Comprehensive Example
<b>Week 16:</b>	Special Topics
<b>Finals:</b>	Final Project Interactive Grading

Recommended Books:

1. Oracle Complete Reference : Oracle Press
2. Official Document of Microsoft Press : Visual Basic 6.0 Programmer’s Guide
3. BPB Publications : Mastering Visual Basic 6
4. Jerke (Tata McGraw Hill) : The Complete Reference Visual Basic 6
5. Silbershatz, Korth : Database System Concepts
6. Jeffrey O Ullman : Principles of Database System
7. Step by Step - Riorain : Microsoft SQL Server 2000 Programming

**Course code : CSE-4708**

**Course title : Field Work**

**Credit Hours: 1**

**Contact Hours: 2 weeks**

Students will get practical experience for at least 2 weeks from a computer related industry. Students will be evaluated on the basis of a report submitted by them after the completion of the training, oral examination and report from the concerned industry. This training is to be organized during the inter-session break. Or project work.

**Course code : CSE-4741**

**Course title : Computer Graphics**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: MATH-2401 Mathematics III, CSE-2403 Computer Algorithms]



**Objectives:**

- This course is designed to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
- A thorough introduction to computer graphics techniques, focusing on 3D modeling, image synthesis, and rendering. Topics cover: geometric transformations, geometric algorithms, software systems (OpenGL, shaders), 3D object models (surface, volume and implicit), visible surface algorithms, image synthesis, shading and mapping, ray tracing, radiosity, global illumination, photon mapping, and anti-aliasing.
- The interdisciplinary nature of computer graphics is emphasized in the wide variety of examples and applications.

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

- 1. Computer Graphics:** Introduction to computer graphics: brief history, applications, hardware and software and the fundamental ideas behind modern computer graphics, Characteristics of display devices
- 2. Image representation:** Representing primitive's objects: point, line, circle, ellipse, rectangle, polygon, arc and sector, Representation of Characters, Filling Algorithm, Aliasing, Anti-aliasing etc.
- 3. Two Dimensional Objects:** Two dimensional transformations, translation, rotation, scaling, mirror reflection.

**Section-B (Final Exam: 50 Marks)**

**Group-A (20 Marks)**

- 4. Two Dimensional Viewing and Clipping:** Two dimensional viewing, line, circle and polygon clipping, 2D graphics pipeline, Composite and Instance transformation.
- 5. Three Dimensional Objects:** Three dimensional transformations, translation, rotation, scaling, mirror reflection, Three dimensional viewing, line, circle and polygon clipping, 3D graphics pipeline, Composite and Instance transformation.

**Group-B (30 Marks)**

- 6. Projection & Curves:** Projection, orthogonal and perspective projection, perspective anomalies, parallel projection, 3D curves and surfaces
- 7. Hidden Surface:** Hidden Surface, hidden-surface algorithms, z-buffer algorithm Color and shading models
- 8. Ray Tracing & Modeling** Ray Tracing, Future trends in computer graphics, Modeling of 3D Objects, polygonal net model, wire-frame model.

Recommended Books :

- |                                   |  |
|-----------------------------------|--|
| 1. Roy Plastock and Zhigang Xiang | : Computer Graphics ( Schaum 's Outlines)      |
| 2. Foley, Hughes                  | : Computer Graphics Principles and Practice    |
| 3. William M. Newman              | : Principles of Interactive Computer Graphics. |
| 4. F.S. Hill                      | : Fundamentals of computer Graphics.           |
| 5. Allan Watt                     | : 3D Computer Graphics.                        |
| 6. D. Hearn & M.P. Baker          | : Computer Graphics C Version.                 |
| 7. Steven Harrington              | : Computer Graphics and Programming Approaches |
| 8. The Red Book                   | : OpenGL programming Guide.                    |

**Course code : CSE-4742**

**Course title : Computer Graphics Lab**

**Credit Hours: 1**

**Contact Hours: 2 per week**

1. Draw a Line using Polynomial Line Algorithm, DDA Line Algorithm, Bresenham's Line Algorithm



2. Draw a Circle using Midpoint Circle Algorithm, Polynomial circle algorithm, Trigonometric circle algorithm, Bresenham's circle algorithm
3. Draw an Ellipse using Polynomial algorithm, Trigonometric algorithm.
4. Draw an Arc and a sector.
5. Scan conversion of various characters: using Bitmap method and Outline method
6. Scan converting a character bangle ka using Bitmap method and Outline method
7. Scan convert Shohid Minar, Sriti Shoudo , a clock and a flower.
8. Rotate a Line, Triangle and Rectangle about a point.
9. Magnifying a circle, a triangle and a rectangle about a point.
10. Create a flower with rotating an object.
11. Scan convert a three-dimensional "F" and cube then rotate the object about x-axis and magnify it.
12. Rotate a 3D cube and Sriti Shoudo using OpenGL.
13. Projection of 3D cube
14. Line & polygon clipping problems.
15. Project using OpenGL.
16. To perform also other experiments relevant to this course.

**Recommended Books :**

- |                                   |  |
|-----------------------------------|--|
| 1. Roy Plastock and Zhigang Xiang | : Computer Graphics ( Schaum's Outlines)       |
| 2. Foley, Hughes                  | : Computer Graphics Principles and Practice    |
| 3. William M. Newman              | : Principles of Interactive Computer Graphics. |
| 4. F.S. Hill                      | : Fundamentals of computer Graphics.           |
| 5. Allan Watt                     | : 3D Computer Graphics.                        |
| 6. D. Hearn & M.P. Baker          | : Computer Graphics C Version.                 |
| 7. Steven Harrington              | : Computer Graphics and Programming Approaches |
| 8. The Red Book                   | : OpenGL programming Guide.                    |

**Course code : CSE-4743**

**Course title : Computer Security**

**Credit Hours: 3**

**[Pre requisite: CSE-2425, CSE-3633]  
week**

**Contact Hours: 3 per**

**Course description:** This course will introduce the concepts of the Cryptography and Network Security. It consists of topics on various cryptographic models available, Mail Protocols Standards, IP Security Architecture; Firewall Design Principles. Cloud computing Security, TOR Network for security and privacy, Block Chain Algorithm for Crypto Currency.

**Course Objectives:**

- To provide introduction to the concept of Network Security Model and Cryptography systems.
- To give the knowledge of Digital Signature and other Security Measures available.
- To familiarize with the various techniques like PGP and S/MIME.
- To showcase IP Security Architecture & Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks.
- To explain the firewall design principles and various intrusion detection system.
- To understand the network privacy and crypto currency.



### Course Outcomes

Upon completion of this course, students will be able to do the following:

CO1	Illustrate the <b>concepts of Network Security</b> and Compare Various Symmetric and Asymmetric Cryptographic methods used for Network Security.
CO2	<b>Classify various Algorithms</b> to be used at various TCP/IP Layers & to operate Digital Signature in Real World Situation, describe programs like PGP & S/MIME
CO3	<b>Implement IP Security</b> Architecture & Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks, and apply them to design and evaluate counter-measure tools
CO4	<b>Implement Firewall design principles</b> and identify various intrusion detection systems and be able to achieve highest system security
CO5	Developing Network architectures for <b>Privacy and Crypto Currency</b>

### Mapping of COs to POs

CO	PO1: Engineering Knowledge	PO2: Problem Analysis	PO3: Design/Development of Solutions	PO4: Investigation	PO5: Modern Tool Usage	PO6: The Engineer and Society	PO7: Environment and Sustainability	PO8: Ethics	PO9: Individual and Teamwork	PO10: Communication	PO11: Project Management and Finance	PO12: Life-Long Learning
CO1	X	X				X		X				
CO2				X	X							
CO3	X		X		X	X		X				
CO4			X		X		X	X				
CO5			X		X	X						X

#### Section-A (Mid-term: 30% Marks)

1. Overview: Computer Security Concepts, Security Attacks, Security Services, Security Mechanism, A Model for Network Security.
2. Symmetric Ciphers: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Ciphers and the Data Encryption.
3. Euclid's Algorithm, Placement of Encryption Function, Traffic Confidentiality, key distribution.

#### Section-B (Final Exam: 50% Marks)

4. Public Key Crypto System and RSA: Prime Numbers, Fermat's and Euler's Theorems, Principles of Public-Key Cryptography, the RSA Algorithm, Key Management, Diffie-Hellman Key Exchange



5. Cryptographic Hash Function: Applications, Requirements & Security, SHA-3, Authentication Requirements, Authentication Functions, Digital Signatures, Digital Signature Standards. Authentication Application & Electronic Mail, Security: Kerberos, X.509 Authentication Service, Pretty Good Privacy, S/MIME.
6. IP Security and Web Security: IP Security overview, IP Security Policy, Encapsulating Security Payload, Transport Level Security
7. Wireless Network and Mobile Security: Challenges, Attacks based on Communication, vulnerabilities in Software application, Countermeasures System Security: Intruders, Intrusion Detection, Firewalls, Cloud Security: Threats, Cloud Security Controls.
8. Network Privacy, TOR Network, Blockchain Algorithm, Crypto Currency

### Recommended Books

25. William Stallings, Cryptography and network Security Principles and Practice, 6th edition, Pearson Education, Inc., ISBN 13: 978-0-13-335469-0
26. Andreas M. Antonopoulos, Mastering Bitcoin, O'Reilly Media, Inc, ISBN: 978-1-449-37404-4
27. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 5th Edition, PRENTICE HALL , ISBN-13: 978-0-13-212695-3
28. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw-Hill Education, ISBN-13: 978-0073376226

**Course code : CSE-4744**

**Course title : Computer Security Lab**

**Credit Hours: 1.5**

**[Co-requisite: CSE-4744]**

**Contact Hours: 3 per week**

**Course description:** This course will introduce hands on penetration Testing with Kali Linux. Setting up virtual penetration testing lab where techniques learned within the course can be practiced in a safe and legal environment. Investigating the cryptographic algorithms studied in theory course CSE-4743.

### Course Outcomes

Upon completion of this course, students will be able to do the following:

CO1	Setting up virtual <b>penetration testing lab</b> for practicing in a legal environment
CO2	Write basic scripts and tools to aid in the <b>penetration testing process</b>
CO3	Analyze, correct, modify, cross-compile, and port <b>public exploit code</b>
CO4	<b>Understanding vulnerabilities</b> of the systems
CO5	Invaluable <b>creative problem solving</b> and lateral thinking skills

### Mapping of COs to POs



CO	PO1: Engineering Knowledge	PO2: Problem Analysis	PO3: Design/Development of Solutions	PO4: Investigation	PO5: Modern Tool Usage	PO6: The Engineer and Society	PO7: Environment and Sustainability	PO8: Ethics	PO9: Individual and Teamwork	PO10: Communication	PO11: Project Management and Finance	PO12: Life-Long Learning
CO1	X				X			X				
CO2		X	X	X				X				
CO3				X		X						
CO4		X		X			X	X				
CO5	X					X			X	X	X	X

#### Laboratory works

15. Setting up virtual lab with virtual machine, Kalilinux, Metasploit and other OSes.
16. Passive Information Gathering, Active Information Gathering, Vulnerability Scanning, Buffer Overflows, Win32 Buffer Overflow Exploitation, Linux Buffer Overflow Exploitation, Working with Exploits, File Transfers
17. Privilege Escalation, Client Side Attacks, Web Application Attacks, Password Attacks, Port Redirection and Tunneling, The Metasploit Framework, Bypassing Antivirus Software, Assembling the Pieces: Penetration Test Breakdown
18. Implementing blockchain for crypto currency.
19. Team Project works

#### Recommended Books

29. Kali Linux, Tutorials Point (I) Pvt. Ltd., 2017
30. Robert W. Beggs, Mastering Kali Linux for Advanced Penetration Testing, Packt Publishing, 2014, ISBN 978-1-78216-312-1
31. William Stallings, Cryptography and network Security Principles and Practice, 6th edition, Pearson Education, Inc., ISBN 13: 978-0-13-335469-0
32. Andreas M. Antonopoulos, Mastering Bitcoin, O'Reilly Media, Inc, ISBN: 978-1-449-37404-4

**Course code : CSE-4745**

**Course title : Numerical Methods**

**Credit Hours: 2**

**Contact Hours: 2 per week**

[Pre requisite: CSE-1201 Structured Programming]

#### Course Objectives:

To introduce students to the mostly used numerical methods in the different engineering fields. The emphasis will be on understanding the concepts of the numerical methods and on applying these concepts for solving various problems. C/C++ Programming and MATLAB will be used as tools to solve the problems using the different numerical methods.

**Course Outcomes:**

At the end of the course students will become proficient in

1. Understanding the theoretical and practical aspects of the use of numerical methods
2. Implementing numerical methods for a variety of multidisciplinary applications
3. Establishing the limitations, advantages, and disadvantages of numerical methods

**Mapping of Cos to POs**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√								√	√	√
CO2	√	√	√						√		√	
CO3	√	√	√						√		√	√

**Course Content****Section-A (Mid-term: 30 Marks)**

- 1. Errors in numerical calculations:** What is numerical methods, It's areas, Exact & Approximate numbers, Significant figures, Banker's rounding rule, Sources of errors – Inherent errors, Roundoff errors, Truncation errors; Absolute, Relative & Percentage errors, Error propagation.
- 2. Solution of non-linear equations:** Intermediate value theorem, Bisection method, False position method, Direct substitution method, Newton-Raphson method, Secant method, Evaluation of polynomials, Newton's Binomial expansion formula, Horner's rule, Synthetic division, Finding multiple roots using bisection method and Newton-Raphson method.
- 3. Interpolation:** Definition, Finite Differences – Forward difference, Backward difference, Central differences; Shift operator, Averaging operator; Divided difference; Error propagation in a difference table; Newton's Forward and Backward interpolation formula; Central difference interpolation formulas – Gauss Forward, Gauss Backward, Stirling's formula, Bessel's formula; Interpolation with unequal intervals – Lagrange's interpolation formula, Newton's general divided difference formula; Inverse interpolation-Lagrange's inverse interpolation formula, method of successive approximation.

**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, Cramer's rule, Dolittle LU method, Iterative method - Jacobi's method, Gauss-Seidel method, Eigen vector and Eigen value problem.
- 5. Curve fitting:** Definition, importance of curve fitting, Least square method, Fitting a straight line, Non-linear curve fitting.

**Group-B (30 Marks)**

- 6. Numerical differentiation:** Definition, Derivatives using Newton's Forward and Backward difference and Central difference interpolation formulas, Maximum and minimum values of a tabulated function.
- 7. Numerical Integration:** Definition, General Quadrature formula, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Boole's rule.
- 8. Numerical Solution of ordinary differential equations:** Review of Differential equation, Taylor's series method, Euler's method, Heun's method, Runge-Kutta method.

**Recommended Books:**

1. E. Balagurusamy : Numerical methods, Tata McGraw-Hill, Inc., 2002.
2. G. Shanker Rao : Numerical Analysis, 1<sup>st</sup> edition, New Age International (P) Limited, 1999.
3. S. S. Sastry. : Introductory Methods of Numerical Analysis, 3<sup>rd</sup> edition, Prentice Hall of India, 1999.
4. S. B. Rao and C.K. Shantha: Numerical Methods with Programs in BASIC, FORTRAN and Pascal, Universities Press (India) Ltd., 1992.
5. V. Rajaraman : Computer Oriented Numerical Methods, 3<sup>rd</sup> edition, Prentice hall of India, 1999.



6. J. B. Scarborough : Numerical Mathematical Analysis, 6<sup>th</sup> edition, The John Hopkins Press, Baltimore, U.S.A., 1966.
7. K. Sankara Rao : Numerical Methods for Scientists and Engineers, Prentice Hall of India, 2001.
8. R. W. Daniels : An Introduction to Numerical Methods and Optimization Techniques, Elsevier North-Holland, Inc., 1978.
9. F. Scheid : Theory and Problems of Numerical Analysis, 2<sup>nd</sup> edition, Schaum's Outline Series, McGraw-Hill, Inc., 1988.
10. Steven C. Chapra & Raymond P. Canale : Numerical Methods for Engineers, 3/e, Tata McGraw-Hill, Inc., 2000.
11. Curtis F. Gerland and Patric O. Wheatly : Applied Numerical Analysis, 5<sup>th</sup> Edition, Addison Wesley, 1998.
12. A.R. Vasishtha and Vipin Vasistha : Numerical Analysis, 4<sup>th</sup> edition, Kedarnath Ram Nath, 1999.

**Course code : CSE-4747**

**Course title : Mathematical Analysis for Computer Science**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: MATH-3501 Mathematics IV]

Recurrent problems; Manipulation of sums; Number theory; Special number; Generating function; Random variables; Stochastic process; Markov chain (discrete parameter, continuous parameter, birth-death process); Queuing models (birth-death model, Markov model), open and closed queuing network; Application of queuing models.

Recommended Books:

1. Donald E. Knuth, Ronald Graham : Concrete Mathematics
2. Sheldon Ross : Introduction to probability Model.

**Course code : CSE-4750**

**Course title : Technical Writing and Presentation**

**Credit Hours: 1**

**Contact Hours: 2 per week**

**1. Issues of technical writing:** Planning and preparation for writing; Organization, accessibility, audience, style of writing, flow of writing; Word order; Breaking up long sentences; Structuring of paragraph and sentences; Use of punctuation marks; Being concise and removing redundancy; Avoiding ambiguity and vagueness; Writing coherent texts; Highlighting an issue/point; Paraphrasing and plagiarism

**2. Effective oral presentation:** Preparation and planning; Etiquettes; Structure of an oral presentation; Preparing effective presentation slides and issues related to it; Visuals, use of graphics; Placement and presentation of diagrams and figures; Pace of presentation and volume; Body stuff, posture and movement of body; Handling Q/A; Handling adversity

**3. Reading and searching skills:** Effective reading; Types of reading, scanning, skimming, intensive and extensive reading; Searching and finding relevant information; Note taking; Summarizing

**4. Writing styles of definitions, propositions, theorems and proofs**

**5. Preparation of proposals, reports, research papers, theses and books:** Structure of proposals, reports, theses, research papers books; Issues related to writing title, abstract, preface, contents, bibliography, index, literature review, explaining methods, describing results and discussion on result, conclusion

**6. Writing of book reviews and referee reports**

**7. Software and Tools:** Writing/typesetting tools, LATEX; Diagram drawing software, Microsoft Visio; Data analysis and graphing software, Origin Pro; Presentation tools; Version controlling

Recommended Books:

1. Adrian Wallwork: English for Writing Research Papers
2. John M. Swales and Christine B. Feak: Academic Writing For Graduate Students



**Course code : CSE-4800**

**Course title : Project / Thesis**

**Credit Hours: 4**

**Contact Hours: 8 per week**

Research/Study of problems in the field of Computer Science & Engineering. Evaluation based on report, software and oral defense

**Course code : CSE-4805**

**Course title : Social, Professional and Ethical Issues in Computing**

**Credit Hours: 2**

**Contact Hours: 2 per week**

**[To be determined]**

**Course code : CSE-4805**

**Course title : Social, Professional and Ethical Issues in Computing**

**Credit Hours: 2**

**Contact Hours: 2 per week**

**Overview of the Course:**

Computing takes place in a social context which can affect the ways in which technology develops and in turn may be affected by those developments. In this course, we study these influences, and examine questions that must be answered by computing professionals, policy makers, and members of the public, in relation to the potential uses and abuses of computing technology.

- ✓ The course is illustrated by a number of case studies, and students are encouraged to draw upon a number of perspectives to address the issues raised by the case studies.
- ✓ The course is designed to enable participants to:
- ✓ Identify areas of society where information technology has had a substantial impact and where its effects may be of concern.
- ✓ Appreciate how different perspectives can contribute to making choices about the development and use of computing technology.
- ✓ Appreciate the legal and social issues associated with the use of computers in organisations and computer crime.
- ✓ Critically assess the concepts, theories and issues in recent public debates about technology and society and develop a personal position.
- ✓ Provide informed opinions in discussion and debate about topics relating to technology and its effect on society

Coursework consists of discussion questions, group presentations, a mid-term and a final written exam with essay-style questions. By those means it is expected that participants will also improve their verbal and written communication skills, as well as their presentation skills.

**Learning Outcomes:**

The ultimate goal of the course outcomes is:

- ✓ Understand, identify, and apply different ethical philosophies, frameworks, and methodologies. The goal is for students to be able to address ethical dilemmas with reasoned arguments, grounded in a combination of these ethical theories.
- ✓ Identify and interpret the codes of professional conduct relating to the disciplines of computer science and software engineering such as ACM Code of Ethics. We will also learn how we can use these in our daily practice.
- ✓ Analyze the local and global impact of computing on individuals, organizations, and society. Students will be able to discuss key concepts in a digital society including issues of copyright, privacy, personal freedom, computer crimes and new legal issues as well as advances in medicine, telecommunications and education.
- ✓ Understand and apply the concepts and principles of moral thinking to problems relating to computing and digital technologies.



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

1. Introduction: History of computer hardware, software, networking; Overview of Technological Change; Impact of information technology on some sectors.
2. Privacy and personal information: Definition of privacy. How does computer technology effect privacy? To what moral problems does this lead? Ethical and legal basis for privacy protection; Privacy implications of database systems; Technological strategies for privacy protection;
3. Cyber Laws: UNCITRAL model law, ICT Act 2006 in Bangladesh, Pornography Control Act 2012, Freedom of expression in cyberspace, Offensive speech and censorship in cyberspace Anonymity, Spam etc.

**Section-B (Final Exam: 50 Marks)**

**Group-A (20 Marks)**

4. Computer & Software Reliability: How liability is determined when computer hardware and software fails? Responsibility vs. Liability vs. Accountability; Some historical examples of software risks (such as the Therac-25 case)
5. Intellectual Property: What is intellectual property” Copyrights, patents, and trade secrets; Software piracy; Software patents; Free software, What is fair use?

**Group-B (30 Marks)**

6. Computer Crime: History and examples of computer crime; “Cracking” (“hacking”) and its effects; Viruses, worms, and Trojan horses; Online scams, Identity theft; moral issues related to these crimes.
7. Computer and Work: Impact of employment, work environment, Employee monitoring, Health issues
8. Professional Ethics and responsibilities: What is Ethics? What is Computer ethics, Some ethical guidelines for computer professionals, Examine and discuss professional codes of ethics, conduct, and practice (IEEE, ACM, SE, AITP, and so forth).

Recommended Books:

1. Sara Baase: A gift of fire, 2/e, Pearson Education Inc., 2003.
2. Michael A Gallo & Robert B. Nenno: Computer and society 2/e, McGraw-Hill, 1997.



# **OPTIONAL COURSES**



**Course code : CSE-4839**

**Course title : Digital System Design**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-3511 Microprocessors and Microcontrollers]

Design using MSI and LSI components; Design of memory subsystem using SRAM and DRAM; Design of various components of computer: ALU, memory and control unit- hardwired and micro-programmed; Microprocessor based designs; Computer bus standards; Design using special purpose controllers, floppy disk controller.

**Course code : CSE-4840**

**Course title : Digital System Design Lab**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on CSE-4719

To perform also other experiments relevant to this course.

**Course code : CSE-4823**

**Course title : Fault Tolerant System**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-3509 Computer Architecture]

Introduction to fault tolerant system and architecture; Fault detection and location in combination and sequential circuits; Fault test generation for combination and sequential circuits; Digital simulation as a diagnostic tool; Automatic test pattern generator; Fault modeling; Automatic test equipment, Faults in memory, memory test pattern and reliability; Performance monitoring, self-checking circuits; Burst error correction and triple modular redundancy; Maintenance processors.

Recommended Books:

David James Norman : Professional Electronics Trading

**Course code : CSE-4824**

**Course title : Fault Tolerant System sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on CSE-4721

To perform also other experiments relevant to this course.

**Course code : CSE-4825**

**Course title : Basic Graph Theory**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-2409 Computer Algorithms]

Course Objectives:

This course is aimed to cover a variety of different problems in Graph Theory. In this course students will come across a number of theorems and proofs. Theorems will be stated and proved formally using various techniques. Various graphs algorithms will also be taught along with its analysis.

Learning outcomes:

After the course the student will have a strong background of graph theory which has diverse applications in the areas of computer science, biology, chemistry, physics, sociology, and engineering



Graphs and simple graphs, diagraphs, subgraphs, walks, paths and cycles; trees spanning tree of graph, distance in graphs; Complementary graphs, cut-vertex, bridge and blocks, k-connected graphs; Euler tures, Hamiltonian cycles, Chines postman problem, Traveling salesman problem; Chromatic number, Chromatic polynomials, chromatic index, Vizing's theorems, planar graphs, perfect graphs.

**Text Books:**

1. Robin J. Wilson: *Introduction to Graph Theory (5th Revised edition)*, Pearson Education Limited.
2. Narsingh Deo: *Graph Theory with Applications to Engineering and Computer Science*, PHI Learning.
3. Bondy, J. A.; U. S. R. Murty: *Graph Theory with Applications*, North-Holland.

**Recommended Books:**

1. Haraary Frank: *Graph Theory*, Narosa Publishing House.
2. Marshall, C. W: *Applied Graph Theory*, John Wiley and Sons.
3. Diestel, R: *Graph Theory*, Springer.

**Course code : CSE-4826**

**Course title : Basic Graph Theory Lab**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

**Course Objectives:**

The main objective of this course is to introduce graphs as a powerful modeling tool that can be used to solve practical problems in various fields. To achieve this goal, the course introduces the main concepts of graph theory, graph representations and the basic classes of graphs. Several famous graph problems and associated algorithms are also covered.

**Learning Outcome:**

At the end of this course, the student should be able to apply the abstract concepts of graph theory in modeling and solving non-trivial problems in different fields of study.

**Name of Experiments**

1. Develop a code to represent graph on computer.
2. Develop a code to determine a graph is graph or tree.
3. Develop a code to find degree of all nodes of a graph.
4. Develop a code to check whether the given graphs are isomorphic or not.
5. Develop a code determine a given graph is a cycle, wheel or none.
6. Develop a code to print the distance of all nodes from the starting node using BFS.
7. Develop a code to print the discover time of all nodes using DFS.
8. Develop a code to find the Minimum spanning tree of the above figure using Kruskal's algorithm.
9. Develop a code to find the Minimum spanning tree of the above figure using Prim's algorithm.
10. Develop a code to sort a graph using Topological sort.
11. Develop a code to find a graph is Bipartite graphs or not.
12. Develop a code to determine the number of bridge in a graph.
13. Develop a code to find cycle and cutset rank of a graph.
14. Develop a code to determine number of connected component in a graph.
15. Develop a code to find a graph is Eulerian graphs or semi-Eulerian graph.
16. Develop a code to find Eulerian tour of a graph (Fleury's algorithm).
17. Develop a code to find a graph has Hamiltonian cycle or not.
18. Develop a code to find the shortest distance of all nodes from a node.
19. Develop a code to find the shortest path between every vertices.
20. Develop a code to find the maximum flow from starting node to target node.
21. Develop a code to find the closed walk Chinese postman problem of a graph.
22. Given a graph G, develop a code find dual graph of G.
23. Given two graphs G and G\*, develop a code to determine G\* is an abstract dual



of G or not.

24. Develop a code to color each vertex of a graph such that adjacent vertices have different colors.
25. Develop a code to color each edge of a graph such that adjacent edges have different colors.
26. Develop a code to color each face of a graph such that adjacent faces have different colors.
27. Develop a code to find Chromatic number of a graph.
29. Develop a code to find the underlying graph of a directed graph.
29. Given an activity network, develop a code to determine the completion time of the entire job
30. Develop a code to implement the Markov chain problems.
31. Develop a code to find Tournaments for a graph.
32. Develop a code to implement the Hall's marriage theorem.

**Lab Requirement:**

**Hardware:** PC [with latest Configuration]

**Software:**OS: Windows 7 or above, Code::Blocks

**Reference Books:**

1. Robin J. Wilson: *Introduction to Graph Theory (5th Revised edition)*, Pearson Education Limited.
2. NarsinghDeo: *Graph Theory with Applications to Engineering and Computer Science*, PHI Learning.
3. Bondy, J. A.; U. S. R. Murty: *Graph Theory with Applications*, North-Holland.

**Course code : CSE-4827**

**Course title : Simulation and Modeling**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: MATH-3501 Mathematics IV]

Simulation methods, Model building, Random number generator, Simulation languages; Statistical analysis of results, Validation and verification technique; Digital simulation of continuous systems; Analogue simulation of continuous systems; Simulation and analytical methods for analysis of computer systems and practical problems in business and practice; Introduction to simulation packages.

**Recommended Books:**

1. J. Banks, J. S. Carson : Discrete Event System Simulation
2. Averill M. Law, W. D. Kelton : Simulation and Modeling Analysis

**Course code : CSE-4828**

**Course title : Simulation and Modeling sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on CSE-4733

To perform also other experiments relevant to this course.

**Course code : CSE-4819**

**Course title : Special Topic on Computer Science and Engineering**

**Credit Hours: 3**

**Contact Hours: 3 per week**

Selected advanced topic from the field of computer science and engineering. It may vary from time to time.



**Course code : CSE-4820**

**Course title : Special Topic on Computer Science and Engineering sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on CSE-4819

To perform also other experiments relevant to this course.

**Course code : CSE-4857**

**Course title : VLSI Design**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-2305]

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

1. **Chapter one:** A Historical Perspective; Issues in VLSI Design; CMOS Logic (Inverter, Combinational Logic, NAND, NOR, Compound gates, Multiplexers, Memory --Latches and Registers. Circuit and System Representations and Examples
2. **Chapter Two:** MOSFET Transistor; MOS Device Design Equations; CMOS Inverter and Bipolar Devices.
3. **Chapter Three:** Silicon Semiconductor and Basic CMOS Technology; CMOS Process Enhancements; Layout Design Rules and Latch up.

**Section-B (Final Exam: 50 Marks)**

**Group-A (20 Marks)**

4. **Chapter Four:** CMOS Logic Gate Design; Basic Physical Design of Simple Logic Gates; CMOS Logic Structures; Clocking Strategies and I/O Structures
5. **Chapter Five:** Circuit Characterization and Performance Estimation (Resistance Estimation, Capacitance Estimation, Inductance, Switching Characteristics, Power Dissipation, Charge Sharing, Scaling of MOS Transistors Dimensions)

**Group-B (30 Marks)**

6. **Chapter six** CMOS Design Methods, Design Strategies, CMOS Chip design options, Design Methods, Design Capture Tools, Design Verification Tools, Design economics.
7. **Chapter Seven:** Need for Testing, Manufacturing Test Principles, Design Strategies for Test, Chip Level and System Level Test Techniques
8. **Chapter Eight:** CMOS Subsystem Design (Data path Operations, Memory elements and Control); A Core RISC Micro controller Design; Major Logic Blocs Design and A 6-bit Flash A/D Design

**Recommended Books:**

1. Neil H.E. Weste and Kamran Eshraghian :Principles of CMOS Design,
2. Sung-Mo Kang, Yusuf Leblebici :CMOS Digital Integrated Circuits Analysis and Design
3. R.Jacob Baker, Harry W .Li, David E.Boyce :CMOS Circuit design, Layout and Simulation, Modern VLSI Design : Systems on Silicon,.
4. Linda E.M. Brackendury :Design of VLSI Systems : A practical Introduction,
5. Jan M. Rabaey, :Digital Integrated Circuits:
6. J D. Plummer, Michael D. Deal B. Griffin :Silicon VLSI Technology: Fundamentals, Practice & Modeling.:



**Course code : CSE-4858**

**Course title : VLSI Design sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on CSE-4803

1. Installation of VLSI Software and introduction of the manual.
2. nWell CMOS design rules.
3. Layout design for the CMOS inverter and simulation.
4. Layout design for CMOS NAND2 and simulation.
5. Layout design for CMOS NOR2 and simulation.
6. Layout design for CMOS XOR2 and simulation.
7. Design the layout of a standard half adder and simulation.
8. Design the layout of a standard full adder and simulation.
9. Design of the layout of 6-transistor static RAM and simulation.
10. Design of the layout of 4-bit Manchester adder and simulation.
11. Other relevant design related this course.

**Course code : CSE-4859**

**Course title : Real Time Embedded System**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-3501]

**Introduction:** Introduction to embedded systems – hardware and software components – types – examples – characteristics – challenges in Embedded computing system design – embedded system design processes.

**Architecture of Embedded System:** Hardware components – SOC – Processors – CPU – Types of memory – Memory management – I/O devices and interfacing – Software components – Interpreter – Compiler – Assembler – Cross Assembler – RTOS – Languages for embedded applications – Hardware and software architecture. Examples: Cellphone, Smartcard, Digital Thermometer.

**OS for Embedded Systems:** Introduction to real time theory – Operating System Services – Real time Operating System Concepts – Basic design using a RTOS – underground tank monitoring system.

**Performance Issues of an Embedded System:** CPU performance – CPU Power Consumption – Analysis and Optimization of CPU Power Consumption program execution time – Analysis and optimization of energy and power – Analysis of program size – Hardware accelerators.

**Design Examples:** Personal Digital Assistants – Set Top Boxes – Ink Jet Printers – Telephone PBX. Introduction to Micro C/OS-II operating system and its uses.

References:

1. Wayne Wolf, (2001). “Computer as Components – Principles of Embedded Computing System Design”, Harcourt India Pvt Ltd.,
2. David E Simon, (2004) “An Embedded Software Primer”, Pearson Education,
3. Raj Kamal, (2003) “Embedded Systems – Architecture, Programming and Design”, Tata McGraw Hill,
4. Sriram V Iyer, Pankaj Gupta, (2004) “Embedded Realtime Systems Programming”, Tata McGraw Hill,
5. K.V.K.K. Prasad, (2004) “Embedded/Realtime Systems: Concepts, Design and Programming”, Dreamtech Press,

**Course code : CSE-4860**

**Course title : Real Time Embedded System Sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Lab Based on CSE-4835



**Course code : CSE-4843**

**Course title : Decision Support System and Expert System**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-4705]

**Course Objectives:**

This course will examine the design, development and implementation of information technology based systems that support managerial and professional work, including Communications-Driven and Group Decision Support Systems (GDSS), Data-Driven DSS, Model-Driven DSS, Document-Driven DSS, and Knowledge-Driven DSS.

1. To review and clarify the fundamental terms, concepts and theories associated with Decision Support Systems, computerized decision aids, expert systems, group support systems and executive information systems.
2. To examine examples and case studies documenting computer support for organizational decision making, and various planning, analysis and control tasks.
3. To discuss and develop skills in the analysis, design and implementation of computerized Decision Support Systems.
4. To examine user interface design issues and evaluate the user interfaces and capabilities of Decision Support Systems.
5. To improve hands-on skills using HTML, Microsoft Access and Excel, and JavaScript for building state-of-the-art Decision Support Systems, especially Web-Based systems that use advanced computing and networking technologies.
6. To understand that most Decision Support Systems are designed to support rather than replace decision makers and the consequences of this perspective for designing DSS.
7. To discuss organizational and social implications of Decision Support Systems.

**Learning Outcomes:**

1. Understand the interaction of decision processes and information systems within fluid organizations;
2. Understand and be able to assess the various phases and components in the design of decision support systems;
3. Discuss the socio-technical aspects of development and implementation of decision support systems;
4. Discuss special types of support systems, including group support systems, executive information systems and expert systems;
5. Critique current literature on decision support systems, including knowledge-based systems.

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

1. **Introduction:** An overview of Decision technologies. Introduction to different types of decision making: strategic, tactical and operational. Decision making in organization. Extension to other 'non organizational' areas of decision making, e.g. military and emergency management,
2. **Decision making issues and Models:** Implications for design of decision making support. Communication issues. Normative, descriptive and prescriptive analysis: requisite modeling. Contrast with recognition primed decision tools.



3. **Decision Support Systems:** Configuration, Definition, Characteristics and capabilities, Data Management Subsystem, Knowledge-Based Management Subsystems, Model Management Subsystem, User Interface Subsystem, DSS hardware.

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

1. **DSS Development and Modeling:** Introduction, Traditional SDLC, Alternative Development Methodologies, DSS development platforms, DSS development tool selection. Mathematical Programming Optimization, Linear Programming, Dynamic Programming, Heuristic Programming, and Simulation.
2. **Data mining:** Concepts, Characteristics and benefits, Data in Data Mining, Working procedure of Data mining, Data Mining Applications, Data Mining Process, Data Mining methods, Data Mining Software's.

**Group-B (30 Marks)**

3. **Data Warehouse:** Data Warehouse concept, characteristics of Data Warehouse, Data Warehouse Process and Architecture. Real Time Data warehousing
4. **Other Support systems and Related Issues:** Decision analysis and strategic decision support. Group decision support systems and decision conferencing. Cutting-edge decision support technologies. Quality assurance and validity of decision support, Risk assessment.
5. **Expert System (ES):** Basic Concept of Expert System, Feature of ES, Application of ES, Structure of ES, Popular Areas suitable for ES, Development of ES, Benefits and Limitations of ES.

**Recommended Books:**

1. Decision Support and Business Intelligent System, Pearson, Ninth Edition.
2. System Simulation by Geoffrey Gordon, Prentice Hall.
3. Discrete-event System Simulation by Banks J. and Carson JS, Prentice Hall.
4. Simulation Modeling with Pascal, Prentice Hall.

**Course code : CSE-4844**

**Course title : Decision Support System and Expert System Sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

**Lab Experiments**

1. Introduction to SPSS
2. Basic Data analysis using SPSS
3. Summary Statistics, Correlation
4. Regression
5. Statistical Analysis for finding the relatedness between different entities of research
6. Practical overview of Predicting techniques
7. Practical overview of Classification
8. Introduction to Python for Data mining
9. Decision Support using Decision Tree
10. Decision Support using Clustering Algorithms
11. Decision Support using Classification Algorithms

**Software:**

- SPSS Statistics 22.0



- Python

**Recommended Books:**

1. Decision Support and Business Intelligent System, Pearson, Ninth Edition.
2. System Simulation by Geoffrey Gordon, Prentice Hall.
3. Discrete-event System Simulation by Banks J. and Carson JS, Prentice Hall.
4. Simulation Modeling with Pascal, Prentice Hall.

**Course code : CSE-4845**
**Course title : Distributed Database**
**Credit Hours: 3**
**Contact Hours: 3 per week**

[Pre requisite: CSE-2407]

**Rationale:** Use of distributed systems has become a common practice in today's computing environment especially with the easy access of the internet. Distributed Database Systems (DDBSs), however, are generally implemented in relatively large organizations and need better understanding of the database and networking concepts. The same two concepts provide the foundation of this course. The emphasis in this course is on the design and management issues of a DDBS and at the same time on the implementation issues.

**Course Objectives:** The course has dual objectives. The first is an in-depth study of the classical distributed database management issues such as distribution design, distributed query processing and optimization, and distributed transaction management. The second objective is to study more current distributed database management topics such as pervasive computing, Web data management, different distribution models (push versus pull), interoperability and componentization, and data mining on the web.

**Course Outcomes (COs):**

After completion of this course students will be able to:

CO1	Explain the techniques used for data fragmentation, replication, and allocation during the distributed database design process.
CO2	Evaluate simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer.
CO3	Explain how the two-phase commit protocol issued to deal with committing a transaction that accesses databases stored on multiple nodes.
CO4	Developed basic concepts of parallel databases, object distributed databases, and multi databases.

**Mapping of COs to POs**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	X						X					
CO2					X							
CO3		X		X								
CO4			X									X

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



1. **Introduction:** Introduction to Distributed Databases, Distributed DBMS (DDBMS), Distributed DBMS Architecture, Data Independence, Functional goals of distributed databases, Characteristics of DDBMS, Advantages and Disadvantages of DDBMS.
2. **Data Integration:** Virtual vs Materialized integration, Views, View Integration, Conflict analysis, Schema Integration, Data Integration in the Multidatabase, Global query processing, Source Schema Reverse engineering, GAV (global as view), LAV (local as view), Mapping, Wrappers.
3. **Distributed Database Design:** Design problem of distributed systems, Design Strategies, Fragmentation, Correctness Rules of Fragmentation, Horizontal Fragmentation, Vertical Fragmentation, Correctness of Vertical Fragmentation, Mixed Fragmentation, Replication and Allocation.

**Section-B (Final Exam: 50 Marks)**

**Group-A (20 Marks)**

4. **Overview of Query Processing:** Query Processing, Query Optimization, Distributed Query Processing Steps, Query Decomposition, Normalization, Analysis, Elimination of Redundancy, Rewriting, Data Localization.
5. **Transaction Management:** Definition, Formalization of a Transaction, Properties of Transactions, Atomicity, Consistency, Isolation, Durability Classification of Transactions, Transaction Processing Issues.

**Group-B (30 Marks)**

6. **Concurrency Control:** Concurrency, Conflicts, Schedules, Serializability, Concurrency Control Algorithms, Locking Based Algorithms, Two-Phase Locking (2PL), 2PL for DDBMS, Timestamp Ordering, Deadlock Management, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection.
7. **Distributed DBMS Reliability:** Definitions and Basic Concepts, Local Recovery Management, In-Place Update, Out-of-Place Update, Distributed Reliability Protocols, Commit Protocols, Centralized Two Phase Commit Protocol (2PC), Linear 2PC Protocol, Distributed 2PC Protocol, 2PC Protocol and Site Failures, Three Phase Commit Protocol (3PC).
8. **Data Warehouses:** Definition, Architecture for a data warehouse, Dimensional Fact Model, Dimensions and hierarchies, OLAP OPERATIONS, Data cube in SQL (ROLAP), Data Warehouse Design, Conceptual Design, Logical Design.

**Recommended Textbooks:**

1. Concurrency Control and Recovery in Database Systems. Bernstein, Hadzilacos and Goodman, AW.
2. Distributed Systems: Concept and Design. Coulouris, Dollimore, and Kindberg. AW.
3. Distributed Database Principles and Systems. Ceri and Pelagatti. McGraw Hill.
4. Recovery Mechanisms in Database Systems. Kumar and Hsu, Prentice Hall.
5. Principles of Distributed Database Systems. M. Tamer Ozsu, Paterick Valduriez- Springer
6. Distributed Database Systems. David Bell, Jane Grimson- Addison-Wesely

**Course code : CSE-4846**

**Course title : Distributed Database sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

**Objectives:** This course investigates the architecture, design, and implementation of massive-scale data systems. The course discusses foundational concepts of distributed database theory including design and architecture, security, integrity, query processing and optimization, transaction management, concurrency control, and fault tolerance. It then applies these concepts to both large-scale data warehouse and cloud computing systems. The course blends theory with practice, with each student developing both distributed database and cloud computing projects.



- **Integration:** View-based data integration (Relational data model), Data integration (homogeneous and heterogeneous data sources), Identification of the sources data models, Reverse engineering (conceptual models), Identification and resolution of conflicts, Conceptual models integration, Choice of the target data model (for global conceptual schema translation), Source schemata translation to the target data model (by means of adapters), Conceptual model translation, Definition of data views (mappings), Exam Simulation.
- **Data Warehouse:** SQL Recall, Data warehousing conceptual design, Facts definition, For each fact: attribute tree definition, attribute tree editing, dimensions definition, measures definition, hierarchies definition, fact schemata creation, glossary definition, Data warehousing logical design, ROLAP model: star schema, snowflake schema

Laboratory works based on CSE-4815

To perform also other experiments relevant to this course.

**Recommended Textbooks:**

1. M. Tamer Oezsu, Patrick Valduriez ``Principles of Distributed Database Systems, Second Edition" Prentice Hall.
2. Distributed Systems: Concept and Design. Coulouris, Dollimore, and Kindberg. AW.
3. Distributed Database Principles and Systems. Ceri and Pelagatti. McGraw Hill.
4. Recovery Mechanisms in Database Systems. Kumar and Hsu, Prentice Hall.
5. Concurrency Control and Recovery in Database Systems. Bernstein, Hadzilacos and Goodman, AW.

**Course code : CSE-4847**

**Course title : Software Project Management**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-3505]

Foundations of software project management; organization structure and staffing; motivation, authority and influence; conflict management; proposal preparation; a large engineering software system management; client management; managing software project teams; project planning and scheduling; risk management; configuration management; pricing estimation and cost control; quality assurance and accreditation; factors affecting software quality; software quality assurance plans; business context and legal issues for software projects; software measurement: testing, upgrading and maintenance; network systems; and international project management

**Course code : CSE-4848**

**Course title : Software Project Management Sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Lab Based on CSE-4847

**Course code : CSE-4849**

**Course title : Software Quality Assurance**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-3505]

Definition and concept of software quality assurance (SQA); quality models; specification of quality requirements; product development & delivery issues; software development processes & maturity; software quality management process: total quality management, improvement cycle, SQA planning & management, organizing the SQA effort; software verification & validation; typical software development errors; Fagan inspections; software audit; software testing: testing objectives & testing fundamentals, testing theory, coverage criteria, equivalence class testing, value-based testing, decision table, syntax & state transition



testing, statement & path testing, branch & condition testing, data flow testing, thread-based testing, integration & integration testing, system testing; testing in object-oriented systems; test tools & test automation; test management; problem reporting & corrective action.

**Course code : CSE-4850**

**Course title : Software Quality Assurance Sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Lab Based on CSE-4849

**Course code : CSE-4851**

**Course title : Wireless and Mobile Communication**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-4701]

Cellular concepts: frequency reuse, handoff strategies, interference and system capacity, grade of service, improving capacity and coverage, call blocking probability; Propagation effects: outdoor propagation models, indoor propagation models, power control, Doppler's effect, small and large scale fades; Wireless LAN Technology; IEEE 802.11: standard, protocol architecture, physical layer and media access control; Mobile IP; Wireless Application Protocol; IEEE 802.16 Broadband Wireless Access; Brief review of 2nd and 3rd generation wireless: GSM, GPRS, CDMA; Cordless system; Wireless local loop; Bluetooth: overview and baseband specifications.

**Course code : CSE-4852**

**Course title : Wireless and Mobile Communication Sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

**Course code : CSE-4853**

**Course title : Optical Fiber Communication**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-3601]

Optical fiber: introduction, structure, step index and graded index fibers, modes of propagation; Signal degradation in optical fibers: attenuation, signal distortion, pulses broadening mode coupling; Optical sources: LED, Laser diodes light source linearity modal partition and reflection noise; Power launching and coupling: source to fiber power launching Lansing scheme, fiber to fiber join, splicing fiber connectors; Photo detectors: basic principles, photo-detectors noise, response time, avalanche multiplication noise; Optical receiver operation: receiver configurations, digital receiver performance preamplifiers; Digital translation systems: point to point link, line coding, eye pattern, system performances; Advanced systems and techniques: WDM, local area networks, optical amplifier, phonic switching.

Recommended Books:

1. John M. Senior : Optical Fiber Communication.
2. D. K. Mynbaev : Fiber Optic communication teach.

**Course code : CSE-4854**

**Course title : Optical Fiber Communication sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**



Laboratory works based on CSE-4727

To perform also other experiments relevant to this course.

**Course code : CSE-4855**

**Course title : Communication Engineering**

Credit Hours: 3

Contact Hours: 3 per week

[Pre requisite: CSE-3601]

Objectives:

- To equip students with various issues related to analog and digital communication such as modulation, Demodulation, Noise handling, Data conversion and Multiplexing
- Students will be familiar with the techniques involved in the transfer of information in the field of Radio communication
- Students will be able to detect and correct the errors that occur due to noise during transmission
- Students will be able to understand the concepts of Facsimile, Television, Cellular and Satellite Communication

#### **Section-A (Mid-term: 30 Marks)**

1. **Digital Communication system:** Principal of Digital communication system design (Tx and Rx), Tradeoffs, advantages, comparison between analog and digital system. Information capacity, bit rate, baud rate and M-ary Encoding. Modulator and Demodulator of ASK, FSK, BPSK, QPSK, DPSK, GMSK, QAM etc.
2. **Performance analysis:** Performance metrics, Random variables and probability distribution. Probability of Error and Bit Error Rate. Error Performance. Random process, Gaussian process. Noise analysis, Channel types and characteristics, Simulation method.
3. **Optical communication:** Optical transmitter and receiver. Fiber optic cable Fiber geometry: step-index and graded-index fibers, wave propagation in fiber, dispersion. , Optical sources and detectors, feedback, driving circuitry. P-I-N and avalanche photodiode receivers, receiver sensitivity, bit error rate and fiber amplifiers. Multiplexing, System link budget.

#### **Section-B (Final Exam: 50 Marks)**

##### **Group-A (20 Marks)**

4. **Pulse Communication:** Pulse Modulation: PAM, PPM, PWM, PCM. Transmitter and Receiver. Coding method. Delta modulation. Pulse Transmission method. Inter symbol Interference. Signal power and Eye diagram.
5. **Wireless communication:** Modern wireless communication system overview, Application and requirements of wireless service: Broadcast, cellular and cordless telephony, Trunking radio system and fixed wireless access. Data rate versus range for various application, Energy consumption, Use of spectrum, service quality, Economic and social aspect. Difference between wired and wireless system, Fading, frequency reuse principal.

##### **Group-B (30 Marks)**

6. **Cellular and mobile communication:** Cellular communications system, 3G, 4G system, Multiplexing and Air Interface: Frequency division multiple access (FDMA), Time division multiple access (TDMA). Spread spectrum multiple access: FHMA, DS CDMA. Service: GSM, EDGE etc. Mobile OS, Protocol, J2ME. New technology: UWB, Wi-Max etc.
7. **Satellite communication:** Configuration of satellite communication systems, satellite services and frequency allocation Satellite orbit, motion, paths, types of satellites. Earth station antennas: types, gain, and effective isotropic radiated power (EIRP). VSAT technologies and network configurations.



8. **RF technique and Radio system design:** RF components: Antenna, Amplifier, Filter, Mixer, Oscillator, Switch, Attenuator, Divider, Combiner, Coupler, Circulator, Isolator, transformer, Detector etc. Customized system design.

**Book Reference:**

1. Advanced electronic communication system by Wayne Tomasi
2. Digital Communication by Proakis
3. Wireless communication by A. F. Molisch
4. Modern wireless communication by Simon Haykin
5. Electronic Communication System by Kennedy & Davis

**Course code : CSE-4856**

**Course title : Communication Engineering sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

**Digital Communication Board**

- (a) PAM modulation and Demodulation
- (b) PCM modulation and Demodulation
- (c) Time division multiplexing (TDM)

**MATLAB Simulation & Simulink**

- (a) Signal analysis and Digital Modulation (ASK, FSK, PSK)
- (b) Tx/Rx, Channel and Noise
- (c) Pulse Communication

**Optical Communication Board**

- (a) Transmitter
- (b) Receiver

**Course code : CSE-4861**

**Course title : Multimedia Theory**

**Credit Hours: 3**

**Contact Hours: 3 per week**

1. Multimedia systems-introduction; Coding and compression standards; Architecture issues in multimedia
2. Operating systems issues in multimedia-real time OS issues, synchronization
3. Interrupt handling; Database issues in multimedia- indexing and storing multimedia data
4. Disk placement, disk scheduling, searching for a multimedia document
5. Networking issues in multimedia – Quality-of service guarantees, resource reservation, traffic specification, shaping and monitoring, admission control
6. Multicasting issues; Session directories; Protocols for controlling sessions
7. Security issues in multimedia- digital water- marking, partial encryption schemes for video streams
8. Multimedia applications- audio and video conferencing, video on demand, voice over IP

**Recommended Books:**

1. Multimedia. An Introduction- John Villamil-Casanova, Louis Molina
2. Multimedia. Graphics- John Villamil-Casanova, Leony Fernandez-Elias
3. Multimedia Sound and Video- John Villamil-Casanova, Louis Molina



**Course code : CSE-4862**

**Course title : Multimedia Theory sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on CSE-4807

To perform also other experiments relevant to this course.

**Course code : CSE-4863**

**Course title : Digital Signal Processing**

**Credit Hours: 3**

**Contact Hours: 3 per week**

1. Signal, System and processing, Advantages and Limitations of DSP, Components of DSP, Classification of Signals, Concept of Frequency, Sampling Theorem, Nyquist Rate, Aliasing, Quantization. Coding, Classifications of Discrete Time Signal and Systems, Implementation of Discrete Time Systems
2. Analysis of LTI System, Casuality and Stability of LTI System, Natural Response and Forced Response, Convolution, Correlation
3. Z-Transform, Importance of Z-Transform, ROC, Properties of Z-Transform, Inverse Z-Transform, Rational Z-Transform, Concept of Pole and Zero, One sided Z-Transform
4. Frequency Analysis of Continuous and Discrete time Signals, Fourier Series, Fourier Transform, Energy and power Density Spectrum, Dirichlet Conditions, Properties of Fourier Transform
5. Frequency Domain Sampling, DFT, DFT as a Linear Transformation, Properties of DFT, Circular Convolution, Efficient Computation of DFT, Divide and Conquer Approach
6. Radix-2 FFT, Butterfly Structure, Implementation of Discrete Time Systems, FIR: Direct Form Structure, Lattice Structure, Transposed Structure
7. IIR: Direct Form Structure, Transposed Structure, Filter: Features and Applications of FIR and IIR Filters, FIR Filter Design: Window Method and Different Types of Windows
8. IIR Filter Design: Pole Zero Placement Method, Adaptive Filter, Applications of Adaptive Filters: Noise Cancellation, Equalization, System Identification, Adaptive Algorithms: LMS, RLS

**Recommended Books:**

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

**Course code : CSE-4864**

**Course title : Digital Signal Processing Sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on Digital Signal Processing

**Course code : CSE-4865**

**Course title : Bio-Informatics**

**Credit Hours: 3**

**Contact Hours: 3 per week**

1. Overview of Bio-Informatics, Nucleotide and Protein databases, Derivation and Format of Nucleotide and Protein Sequences
2. Using Web Resources e.g. NCBI to access and retrieve Sequences of Information, Interrogating DNA (Genbank/EMBL) and Protein (SWISS-PROT) Databases
3. Retrieval of Sequence Information, Displaying Similarities using Alignments and Multiple Alignments
4. Identification of Coding Regions and Consensus Sequences
5. Translating Nucleotide Sequences and Searching for Open Reading Frames
6. Analysis of Nucleotide Sequences for Restriction Enzymes Designing PCR Primers and Gene Probes



7. Identification of Protein Modifications and Sequences
8. Analysis of 2D Gel Patterns, Peptide Mass Fingerprinting.

**Recommended Books:**

1. An Introduction to Bio-Informatics Algorithms- Neil C. Jones, Pave A. Pevzner
2. Bioinformatics for Dummies- Jean-Michel Claverie
3. Bioinformatics: Sequence and Genome Analysis- David W. Mount
4. Statistical Methods in Bioinformatics: An Introduction- Warren J. Ewens, Gregory Grant
5. Developing Bioinformatics Computer Skills- Cynthia Gibas, per Jambeck

**Course code : CSE-4866**

**Course title : Bio-Informatics Sessional**

**Credit Hours:** 1.5

**Contact Hours:** 3 per week

Laboratory works based on Bio-Informatics

**Course code : CSE-4867**

**Course title : Speech and Language Processing**

**Credit Hours:** 3

**Contact Hours:** 3 per week

1. Words, Parts of Speech, Syntax, Grammars, Semantics,
2. Language Modeling: in General and the Noisy Channel Model
3. Linguistics: Phonology and Morphology Word Classes and Lexicography, Mutual Information, The t-score, The Chi-square test,
4. Hidden Markov Models (HMMs), The Trellis & the Viterbi Algorithms, HMM Tagging (Supervised, Unsupervised),
5. Evaluation Methodology (Examples from Tagging), Precision, recall, Accuracy, statistical Transformation,
6. Rule Based Tagging, maximum Entropy Tagging, Feature Based Tagging, Results of Tagging various Natural Languages,
7. Non-statistical Parsing Algorithms (An Overview), Simple top-down Parser with Backtracking,
8. Probabilistic Parsing, Introduction, Statistical Machine Translation (MT)

**Recommended Books**

1. Foundations of Statistical Natural Language Processing- Manning; C. D. and H. SchOtzte.  
Publisher: The MIT Press
2. Speech and Language Processing: An Introduction to Natural Language Processing,  
Computational Linguistics and Speech Recognition- Daniel Jurafsky, James H. Martin,  
Publisher: Prentice Hall
3. Natural Language Understanding- Allen, J. publisher: The Benajmins/Cummings Publishing  
Company inc.

**Course code : CSE-4868**

**Course title : Speech and Language Processing Sessional**

**Credit Hours:** 1.5

**Contact Hours:** 3 per week

Laboratory works based on Speech and Language Processing

**Course code : CSE-4869**

**Course title : Geographical Information System**

**Credit Hours:** 3

**Contact Hours:** 3 per week

1. Introduction: Terminology, Computer Assisted Cartography, Remote Sensing, Photogrammetriy and Land Information Systems, Geographical Data, GIS Data Capture, GIS Displays etc



2. Spatial Analysis and Cartographic Concepts: Points, Lines, Areas and Surfaces, Normal, Ordinal, Interval and Ratio Attributes, Socio-economic versus Resource and Physical data, Georeferencing, Geocodes etc
3. Map Projections and Transformations, their Properties, Co-ordinate Transformations in 2D and 3D, Fundamental Spatial Concepts: The Quality of Spatial Data, Scale, Accuracy, Precision and Time, Basic Spatial Operations on Lines, Areas and Surfaces, The Object/Layer Debate
4. Technical Aspects of GIS: Relationship between GIS and Other Information Systems, Data Models for Spatial Data: Arcs, Polygons, Topological Data Structures, Polygon Building, Data Capture Devices
5. Digitizing and Scanning Techniques- State of the Art, Special Environment for GIS, Issues of Display, Hard v. Virtual, Vector v. Raster, Data Resolution, Graphics
6. Output Design Issues: Odes of use/GIS Interaction, Temporal and 3d Representation, Line Generalizations, Use and Function of the Global Positioning System (GPS) in GIS
7. The Application of Geographical Information Systems: Purpose and users of GIS, Public Utilities, Resources Analysis, Urban Planning and Decision Support, Knowledge based Techniques in GIS.
8. Global Scale Applications: International Initiatives, Global Data Capture and Referencing, GIS in Practice, Map Analysis, Spatial Data Searches etc. Cost and Benefits of GIS, GIS Global Science, GIS and Spatial Cognition,

**Recommended Books:**

1. GIUS- A Visual Approach, Davis
2. An Introduction to Geographical Information Systems- Dr Ian Heywood , Ms Sarah Cornelius, Dr Steve Carver
3. Geographic Information Systems and Science- Paul A. Longley
4. GIS For Dummies- Michael N. DeMers

**Course code : CSE-4870**

**Course title : Geographical Information System Sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on Geographical Information Systems

**Course code : CSE-4871**

**Course title : Neural Network and Fuzzy System**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-4705]

**Course Objectives:**

- To understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
- To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

**Learning outcomes:**

- The role of neural networks in engineering, artificial intelligence, and cognitive modeling.
- Feed-forward neural networks of increasing complexity, gradient descent learning and extensions, learning and generalization theory
- Have an understanding of the concepts and techniques of neural networks through the study of the most important neural network models.
- Have knowledge of sufficient theoretical background to be able to reason about the behavior of neural networks.
- Be able to evaluate whether neural networks are appropriate to a particular application.



- Be able to apply neural networks to particular applications, and to know what steps to take to improve performance.
- Have knowledge of research literature on neural networks in one particular domain, and be able to put new work into context of that literature.

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

- 1. Introductory Concept:** History of neural network, human brain, biological neural network, synapses and their weights, pre- and post-synaptic signals, activation potential and activation function. Excitatory and inhibitory synapses, biasing input, characteristics of neural network, limitation of neural network, application of neural network
- 2. Fundamental concept of ANN:** Basic models of artificial neuron, activation function, network architecture, neural network viewed as directed graph, Basic learning rules, supervised and unsupervised learning, Competitive learning.
- 3. Perceptrons:** Overview of perceptrons, Single layer of perceptrons, mathematical model of single layer perceptrons, perceptrons learning algorithm, Delta learning rule, Multi-layer perceptrons, Back propagation learning algorithm, mathematical model of MLP network.

**Section-B (Final Exam: 50 Marks)**

**Group-A (20 Marks)**

**Function Approximation:** Basis function network, Radial Basis function networks (RBF), MLP vs. RBF networks, Support vector machine (SVM), Hebbian learning and PCA, Linear Associative Memories (LAMs)

- 4. Competitive Network:** Simple competitive network: Winner-take-all network, Adaptive Resonance Theory (ART), ART-1 architecture and algorithm, Kohonen Self-organizing Maps (SOMs), Counter Propagation Network (CPNs)

**Group-B (30 Marks)**

- 5. Associative memory network:** Linear Feedforward Associative memory network, Recurrent associative memory network, Bidirectional Associative memory network (BAM), Brain-State-in-a-Box (BSB) network, Hopfield networks, Boltzmann machine, Travelling salesman problem
- 6. Fuzzy system:** Introduction to Fuzzy system, Fuzzy relations, fuzzy numbers, Linguistic description and their analytical form, fuzzy control.
- 7. Defuzzification:** Defuzzification Methods, Centroid Method, Center of Sum Method, Mean of Maxima Defuzzification, Applications

Recommended Books:

- 1) Simon Haykin : Neural Networks -- a Comprehensive Foundation
- 2) Zurada, Jacek M. : Introduction to Artificial Neural Systems,
- 3) S. Rajasekaran,G.A. Vijayalakshmi Pai,: Neural Networks, Fuzzy Logics, and Genetic Algorithm
- 4) Stamatios V. Kartalopoulos, : Understanding Neural Networks and Fuzzy Logic,
- 5) Bart Kosko, : Neural Networks and Fuzzy System,
- 6) Mohamad H. Hassoun, :*Fundamentals of artificial neural networks*

**Course code : CSE-4872**

**Course title : Neural Network and Fuzzy System sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on CSE-4811

1. MATLAB and ANN Toolbox
2. Problem related perceptron (Logical AND, OR, NOT Problem)
3. Problem based on Backpropagation Network (XOR problem)
4. **Pattern Recognition:** Classification of Digits 0-9



5. Problems based on Hopfield Model
6. Boltzmann Machine problem: Traveling Salesman Problem
7. Problem related to Self-Organizing Map
8. Problems on Adaptive Resonance Theory
9. Problem on Fuzzy system
10. To perform also other experiments relevant to this course.

**Course code : CSE-4873**

**Course title : Computer Vision and Robotics**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-4703 & CSE-4705]

Introduction to computer vision and perception; Image generation, Physics of image and sensors, statistical, estimation, binary vision and industrial vision systems, representations of the visual world; Two-dimensional systems, common recognition problems; Introduction to robotics: industrial robots, programming systems, geometric reasoning, assembly planning, collision avoidance, mobile robots, robotics IQ test, smart robotics.

Recommended Books:

1. John J. Craig : Introduction To Robotics Machines and Control
2. R. Paul : Robot Manipulators

**Course code : CSE-4874**

**Course title : Computer Vision and Robotics sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on CSE-4813  
To perform also other experiments relevant to this course.

**Course code : CSE-4875**

**Course title : Pattern Recognition and Image processing**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-4703]

Course Objectives:

The course objectives include: overview of digital image processing field ;understand the fundamental DIP algorithms and implementation; gain experience in applying image processing algorithms to real problems, understanding basic concept of pattern recognition.

Learning Outcomes:

After completing this course the students will learn

- The basic concepts of two-dimensional image acquisition, sampling, and quantization.
- Spatial filtering techniques, including linear and non-linear methods.
- The fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.
- Programming techniques in digital image processing related problems.
- Understand segmentation and feature extraction process of pattern recognition.
- To develop a complete pattern recognition system to classify the patterns from images.
- Demonstrated teamwork and communication skills through course projects



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

- 1. Introduction:** Introduction of Digital Image Processing and Pattern Recognition, Application areas, Fundamental steps of Digital Image Processing, Components of Digital Image Processing, Image & Video, Image & Human eyes, Color TV scheme.
- 2. Analog and Digital Image:** Analog and Digital Image, Image Acquisition and acquisition devices, Spatial and amplitude quantization, Pixels, Resolution, Aspect Ratio, Gray levels, Relationship color and gray levels.
- 3. Image Enhancement:** Different types of Image Enhancement operations, Spatial domain and frequency domain processing, Different types of filtering.

**Section-B (Final Exam: 50 Marks)**

**Group-A (20 Marks)**

- 4. Image Compression:** Fundamental concepts of Image Compression and Data Compression, Data Redundancy, Image Compression models, Error free and Lossy compression, Image Compression Standards.
- 5. Morphological processing:** Morphological Image Processing, Dilation, Erosion, Opening, Closing, Hit and Miss etc.

**Group-B (30 Marks)**

- 6. Segmentation:** Image Segmentation, Different types of Segmentation, Edge linking and boundary detection, Thresholding, Region oriented segmentation,
- 7. Image Representation:** Object representation and description algorithms, Run Code, Chain Code, Signature, Skeleton, Boundary detection, Feature Extraction few case studies.
- 8. Pattern Recognition:** Fundamental concepts of Pattern Recognition, Pattern, Pattern Classes, Types of Pattern Recognition, Decision Theoretic methods, Structural method, Statistical method, Neural Network, Few case studies like speech recognition, fingerprint recognition, character recognition etc.

Recommended Books:

- |   |  |
|---|--|
| 1. R. C. Gonzalez, R. E. Woods                  | :Digital Image Processing .              |
| 2. Earl Gose                                    | :Pattern Recognition and Image Analysis. |
| 3. Related Papers from Journals and Conferences |  |
| 4. I.T. Young, J.J. Gerbrands, L.J. van Vliet   | :Image Processing Fundamentals           |
| 5. Russ, J.C.                                   | :The Image Processing Handbook.          |

**Course code : CSE-4876**

**Course title : Pattern Recognition and Image processing sessional**

**Credit Hours: 1.5**

**Contact Hours: 3 per week**

Laboratory works based on CSE-4805

Lab 1: Report on Bitmap image format, Write a program in C/C++ to open a bitmap font image.

Lab2: Image enhancement: Binary Image, gray level image, negative, brightness, darkness, thresholding (single, dual, contrast stretching).

Lab 3: Filtering: Smoothing, Sharpening.

Lab 4: Image Histogram: Calculate the histogram of an image, equalize the image.

Lab 5: Implement various image compression methods.

Lab 7 Implement different segmentation methods.

Lab 8 Pattern recognition using different approaches.

To perform also other experiments relevant to this course.

**Course code : CSE-4877**

**Course title : Machine Learning and Data Mining**

**Credit Hours: 3**

**Contact Hours: 3 per week**

[Pre requisite: CSE-4705]

**Course Objectives:**



- To develop the concepts of and the techniques in key data mining tasks
- To provide hands-on experience with data mining using tools
- To encourage innovative and useful applications of data mining tasks

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to:

- Identify data mining functionalities
- Apply data preprocessing techniques - data cleaning, data integration and transformation, data reduction, discretization, and concept hierarchy generation
- Identify data warehousing functionalities
- Describe data mining primitives, languages, and system architectures
- Apply analytical characterization techniques
- Perform attribute relevance analysis
- Mine descriptive statistical measures in large databases
- Mine association rules in large databases
- Use classification by decision tree induction techniques on large databases
- Use data mining software to perform data mining functionalities – mining association rules, classification and prediction and decision tree analysis.
- Describe the current needs in data mining research

Introduction to machine learning; Learning algorithms: supervised, unsupervised, reinforcement, attribute based, neural network based, relational supervised and negative correlation; Genetic algorithm, genetic programming and evolutionary programming; Practical application of machine learning.

Recommended Books:

1. Data Mining: Concepts and Techniques, Third Edition by Jiawei Han, Micheline Kamber and Jian Pei
2. Web Data Mining, B. Liu, Springer, 2006.
3. Introduction to Information Retrieval, C. Manning et al., Cambridge University Press, Available Online, 2008.
4. Introduction to Data Mining, V. Tan et al. Addison-Wesley, 2006.

**Course code : CSE-4878**

**Course title : Machine Learning and Data Mining Sessional**

Credit Hours: **1.5**

Contact Hours: **3 per week**

**Objectives:**

- To develop the concepts of and the techniques in key data mining tasks
- To provide hands-on experience with data mining using tools
- To encourage innovative and useful applications of data mining tasks

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to:

- Apply data preprocessing techniques - data cleaning, data integration and transformation, data reduction, discretization, and concept hierarchy generation
- Implementing data warehousing functionalities
- Apply analytical characterization techniques
- Perform attribute relevance analysis
- Mine descriptive statistical measures in large databases
- Mine association rules in large databases
- Use classification by decision tree induction techniques on large databases



- Use data mining software to perform data mining functionalities – mining association rules, classification and prediction and decision tree analysis.

**List of Experiments**

1. Experiment on Missing Data Imputation
2. Data Normalization
3. Association Rule Mining
4. Experiments on different classification algorithms
5. Experiments on different clustering algorithm
6. Principal Component Analysis
7. Implementation of Decision Tree Induction
8. Implementation of Ensemble Method
9. Back Propagation algorithm
10. Hidden Markov Model
11. Support Vector Machine
12. Random Forest

**Lab Requirement:**

**Hardware:** PC [with latest Configuration]

**Software:** OS: Windows 7 or above, R-3.4.0 or above, Python 3.6.1 or above, Weka 3.8.1 or above.

**Recommended Books:**

1. Data Mining Principles and Applications: T V Suresh Kumar, B Eswara Reddy, Jagadish S Kallimani
2. Data Mining: Concepts and Techniques, Third Edition by Jiawei Han, Micheline Kamber and Jian Pei
3. Web Data Mining, B. Liu, Springer, 2006.
4. Introduction to Information Retrieval, C. Manning et al., Cambridge University Press, Available Online, 2008.
5. Introduction to Data Mining, V. Tan et al. Addison-Wesley, 2006.