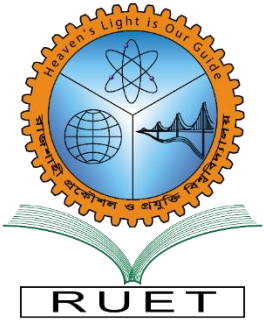
Information Booklet

Undergraduate Studies



Department of Computer Science & Engineering

Rajshahi University of Engineering & Technology

Issued to……...

Roll No……....

Session…….

Head of the Department

Date……

Rajshahi University of Engineering & Technology

Introduction

History of the University

Rajshahi University of Engineering & Technology, abbreviates as RUET, started functioning from September 2003, is one of the prominent and prestigious self-degrees awarding university in the engineering education of Bangladesh. It was founded in 1964 as a faculty of Engineering under the University of Rajshahi providing four years Bachelor degree in Civil, Electrical & Electronic and Mechanical Engineering. To circumvent the aforesaid problems several committees and commissions were formed since 1973. The consistent effort of these committees ultimately led to the establishment of four Engineering colleges to Bangladesh Institute of Technology (BIT) in July 1986. With a view to providing more opportunity and autonomy for the improvement in the quality of higher education and research in engineering and technology, the Institute was upgraded and renamed as Rajshahi University of Engineering & Technology in September 2003 under the "Rajshahi University of Engineering & Technology Act, 2003".

The university was financed by the Government through the university Grants Commission. The university is an autonomous statutory organization of the Government of Bangladesh functioning within the "Rajshahi University of Engineering & Technology Act, 2003". There are various statutory bodies like Syndicate, Academic Council, Finance Committee, Planning and Development Committees etc. for policy and decision making on different aspects of the university under the frame work of the Act.

Vision of the University

To produce highly-skilled human resources through engineering and technology focused education and research in order to contribute to the socio-economic development of the country.

Mission of the University

1	To produce technologically-sound professional human resources with high moral and ethical values in order to meet the demand of the society.
2	To create a conducive environment to confirm high standard higher education, research and innovation in the area of engineering and technology.
3	To create opportunities for multidimensional academic collaboration between universities, industries and professional organizations in higher education, research and innovation.
4	To provide and receive on-demand advice and recommendation to solve scientific and technical issues at national and international level.
5	To contribute in policy formulation in order to obtain sustainable socio-economic and industrial development of Bangladesh.

Location

Rajshahi University of Engineering & Technology is situated at Kazla, five kilometers east of Rajshahi city and by the side of Rajshahi-Natore-Dhaka highway. The university campus extends over an area of 152 acres. Tastefully laid out with beautiful plantation, buildings of various nature and stature, clean and wide roads the campus present spectacle of harmony in architecture and natural beauty. The campus is

laid out with picturesque landscape by the side of famous Padma River and Rajshahi University.

The RUET Campus

The Campus of RUET is remarkable for its natural beauty. It is well organized by many evergreen trees and roads. Mainly the campus area is divided into different functional zones: (i) Residence for students, (ii) Residential zones of faculty and other supporting staffs, (iii) Academic zone for academic buildings and laboratories/workshops, and (iv) Cultural cum social and recreational zones for students. A branch of Rupali Bank, a post office, an auditorium, a central mosque and a medical center are located on the campus. There is Agrani School and College in the campus for facilitating education of the children of university employees. The shopping center includes a branch of general stores, barber shop, photo copying facilities, restaurant and a big playing field. The campus is fully residential providing comfortable social life.

Transportation

The university runs its own regular bus service to and from the city for benefit of the students residing there. This service helps the students to attend the classes at the morning without any delay. Besides, all kinds of mechanized transports carry out between the city and RUET as regular stoppage.

Faculties and Departments

RUET has four faculties and fourteen Bachelor degree departments. At present undergraduate programs leading to Bachelor of Science in Engineering (B.Sc. Engg.), Bachelor of Urban & Regional Planning (BURP) and Bachelor of Architecture degrees are offered in fourteen departments.

Faculty of Electrical & Computer Engineering consists of the following departments

i) Department of Computer Science & Engineering (CSE)
ii) Department of Electrical & Electronic Engineering (EEE)
iii) Department of Electronic & Telecommunication Engineering (ETE)
iv) Department of Electrical & Computer Engineering (ECE)

Faculty of Civil Engineering consists of the following departments

i) Department of Civil Engineering (CE)
ii) Department of Urban & Regional Planning (URP)
iii) Department of Architecture (ARCH)
iv) Department of Building Engineering & Construction Management (BECM)

Faculty of Mechanical Engineering consists of the following departments

i) Department of Mechanical Engineering (ME)
ii) Department of Industrial Production Engineering (IPE)
iii) Department of Mechatronics Engineering (MTE)
iv) Department of Glass & Ceramics Engineering (GCE)
v) Department of Chemical Engineering (ChE)
vi) Department of Material Science & Engineering (MSE)

Faculty of Applied Science & Humanities consists of the following departments

i) Department of Chemistry
ii) Department of Humanities
iii) Department of Physics
iv) Department of Mathematics

Institute

i) Institute of Information & Communication Technology.
ii) Institute of Energy & Environmental Studies.

Administrative Building

The administrative building of RUET is a three storied building. It situated in the central point of RUET campus. It accommodates the offices of Vice-Chancellor, Registrar and different offices. The laboratories of Physics and Chemistry departments are also situated in this building.

Facilities

The University provides various educational and related facilities to build students with the ability to plan, administer and manage the latest technologies to decrease the gap between developed and developing countries. A brief description of them is given below.

Central Library

There is an excellent central library in RUET. The library building is within the walking distance from the academic buildings and students' residences. There are lot of facilities such as reading facility, borrowing of books, journals etc. to the students and teachers of RUET. In consistent with the

academic curricula and development of the world the contents of the library are updated consistently to keep up with modern technological trends.

Rental Library

To accelerate the library facility, each degree-awarding department has its own rental library that provides books on demand to the students for every semester.

Students Health Service

An on campus medical center provides primary and basic health care facilities to the students (residential and non-residential) free of charges. Full-time MBBS doctors, nurses, and staffs provide these facilities to the students. For specialized consultation on complicated cases, the center refers the patients to specialist consultants.

Central Computer Center

RUET has a central computer center providing computing and Internet facilities to the students and faculty members. It is equipped with high-configured PCs and Network Servers, and Printing and Data storage facilities. The center often offers short training courses to skill oneself.

CISCO Networking Academy

CISCO networking academy, RUET offers four semesters CISCO course in Computer Science & Engineering Department at RUET.

Directorate of Student Welfare

The Directorate of Student Welfare (DSW) is responsible for the various activities related to the physical, social and other aspects of the students' welfare. The DSW monitor the supervision for halls of residence, programs for physical education, games and sports, supervision of the programs of co-curricular activities of students through the Central Student Union and through the students' union of the various halls of residence. It is also responsible for providing health services through the students' health center.

The Central Students Union

The students have their own Central Students Union for their welfare. Most of its members are elected by the students, maintains and aids the new students in their introduction to the RUET as well as in looking after the problems of the students.

The student unions also arrange their individual co-curricular activities, literary competitions, local computer-programming contest, IT quizzes. The union also takes active part for the proper management of the hall administration.

Students Hall of Residences

There are seven halls of residence at RUET campus. The total capacity of these halls is about 2050. Name of the halls with their respective capacities are depicted in the table below. Some of the halls are named after the national hero who sacrificed their lives in the liberation war of Bangladesh in 1971.

The existing capacity is around 70% of the total number of students of RUET. Non-residential students are to be attached

with a hall so that the administrative control on the students becomes hall based.

Residential Halls of RUET

Serial No.	Name of the Halls	Residential Capacity
1.	Shahid Lt. Selim Hall	350
2.	Shahid Shahidul Islam Hall	225
3.	Shahid Abdul Hamid Hall	225
4.	Tin Shed Hall (Extension)	100
5.	Deshrotno Sheikh Hasina Hall	250
6.	Bangabandhu Sheikh Mujibur Rahman Hall	450
7.	Shahid President Ziaur Rahman Hall	450

All halls are set in gardens and frontal green plantations and lawns and all halls are within easy walking distance of the University. The students live in these halls on community basis, while 2, 3 or 4 students share a single room, depending on its size. Each hall has a common room facility. A provost and some assistant provosts administrate each hall.

Games and Sports Facilities

RUET has a modern sports center, which provides excellent facilities to students for acquiring physical fitness that is indispensable for a healthy mind and body. The University has a beautiful playground, tennis lawn and basketball court. The sports center arranges a colorful athletic competition every year in the form of annual sports competition.

The University arranges inter-year, inter-departmental football, cricket, basketball, badminton, volleyball competition and also various indoor games. Teacher student friendly games are also arranged during some special occasions.

Auditorium Complex and Seminar Hall

The University has an excellent Auditorium Complex with modern facilities having a seating capacity of about 700 audiences, which is capable of holding conferences, seminars and other cultural programs. Besides this, there are individual seminar and conference rooms in each engineering degree awarding departments.

Central Mosque

The central mosque of Rajshahi University of Engineering and Technology is situated within the walking distance of teachers and staffs quarters as well as the students' residential halls. All the religious Muslims take their prayer here without having any difficulty. The building is under reconstruction considering its existing limited capacity.

Cafeteria

The central cafeteria is under construction near the main gate of RUET. It is within the walking distance from the academic and administrative building. Students, Teachers and the Staffs can get refreshment easily from the cafeteria with cheap rate.

RUET Administration

RUET administration is governed by the rules and statues framed in the University ordinance 2003. On the recommendation of Academic Council and various committees as mentioned in the ordinance, the Syndicate approves the policies and operational procedures of the University. The Vice Chancellor is the administrative head of the University.

Chancellor
Mohammed Shahabuddin
Vice Chancellor

Registrar (In-Charge)
Arif Ahammad Chowdhury

Department of Computer Science & Engineering

About the Department

Department of Computer Science & Engineering includes twenty-three active faculty members, seventeen staff members, seven hundred and twenty undergraduate students (180 graduates per year). It is ranked highly among all the departments of Rajshahi University of Engineering & Technology. We are active in most of the principal areas of the field, and are engaged in a broad range of interdisciplinary initiatives. Computer Science is the discipline that studies the structure, function, and applications of computers as well as the interconnection of computers. Covering topics in the areas of foundations of computer science and computer engineering, artificial intelligence, networking, computer graphics, multimedia computing, software and web technologies, and data and knowledge-based systems, the Computer Science & Engineering programs at this University are dedicated to educating students and to advance research in computer and information technology; as well as to assist in the development and growth of the information industry in the region.

The Department offers a full range of courses to meet the needs of its own students and those from other departments. Its programs lead to the B. Sc. Engg. degree. Aside from taking computer science courses, students are encouraged to design individual study plans tailored to their own interests.

Further, the ability to build a new economy is easier in software than anything else one can set up shop in an office and generate revenue in short order.

We are located in the spectacular newly built building which is beside the auditorium and the Department of Electrical &

Electronics Engineering. The departmental events include student defenses, seminars, lectures, research presentations, study tour, fresher orientation, yearly sports competitions, debates, and other student events.

Vision of the Department

To become a nationwide and global center of excellence by empowering innovation, leading technological evolution, and ensuring the advancement, application, and dissemination of knowledge in diverse domains of Computer Science and Engineering via extensive educational programs, industry collaborations, research, and scholarly publications.

Mission of the Department

1	To deliver contemporary educational programs through proper application and continuous dissemination of Computer Science and Engineering knowledge and train students to confront and resolve complex real-world challenges ensuring significant contribution to the prosperity of the nation and society.
2	To conduct cutting-edge research for the advancement in Computer Science and Engineering and allied fields by collaborating with stakeholders for creating professionals in academia, government and industry.
3	To create leadership by promoting ethical and virtuous values and prepare students as lifelong learner of enhanced skills and abilities to guide them for industrial revolution.

List of Faculty Members

Dr. Md. Ali Hossain
Professor
Head of the Department

Ph. D., University of New South Wales (UNSW), Canberra, Australia
B. Sc. Engg., RUET, Bangladesh

Fields of Specialization: Pattern Recognition, Image Classification, Feature Extraction, Machine Learning, Hyperspectral Image Analysis, Remote Sensing Technology

Dr. Md. Shahid Uz Zaman
Professor

Ph. D., University of Ryukyus, Japan
M. Sc. Engg., University of Shanghai, China
B. Sc. Engg., RUET, Bangladesh

Fields of Specialization: GIS-based Mapping, VRPs and Satellite Imaging, Database Management System and Algorithms

Dr. Md. Nazrul Islam Mondal
Professor

Ph. D., Hiroshima University, Japan
M. Sc. Engg., Asian Institute of Technology, Thailand
B. Sc. Engg., RUET, Bangladesh

Fields of Specialization: FPGA-based Reconfigurable Computing, Parallel Computing, Mobile Computing, Algorithms and Architectures, Image Processing, Digital Signal Processing, Computer Networks and Data Communications

Dr. Md. Rabiul Islam
Professor

Ph. D., RUET, Bangladesh
M. Sc. Engg., RUET, Bangladesh
B. Sc. Engg., RUET, Bangladesh

Fields of Specialization: Biometric Security, Pattern Recognition, Audio-Visual, Speaker Identification, Speech and Speaker Recognition, Artificial Intelligence, Face Recognition, Image and Signal Processing.

	**Dr. Boshir Ahmed** Professor Ph. D., RUET, Bangladesh M. Sc. Engg., RUET, Bangladesh B. Sc. Engg., DUET, Bangladesh **Fields of Specialization:** Computer Vision: Image Classification, Objects Recognition. Feature Extraction and Nonlinear Image Classification, Remote Sensing: Hyperspectral Image Classification, Image Compression and Change Detection, Digital Signal Processing: Audio and Acoustic Signal Processing, Computer Networks and Data Communication., Microprocessor Based System Design
	**Rizoan Toufiq** Associate Professor M. Sc. Engg., RUET, Bangladesh B. Sc. Engg., RUET, Bangladesh **Field of Specialization:** Classifier Fusion Techniques, Pattern Recognition, Machine Learning, Digital Image Processing
	**Shyla Afroge** Associate Professor M. Sc. Engg., RUET, Bangladesh B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Machine Learning, Image Processing, Bioinformatics, Data Mining, Pattern Recognition

	**Dr. Julia Rahman** Assistant Professor Ph. D., Griffith University, Australia M. Sc. Engg., B. Sc. Engg., RUET, Bangladesh **Field of Specialization:** Bioinformatics, Water Quality Monitoring, Machine Learning, IoT
	**Emrana Kabir Hashi** Assistant Professor M. Sc. Engg., RUET, Bangladesh B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Vehicle Routing Problem, Artificial Intelligence, Machine Learning, Deep Learning
	**Sadia Zaman Mishu** Assistant Professor M. Sc. Engg., RUET, Bangladesh B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Remote Sensing Image Analysis, Machine Learning, Natural Language Processing, Deep Learning

	**Barshon Sen** Assistant Professor B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Generative Artificial Intelligence, Heterogeneous Deep Learning.
	**S. M. Mahedy Hasan** Assistant Professor B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Explainable Artificial Intelligence, Pedagogy, Machine Learning, Deep Learning, Computer Vision
	**Suhrid Shakhar Ghosh** Assistant Professor B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Explainable Artificial Intelligence, Machine Learning
	**Nahin Ul Sadad** Assistant Professor B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Computer Architecture, Parallel Processing, Machine Learning

	**Md. Zahirul Islam** Assistant Professor M. Sc. Engg., RUET, Bangladesh B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Video Compression, Video Coding for Machines (VCM), Visual Signal Processing/Communication
	**Md. Farukuzzaman Faruk** Assistant Professor M. Sc. Engg., RUET, Bangladesh B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Deep Learning, Machine Learning, Biomedical Imaging, Biomedical Signal Processing
	**Mohiuddin Ahmed** Assistant Professor M. Sc. Engg., RUET, Bangladesh B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Deep Learning, Digital Image Processing, Biometrics, Machine Learning, Biomedical Imaging, Natural Language Processing

	**Md. Azmain Yakin Srizon** Assistant Professor M. Sc. Engg., RUET, Bangladesh B. Sc. Engg., RUET, Bangladesh **Fields of Specialization**: Computer Vision, Pattern Recognition, Biomedical, Bioinformatics, Deep Learning, Transfer Learning, Machine Learning, Digital Image Processing
	**A. F. M. Minhazur Rahman** Assistant Professor B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Digital Image Processing, Computer Vision
	**Utsha Das** Lecturer M. Sc. Engg., RUET, Bangladesh B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Machine Learning, Data Mining, Health Informatics
	**Md. Sozib Hossain** Lecturer B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Hardware Acceleration, FPGA, Artificial Intelligence, Machine Learning, Deep Learning, Medical Image Analysis, Computer Vision

	**Md. Nasif Osman Khansur** Lecturer B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Artificial Intelligence, Machine Learning, Deep Learning, Medical Image Analysis, Computer Vision, Human-Computer Interaction
	**Md. Mazharul Islam** Lecturer B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Machine Learning, Bioinformatics
	**Md. Farhan Shakib** Lecturer B. Sc. Engg., RUET, Bangladesh **Fields of Specialization:** Satellite Image Processing, Deep Learning, Digital Image Processing

Faculty Members (On Leave)

Professor:
- Dr. Md. Al Mehedi Hasan
- Dr. Md. Al Mamun

Assistant Professor:
- Firoz Mahmud
- Biprodip Pal
- Mumu Aktar
- Abu Sayeed
- Mahit Kumar Paul

Lecturer:
- S. M. Shovan
- Md Rakibul Haque
- Tasmia Jannat
- Farjana Parvin

Academic Ordinance
for the Undergraduate Studies

(Recommended by the 97th Academic Council held on 08/05/2019 and approved in 85th Syndicate Meeting held on 30/07/2019; Amendment at the 130th Academic Council held on 26/07/2022)

1. Definitions:

1.1 'University' means the Rajshahi University of Engineering & Technology abbreviated as RUET.

1.2 'Syndicate' means Syndicate of RUET.

1.3 'Academic Council' means the Academic Council of the University.

1.4 'Deans Committee' means the Executive Committee of concerned Faculty of the University.

1.5 'Academic Committee' means the Academic Committee for Undergraduate Studies of Department of the University.

1.6 'Vice-Chancellor' means the Vice-Chancellor of the University.

1.7 'Dean' means the Dean of the Faculty of the University.

1.8 'Head of the Department' means the Head of a Department of the University.

1.9 'Central Equivalence Committee' means the Central Equivalence Committee of the University.

1.10 'Degree' means the degree of Bachelor of Science in Engineering or Bachelor of Urban & Regional Planning or Bachelor of Architecture offered by the University.

1.11 'Course System' means pass or fail on course basis.

1.12 'Backlog Courses' means the failed courses after appearing at odd/even semester(s) examination.

1.13 'Short Semester' means a semester for conducting classes and examinations of Backlog course(s) at the end of 4^{th} /5^{th} year Backlog examination result.

2. Faculties:

The University has four Faculties:

1) Faculty of Civil Engineering (CE)
2) Faculty of Electrical & Computer Engineering (ECE)
3) Faculty of Mechanical Engineering (ME)
4) Faculty of Applied Science & Humanities (ASH)

2.1 Degree Awarding Departments:

The University has the following Degree Awarding Departments under four Faculties:

i) Department of Civil Engineering (CE)
ii) Department of Electrical & Electronic Engineering (EEE)
iii) Department of Mechanical Engineering (ME)
iv) Department of Computer Science & Engineering (CSE)
v) Department of Electronic and Telecommunication Engineering (ETE)
vi) Department of Industrial and Production Engineering (IPE)
vii) Department of Glass & Ceramic Engineering (GCE)
viii) Department of Urban & Regional Planning (URP)
ix) Department of Mechatronics Engineering (MTE)
x) Department of Architecture (ARCH)
xi) Department of Electrical & Computer Engineering (ECE)
xii) Department of Chemical Engineering (ChE)

xiii) Department of Materials Science & Engineering (MSE)
xiv) Department of Building Engineering & Construction Management (BECM)
xv) Any other Department to be instituted by the Syndicate on the recommendation of the Academic Council.

2.2 Teaching Departments:

The University has the following teaching departments as defined in the statutes:

i) Department of Civil Engineering
ii) Department of Electrical & Electronic Engineering
iii) Department of Mechanical Engineering
iv) Department of Computer Science & Engineering
v) Department of Electronic and Telecommunication Engineering
vi) Department of Industrial and Production Engineering
vii) Department of Glass & Ceramic Engineering
viii) Department of Urban & Regional Planning
ix) Department of Mechatronics Engineering
x) Department of Architecture
xi) Department of Electrical & Computer Engineering
xii) Department of Chemical Engineering
xiii) Department of Materials Science & Engineering
xiv) Department of Building Engineering & Construction Management
xv) Department of Mathematics
xvi) Department of Physics
xvii) Department of Chemistry
xviii) Department of Humanities

xix) Any other Department to be instituted by the Syndicate on the recommendation of the Academic Council.

3. Degrees Offered:

The University offers courses leading to the award of the following degrees:

i. Bachelor of Science in Civil Engineering abbreviated as B.Sc. Engg. (CE)
ii. Bachelor of Science in Electrical & Electronic Engineering abbreviated as B.Sc. Engg. (EEE)
iii. Bachelor of Science in Mechanical Engineering abbreviated as B.Sc. Engg. (ME)
iv. Bachelor of Science in Computer Science & Engineering abbreviated as B.Sc. Engg. (CSE)
v. Bachelor of Science in Electronic & Telecommunication Engineering abbreviated as B.Sc. Engg. (ETE)
vi. Bachelor of Science in Industrial and Production Engineering abbreviated as B.Sc. Engg. (IPE)
vii. Bachelor of Science in Glass & Ceramic Engineering abbreviated as B.Sc. Engg. (GCE)
viii. Bachelor in Urban & Regional Planning abbreviated as BURP.
ix. Bachelor of Science in Mechatronics Engineering abbreviated as B.Sc. Engg. (MTE)
x. Bachelor in Architecture abbreviated as B. ARCH.
xi. Bachelor in Electrical & Computer Engineering abbreviated as B.Sc. Engg. (ECE)
xii. Bachelor in Chemical Engineering abbreviated as B.Sc. Engg. (ChE)
xiii. Bachelor in Materials Science & Engineering abbreviated as B.Sc. Engg. (MSE)

xiv. Bachelor in Building Engineering & Construction Management abbreviated as B.Sc. Engg. (BECM)

Any other degree that may be awarded by any department on the approval of the syndicate on the recommendation of the Academic council.

4. Student Admission, Equivalence and Admission Transfer:

4.1 The four academic years of study for the Bachelor degree have been designated as 1st year class, 2nd year class, 3rd year class and 4th year class in succeeding higher levels of study. For Architecture, five years of study for the Bachelor degree have been designated as 1st year class, 2nd year class, 3rd year class, 4th year class and 5th year class in succeeding higher levels of study.

Students shall be admitted into the 1st year class.

4.2 The Academic Council will form an Admission Committee in each academic session for admission into 1st year Bachelor Degree class.

4.3 A candidate for admission into the 1st year class must have passed the H.S.C Examination from a Secondary and Higher Secondary Education Board in Bangladesh (after 12 years of schooling) with Physics, Chemistry, Mathematics and English as his/her subjects of Examination in Higher Secondary level or examination recognized as equivalent thereto, and must also fulfill all other requirements as prescribed by the Academic Council on the recommendation of the Admission Committee. In case of confusion regarding the equivalence, the case may be referred to Equivalence Committee.

4.4 All candidates for admission into the courses of Bachelor Degree must be the citizens of Bangladesh. Candidates for all seats except the reserved (Tribal) ones, if any, are

selected on the basis of merit. However, all candidates must pass the required level as set by the admission committee. The Academic Council, on the recommendation of the Admission Committee, frames the rules for admission into the reserved seats.

4.5 No student ordinarily is admitted in the 1st year class after the corresponding classes start or after the call goes out for admission into the next session, whichever is earlier.

4.6 Admission of a newly admitted student in the 1st year class is canceled if he/she fails to attend any class within the first two consecutive cycles after the start of class without prior permission. The date of commencement of classes for the newly admitted students will be announced in advance.

4.7 An Equivalence Committee consisting of at least five members will be formed by the Academic Council in order to consider the equivalence of different public examinations.

4.8 A candidate, seeking admission on transfer from other University, should apply to the Registrar of the University if there is any exchange program with that university. The Registrar will refer the case to the concerned Head of the Department and also to the Equivalence Committee. On receiving the opinions of the Head of the Department and of the Equivalence Committee, the matter will be forwarded to the Academic Council. The Academic Council's decision will be communicated to the Head of the Department and the candidate.

4.9 There is no transfer in the 1st year class. In special cases, students may be admitted into a higher class under clause 4.8.

4.10 Every student being admitted to the University shall be examined by a competent medical officer as prescribed in the admission rules.

5. Method of Course Offering and Instruction:

The undergraduate curricula at RUET are based on course system. The salient features of course system is:

i) Number of theoretical courses and examination papers shall be five in each semester (except for architecture and URP).
ii) Continuous evaluation of student's performance.
iii) The flexibility to allow the student to progress at his/her own pace depending on his/her ability or convenience, subject to the regulations on credit and minimum grade point average (GPA) requirements.
iv) Promotion of teacher-student contact.

6. Academic Calendar:

6.1 The academic year is ordinarily divided into two semesters each having duration of not less than 13 weeks.

6.2 There are final examinations at the end of each semester conducted by the respective degree awarding departments of the University.

6.3 On the approval of the Academic Council an academic schedule for the year will be announced for general notification before the start of the academic year.

The schedule may be prepared according to the following guidelines:

Odd Semester	**Duration**
Classes	13 Weeks
Mid-semester recess	1 week
Recess before examination and Semester Final Examination	29 days
Inter-Semester Recess	1 weeks
Even Semester	**Duration**
Classes	13 Weeks
Mid-semester recess	1 week
Recess before examination and Semester Final Examination	29 days
Inter-Year Recess	1 week
Vacation and others	Rest
Total	52 Weeks
Short Semester	**Duration**
Classes and Examinations	10 weeks

7. Duration of Course and Course Structure:

7.1 Bachelor Degree courses (except Architecture) extend over a period of four academic years (8 semesters), each of a normal duration of one calendar year, which is divided as necessary for the purpose of academic program and conduct of examinations. For Bachelor degree in Architecture, the period will be five academic years (10 Semesters).

7.2 The curricula of the Bachelor degree in the different departments are as proposed by the respective Academic and Dean's Committee and approved by the Syndicate on the recommendation of the Academic Council.

7.3 The Academic Committee reviews the curricula as required and put forward suggestions to the Academic Council through Dean's Committee.

7.4 Teaching for the courses is reckoned in credits and the credits allotted to various courses are determined by the Academic Committee with the following guidelines:

Nature of Course	Contact hour	No. of Credit
i) Theory	1 hour/week	1
ii) Tutorial	1 hour/week	1
iii) Independent sessional/design	3/2 hours/week 2 hours/week 3 hours/week and similar	0.75 1 1.5
iv) Project & thesis	3 hours/week and similar	1.5
v) Field work / Industrial Training	2-4 weeks of field work	1-1.5

7.5 The total number of credits that a student has to complete successfully for the award of Bachelor degree is minimum 160 except for Bachelor in Architecture. The maximum period of candidature is seven years, i.e., 3 years (6 semesters) more than the normal time required to complete the course. For Architecture the minimum credit will be 200.

7.6 The total number of credits per week in a semester shall be as approved curricula.

7.7 The total contact hours for students including lecture, tutorial and sessional is around 25 (35 for Architecture) periods per week, each period being of minimum 50 minutes duration.

7.8 In each degree-awarding department, one of the senior teachers nominated by the Head of the Department acts as

Course Coordinator who acts as Member Secretary to the academic committee.

7.9 A course plan for each course, approved by the Course Coordinator, showing details of lectures may be announced at the start of each semester.

7.10 Credits in any theory subject do not exceed 4 and that in sessional subject do not exceed 3.0. For Architecture credits in sessional subject will not exceed 12.0.

8. Course Designation and Numbering System:

Details of the course designation and number system are provided in Annexure A.

9. Types of Courses:

The courses included in undergraduate curricula are divided into several groups as follows:

9.1 **Core Courses:** In each discipline a number of courses are identified as core courses which form the nucleus of the respective Bachelor's degree program. A student has to complete all of the designated core courses for his discipline.

9.2 **Pre-requisite Course:** Some of the core courses are identified as pre-requisite courses. A pre-requisite course is one, which is required to be completed before taking some other course(s). Any such course, on which one or more subsequent courses build up, may be offered in each of the two regular semesters (if possible).

9.3 **Optional Courses:** Apart from the core courses, students have to complete a number of courses which are optional in nature. In those cases, students will have some choices to choose the required number of courses from a specified group/number of courses.

10. Departmental Monitoring Committee and Student Adviser:

10.1 **Department monitoring committee:** Each department constitutes a Departmental Monitoring Committee with two teachers from the respective Department as members, nominated by the Academic Committee and Head of the Department as chairman. This committee monitors and evaluates the performance of the Course System within the Department. The committee may also propose from time to time to the Academic Committee if any changes and modifications needed for upgrading/changing the Undergraduate Curriculum and the Course System.

10.2 **Student Adviser:** Advisor(s) are appointed for a batch of student by the Department Monitoring Committee of the concerned Department(s) who advises each student on the courses to be taken by a student. Adviser discusses with the student on his academic program and then decides the nature of courses for which he/she can register. However, it is the student's responsibility to keep contact with his adviser who reviews and eventually approves the student's specific plan of study and checks on subsequent progress. The adviser generally be of the rank of an Assistant Professor or above from the concerned Department(s). However, in case of shortage of teachers, Lecturers may be appointed as adviser.

For a student of second and subsequent semesters, the nature of courses for which he can register will be decided on the basis of his/her academic performance during the previous semester(s). The adviser advises the students to register for the courses during the next semester within the framework of the guidelines in respect of minimum/maximum credit hours limits.

11. Registration Requirements:

Any student who wants to study a course is required to register formally. Being admitted to the University, each student is assigned to a student adviser. The student can register for courses he/she intends to take during a given semester only on the basis of the advice and consent of his/her adviser.

11.1 **Registration Procedure:** Students must register for each class in which they will participate. Each student will fill up his/her Course Registration Form in consultation with and under the guidance of his/her adviser. The original copy of the Course Registration Form(s) will be submitted to the Registrar's Office, and then the requisite number of copies will be distributed to the adviser and Head. The date, time and venue for registration will be announced in advance by the Department's Office. It is absolutely necessary that all students present themselves for registration at the specified time.

11.2 **Limits on the Credit Hours to be taken:** A student must be enrolled for the requisite number of credits as mentioned in article 7.6. A student must enroll for the prescribed sessional courses in the respective semester within the allowed credit limits.

11.3 **Pre-condition for Registration:** A student will be allowed to register in those courses subject to the satisfaction of pre-requisite courses. If a student fails in a pre-requisite course in any semester, the concerned Department Monitoring Committee may allow him/her to register for a course which builds on the pre-requisite course provided his attendance and grades in continuous assessment in the said pre-requisite course is found to be satisfactory.

Registration will be done at the beginning of each semester. Late registration is however, permitted during the second week on payment of a late registration fee. Students having outstanding dues to the University or a hall of residence shall not be permitted to register. All students have therefore, to clear their dues and get a clearance or no dues certificate, on the production of which, they will be given necessary Course Registration Forms and complete the course registration procedure. Registration Forms are normally available in the Register's office. An orientation program will be conducted for only the first-year students at the beginning of the first semester when they will be handed over the registration package on producing enrollment slip/proof of admission.

11.4 **Registration Deadline:** Student must register for the courses to be taken within 1 (One) cycle from the commencement of each semester and no late registration will be accepted after 2(Two) cycles of classes. Late registration after this date will not be accepted unless the student submits a written appeal to the Registrar through the concerned Head and can document extraordinary circumstances such as medical problems (physically incapacitated and not able to be presented) or some other academic commitments which precluded enrolling prior to the last date of registration.

11.5 **Penalty for Late Registration:** Students who fail to register during the designated dates for registration are charged a late registration fee Tk 500/= per cycle. This extra fee will not be waived whatever be the reason for late registration.

11.6 **Withdrawal from a Semester:** If a student is unable to complete the semester Final Examination due to illness,

accident or any other valid reason etc., he/she may apply to the Head of the department. Each Department will decide for total withdrawal from the semester before the start of the semester final examination. He/she may choose not to withdraw any laboratory/sessional/design course if the grade obtained in such a course is 'D' or better. The application must be supported by a medical certificate from any authorized Medical Officer. The Academic Council will take the final decision about such applications. However, he/she will not be permitted to the next year class unless he/she completes the required credit for that year.

12. Striking off the Names and Readmission:

12.1 The names of the students shall be struck off and removed from the rolls on the following grounds:

i) Non-payment of University fees and dues within the prescribed period.

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

iii) Withdrawal of names from the rolls of the University on grounds acceptable to the Vice-Chancellor of the University/ nominated authority after having cleared all dues.

iv) Could not earn required credits for graduation as outlined in the respective curriculum and/or fulfill CGPA requirement within the maximum allowed time of 7 academic years. For Architecture maximum allowed time is 8 academic years.

v) Every student whose name has been struck off the rolls by exercise of the clauses (ii) of Article 12.1 seeking

re-admission after expiry of the period for which he/she was forced to discontinue his/her studies, shall submit an application to the Head of the Department in the prescribed form before the commencement of the session to which he/she seeks re-admission. The Head of the Department shall forward the application to the Registrar of the University with his remarks. In case the readmission is allowed, the student will be required on payment of all dues to get him/her-self admitted no later than one week from the date of permission given by the Registrar. All readmission should preferably be completed before the session starts. The percentage of attendance of the re-admitted students shall be counted from the date of recommendation of the concerned Head of the department.

vi) No student who has withdrawn his/her name under clause (iii) of Article 12.1 shall be given readmission.

vii) In case, a student whose name has been struck off the rolls under clause (i) of Article 12.1 seeks readmission within the session in which his/her name was struck off, he/she shall be readmitted on payment of all the arrears fees and dues. But if he/she seeks readmission in any subsequent session, the procedure for his/her readmission will be the same as described under Article 12.2.

viii) The application of a student for readmission will be considered if he/she applies within two academic sessions from the semester of discontinuance of his/her studies in the University. Other than debarment as punishment under the ordinance related to discipline, a student failing for any other reason whatsoever to become a candidate for a semester final examination in which he/she ought to have had in the usual process of his/her progressive academic activities, shall be considered to have discontinued his/her studies for the

relevant semester together with striking the name off from current roll and two such discontinuance periods will be considered equivalent to that for one academic session. The maximum period of discontinuance under no circumstances is to exceed two academic sessions during a student's period of studies for the degree.

ix) In case any application for readmission is rejected, the student may appeal to the Academic Council and, in this case, the decision of the Academic Council shall be final.

x) A student, whose name has been struck off the rolls by exercise of clause (iv) of Article 12.1, is not eligible to seek readmission.

xi) After Short semester, if any student fails to complete his/her required courses he/she will take readmission in the final year.

13. Grading System:

The letter grade system shall be used to assess the performance of the student and shall be as follows:

Numerical grade	**Letter grade**	**Grade point**
80% or above	A+ (A Plus)	4.0
75% to less than 80%	A (A Regular)	3.75
70% to less than 75%	A- (A Minus)	3.5
65% to less than 70%	B+ (B Plus)	3.25
60% to less than 65%	B (B Regular)	3.0
55% to less than 60%	B- (B Minus)	2.75
50% to less than 55%	C+ (C Plus)	2.5
45% to less than 50%	C (C Regular)	2.25
40% to less than 45%	D	2.0
Less than 40%	F	0
Incomplete	**I**	-
Need to register again	--	-

A grade 'I' shall be awarded for courses (like project & thesis, design etc.) in the odd semester, which continue through to the even semester.

13.1 **Calculation of GPA and CGPA:** Grade point average (GPA) is the weighted average of the grade points obtained in all the courses passed/completed by a student in a semester. 'F' grades do not count for GPA calculation. GPA of a semester will be calculated as follows:

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

where, n is the total number of courses passed by the student, C_i is the number of credits allotted to a particular course i and G_i is the grade point corresponding to the grade awarded for i-th course.

The overall or Cumulative Grade Point Average (CGPA) gives the cumulative performance of the student from first semester up to any other semester to which it refers and is computed by dividing the total grade points ($\Sigma\ C_i\ G_i$) accumulated up to the date by the total credit hours ($\Sigma\ C_i$). Both GPA and CGPA are rounded off to the second place of decimal for reporting.

14. Distribution of Marks:

14.1 **The distribution of marks for a given course is as follows:**

i) **Theory courses:**

Continuous assessment (40%)

Summative assessment (60%)

Class participation and attendance	10
Class tests	20
Assignment/Project/Viva voce/ Presentation/etc/others	10
Semester Final Examination (3 hours duration)	60
Total =	100

***** Minimum requirement to pass in the theory course is 15 marks out of 60 in the semester final exam.**

ii) **Independent sessional/design/field work courses:**

Class participation and attendance	10
Quizzes	20
Lab Performance, Lab Report, Lab Final, Presentation/Viva and Others.	45
Board Viva (Compulsory)	25
Total =	100

iii) **Project and thesis (Architecture):**

Class participation and attendance	10
Internal criticisms	40
Viva voce/ Jury	30
Supervisor (Internal Examiner)	20
Total =	100

iv) **Project and thesis (Other departments):**

Viva voce (conducted by a viva voce committee)	30
Supervisor (internal examiner)	50
External examiner (any other teacher of the department/ Examination committee)	20
Total =	100

14.2 Basis for awarding marks for class participation and attendance will be as follows:

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

14.3 The students will not be allowed to sit in the semester final examination for failing to attend at least 50% in the classes. The students whose percentage of attendance will fall short of 75% in any of the theory, sessional courses for which he/she has registered in one academic year shall not be eligible for the award of any type of scholarship/stipend/grant for the following academic session.

15. Class tests:

i) 3 best out of 4 class tests may be taken for awarding grade.

ii) Duration of class tests normally should be 20-30 minutes and materials covered should be what were taught in 2 to 3 previous cycles or most recent classes.

iii) The dates for the class tests shall be fixed by the Head or Course Coordinator and dates shall be announced accordingly.

iv) All class tests shall ordinarily be of equal value. The result of each individual class test shall be posted for information of the students preferably before the next class test is held.

16. Earned Credits:

The courses in which a student has obtained 'D' or a higher Grade will be counted as credits earned by him/her. Any course in which a student has obtained 'F' grade will not be counted towards his/her earned credits.

A student, who obtains a 'F' grade in any Core Course in any semester, he/she will have to repeat the course. If a student obtains a 'F' in an Optional Course, he/she may choose to repeat the course or take a substitute course if available.

'F' grades will be considered as backlog courses. 'F' grades will not be counted for GPA calculation but will stay permanently on the Grade Sheet and Transcript.

A student obtaining D grade in a course will be allowed to repeat the course for the purpose of grade improvement if CGPA of the student falls below **2.20**. In such case he/she will be awarded the new grade thus he/she obtains or retains his/her previous grade if he/she fails.

17. Performance Evaluation:

i) The minimum CGPA requirement for obtaining a B.Sc. Engineering/ Bachelor degree is **2.20**. The performance of a student will be evaluated in terms of two indices, viz. Semester grade point average and cumulative grade point average.

ii) Students will be allowed to sit in Backlog examination for maximum 3 courses (in same year) in an academic year. However only 4^{th} year students are allowed to choose 3 courses from his/her Backlog course(s).

18. Honors, VC's List and University gold medal:

18.1 **Honors:** Candidates for Bachelor's degree will be awarded the degree with honors if their CGPA is 3.75 or above and will be called as First Class with Honors.

18.2 **Class:** Candidates having CGPA 3.00 or above and less than 3.75 will be called as First Class and Candidates having CGPA **2.20** or above and less than 3.00 will be called as Second Class.

18.3 **VC's List:** In recognition of excellent performance, the names of students who maintain good standing with the University obtaining SGPA of 3.75 or above in two regular semesters in each academic year may be published in the VC's List in each department. Students who have received F grade in any course during any of the two regular semesters will not be considered for VC's List in that year.

18.4 **University Gold Medal:** If a student can show extraordinary brilliance and obtains all A or better grades in all the courses, he/she attended and fulfills the credit requirement for graduation will be honored by awarding University gold medal in a special function/convocation.

19. Student Classification:

The regular students are classified according to the number of credit hours earned towards a degree shown in the following table:

Year	**Earned Credits**
First Year	0 to 33
Second Year	34 to 66
Third Year	67 to 99
Fourth Year	100 and above/For Architecture 100 to 132
Fifth Year (Architecture)	133 and above (Arch)

20. Registration for the Second & Subsequent Semesters:

A student is normally required to register courses according to the approved curricula in each semester. After odd semester final examination, Students will normally register courses in even semester.

21. Measures for Helping Academically weak Students:

The following provisions are made in order to help academically weak students to enable them to complete their studies within the maximum period of seven years. Adviser will keep special contact for all such students whose Cumulative grade point average (CGPA) is less than **2.20** at the end of a semester.

22. Backlog Examination:

i) There will be Backlog Examination after the publication of result of Even semester examination.
ii) 'F' grade(s) obtained after semester examination will be considered as backlog course(s).
iii) Students are allowed to sit for maximum 3 backlog courses in odd and/or even semester(s).
iv) Class test marks of Backlog courses in odd/even semester(s) will be counted for Backlog examination.
v) **Maximum B (B regular)** grade will be counted in Backlog examination.

Backlog Courses: The course(s) which a student registered in a Semester but after Semester examination he/she obtained 'F' grade in that course(s).

23. Short Semester Examination:

The Short Semester Examination on only backlog courses may be conducted for the students who have participated in their

4(four)/5(Five) year degree course (up to 4^{th} /5^{th} year backlog examination). A student can register maximum 5 (Five) incomplete courses including sessional, project and thesis to obtain Bachelor degree. The short semester examination will be arranged in a convenient time by the Head of the Department within 10 weeks of the publication of results of the final year backlog examination. The evaluation system will be the similar as regular semester. The students willing to appear at the short semester examination have to apply to the Head of the Department and with his permission must register within 15 (Fifteen) working days of publication of final year Backlog examination results. **Maximum grade B** will be counted in short semester examination.

24. Minimum Earned Credit and GPA Requirements for Obtaining Degree:

Minimum credit requirements for the award of Bachelor Degree will be recommended by the respective Academic Committee to the Academic Council. The minimum CGPA requirements for obtaining a Bachelor Degree are 2.20.

25. Time Limits for Completion of Bachelor's Degree:

A student must complete his/her studies within a maximum period of seven years for 4 year bachelor degree and eight years for 5 year bachelor degree.

26. Industrial/Professional Training Requirements:

Depending on each Department's own requirement a student may have to complete a prescribed number of days for industrial/professional training as mentioned in the course curricula.

27. Application for Graduation and Award of Degree:

A student who has fulfilled all the academic requirements for bachelor's degree will have to apply to the Registrar/VC through his/her Adviser for graduation. Provisional degree will be awarded on completion of Credit and GPA requirements. Such provisional degrees will be confirmed by the academic council.

28. Inclusion of repeaters from the present system to the new course system:

Repeater students will be included in the course system of curricula as and when such situation will arise. Equivalence of Courses and Grades (if required) will be done by Academic Council with recommendation by the respective Academic and Dean Committee.

29. Absence during Semester:

A student should not be absent from quizzes, tests etc. during the semester. Such absence will naturally lead to reduction in points/marks, which count towards the final grade. Absence in semester final examination due to lack of attendance (less than 50%) only of any courses will be considered as unregistered, hence requires a new registration with a regular semester.

A student who has been absent for short period, up to a maximum of three weeks due to illness, should approach the course teacher(s) or the course coordinator(s) for a make-up quizzes or assignments immediately on returning to the classes. Such request should be supported by medical certificate from university medical officer. The medical certificate issued by a registered medical practitioner (with the registration number shown explicitly or the certificates) will also be acceptable only in those cases where the student has valid reason for his/her absence from the University.

30. Conduct of Examination:

1. Dean of the respective Faculty will announce the date of final examinations with recommendation from the respective heads of the departments at least one (01) week before the end of the semester classes.
2. Board viva will be held at 13th week as convenient by the department.
3. There will be an Examination Committee for each examination in every department as:

Sl No.	Name	Remarks
1.	Head	Chairman
2.	Three (03) Teachers within the University not below the rank of Assistant Professor	Members
3.	One (01) Teacher from within (not from the same department) or outside the University (Not below the rank of Associate Professor)	External Member

N.B: For 4th year backlog and short semester examination committee members including chairman will be six (o6).

4. Odd, Even, Backlog and Short Semesters will be treated as separate examinations.
5. Head of the department will put forward the proposal of formation of the examination committee to respective Dean of the Faculty. Dean will place this proposal to the Dean's executive committee for recommendation to the Academic Council's approval.

6. Chairman of the Examination committee will propose the name of the Paper Setters and Examiners from the panel of Paper setters and Examiners to the Vice-chancellor. Vice-Chancellor will appoint the examiners. Two Paper Setters and Examiners will be appointed for each course.
7. Examination Committee will moderate the questions for semester final, backlog and short semester examinations.
8. Chairman of the Examination committee will arrange to prepare question typing and printing (as required). The persons involved for preparation of question papers will be kept among the members of the respective examination committee.
9. Printed Questions will be sent to Dean in sealed envelope signed by the Chairman of the Examination committee and the person involved with question preparation at least 1(one) day before the examination.
10. Dean will keep the questions and will open and distribute the questions to the invigilators before the examination(s).
11. Results of Even semesters must be published before the start of next academic year.
12. Backlog examination must be completed within 2nd cycle of the odd semester.
13. After examinations all answer scripts will be submitted to Dean's office by the invigilators.
14. Examiners, who will perform invigilation duty, must collect the answer script from the Dean's office after the examinations on same day. All other examiners will collect the answer script from Dean's office on next office day.

Script Evaluation:

1. There will be two sections in the questions and answer script. Each examiner will evaluate one section.
2. Examiners will send four copies of mark sheet along with marked answer script to the Chairman of Examination committee.
3. Chairman of the examination committee will send the answer script with mark sheet and questions to the scrutinizers for scrutiny.
4. Vice-Chancellor will appoint two Scrutinizers on recommendation from the Chairman of the examination committee.
5. Vice-Chancellor will appoint three tabulators/Data Entry Teachers on recommendation from the chairman of the examination committee. Advisor(s) or other teacher (as required) may be the Tabulators/ Data entry teachers for a particular series and will continue to do so until that series will pass away. However, the appointment will be on annual basis.
6. Chairman of the examination committee will provide the three copies of scrutinized mark sheets to the tabulators/Data Entry Teachers.
7. Chairman of the examination committee will arrange examination committee meeting for result finalization.
8. Tabulation will be done at a secured place under the supervision of the chairman of the examination committee.
9. Proper security measure is required to be taken.
10. Chairman of examination committee will send the three copies of prepared result along with one copy of scrutinized mark sheet to the Controller of Examination.
11. Controller of examination will publish the result after the

approval of the Vice-Chancellor.

12. Grade sheets will be prepared and checked by the tabulators.

Special Instructions:

1. Students will not be allowed to enter the examination hall after half an hour from the start of the final examination(s).
2. Students will not be allowed to leave the exam hall before completion of one hour from the start of examination.
3. Students are not allowed to keep any electronic device unless it is officially permitted.
4. Students normally will not be allowed to go outside the exam hall during examination.
5. Students will be under Ordinance related to discipline for any unfair means as laid out.

Some Academic Rules and Regulation

Duration of the Program

- The four academic years of study for the Bachelor degree have been designated as 1st year class, 2nd year class, 3rd year class and 4th year class in succeeding higher levels of study. For Architecture, five years of study.
- The academic year is ordinarily divided into two semesters (**Odd and Even Semester**) each having duration of ordinarily not less than 13 weeks.

Working Days and Weekend

- **One Week:** Saturday to Friday
- **Office and Class:** Saturday to Wednesday
- **Thursday and Friday**: Off day/Weekend

Admission Cancellation Rule

Admission of a newly admitted student in the 1st year class is **cancelled if he/she fails to attend any class within the first two consecutive weeks** after the start of class without prior permission.

Roll Numbering Convention

Example Roll No: 2203001 (7 digits)

22	03	001
Batch Code	**Department Code**	**Student Serial No**

Course Type

- Theory
    - Continuous assessment (40%)
    - Summative assessment (60%)
- Sessional

Theory Course Mark Distribution

The distribution of marks for a given course is as follows:

Sl. No.	Name of Assessment		Marks
1.	Continuous Assessment	Class Participation and Attendance	10
2.		Class Test	20
3.		Assignment/Project/Viva-voce/Presentation/etc/others	10
4.	Summative Assessment	Final Examination	60
Total Marks:			**100**

*** Student must obtain at least 15 marks out of 60 in the final examination.**

Sessional Course Mark Distribution

Sl. No.	Name of Assessment	Marks
1.	Lab Participation and Attendance	10
2.	Quiz	20
3.	Lab Performance, Lab Reports, Lab Final, Presentation/Viva and Others	45
4.	Board Viva (Compulsory)	25
Total Marks:		100

Marks for class participation and attendance will be as follows:

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

- The students **will not be allowed** to sit in the semester final examination for **failing to attend at least 50% in the classes**.
- Best 3 out of 4 class tests may be taken for awarding a grade.
- A student, who obtains a 'F' grade in any Core Course in any semester, he/she will have to repeat the course. Course. '**F' grades will be considered as backlog courses**.
- 'F' grades will not be counted for GPA calculation **but will stay permanently on the Grade Sheet and Transcript**.

Grading System

Range of Marks	**Letter Grade**	**Grade Point**
80 % or above	A+ (A Plus)	4.00
75% to less than 80 %	A (A Regular)	3.75
70 % to less than 75%	A- (A Minus)	3.50
65% to less than 70%	B+ (B Plus)	3.25
60% to less than 65%	B (B Regular)	3.00
55% to less than 60%	B- (B Minus)	2.75
50% to less than 55%	C+ (C Plus)	2.50
45% to less than 50%	C (C Regular)	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00
Incomplete	**I**	-
Need to register again	--	-

Student Adviser

One adviser is appointed for a section of students by the Department Monitoring Committee, who advises each student on the courses to be taken by a student.

Course Registration

Each student will fill up his/her Course Registration Form in consultation **with his/her adviser** within one week from the commencement of each semester.

Class Duration

- Each Theory Class Duration: 50 Minutes
- Each Sessional Class Duration: 150 Minutes (3x50 Minutes)

Distribution of Undergraduate Courses

Course Type	Percentage of Credit (%)	Credits
Mathematics and Basic Sciences		
(a) Mathematics	7.50	12.00
(b) Physics	2.34	3.75
(c) Chemistry	2.34	3.75
Humanities		
(a) Economics, Government & Sociology	1.88	3.00
(b) Industrial Management & Accountancy	1.88	3.00
(c) English with Sessional	2.34	3.75
Basic and Major Engineering		
(i) Electrical Engineering with Sessional	7.50	12.00
(ii) Core Courses		
(a) Theoretical	52.50	84.00
(b) Sessional, Project and Thesis	21.72	34.75
Total	100.00	160.00

Summary of Undergraduate Course Plan

Sl. No.	Year/Semester	Theory		Sessional		Total Credits
		No. of Course	Credits	No. of Course	Credits	
1	1st / Odd	5	15.00	5	4.50	19.50
2	1st / Even	5	15.00	5	6.00	21.00
3	2nd / Odd	5	15.00	4	4.50	19.50
4	2nd / Even	5	15.00	4	4.50	19.50
5	3rd / Odd	5	15.00	4	3.75	18.75
6	3rd / Even	5	15.00	6	4.50	19.50
7	4th / Odd	5	15.00	7	6.25	21.25
8	4th / Even	5	15.00	5	6.00	21.00
Total=		**40**	**120.00**	**40**	**40.00**	**160.00**

Course Offered to the Undergraduate Students of Computer Science & Engineering Department

1st YEAR ODD SEMESTER

Sl. No.	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credit
1	CSE 1100	Computer Fundamentals and Ethics Sessional	0	3/2	0.75
2	CSE 1101	Structured Programming	3	0	3.00
3	CSE 1102	Structured Programming Sessional	0	3	1.50
4	EEE 1151	Basic Electrical Engineering	3	0	3.00
5	EEE 1152	Basic Electrical Engineering Sessional	0	3/2	0.75
6	Math 1113	Differential and Integral Calculus	3	0	3.00
7	Hum 1113	Functional English	3	0	3.00
8	Hum 1114	Functional English Sessional	0	3/2	0.75
9	Chem 1113	Inorganic and Physical Chemistry	3	0	3.00
10	Chem 1114	Inorganic and Physical Chemistry Sessional	0	3/2	0.75
Total=			**15**	**9.00**	**19.50**

1st YEAR EVEN SEMESTER

Sl. No.	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credit
1	CSE 1200	Competitive Programming Sessional	0	3/2	0.75
2	CSE 1201	Data Structure	3	0	3.00
3	CSE 1202	Data Structure Sessional	0	3	1.50
4	CSE 1203	Object Oriented Programming	3	0	3.00
5	CSE 1204	Object Oriented Programming Sessional	0	3	1.50
6	EEE 1251	Electronic Devices and Circuits	3	0	3.00
7	EEE 1252	Electronic Devices and Circuits Sessional	0	3	1.50
8	Math 1213	Coordinate Geometry and Ordinary Differential Equation	3	0	3.00
9	Phy 1213	Physics	3	0	3.00
10	Phy 1214	Physics Sessional	0	3/2	0.75
Total=			**15**	**12.00**	**21.00**

2nd YEAR ODD SEMESTER

Sl. No.	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credit
1	CSE 2100	Software Development Project I	0	3/2	0.75
2	CSE 2101	Discrete Mathematics	3	0	3.00
3	CSE 2102	Discrete Mathematics Sessional	0	3	1.50
4	CSE 2103	Digital Logic Design	3	0	3.00
5	CSE 2104	Digital Logic Design Sessional	0	3	1.50
6	EEE 2151	Electrical Drives and Instrumentations	3	0	3.00
7	EEE 2152	Electrical Drives and Instrumentations Sessional	0	3/2	0.75
8	Math 2113	Vector Analysis and Linear Algebra	3	0	3.00
9	Hum 2113	Economics, Government and Sociology	3	0	3.00
Total=			**15**	**9.00**	**19.50**

2nd YEAR EVEN SEMESTER

Sl. No.	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credit
1	CSE 2200	Technical Writing and Presentation Sessional	0	3/2	0.75
2	CSE 2201	Algorithm Analysis and Design	3	0	3.00
3	CSE 2202	Algorithm Analysis and Design Sessional	0	3	1.50
4	CSE 2203	Numerical Methods	3	0	3.00
5	CSE 2204	Numerical Methods Sessional	0	3/2	0.75
6	CSE 2205	Microprocessors, Microcontrollers and Assembly Language	3	0	3.00
7	CSE 2206	Microprocessors, Microcontrollers and Assembly Language Sessional	0	3	1.50
8	Math 2213	Complex Variable, Partial Differential Equation and Harmonic Analysis	3	0	3.00
9	Hum 2213	Industrial Management and Accountancy	3	0	3.00
Total=			**15**	**9.00**	**19.50**

3rd YEAR ODD SEMESTER

Sl. No.	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credit
1	CSE 3100	Web Based Application Project	0	3/2	0.75
2	CSE 3101	Database Systems	3	0	3.00
3	CSE 3102	Database Systems Sessional	0	3	1.50
4	CSE 3103	Theory of Computation	3	0	3.00
5	CSE 3105	Computer Interfacing and Embedded System	3	0	3.00
6	CSE 3106	Computer Interfacing and Embedded System Sessional	0	3/2	0.75
7	CSE 3107	Computer Architecture	3	0	3.00
8	CSE 3108	Computer Architecture Sessional	0	3/2	0.75
9	CSE 3109	Applied Statistics and Queuing Theory	3	0	3.00
Total=			**15**	**7.50**	**18.75**

3rd YEAR EVEN SEMESTER

Sl. No.	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credit
1	CSE 3200	Software Development Project II	0	3/2	0.75
2	CSE 3201	Operating Systems	3	0	3.00
3	CSE 3202	Operating Systems Sessional	0	3/2	0.75
4	CSE 3203	Data Communication	3	0	3.00
5	CSE 3204	Data Communication Sessional	0	3/2	0.75
6	CSE 3205	Software Engineering	3	0	3.00
7	CSE 3206	Software Engineering Sessional	0	3/2	0.75
8	CSE 3207	Artificial Intelligence	3	0	3.00
9	CSE 3208	Artificial Intelligence Sessional	0	3/2	0.75
10	CSE 3209	Digital Signal Processing	3	0	3.00
11	CSE 3210	Digital Signal Processing Sessional	0	3/2	0.75
Total=			**15**	**9.00**	**19.50**

4th YEAR ODD SEMESTER

Sl. No.	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credit
1	CSE 4000	Project/Thesis I	0	2	1.00
2	CSE 4101	Compiler Design	3	0	3.00
3	CSE 4102	Compiler Design Sessional	0	3/2	0.75
4	CSE 4103	Computer Networks	3	0	3.00
5	CSE 4104	Computer Networks Sessional	0	3	1.50
6	CSE 4105	Digital Image Processing	3	0	3.00
7	CSE 4106	Digital Image Processing Sessional	0	3/2	0.75
8	CSE 4108	Industrial Attachment	0	3/2	0.75
9	CSE ****	Optional I	3	0	3.00
10	CSE ****	Optional I Sessional	0	3/2	0.75
11	CSE ****	Optional II	3	0	3.00
12	CSE ****	Optional II Sessional	0	3/2	0.75
Total=			**15**	**12.50**	**21.25**

**** Industrial Attachment:** Students will be attached with the industries/service agencies after completing their Third year first semester (during any vacation between the start of Third year second semester and the end Fourth year first semester) to gain practical knowledge.

Optional I/II				
Course Code	**Course Title**	**Theory Hrs. / Week**	**Sessional Hrs. / Week**	**Credit**
CSE 4109	Information Systems Analysis and Design	3	0	3.00
CSE 4110	Information Systems Analysis and Design Sessional	0	3/2	0.75
CSE 4111	Unix Programming	3	0	3.00
CSE 4112	Unix Programming Sessional	0	3/2	0.75
CSE 4113	Digital System Design	3	0	3.00
CSE 4114	Digital System Design Sessional	0	3/2	0.75
CSE 4115	Simulation and Modeling	3	0	3.00
CSE 4116	Simulation and Modeling Sessional	0	3/2	0.75
CSE 4117	Wireless Networks	3	0	3.00
CSE 4118	Wireless Networks Sessional	0	3/2	0.75
CSE 4119	Data Mining	3	0	3.00
CSE 4120	Data Mining Sessional	0	3/2	0.75
CSE 4121	Computer Vision	3	0	3.00
CSE 4122	Computer Vision Sessional	0	3/2	0.75
CSE 4123	Knowledge Engineering	3	0	3.00
CSE 4124	Knowledge Engineering Sessional	0	3/2	0.75

4th YEAR EVEN SEMESTER

Sl. No.	Course Code	Course Title	Theory Hrs. / Week	Sessional Hrs. / Week	Credit
1	CSE 4000	Project/Thesis II	0	6	3.00
2	CSE 4201	Computer Graphics	3	0	3.00
3	CSE 4202	Computer Graphics Sessional	0	3/2	0.75
4	CSE 4203	Machine Learning	3	0	3.00
5	CSE 4204	Machine Learning Sessional	0	3/2	0.75
6	CSE 4205	Security and Privacy	3	0	3.00
7	CSE 4206	Security and Privacy Sessional	0	3/2	0.75
8	CSE 4208	Seminar	0	3/2	0.75
9	CSE ****	Optional III	3	0	3.00
10	CSE ****	Optional IV	3	0	3.00
Total=			**15**	**12.00**	**21.00**

Optional III/IV				
Course Code	**Course Title**	**Theory Hrs. / Week**	**Sessional Hrs. / Week**	**Credit**
CSE 4209	VLSI Design	3	0	3.00
CSE 4211	Parallel and Distributed Processing	3	0	3.00
CSE 4213	Impact of Computer on Society	3	0	3.00
CSE 4215	Decision Support System	3	0	3.00
CSE 4217	Network Planning	3	0	3.00
CSE 4219	Human Computer Interaction	3	0	3.00
CSE 4221	Switching Systems	3	0	3.00
CSE 4223	Control System Engineering	3	0	3.00

Course Contents

1st YEAR ODD SEMESTER

CSE 1100 **Contact Hours/Week: 3/2 Hours**
Computer Fundamentals and Ethics Sessional **Credit Hour: 0.75**

Course Contents:

Computer Science and Engineering as a Discipline: Computer Science, Computer Engineering, Theoretical Computer Science, Central Themes of CSE, Subfields of CSE, Course Map for Four Year Undergrad CSE Degree, Role of Mathematics in CSE, Role of Electrical Engineering in CSE, Diversified Applications of CSE: Artificial Intelligence, Machine Learning, Digital Image Processing, Computer Graphics, Computer Security etc.

Hardware: Types and Generation of Computers, Data Representation, Computer Arithmetic, Processor, Types of Memory, Peripherals, Interfacing, Assembler, Compiler, Interpreter, Levels of Programming Language, Data Communication and Computer Network**.**

Software: Computer Programming, Data Structure & Algorithms, Database System, Types of Software, Software Licenses, Software Engineering, Familiarization with Various Operating Systems (Windows, DOS, UNIX, Android, IOS Etc.), Computer Operations: Text Processing (MS-WORD, etc.), Spreadsheet (MS-EXCEL etc.), Browser Software (Chrome, Firefox etc.).

Ethics: Introduction to Ethics and Morality, Ethics for IT Workers and IT Users, Privacy, Intellectual Property, Ethical Decisions in Software Development, Ethics of IT Organizations, Cybercrimes, Cyberattacks and Cybersecurity, Laws against Cybercrimes, Professional Responsibility.

CSE 1101 **Contact Hours/Week: 3 Hours**
Structured Programming **Credit Hour: 3.00**

Course Contents:

Introduction to Structured Programming: Algorithm, Writing, Debugging and Running Programs using Compiler / Interpreter.

Basic Concepts: Basic I/O, Formatted I/O, Different Data Types and their Range, Operators and their Precedence, Operands and Expression, Expression Evaluation, Conditional Logic, Switch-Case, Character, ASCII Value, Reading and Writing Character, Integer to Character Conversion.

Loop: Basic of Loop, while Loop, for Loops, do-while Loop, Entry Controlled and Exit Controlled Loops, Nested Loop, Formulating Problems using Loops.

Array: Basics of Array, Necessity, Declaration, Initialization, Array Manipulation- Accessing through Indices, Accessing using Loops, One-Dimensional and Multi-Dimensional Arrays.

String: Basic String Operations, Difference between String and Character-Array, String I/O, Array of Strings.

Pointer: Introduction to Pointer, Pointer Operations, Pointers and Array, Array of Pointers.

Functions: Defining & Calling of User–defined Functions, Void Functions with No Parameters, Functions with Return Type and Parameters, Call by Value, Local and Global Variables, Scope of Variables, Built-in Functions, Recursive Functions, Passing Arrays in a Function as Parameter, Call by Reference.

Custom data types: Structures, Unions, Enumerations.

File: Basic Files Operations, Opening, Closing and Updating Binary and Sequential Files, File I/O (Read from File and Write in File).

Advanced Topics: Operations on Bits, Preprocessors and Macros.

CSE 1102 **Contact Hours/Week: 3 Hours**
Structured Programming Sessional **Credit Hour: 1.50**

Course Contents:
Sessional on Structured Programming: Introduction, Basics Concepts, Selection Statements, Control Statements, Arrays, Strings, Pointer, Functions, Custom Data Types, Files, Advanced Topics.

EEE 1151 **Contact Hours/Week: 3 Hours**
Basic Electrical Engineering **Credit Hour: 3.00**

Course Contents:
Direct Current: Voltage, Current, Resistance and Power, Laws of Electrical Circuits, Methods of Network Analysis, Capacitance, Types of Capacitors, Capacitors in Series and Parallel, Inductance, Types of Inductors, Faraday's Law and Lenz's Law, Inductors in Series and Parallel.

Alternating current: Signal and Waveforms, Instantaneous and RMS Values of Current, Voltage and Power, Average Power, AC Analysis for Various Combination of R, L and C Circuits, Phasor Representation of Sinusoidal Quantities, Resonance, Frequency Response, Passive Filters.

EEE 1152 **Contact Hours/Week: 3/2 Hours**
Basic Electrical Engineering Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Basic Electrical Engineering: Basic of Electrical Circuit, Experiments on Circuit Theorems, Circuit Simulation and Design.

Math 1113 **Contact Hours/Week: 3 Hours**
Differential and Integral Calculus **Credit Hour: 3.00**

Course Contents:

Differential Calculus: Limit, Continuity and Differentiability, Differentiation of Explicit and Implicit Function and Parametric Equations, Significance of Derivatives, Differentials, Successive Differentiation of Various Types of Functions, Leibnitz's Theorem, Rolle's Theorem, Mean Value Theorem, Taylor's Theorem in Finite and Infinite Forms, Maclaurin's Theorem in Finite and Infinite Forms, Lagrange's Form of Remainders. Cauehy's Form of Remainder, Expansion of Functions by Differentiation and Integration. Partial Differentiation, Euler's Theorem, Tangent and Normal, Maxima and Minima, Points of Inflection and their Applications, Evaluation of Indeterminate Forms by L'Hospital Rule, Curvature, Evaluate and Inviolate, Asymptotes, Envelopes, Curve Tracing.

Integral Calculus: Definitions of Integration, Integration by the Method of Substitutions, Integration by the Method of Successive Reduction, Definite Integrals, Beta Function and Gamma Function, Area under a Plane Curve in Cartesian and Polar Coordinates, Area of the Region Enclosed by Two Curves in Cartesian and Polar Coordinates, Parametric and Pedal Equations, Intrinsic Equation, Volumes of Solids of Revolution, Volume of Hollow Solids of Revolution by Shell Method, Area of Surface of Revolution, Multiple Integration.

Hum 1113 **Contact Hours/Week: 3 Hours**
Functional English **Credit Hour: 3.00**

Course Contents:

Grammar: Construction and Transformation of Sentences, Analysis of Sentence Structure, Use of Preposition, Question Words, WH & Yes/No Question, Phrases & Idioms, Correction, Conditional Sentences, Punctuation, Pronunciation, Phonetic Transcription, Spoken English, Vocabulary.

Reading: Techniques and Strategies for Improving Comprehension Skills, Prose Pieces by Renowned Authors.

Writing: Paragraph and Essay Writing, Amplification, Précis Writing.

Commercial/Professional Correspondence: Business Letters, CV, Notices for and Minutes of Meetings, Tenders & Schedules, Memos & Press Release, Research Paper/Technical Report Writing.

Hum 1114 **Contact Hours/Week: 3/2 Hours**
Functional English Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Functional English: Principles of Language Communication, Academic Vocabulary for Scholarly Reading-Writing, Listening for Monologue and Dialogue, Note Taking and Drafting Skills, Common Speaking Functions, English Varieties: Pronunciation, Intonation, Stress, Reading Strategies for Non-literary Texts, Multi-Skill and integrated Questions, Produce and Design Audio and Video Presentation, Sample Project: Short biography, Sample Conference Presentation.

Chem 1113 **Contact Hours/Week: 3 Hours**
Inorganic and Physical Chemistry **Credit Hour: 3.00**

Course Contents:

Chemical Bond: Ionic Bond, Covalent Bond, Coordination Bond, Metallic Bond, Hydrogen Bond, Dipole Bond, Vander Waal's Forces, Hybridization, Resonance, Valence Bond Theory (VBT), Molecular Orbital Theory (MOT), Linear Combination of Atomic Orbital (LCAO) Method.

Thermo-chemistry: Types of Energy, Enthalpy of Reaction, Heat of Combustion, Heat of Formation and Heat of Neutralization, Experimental Determination of Thermal Changes during Chemical Reaction.

Solution: Types of Solution, Factors Influencing the Solubility of Substance, Mechanism of Dissolution, Solution of Gases in Liquids, Different Units of Concentration, Distribution Law and its Application, Properties of Dilute Solution, Raoult's Law - its Application, Elevation of Boiling Point, Depression of Freezing Point and Osmotic Pressure.

Conductivity of Electrolytic Solution: Type of Conductors, Conductance, Specific Conductance, Equivalent Conductance, Mechanism of Electrolytic Conductance, Factors Influencing Conductivity, Arrhenius Theory, Law of Independent Migration of Ions and its Applications, Determination of Transport Number, Abnormal Conductance.

Electromotive Forces: Electrochemical Cell, Cell Reaction, Cell Potential, Cell Representation, Measurement of EMF of a Cell, Relation Between EMF and Free Energy, Electrode Potential, Electrochemical Series, Nernest's Equation, Different Types of Reference Electrodes and pH Measurement, Over Potential, Lithium Ion Battery, Fuel Cell its Latest Development.

Photochemistry: Photochemical Reactions, Laws of Photochemistry, Quantum Yield and its Determination, Photosensitized Reaction, Photo-Physical Processes.
Spectroscopy: Quantization of Energy, Basic Elements of Spectroscopy.
Chemistry of Polymerization: Classification, Bonding in Polymer, Thermosetting and Thermoplastic Polymer, Synthesis, Properties and Uses of Some Polymers-Polyethylene, PVC, Bakelite, and Melamine etc.

Chem 1114 **Contact Hours/Week: 3/2 Hours**
Inorganic and Physical Chemistry Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Inorganic and Physical Chemistry: Introduction to Lab Experiments, Conducting Lab Experiments, Preparing Lab Report and Presentation

1st YEAR EVEN SEMESTER

CSE 1200 **Contact Hours/Week: 3/2 Hours**
Competitive Programming Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Competitive Programming:
Warmup: Basic Input/Output and Conditionals, Basic Mathematics and Introduction to Number Theory, Basic Geometry, Introduction to Different Online Judges.

Loop and Array: Loops and Nested Loops, Array Operations and Techniques i.e., Cumulative Sum, Longest Consecutive Elements, Finding Duplicates etc.

Functions and Strings: Function Building, Specialized Functions, Basic String Operations and Techniques, Substrings, Subsequences, Palindrome.

Searching and Sorting: Searching Techniques i.e., Linear Search, Binary Search, etc., Sorting Techniques i.e., Bubble Sort, Selection Sort, etc.

Advanced Topics: Recursion, Backtracking, Matrix Operations etc.

CSE 1201 **Contact Hours/Week: 3 Hours**
Data Structure **Credit Hour: 3.00**

Course Contents:

Introduction: Concepts and Examples of Elementary Data Objects, Necessity of Structured Data, Types of Data Structure, Ideas on Linear and Nonlinear Data Structure.

Linear Array: Linear Array & its Representation in Memory, Traversing LA, Insertion & Deletion in LA, Multidimensional Array & its Representation in Memory, Algebra of Matrices, Sparse Matrices.

Stack: Stack Representation & Applications; PUSH and POP Operation on Stack. Polish Notation, Reverse Polish Notation; Evaluation of a Postfix Expression; Transforming Infix Expression into Postfix Expression.

Queue: Its Representation, Insertion & Deletion in Queue, Priority Queues, Recursion: [Factorial Function, Fibonacci Sequence, Ackermann Function, Towers of Hanoi].

Linked List: Linked List & its Representation in Memory, Traversing, Searching, Insertion & Deletion Operation on Linked List, Circular List, Header Linked Lists, Two Way Lists.

Complexity Analysis: Algorithm and Flowchart, Asymptotic Notations: Best case, Worst Case, Average Case, Complexity Analysis of Different Algorithms.
Sorting and Searching: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Merge Sort, Binary and Linear Search, Hash Function, Collision Resolution.
Tree: Tree Terminology, Representation of Binary Trees in Memory, Traversing Binary Tree, Binary Search Tree, Insertion & Deletion on Binary Search Tree, Balanced Binary Search Tree, AVL tree, Red Black Tree, Insertion & Deletion on Heap, Heap Sort, B Trees, General Tree.

CSE 1202 **Contact Hours/Week: 3 Hours**
Data Structure Sessional **Credit Hour: 1.50**

Course Contents:
Sessional on Data Structure: Linear Array, Stack, Queue, Recursion, Linked List, Sorting & Searching, Tree.

CSE 1203 **Contact Hours/Week: 3 Hours**
Object Oriented Programming **Credit Hour: 3.00**

Course Contents:
Fundamentals of OOP: Introduction to Object Oriented Programming, Principles of Object-Oriented Design, Encapsulation and Information-hiding, Data Binding, Static and Dynamic Binding.
Classes and Objects: Structure of Class, Access Modifiers, Nested Classes, Abstract Classes, Arrays of Objects, Pointer to Objects, Friend Function, Data Abstraction, Static Variable and Function.

Constructors and Destructors: Default Constructor, Copy Constructor, Dynamic Constructor, Deep Copy and Shallow Copy, Constructor Function for Derived Class and their Order of Execution, Destructor.

Inheritance: Single Inheritance vs. Multiple Inheritance, Mode of Inheritance, Virtual Inheritance, Interface.

Polymorphism: Operator and Function Overloading, Run-Time and Compile Time Polymorphism, Virtual Function, Errors and Exception Handling.

Advanced Topics: Persistent Objects, Objects and Portable Data, UML Basics, Namespace, Package, Templates, JFrame, Multithreading, Concept of MVC Framework.

CSE 1204 **Contact Hours/Week: 3 Hours**

Object Oriented Programming Sessional **Credit Hour: 1.50**

Course Contents:

Sessional on Object Oriented Programming: Fundamentals of OOP, Classes and Objects, Constructors and Destructors, Inheritance, Polymorphism, Advanced Topics.

EEE 1251 **Contact Hours/Week: 3 Hours**

Electronic Devices and Circuits **Credit Hour: 3.00**

Course Contents:

Introduction to Semiconductors & Diode: P-N Junction Diode, V-I Characteristics, Light-Emitting Diode (LED), Zener Diode, Diode Applications: Half-Wave and Full-Wave Rectifiers – Operation and Efficiency, Ripple factor.

Linear Wave Shaping: Diode Wave Shaping Techniques, Clipping and Clamping Circuits, Voltage Regulation using Zener Diode.

Bipolar Junction Transistor: NPN and PNP Transistors, Amplifying and Switching Actions of Transistor, Transistor Characteristics and Regions of Operation, CB, CE & CC Configurations, Transistor Load Line and Operating Point, BJT Biasing, Small Signal Equivalent Circuit Models, Small-Signal Analysis of Single-Stage Amplifiers, Designing Logic Gate using BJT.

Field Effect Transistor: Principle of Operation of JFET and MOSFET, Depletion and Enhancement Type NMOS and PMOS, MOSFET as switch and amplifier, CMOS Inverter.

Op-amp: Basic OP-amp Characteristics, Gain, Input and Output Impedance, Feedback, Inverting and Non-Inverting Amplifiers, Integrators, Differentiators, Summing Amplifiers, Introduction to Oscillators, Comparator Circuits, Schmitt Trigger, Linear and Non-Linear Applications of Op-amp.

555 Timer: Architecture of 555 Timer, Monostable, Bistable and Astable Multivibrators using 555 Timer.

Filter Circuits: Filter Fundamentals, Different Types of Filters, Passive Filters, Active Filters.

Power Electronic Devices: SCR, TRIAC, DIAC, UJT Characteristics and Applications; Introduction to IC Fabrication Techniques.

EEE 1252 **Contact Hours/Week: 3 Hours**

Electronic Devices and Circuits Sessional **Credit Hour: 1.50**

Course Contents:

Sessional on Electronic Drives and Circuits: Diode, Bipolar Junction Transistor (BJT), Field Effect Transistor (FET), Op-Amps, 555 Timer, Filter Circuit, Logic Gate Design using BJT.

Math 1213 **Contact Hours/Week: 3 Hours**
Coordinate Geometry and Ordinary Differential Equation **Credit Hour: 3.00**

Course Contents:

Coordinate Geometry of Two Dimensions: Change of Axes, Transformation of Coordinates, Simplification of Equations of Curves.

Coordinate Geometry of Three Dimensions: System of Coordinates, Distance between two Points, Section Formula, Direction Cosines and Projection, Planes and Straight Lines.

Ordinary Differential Equation: Degree and Order of Ordinary Differential Equations. Formation of Differential Equations. Solutions of First Order Differential Equations by Various Methods, Solutions of General Linear Differential Equations of Second and Higher Orders with Constant Coefficients, Solution of Homogeneous Linear Differential Equations. Solution of Higher Order Differential Equations when the Dependent of Independent Variables are Absent. Differential Equations with Variable Coefficients.

Series Solution: Singular Points, Series Solutions: Frobenius Method, Bessel's and Legender's Differential Equations.

Phy 1213 **Contact Hours/Week: 3 Hours**
Physics **Credit Hour: 3.00**

Course Contents:

Structure of Matter: Structure of Matter. Different Types of Bonds in Solids: Metallic, Van Der Waals', Covalent and Ionic Bond. Packing in Solids: Inter Atomic Distances and Forces of Equilibrium, X-Ray Diffraction, Bragg's Law, Distinction among Insulator, Semiconductor and Conductor.

Atomic Physics: Atom Models: Thomson Atom Model, Rutherford Atom Model, Rutherford Scattering Formula, Electron Orbits, Bohr Atom Model, Energy Levels and Spectra, Particle Properties of Waves: Photoelectric Effect, Einstein's Photoelectric Equation, Laws of Photoelectric Emission, Photovoltaic Cells, Compton Effect, Wave Properties of Particle: De Broglie Waves, Group Velocity, Phase Velocity.

Waves and Oscillations: Oscillations: Simple Harmonic Motion, Composition of Simple Harmonic Motions and Lissajous' Figures, Damped and Forced Oscillations, Resonance. Waves: Traveling and Standing waves, Energy Calculation of Traveling and Standing Waves, Intensity of Waves, Beats, Doppler Effect.

Physical Optics: Theories of Light: Wave theory: Huygen's Wave Theory, Huygen's Principle and Construction, Superposition of Light Waves, Electromagnetic Theory, Particle Theory: Newton's Corpuscular Theory, Quantum Theory of Light.

Interference: Introduction, Conditions of Interference, Young's Double Slit Experiment, Fresnel's Bi-prism, Thin Film Interference, Interference Due to Multiple Reflection, Newton's Ring.

Diffraction: Fresnel and Fraunhofer Diffraction, Diffraction by Single and Double Slit, Diffraction Gratings**.**

Polarization: Introduction, Methods of Producing Polarized Light, Polarization by Reflection and Refraction, Polarization by Double Refraction, Construction of Nicol Prism. Production and Analysis of Polarized Light, Optical Activity, Optics of Crystals, Polarimeter.

Phy 1214 **Contact Hours/Week: 3/2 Hours**
Physics Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Physics: Introduction to Laboratory Works and Experiments, Waves and Oscillations, Atomic and Modern Physics, Physical Optics.

2nd YEAR ODD SEMESTER

CSE 2100 **Contact Hours/Week: 3/2 Hours**
Software Development Project I **Credit Hour: 0.75**

Course Contents:
Students will develop one or more Programs/Projects on some practical problems with sound Software Engineering practices as assigned by the teacher.

CSE 2101 **Contact Hours/Week: 3 Hours**
Discrete Mathematics **Credit Hour: 3.00**

Course Contents:
Logic and Proof: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.
Set: Using Set Notation with Quantifiers, Truth Sets and Quantifiers, Generalized Unions and Intersections, Computer Representation of set.
Function: One-to-One and Onto Functions, Inverse Functions and Compositions of Functions, The Graphs of Functions, floor and ceiling function with their properties, Partial Functions.
Sequences and Summations: Sequences, recurrence relations and Summations.
Cardinality of Sets: Countable Sets, Uncountable Set, Uncomputable Functions.
Number Theory: Divisibility and Modular Arithmetic, Primes and Greatest Common Divisors, Solving Congruences, Applications of Congruences.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction.

Counting: The Pigeonhole Principle, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Generating Permutations and Combinations. Applications of Recurrence Relations, Generating Functions, Inclusion–Exclusion, Applications of Inclusion–Exclusion.

Relation: Property of relation, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

Graphs: Graphs and Graph Models Graph Terminology and Special Types of Graphs, Representing Graphs, Graph Traversing, Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Planar Graphs, Graph Coloring.

CSE 2102 **Contact Hours/Week: 3 Hours**
Discrete Mathematics Sessional **Credit Hour: 1.50**

Course Contents:

Sessional on Discrete Mathematics: Logic and Proof, Set, Function, Sequences and Summations, Cardinality of Sets, Relation, Number Theory, Induction and Recursion, Counting, Graphs.

CSE 2103 **Contact Hours/Week: 3 Hours**
Digital Logic Design **Credit Hour: 3.00**

Course Contents:

Information and Digital Systems: Introduction to Digital Systems, Number Systems, Weighted and Non-Weighted Codes, Error

Detection Code, Binary Addition and Subtraction, 2's Complement Methods.

Boolean Algebra and Combinational Logic Circuits: Digital Logic, Boolean Algebra, Boolean Function, Canonical Forms, Karnaugh Maps, Minimization of Boolean Functions, Logic Gates and their Truth Tables, Design Methodologies, Combinational Logic Circuit Design, Arithmetic and Data Handling Logic Circuits. Decoders, Encoders, Multiplexer, Demultiplexer.

Flip Flop and Sequential Logic Circuits: Transistor Latch, NAND Gate Latch, NOR Gate Latch, D Latch. Clock Signals and Clocked FFs: Clocked SR, JK and D Flip-Flops, Master/Slave JK FF, Timing Diagram of Different FFs, Edge-Triggered and Level-Triggered Timing Diagrams, Counters, Registers, Memory Devices and their Applications.

Hardware Description Language (HDL): Synthesis of digital circuits using Hardware Description Language (HDL). Reference Language: Verilog.

Technology Parameters: Fan In, Fan Out, Propagation Delay, Power Dissipation and Noise Immunity.

Others: Diode Logic Gates, Transistor Gates, MOS Gates, Logic Families: TTL and CMOS Logic with Operation Details.

CSE 2104 **Contact Hours/Week: 3 Hours**
Digital Logic Design Sessional **Credit Hour: 1.50**

Course Contents:

Sessional on Digital Logic Design: Designing Various Logic Combinational circuits, Designing Various Sequential Circuits, Hardware Description Language (HDL), Designing and Implementing Various TTL & CMOS Logic Devices. Reference HDL: Verilog.

EEE 2151 **Contact Hours/Week: 3 Hours**
Electrical Drives and Instrumentations **Credit Hour: 3.00**

Course Contents:

DC Machines: Operation and Performance Characteristics of Generators and Motors, Starting, Speed Control and Braking of Motors, Different Application of DC Motors.

AC Machines: Transformer: Principle of Operation of Transformer, Single Phase Induction Motors and its Methods of Starting, Introduction to alternator.

Special Machines: Stepper Motor, Servomotor, Brush less Motors.

Measuring Instruments: Electromechanical and Electronic Meters and their Uses, Extension of Instrument Range.

Instrumentation Amplifiers: Differential, Logarithmic and Chopper Amplifiers, Frequency and Voltage Measurements using Digital Techniques, Recorders and Display Devices, Spectrum Analyzers and Logic Analyzers.

Transducers: Terminology, Types, Principles and Application of Photovoltaic, Piezoelectric, Thermoelectric, Position and Displacement Transducers, Potentiometer, Linear Variable Differential Transformers (LVDT), Pressure Transducer, Temperature Transducer, Optical Transducer, Ultrasonic Transducer, Humidity Transducer, Hall Effect Transducer, Speed Transducer, Noise Reduction in Instrumentation.

EEE 2152 **Contact Hours/Week: 3/2 Hours**
Electrical Drives and Instrumentations Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Electrical Drives and Instrumentation: Transformer, DC Machine, AC Machine, Measuring Instruments and Transducers.

Math 2113 **Contact Hours/Week: 3 Hours**
Vector Analysis and Linear Algebra **Credit Hour: 3.00**

Course Contents:
Vector Analysis: Different Types of Vectors, Vector Differentiation and Integration, Line, Surface and Volume Integrals, Gradient of a Function, Divergence and Curl of Vector and Their Applications, Physical Significance of Gradient, Divergence and Curl, Vector Identities, Integral Forms of Gradient, Divergence and Curl, Green's Theorem, Stokes' Theorem, Gauss's Divergence Theorem.
Matrix: Definition of Matrices, Equality of two Matrices, Addition, Subtraction and Multiplication of Matrices, Equivalence of Matrices, Positive and Negative Matrices, Adjoint of Matrices, Transpose and Inverse of Matrices, Rank and Normal Form of Matrices, System of Linear Equations, Solution of Homogeneous and Non-Homogeneous Systems, Determination of Eigen Values and Eigen Vectors, Solution of Matrix Differential Equations.
Linear Algebra: Vector Space, Subspace, Sum and Direct Sum, Hilbert Space, Normed Linear Space, Branch Space, Basis and Dimension, Linear Transformation: Range, Kernel, Nullity, Singular and Non-Singular transformation, Linear Operations:

Matrix Representation of a Linear Operator, Change of Basis, Similarity and Linear Mapping.

Hum 2113 **Contact Hours/Week: 3 Hours**
Economics, Government and Sociology **Credit Hour: 3.00**

Course Contents:

Economics

Introduction of Economics: Definition of Economics, Goals of Economics, Scope of Economics, Economic Problems, Why Study Economics, Scarcity & Efficiency, Economic & Technical Efficiency.

Demand, Supply and Their Elasticity: Definition of Demand, Law of Demand and Its Limitations, Demand Curve, Market Demand, Determinants of Demand, Extension & Contraction of Demand, Increase and Decrease of Demand, Elasticity of Demand and its Types, Elastic & Inelastic Demand, CPE, IE, Determinants of Elasticity of Demand, Total Revenue Test, Elasticity & Revenue , Point Elasticity, Elasticity in a Linear Demand Curve, Supply and Stock, Law of Supply and its Limitations, Supply Curve, Shifts in Supply Curve, Determinants of Supply, Market Supply, Elasticity of Supply. Consumer Surplus & Producer Surplus, Equilibrium, Shortage and Surplus.

Theory of Production: Factors of Production, Producer's Equilibrium - Isoquant Curve, Production Possibility Curve - Equilibrium of a Firm, Internal & External Economies & Diseconomies, Laws of Return, Input Output Analysis.

Theory of Cost: Cost of Production, Cost Function, Total Cost-Fixed & Variable, AC, MC, Why Short Run Average Cost Curve is U-Shaped?, Envelope Curve or Long Run Cost Curve, Explicit & Implicit Cost, Engineering Cost Curves, Math.

Economic Development and Economic Planning: Economic Growth, Economic Growth Rate and When it will be Double - Calculation, Economic Development, Difference Between Economic Growth and Development, Indicators of Economic Development, HDI, Barriers to Economic Development in Developing Countries, Sustainable Development & its Goals, Economic Planning, Essential Features of Economic Planning, Objectives of Economic Planning, Stages of Planning, Essentials of Planning, Planning in Bangladesh.

Concept of National Income: Define National Income. Circular Flow of NI in Two Sectors. GDP, GNP, NNP, NDP, PI, DPI, Saving, Investment, Methods of Calculating NI, Methods used in Bangladesh, Problems of Calculating NI in Bangladesh, Importance of Calculating NI, Math.

Economic Policies: Fiscal Policy, Monetary Policy, Trade Policy and their Applicability in Bangladesh, Industry & Population of Bangladesh.

Government

Institutions: State - Forms & Functions of State, Government- Forms & Functions of Government, Local & Central Government, Judiciary & Legislative System, Political, Economic & Recreational Institutions and their Roles in the Society, Formal Organization & Bureaucracy, Public Opinion.

Sociology

Introduction: Define Society, Evaluation of Society, distinguish between Community and Society, Culture, Define Sociology, Importance of Sociology, Scope of Sociology.

Social System: Family, Marriage, Role of Engineers in the Society, Effects of Change in Technology on Society, Ethical Perspectives of Technology.

Culture: Elements of Culture, Cultural Systems and Subsystems, Cultural Lag, Relationship between Culture and Civilization.

Social Problems: Unemployed Delinquency and Crime, Social Crime, Cyber Crime, Deviant Behavior, Globalization and Human Rights.

Others: Geographical Location of Bangladesh, Urban Community, Urban Ecology, Rural & Urban Power Structure.

2nd YEAR EVEN SEMESTER

CSE 2200 **Contact Hours/Week: 3/2 Hours**
Technical Writing and Presentation Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Technical Writing and Presentation:

Introduction: Issues of Technical Writing and Effective Oral Presentation in Computer Science and Engineering; Criteria for Good Technical Writing and Presentation; An Overview of **Research Methodologies:** Quantitative and Qualitative Research.

Writing Issues: Writing Styles of Definitions, Propositions, Theorems, Proofs, etc.; Preparation of Reports, Scientific Articles, and Research Papers.

Thesis, Books and Others: Abstract, Preface, Contents, Bibliography and Index; Writing of Book Reviews and Referee Reports; Curriculum Vitae, Resume Writing, etc.

Writing and Presentation Tools: LATEX; Diagram Drawing Software; Presentation Tools.

Writing Ethics: Plagiarism Issues; Writing and Presentation Ethics; Ethical Technical Communication.

CSE 2201 **Contact Hours/Week: 3 Hours**
Algorithm Analysis and Design **Credit Hour: 3.00**

Course Contents:

Methods of Complexity Analysis: Substitution method, Iteration Method, Master Method, Amortized Analysis.

Linear Time Sorting: Radix Sort, Bucket Sort, Counting Sort, Proof of Correctness of Sorting algorithms, Lower bound on sorting

Divide and Conquer approach: Minimum and Maximum Elements Finding, Median Finding, Kartasuba multiplication: Integer Multiplication, Strassens Matrix Multiplication, Quick Hull, Divide and Conquer Based Sorting Algorithms Review.

Greedy Algorithms: Greedy Algorithm Properties, Job Sequencing Problem, Huffman Codes, Fractional Knapsack Problem, Minimum Spanning Tree: Kruskal and Prims Algorithm, Single Source Shortest Path: Dijkstra's Algorithm, Proof of correctness

Dynamic Programming: Dynamic Algorithm Properties**,** Longest Common Subsequence (LCS), 0-1 Knapsack, Knapsack with duplicate items, Max Sum without Adjacent, Matrix Chain Multiplication (MCM), Single Source Shortest Path: Bellman-Ford Algorithm, All pair of shortest path: Floyd Warshall Algorithm, Bitmasking with DP: Traveling Salesperson Problem.

Backtracking: Backtracking, State Space Tree, N-Queen Problem, M-Coloring, Rat in a Maze, Solving Sudoku / Puzzle.

Branch and Bounds: Branch and Bounds in State Space Tree**,** LC Branch and Bound, FIFO Branch and Bound.

Flow Networks: Maximum Flow, Minimum Cut problem, Ford-Fulkerson Algorithm

P and NP Problems: Introduction to Optimization and Decision Problems, Tractable and Intractable Problems, Deterministic and Nondeterministic Algorithms, P and NP Set of problems, NP-hardness and NP-completeness, Proof of NP-completeness for algorithms, Cook's Theorem.

Reducibility between Problems and Approximation Algorithms: Discussion of different NP-complete problems like Satisfiability, Clique, Vertex Cover, Independent Set, Hamiltonian Cycle, TSP and Knapsack. Reduction between problems, Approximation algorithm design for sample problems and corresponding performance bound analysis.

CSE 2202 **Contact Hours/Week: 3 Hours**
Algorithm Analysis and Design Sessional **Credit Hour: 1.50**

Course Contents:
Sessional on Algorithm Analysis and Design: Methods of Complexity Analysis, Linear Time Sorting, Divide and Conquer Approach, Greedy Algorithms, Dynamic Programming, Backtracking, Branch and Bounds, Flow Networks, P and NP Problems, Reducibility between Problems and Approximation Algorithms.

CSE 2203 **Contact Hours/Week: 3 Hours**
Numerical Methods **Credit Hour: 3.00**

Course Contents:
Modeling, Computers and Error Analysis: Mathematical Modeling and Engineering Problem Solving, Programming and Software, Approximations and Round-Off Errors, Truncation Errors and the Taylor Series.
Roots of Equations: Bracketing Methods, Open Methods, Roots of Polynomials.

Linear Algebraic Equations: Gauss Elimination, LU Decomposition and Matrix Inversion, Gauss-Seidel.
Optimization: One-Dimensional Unconstrained Optimization.
Curve Fitting: Least-Square Regression.
Interpolation: Interpolation with one and two Independent Variables, Formation of Different Difference Table, Newton's Forward and Backward Difference, Langrange's Interpolation.
Numerical Differentiation and Integration: Newton-Cotes Integration Formulas, Integration of Equations, Numerical Differentiation
Ordinary Differential Equations: Runge-Kutta Methods, Boundary-Value and Eigenvalue Problems, Numerical Solution of Partial Differential Equations.

CSE 2204
Numerical Methods Sessional

Contact Hours/Week: 3/2 Hours
Credit Hour: 0.75

Course Contents:
Seasonal on Numerical Methods: Modeling, Computers and Error Analysis, Roots of Equations, Linear Algebraic Equations, Optimization, Curve Fitting, Interpolation, Numerical Differentiation and Integration, Ordinary Differential Equations.

CSE 2205
Microprocessors, Microcontrollers and Assembly Language

Contact Hours/Week: 3 Hours
Credit Hour: 3.00

Course Contents:
Microprocessor: Introduction to Different Types of Microprocessors and its Applications, Organization of Intel x86

Architecture, Overview of Different Generations of Intel Processors, Component of Microcomputer System, Interrupt Structures, I/O Interfacing, DMA, Co-processors, Memory Module, Overview of Advanced Intel Instructions: AVX, MMX, SSE & SIMD.

Microprocessor Assembly: Introduction to x86 and x86-64 Assembly, Assembly Program Structure and Its Components, Basic Instructions, Input/Output Instructions, Flag Register, Flow Control Instructions, Logic, Shift and Rotate Instruction, Arithmetic Instructions, Arrays and Related Addressing Modes, Basic Stack Operations, Procedures Declaration, Calling a Procedure**,** String Instructions, Macros, Floating-Point Instructions.

Microcontroller: Microcontroller History and Features, Microcontroller Architecture, General Purpose Registers in Microcontroller, Microcontroller Data Memory, Microcontroller Status Register, Microcontroller Data Format and Directives.

Microcontroller Assembly: Microcontroller Assembly Programming, Program Counter and Program ROM Space in Microcontroller, Branch Instructions and Looping, Call Instructions and Stack, Time Delay, Arithmetic Instructions, Logic and Compare Instructions, Rotate and Shift Instructions.

CSE 2206
Microprocessors, Microcontrollers and Assembly Language Sessional

Contact Hours/Week: 3 Hours
Credit Hour: 1.50

Course Contents:

Sessional on Microprocessors, Microcontrollers and Assembly Language: Environment Setup, Microprocessor Assembly: Registers and Program Structure, Flow Control, Looping and Branching, Logic and Arithmetic Operation, Stack Operation,

Arrays and Data Structure, Addressing Modes, String Manipulation, Macros, Microcontroller Assembly: Branch and Looping Instructions, Call Instructions and Stack, Time Delay, Arithmetic Instructions, Logic and Compare Instructions, Rotate and Shift Instructions.

Math 2213 **Contact Hours/Week: 3 Hours**
Complex Variable, Partial Differential Equation and Harmonic Analysis **Credit Hour: 3.00**

Course Contents:

Complex Variable: Complex Number Systems, General Functions of a Complex Variable, Limits and Continuity of a Function of Complex Variable and Related Theorems, Complex Differentiation and the Cauchy-Riemenn Equations, Infinite Series, Convergence, Line Integral, Cauchy Integral Theorem, Cauchy Integral Formula, Liouville's Theorem, Taylor's and Laurent's Theorems, Singular Points, Residue, Cauchy's Residue Theorem, Contour Integration.

Partial Differential Equation: Partial Differential Equations, Solution of First Order Partial Differential Equation by Lagrange and Charpit Methods, Solution of Laplace Equation and Wave Equation.

Harmonic Analysis and Laplace Transform: Fourier Series and Fourier Transformations and its Applications to Solve Boundary Value Problems. Laplace Transforms, Inverse Laplace Transforms, Solution of Differential Equation by Laplace Transforms.

Hum 2213 **Contact Hours/Week: 3 Hours**
Industrial Management and Accountancy **Credit Hour: 3.00**

Course Contents:

Industrial Management: Principles of Management, Management Functions, Management Skills, Authority and Responsibility, Span of Control, Management by Objective, Consultative Management, Participative Management, Decision Making, Manpower Motivation, Human Resources Management: Manpower Planning, Recruitment and Selection, Employee Training and Development, Performance Appraisal, Wages and Salary administration, Production Management: Plant Layout: Definition, Basic Layout Types, Problem Solving, Linear Programming, EOQ, Lead Time, Safety Stock, Re-order Point.

Accounting: Basic Accounting Principles, Objectives of Accounting, Transaction, Double Entry Systems, Accounts and its Classification, Journals, Cash Book, Ledger, Trial Balance, Financial Statement, Cost Accounts and its Objectives, Cost Classification, Preparation of cost sheet, Cost Volume Profit analysis, Standard Costing, Process Costing.

3rd YEAR ODD SEMESTER

CSE 3100 **Contact Hours/Week: 3/2 Hours**
Web Based Application Project **Credit Hour: 0.75**

Course Contents:

Students will work in groups or individually to develop web-based applications and a website by incorporating client-side and server-side scripting and interfacing the web applications to a database.

CSE 3101 **Contact Hours/Week: 3 Hours**
Database Systems **Credit Hour: 3.00**

Course Contents:

Concepts of Database Systems: Files and Databases, Database Management Systems; Transaction management, Structure of a DBMS, Applications.

Entity-Relationship Concepts: Entity types, Entity set, Attribute and key, Relationships, Relation types, Entity relationship, ER modeling, ER diagrams, Database design using ER diagrams, Enhanced Entity-Relationship (EER) model.

Normalization: Normal forms, Normalized Relations and Database performance; De-normalization.

Relational Model: Structure of relational databases, Relational algebra, Relational algebra operations, Modification of the database, Introduction to views, Pitfalls in relational database design.

SQL: Data Definition Language, Data Manipulation Language, Basics of SQL, Query designing in SQL using aggregate functions and nested queries, Embedded SQL, Triggers, Procedures; Indexes; Declarative Constrains and Database Triggers.

Concurrency Control: Lock based protocols, Timestamp based protocols, Validation based protocols, Deadlock.

Recovery System: Failure classification, Storage structure, Recovery and atomicity, Log- based recovery, Recovery with concurrent transactions, Advanced recovery techniques, RAID model.

Advanced Database Management Systems: No SQL Systems, distributed systems, object-oriented System, Temporal, Database Security, Data Warehousing and Data Mining, Database Administration and Tuning.

CSE 3102 **Contact Hours/Week: 3 Hours**
Database Systems Sessional **Credit Hour: 1.50**

Course Contents:
Sessional on Database Systems: Concepts of database systems, Entity-Relationship concepts, Normalization, Relational model, SQL, Concurrency control, Recovery system, Advanced database management systems.

CSE 3103 **Contact Hours/Week: 3 Hours**
Theory of Computation **Credit Hour: 3.00**

Course Contents:
Finite State Machine: Fundamental of Finite State Machine, State Equivalence and Minimization of Machine, Incompletely Specified Machine and Minimal Machine, Merger Graph and Compatibility Graph, Finite Memory and Definite Memory Machine, Information Lossless Machine and Inverse Machine.
Finite Automata: Introduction to Finite automata, Structural Representations, Automata and Complexity, an Informal Picture of Finite Automata, Deterministic Finite Automata, Nondeterministic Finite Automata, an Application (i.e. text search or other), Finite automata with Epsilon-Transitions.
Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expression, Application of Regular Expressions, Algebraic Laws for Regular Expressions, Closure Properties of Regular Language, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.
Context-Free Grammar and Languages: Context-Free Grammars, Parse Trees, Application of Context-Free Grammars, Ambiguity in Grammars and Languages, Normal Form for Context-

Free Grammars, the Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages, Decision Properties of CFL's.

Pushdown Automata: Definition of the Pushdown Automata, the Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata.

Introduction to Turing Machines: The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Restricted Turing Machines, Turing Machines and Computers.

Undecidability: A language that is not recursively enumerable, an undecidable problem that is RE, undecidable problems about Turing machines, post's correspondence problem, other undecidable problems.

CSE 3105 **Contact Hours/Week: 3 Hours**
Computer Interfacing and Embedded System **Credit Hour: 3.00**

Course Contents:

Microprocessor Interfacing: 8086/8088 Hardware Specifications, 8284A Clock Generator, Memory Interface, Address Decoding, 82C55 Programmable Peripheral Interface, 8254 Programmable Interval Timer, 8259A Programmable Interrupt Controller, 8237 DMA Controller, Co-processor, 80X87 Architecture, 80X87 Instruction Set, Programming with 80X87 Co-processor, 8251A Programmable Communication Interface.

Microcontroller Interfacing: Microcontroller Hardware Connection, Microcontroller Programming in C, HEX File, Flash Loader, I/O Port, Timer, Interrupt and Serial Port Programming, LCD, Keyboard, Display and Motor Interfacing, A/D Conversion,

D/A Conversion and Sensor Programming, Waveform Generation, UART, SPI and I2C Protocol.

Embedded System: Overview of the Design Flow, Embedded Systems Specifications and Modeling, Embedded Hardware Platforms: Raspberry Pi & Arduino, Real Time Operating System (RTOS), Interfacing to the External World through Sensors and Actuators, Interfacing Ethernet, Bluetooth & 802.15.4.

CSE 3106 **Contact Hours/Week: 3/2 Hours**
Computer Interfacing and Embedded System Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Computer Interfacing and Embedded System: Microprocessor Interfacing, Microcontroller Interfacing, Embedded System.

CSE 3107 **Contact Hours/Week: 3 Hours**
Computer Architecture **Credit Hour: 3.00**

Course Contents:

Introduction: Introduction to Von Neumann Organization, RISC and CISC Machines, HDL for Simple CPU Implementation, FPGA.

Data Representation and Computer Arithmetic: Big-Endian and Little-Endian Organization, Data Representation, Signed and Unsigned Formats, Computer Integer Arithmetic, Booth Multiplication Algorithm, IEEE Floating Point Representation and Arithmetic, FPU Design, Computer Arithmetic Circuits.

CPU Design: Fetch-Execute Cycle, Arithmetic and Logic Unit (ALU) and Register Set Design, CPU Instruction Set Design,

Addressing Modes, Assembly Language and Assembler Design, Stack Implementation for Supporting Function Calling with Parameters, Interrupts, Exceptions, Operating System Calls and I/O Operations, Bus Architecture.

Memory Design: Memory Hierarchy, Memory Organization into Bytes and Words, Different Types of ROM and RAM Architectures, Flash Memory, Secondary Memory, Optical Memory, Read/Write Cycle, Cache Memory, Basic Cache Algorithm, Direct-Mapped and Associative Cache, Virtual Memory.

Pipelining and Parallel Processing: Pipelining, Pipeline Hazards, Branch Prediction, Speculative Execution, Instruction Level Parallelism, Superscalar Processor, Parallel Processing, Threading.

CSE 3108 **Contact Hours/Week: 3/2 Hours**
Computer Architecture Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Computer Architecture: Simple CPU and memory design using simulator and HDL.

CSE 3109 **Contact Hours/Week: 3 Hours**
Applied Statistics and Queuing Theory **Credit Hour: 3.00**

Course Contents:

Introduction: Statistics and its Importance, Population and Sample, Variable and Constants, Statistical Data, Data Collection and Presentation, Construction of Frequency Distribution and Graphical Presentation.

Measures of Central Tendency: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Weighted Mean.

Measures of Dispersion: Range, Standard Deviation, Variance, Moments, Skewness and Kurtosis.

Correlation Theory and Causality Analysis: Linear Correlation and its Measures and Significance, Rank Correlation, Causality Analysis.

Tests of Significance: Hypothesis Testing, P-value, t-test, z-test, Statistical Significance, Statistical Inference.

Probability: Elementary Concepts, Laws of Probability – Additive and Multiplicative Law, Conditional Probability and Bayes Theorem, Random Variables, Mathematical Expectation.

Probability Distributions: Binomial Distribution, Poisson Distribution and Normal Distribution.

Queuing Theory: Stochastic Processes, Discrete Time Markov Chain and Continuous Time Markov Chain. Birth-Death Process in Queuing. Queuing Models: M/M/1, M/M/C, M/G/1, M/D/1, G/M/1 Solution of Network of Queue-Closed Queuing Models and Approximate Models. Application of Queuing Models in Computer Science.

3rd YEAR EVEN SEMESTER

CSE 3200 **Contact Hours/Week: 2 Hours**
Software Development Project II **Credit Hour: 0.75**

Course Contents:

Students will Work in Groups or Individually to Develop High Quality Software/Projects Including New I/O Drivers or Similar Projects Involving Operating Systems Modules in Different Types of Database Systems or Project Oriented and Visual Languages,

Students will Writes Structure Program and use Proper Documentation.

CSE 3201 **Contact Hours/Week: 3 Hours**
Operating Systems **Credit Hour: 3.00**

Course Contents:

Introduction to Operating System: Operating System Concepts, Its Role in Computer Systems, Computer System Structure, Fundamental of Different Types of Computer System, Operating System Structure and Operation, Kernel, System Call, Protection and Security.

Process Management: Process concept, Model and Implementation, Process Scheduling, Process State, Co-operating Processes.

Threads: Basics Concept, Multithreading Models, Threading Issues.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithm (SJF, FIFO, round robin, etc.), Algorithm Evaluation.

Concurrency and Synchronization: Inter-Process Communication and Inter-Thread Communication, Critical Region, Critical Section Problems and Solutions.

Memory Management: Memory Portioning, With and Without Swapping, Virtual Memory – Paging and Segmentation, Demand Paging, Page Replacement Algorithms, Implementation.

File Systems: Files, Directories, Security, Protection.

Deadlocks: Modeling, Detection and Recovery, Prevention and Avoidance.

Others: Case Study of Some Operating Systems, Introduction to the Different Smart Device Operating System and Their Usage.

CSE 3202 **Contact Hours/Week: 2 Hours**
Operating System Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Operating System: Shell Programming, System Programming, OS Development.

CSE 3203 **Contact Hours/Week: 3 Hours**
Data Communication **Credit Hour: 3.00**

Course Contents:
Fundamental: Representation of signals in time and frequency domain, Properties of Fourier transform, Auto-correlation, Cross-correlation.
Data Communication and Network Model: Data communication, Fundamentals of networks, History of the internet, Protocols and standards.
Signal and System, Transmission Media, Interfaces: Analog and digital data, Periodic analog signals, Digital signals, Transmission impairment, Data rate limits and performance.
Analog Transmission: Digital-to-Analog conversion: ASK, FSK, PSK, QAM. Analog-to-Analog conversion: Amplitude modulation, Frequency modulation, Phase modulation.
Digital Transmission: Digital-to-Digital conversion: Line coding, block coding, scrambling, Analog-to-Digital conversion: Pulse code modulation, Delta modulation, Transmission modes: Parallel and serial transmission.
Multiplexing, Spreading and Switching: Bandwidth Utilization, Multiplexing, Spread spectrum, Packet-switched data networks, Circuit-switched data networks, Virtual packet networks.
Transmission Medium: Guided and unguided media.

Error Detection and Correction: Data word, Codeword, Redundancy, Forward Error Detection, Retransmission, Parity Checker, Single Bit Error, Burst Errors, LRC, VRC, CRC, Checksum, Hamming Code.
Telephone Networks: Telephone Networks, Dial-up Modems, and Digital Subscriber Line.

CSE 3204 **Contact Hours/Week: 2.5 Hours**
Data Communication Sessional **Credit Hour: 1.5**

Course Contents:
Sessional on Data Communication: Introduction to Tuned Circuits, Modulator and Demodulator, Multiplexer and Demultiplexer.

CSE 3205 **Contact Hours/Week: 3 Hours**
Software Engineering **Credit Hour: 3.00**

Course Contents:
Introduction: Introduction to Software and its Nature, Software Engineering Methods, Professional and Ethical Responsibility of a Software Engineer.
Software Process Model: Different Types of Software Process Model and their Implementations, Agile Software Process, Costs of Software Engineering.
Software Requirement Analysis: Software Requirements Analysis and their Applications, Software Prototyping, Basic Concepts of Different Formal Software Specification.
Design of Software: Software Design and its Different Techniques, Version Control, Software Configuration Managements. System

Structuring, Control Models, Modular Decomposition, Domain-Specific Architecture.

Design Patterns: Introduction to design patterns, Creational Design Patterns: Factory, Singleton, Object Pool, Prototype, Builder, Structural Design Patterns: Adapter, Composite, Façade, Proxy, Decorator, Behavioral Design Patterns: Strategy, Observer, Command, Template Method, Iterator.

Software Testing: Software Validation and Verification: Verification and Validation Planning, Software's Testing Strategies and Different Type of Testing Techniques, Art of Debugging.

Software Quality Assurance: Software Quality Assurance Activities, Software Quality Assurance Plan, Software Cognitive Fundamentals, Concepts of Software Reengineering and Web Engineering.

Advanced Topics: 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.

CSE 3206 **Contact Hours/Week: 2 Hours**
Software **Credit Hour: 0.75**
Engineering Sessional

Course Contents:

Sessional on Software Engineering: Software Configuration Management Tool, Design Patterns, Software Testing.

CSE 3207 **Contact Hours/Week: 3 Hours**
Artificial Intelligence **Credit Hour: 3.00**

Course Contents:

Fundamental: Definition of AI, historical development of AI, application of AI.

Production systems: Introduction of product system, production rules, types of production systems, knowledge base optimization in a production system.

General Problem-Solving Approaches: Breadth first search, depth first search, iterative deepening search, hill climbing, simulated annealing, heuristic search, A* algorithm, adversary search, the minimax algorithm, constraint satisfaction problems, Genetic Algorithm: Basic concepts, offspring, reproduction, selection, crossover, mutation, fitness.

Logic and Structural Knowledge Representation: Propositional logic, first-order logic, resolution principle, frames, semantic-nets, petri nets, relational data model.

Reasoning under Uncertainty: Bayesian reasoning, fuzzy knowledge, probability theory, fuzzy set theory, expert systems.

Natural language processing: Naive Bayes algorithm, syntactic semantics and pragmatic, lexicon.

Programming Languages for AI Research: Historical overview, features of AI programming languages, Implementation of AI algorithms through Python.

CSE 3208 **Contact Hours/Week: 2 Hours**
Artificial Intelligence Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Artificial Intelligence: Python Programming, General Problem-Solving Approaches, Logic and Structural Knowledge

Representation, Reasoning under Uncertainty, Natural Language Processing.

CSE 3209 **Contact Hours/Week: 3 Hours**
Digital Signal Processing **Credit Hour: 3.00**

Course Contents:

Introduction: Signals, Systems and Signal Processing, Classification of Signals, the Concept of Frequency in Continuous Time and Discrete Time Signals, Analog to Digital and Digital to Analog Conversion, Sampling and Quantization, Under Sampling and Oversampling of a digital Signal.

Discrete Time Signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time Invariant Systems. Discrete Time Systems Described by Difference Equations, Implementation of Discrete Time Systems, Correlation and Convolution of Discrete Time Signals.

The Z-Transform: Introduction, Definition of the Z-Transform, Z-Transform and ROC of Infinite Duration Sequence, Properties of Z-Transform Inversion of the Z-Transform, the One-Sided Z Transform.

Frequency Analysis of Signals and Systems: Frequency Analysis of Continuous Time Signals, Frequency Analysis of Discrete Time Signals, Properties of Fourier Transform of Discrete Time Signals, Frequency Domain Characteristics of Linear Time Invariant System, Linear Time Invariant Systems as Frequency Selective Filters, Inverse Systems and De-convolution.

Discrete Fourier Transform (DFT): Discrete Fourier Series (DFS), Properties of DFS, Discrete Fourier Transformation (DFT), Properties and Application of DFT.

Fast Fourier Transform (FFT): FFT Algorithms, Applications of FFT Algorithm.

Digital Filter Design: Differential and Difference Equations, Digital Transfer Functions, Frequency Response, Digital Filter Realization Scheme, Finite Impulse Response (FIR) Infinite Impulse Response (IIR) Filter Design.
Application of DSP: Speech, Image and Video Processing.

CSE 3210 **Contact Hours/Week: 2 Hours**
Digital Signal Processing Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Digital Signal Processing: LTI System, Z Transform, Frequency Analysis of Signals and Systems, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Filter Design.

4th YEAR ODD SEMESTER

CSE 4000 **Contact Hours/Week: 2 Hours**
Project/Thesis I **Credit Hour: 1.00**

Course Contents:
Study of Problems in the Field of Computer Science and Engineering. The Project/Thesis Topic Selected in this course will be continued in the CSE 4000 course of 4th year even semester.

CSE 4101 **Contact Hours/Week: 3 Hours**
Compiler Design **Credit Hour: 3.00**

Course Contents:
Introduction to Compiler: Compiler Structure, Analysis-Synthesis Model of Compilation, Various Phases of a Compiler, Tool based Approach to Compiler Construction, Compiler-Compilers and

Translator Writing Systems, Cross-Compilation, Just-In-Time Compilation, Ahead-Of-Time Compilation, Bootstrapping, Source-to-Source Compiler.

Lexical Analysis: Interface with Input, Parser and Symbol Table, Token, Lexeme and Patterns, Difficulties in Lexical Analysis, Error Reporting, Implementation, Regular Definition, Transition Diagrams, Lex.

Syntax Analysis: Top-Down Parsing, Recursive Descent Parsing, Transformation on the Grammars, Predictive Parsing, Bottom-Up Parsing, Operator Precedence Grammars, LR Parsers (SLR, LALR, LR), YACC.

Syntax Directed Translation: Inherited and Synthesized Attributes, Dependency Graph, Evaluation Order, Bottom Up and Top Down Evaluation of Attributes, L- and S-Attributed Definitions.

Type Checking: Type System, Type Expressions, Structural and Name Equivalence of Types, Type Conversion, Overloaded Functions and Operators, Polymorphic Functions.

Run Time System: Storage Organization, Activation Tree, Activation Record, Parameter Passing, Dynamic Storage Allocation, and Heap Storage Management, Garbage Collection.

Intermediate Code Generation: Intermediate Representations, Translation of Declarations, Assignments, Control Flow, Boolean Expressions and Procedure Calls, Implementation Issues.

Code Generation and Instruction Selection: Issues, Basic Blocks and Flow Graphs, Register Allocation, Code Generation, Dag Representation of Programs, Code Generation from Dags, Peephole Optimization, Code Generator Generators, Specifications of Machine, Code Optimization Techniques.

CSE 4102 **Contact Hours/Week: 3/2 Hours**
Compiler Design Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Compiler Design: Lexical Analysis, Syntax Analysis, Semantic Analysis, Syntax Directed Translation, Type Checking, Run Time System, Intermediate Code Generation and Code Generation, Simple Compiler Design using Flex and Bison/Lex and Yacc.

CSE 4103 **Contact Hours/Week: 3 Hours**
Computer Networks **Credit Hour: 3.00**

Course Contents:
Introduction: Definition, Uses of Computer Networks, Network Topology, Network Media, Network Devices, Different Types of Networks: PAN, LAN, MAN, WAN etc.

Network Model: OSI Reference Model, TCP/IP Reference Model, Functions of the Layers of Different Models, Network Protocols Working at Different Layers.

IP Addressing: IP Addressing, IPV4 & IPV6, Classification of IP Addressing, Subnet Mask, CIDR, Private IP Address, Public IP Address, Subnetting, VLSM etc.

Data Link Layer: Data Link layer Design Issues and Framing: Character Count, Byte Stuffing, Bit Stuffing.

Data Link Layer Protocols: Simplex Stop & Wait Protocol, Piggybacking, Point to Point Protocol (PPP), Sliding Window Protocols (One Bit Sliding Window Protocol, Go Back N ARQ, Selective Repeat ARQ).

Media Access Control: Random Access: ALOHA, CSMA,

CSMA/CD, CSMA/CA; Controlled Access: Reservation, Poling, Token Passing; Channelized Access: CDMA, TDMA, FDMA.

Wired & Wireless LANs: IEEE 802. *, Ethernet, Sonet, ATM, ATM, Bluetooth, WiMAX.

Network Layer: Network Layer Design Issues, Various Routing Algorithms (Static & Dynamic Routing, Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Multicast & Broadcast Routing etc.), Congestion Control Algorithms, Quality of Service, Internetworking, Internetworking Devices etc.

Network Layer Protocols: Address Resolution Protocol, Internet Protocol, Internet Control Message Protocol, Routing Information Protocol, Open Shortest Path First, Border Gateway Protocol, User Datagram Protocol, Transmission Control Protocol.

Transport Layer: Elements of Transport Protocols; Connection Establishment (Three Way Handshake), Connection Release (Blue & White Army Problem).

Application Layer & Others: HTTP and Recent Advances in Internet Protocols, Web Server Performance, Proxy Servers, Load Balancing in Web Servers, IP Security, Queuing Models for Networks and Protocols.

CSE 4104 **Contact Hours/Week: 3 Hours**
Computer Networks Sessional **Credit Hour: 1.50**

Course Contents:

Sessional on Computer Networks: Introduction to CISCO Packet Tracer and NS2 (Network Simulation Version 2), IP Addressing, Routing Algorithms, Socket Programming.

CSE 4105 **Contact Hours/Week: 3 Hours**
Digital Image Processing **Credit Hour: 3.00**

Course Contents:

Digital Image Fundamentals: Different Types of Digital Images, Sampling and Quantization, Imaging Geometry, Image Acquisition Systems.

Bilevel Image Processing: Basic Concepts of Digital Distances, Distance Transform, Medial Axis Transform, Component Labeling, Thinning, Morphological Processing, Extension to Grayscale Morphology.

Binarization of Grey Level Images: Histogram of Grey Level Images, Optimal Thresholding using Bayesian Classification, Multilevel Thresholding.

Edge Detection: First Order and Second Order Edge Operators, Multi-Scale Edge Detection, Canny's Edge Detection Algorithm, Hough Transform for Detecting Lines and Curves, Edge Linking.

Image Enhancement: Point Processing, Spatial Filtering, Frequency Domain Filtering, Multi-Spectral Image Enhancement, Image Restoration.

Image Segmentation: Segmentation of Grey Level Images, Water Shade Algorithm for Segmenting Grey Level Image. Image Representation and Description, Recognition and Interpretation.

Image Compression: Lossy and Lossless Compression Schemes, Prediction Based Compression Schemes, Vector Quantization, Sub-band Encoding Schemes, JPEG Compression Standard, Fractal Compression Scheme, Wavelet Compression Scheme.

CSE 4106 **Contact Hours/Week: 3/2 Hours**
Digital Image Processing Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Digital Image Processing: Digital Image Fundamentals, Bilevel Image Processing, Binarization of Grey Level Images, Edge Detection, Image Enhancement, Image Segmentation, Image Compression.

CSE 4108 **Contact Hours/Week: 3/2 Hours**
Industrial Attachment **Credit Hour: 0.75**

Course Contents:
Students will visit industries and collaborate with them via interactive sessions for a specific period defined by the corresponding industry and the department.

Optional I/II Courses

CSE 4109 **Contact Hours/Week: 3 Hours**
Information Systems Analysis and Design **Credit Hour: 3.00**

Course Contents:
Application Development Policy and Strategies: Planning of Information System, Policy in Information System Development, Strategies for Achieving Information System Goals.
Application System Development Life Cycle: Phases in Application System Development, Interrelationship among Each Phase.

Feasibility Assessment: Problems and Needs in Information System Development, Preliminary Application Requirements Determination, Feasibility Assessment: Economic, Technical, Operational and Schedule Feasibility.

Information Requirements Determination: Strategies for Obtaining Information Requirements, Technique for Information Requirements Determination, Methods for Providing Assurance that Requirements are Correct and Complete.

Structured Systems Analysis: Steps in Structured Systems Analysis, Activity Diagrams and Related Documentation, Data Dictionary, Problem Analysis, Structured Walk Through.

Systems Design Methodology: Check List Methodology, Process-Oriented Methodology, Application Generator, Structured Design.

Program Development and Testing: Structured Programming and Method for Testing.

CSE 4110 **Contact Hours/Week: 3/2 Hours**
Information Systems Analysis and Design Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Information Systems Analysis and Design: Identification of the problems, Initial investigation, Detailed Analysis of the Information System, Design alternative solutions of the identified problems, Finalize the design of the targeted information system.

CSE 4111 **Contact Hours/Week: 3 Hours**
Unix Programming **Credit Hour: 3.00**

Course Contents:
Introduction: Introduction to Unix Programming.
Unix Environment: Command Line, Globbing, I/O Redirection, Piping, Basic Commands, Memory Layout.
Debugging: GDB, Valgrind, Essential X86, Fork, Exec, Wait, Process Status, Bit Manipulation, Sending Signals Unix I/O Implementing I/O Redirection, Piping Directories and Files. Walking a Directory Tree, Exploring Attributes. Implementing Ls-L. Permissions, File Owner / Group, Time-Stamps. Signals and Signal Handling Design / Implementation of Sleep Process Relationships Backgrounding. Popen / Pclose Midterm Terminal Handling Review Midterm Networking Client / Server. I/O Multiplexing.
Multi-threading: Basics, Mutual Exclusion Multi-Threading: Bounded Buffers, Condition Variables Multi-Threading: Deadlocks Non-Blocking I/O. Regular Expressions. Sys V IPC. Semaphores and Shared Memory. Shell Scripting.

CSE 4112 **Contact Hours/Week: 3/2 Hours**
Unix Programming **Credit Hour: 0.75**
Sessional

Course Contents:
Sessional on Unix Programming: Unix Environment, Debugging, Multi-threading.

CSE 4113 **Contact Hours/Week: 3 Hours**
Digital System Design **Credit Hour: 3.00**

Course Contents:

System Design: Designing I/O System; I/O Devices; Designing Microprocessor based System with Interfacing Chips.

Programmable Design: Programmable Peripheral Interface (Interface to A/D and D/A Converter); Keyboard/Display Interface; Programmable Timer; Programmable Interrupt Controller, DMA Controller.

Memory Design: Design using MSI and LSI Components; Design of Memory Subsystem using SRAM and DRAM.

Design of Various Components of a Computer: ALU, Memory and Control Unit, Hardwired and Micro Programmed; Microprocessor based Designs; Computer BUS Standards; Design Special Purpose Controllers.

CSE 4114 **Contact Hours/Week: 3/2 Hours**
Digital System Design Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Digital System Design: Designing I/O systems and I/O devices, Designing MSI and LSI components and SRAM, DRAM, Designing ALU, Memory and Control Unit.

CSE 4115 **Contact Hours/Week: 3 Hours**
Simulation and Modeling **Credit Hour: 3.00**

Course Contents:

Simulation Modeling Basics: Systems, Models and Simulation; Classification of Simulation Models; Steps in a Simulation Study.

Concepts in Discrete-Event Simulation: Event-Scheduling vs. Process-Interaction Approaches, Time-Advance Mechanism, Organization of a Discrete-Event Simulation Model; Continuous Simulation Models; Combined Discrete-continuous models; Monte Carlo Simulation; Simulation of Queuing Systems.

Building Valid and Credible Simulation Models: Validation Principles and Techniques, Statistical Procedures for Comparing Real-World Observations and Simulated Outputs, Input Modeling; Generating Random Numbers and Random Variates; Output Analysis. Simulation Languages; Analysis and Modeling of Some Practical Systems

CSE 4116 **Contact Hours/Week: 3/2 Hours**
Simulation and Modeling Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Simulation and Modeling: Designing Discrete-event and continuous simulation model, designing combined discrete-continuous model, Designing Monte Carlo simulation and simulation of queuing systems.

CSE 4117 **Contact Hours/Week: 3 Hours**
Wireless Networks **Credit Hour: 3.00**

Course Contents:
Introduction to Wireless Networks: Wireless Access Networks, Wireless Mesh Networks, Personal Area Networks (Wireless Sensor Networks, Body Area Networks, Lowpan, and Bluetooth),

Wireless and Mobile Ad Hoc Networks, Challenged Networks (Dtns, Vanets).

Wireless MAC Protocols: IEEE 802.11, IEEE 802.11e, IEEE 802.11n, IEEE 802.11s, IEEE 802.15.4, S-MAC, B-MAC, IEEE 802.22/20, IEEE 802.16d/e.

Wireless Routing: Routing Matrix ETX, ETT, WCETT, Air Time Metric, Routing Protocols AODV, DSR, DSDV, HWMP, Sensor Network Routing, VANET Routing etc.

Others: Wireless Transport Protocols; Wireless TCP and its Variants, Hop by Hop Congestion Control, Rate based Congestion Control etc. Quality of Service in Wireless Networks.

CSE 4118 **Contact Hours/Week: 3/2 Hours**
Wireless Networks Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Wireless Networks: Introduction to Wireless Networks, Wireless MAC Protocols and routing.

CSE 4119 **Contact Hours/Week: 3 Hours**
Data Mining **Credit Hour: 3.00**

Course Contents:

Introduction and Applications: Relational Databases, Data Warehouses, Transactional Databases, Advanced Data and Information Systems, Characterization and Discrimination, Classification and Prediction, Cluster Analysis, Outlier Analysis, Evolution Analysis.

Data Preprocessing: Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

Mining Frequent Patterns, Associations, and Correlations: Definitions and background, applications, closed and maximal frequent itemsets, Apriori and FP-growth algorithms, generating association rules from frequent itemsets, mining correlations, and different correlation measures.

Classification, Clustering and Prediction: Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Clustering by Partitioning/ Hierarchical/ Density-based/ Model-based methods, Clustering High-Dimensional Data, Outlier analysis, Prediction, Linear Regression, Nonlinear Regression, Other Regression-Based Methods of prediction, Evaluating the Accuracy and error measures of a Classifier or Predictor.

Advanced Analysis: Mining Stream, Time-Series, and Sequence Data, Graph Mining, Social Network Analysis, and Multi-relational data mining, Mining Object, Spatial, Multimedia, and Text Data.

CSE 4120 **Contact Hours/Week: 3/2 Hours**
Data Mining Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Data Mining: Introduction, Data Preprocessing, Mining Frequent Patterns, Associations, and Correlations, Classification, Clustering and Prediction, Advanced Analysis.

CSE 4121 **Contact Hours/Week: 3 Hours**
Computer Vision **Credit Hour: 3.00**

Course Contents:

Introduction and Image Formation: Background, Human vision, Computer Vision and Computer Graphic, Geometry, Photometry (brightness and color), Quantization, Camera calibration, Photometric Stereo, Depth from Defocus, Construction of 3D models.

Image segmentation and Feature Extraction: Image preprocessing, Image representations (continuous and discrete), Convolution, Filtering, Edge detection, Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis, SIFT features.

Motion Estimation: Regularization theory, Optical computation, Stereo Vision, Motion Estimation, Structure from motion, Shape from stereo and motion, Feature matching, Surface fitting, Active ranging.

Object Recognition: Detectors and Descriptors, SIFT & Single Object Recognition, Optical Flow & Tracking, HoG/SIFT features, Hough transforms and other simple object recognition methods, Principal component analysis, Bayes classifiers, SVM classifiers, Human Motion Recognition.

CSE 4122 **Contact Hours/Week: 3/2 Hours**
Computer Vision Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Computer Vision: Introduction and Image Formation, Image segmentation and Feature Extraction, Motion Estimation, Object Recognition.

CSE 4123 **Contact Hours/Week: 3 Hours**
Knowledge Engineering **Credit Hour: 3.00**

Course Contents:
Introduction: Fundamental of knowledge-based systems or knowledge-based decision support systems and expert database systems, Classical mathematical models vs. knowledge representations (KRs), Relational KR, Logical KR, Automated knowledge extraction from large data sets, Knowledge discovery in databases, Attributes' domains discretization and other data mining problems, Knowledge Acquisition and Sharing, Sharing Ontologies, Language Ontologies, Language Patterns, Tools for Knowledge Acquisition.
Knowledge representation - Using Predicate logic - representing facts in logic, functions and predicates, Conversion to clause form, Resolution in propositional logic, Resolution in predicate logic, Unification. Representing Knowledge Using Rules: Procedural Versus Declarative knowledge, Logic Programming, Forward versus Backward Reasoning.
Reasoning: Proportional Case, Handling Variables and Qualifies, Dealing with Intractability, Reasoning with Horn Clauses, Procedural Control of Reasoning, Rules in Production, Description Logic, Vivid Knowledge, Beyond Vivid, Closed World Reasoning,

Non categorical Reasoning, Vagueness, Uncertainty and Degrees of Belief, Objective and Subjective Probability.

Learning: What is learning, Rote learning, Learning by Taking Advice, Learning in Problem-solving, Learning from example: induction, Explanation-based learning.

Connectionist Models: Hopfield Networks, Learning in Neural Networks, Applications of Neural Networks, Recurrent Networks. Connectionist AI and Symbolic AI, Fuzzy Logic.

Expert System: Representing and using Domain Knowledge, Reasoning with knowledge, Expert System Shells, Support for explanation- examples –Knowledge acquisition-examples.

CSE 4124 **Contact Hours/Week: 3/2 Hours**
Knowledge Engineering Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Knowledge Engineering: Knowledge representation, Reasoning, Learning, Connectionist Models, Expert System.

4th YEAR EVEN SEMESTER

CSE 4000 **Contact Hours/Week: 6 Hours**
Project/ Thesis II **Credit Hour: 3.00**

Course Contents:

Continuation of Project/Thesis Topic Under Taken in CSE 4000.

CSE 4201 **Contact Hours/Week: 3 Hours**
Computer Graphics **Credit Hour: 3.00**

Course Contents:

Introduction: Applications of Computer Graphics, Graphical User Interface, Graphics Hardware Display Devices, Vector Graphics and Raster Graphics System, Graphics Pipeline, Computer Animation.

Scan Conversion Algorithms: Midpoint Line, Circle and Ellipse Creation Algorithms, Slope Independent Line Drawing using Midpoint Line Algorithm.

Polygons: Standard Graphics Primitives, Difference Type of Polygons, Polygon Filling, Triangulation, Polygon Filling Algorithm.

Transformation: Homogeneous Coordination, Transformation in 3D, Transformation Matrices, Translation, Rotation, Scaling.

Windowing and Clipping: Window Viewpoint, Zooming, Panning, Line, Text and Polygon, Clipping Algorithms.

Projection: Parallel and Perspective, Standard Projection Matrices.

Hidden Surface Removal: Z-Buffering, Ray Casting Methods, BSP Trees Method, Back-Face Detection.

Curves and Surfaces: Polygonal surfaces, Parametric Cubic Curves- Hermite, Bezier and B-spline curves, Parametric Bicubic Surfaces: Bicubic splines.

Illumination and Shading: Light Models, Ambient light, Diffuse and Specular Reflection, Light Attenuations, Goraud and Phong Shading, Recursive Ray Tracing.

Monochrome and Colored Light: Monochrome Light, Additive and Subtractive Light, Colored Light- RGB, CMY, YIQ, HSV and HLS Color Model, Image File Format: PPM file, BMP file.

API Specifies: Introduction to Graphics Programming using Modern OpenGL (3.3+), Drawing Shapes with Modern OpenGL, Graphics Pipeline of Modern OpenGL.

CSE 4202 **Contact Hours/Week: 3/2 Hours**
Computer Graphics Sessional **Credit Hour: 0.75**

Course Contents:
Sessional on Computer Graphics: Introduction to Modern OpenGL, OpenGL Transformations and Camera, OpenGL Lighting, Writing Simple Graphics Program.

CSE 4203 **Contact Hours/Week: 3 Hours**
Machine Learning **Credit Hour: 3.00**

Course Contents:
Introduction: Introduction to Concepts of Supervised learning, Unsupervised Learning, Reinforcement Learning, Feature, Hypothesis, Prediction Model, Loss Function, Evaluation Metrics, Optimization and Brief Review of Required Mathematics.
Classification and regression: Nearest Neighbor algorithm, Linear Discriminant Analysis (LDA), Linear Regression, Logistic Regression.
Artificial Neural Networks: Perceptron Learning Rule, Multilayer Perceptron, Backpropagation, Backpropagation with time, Activation Functions, Loss Functions, Gradient Descent Optimization, Adam, Rmsprop, Bias Variance and Error analysis, Regularization (L1, L2, Dropout), Kohenen Self-organizing Maps.
Decision Tree Learning: ID3, CART, Overfitting Issue, Incorporating Continuous-Valued Attributes, Measures for Selecting Attributes, Handling Training Examples with Missing Attribute Values.
Bayesian Learning: Naïve Bayes classifier, Bayesian Networks.
Support Vector Machine: Maximum Margin Classification, Soft Margin Optimization, Gradient Ascent, Sequential Minimal

Optimization, Support Vector Machine for Binary and Multiclass Classification, Hyperparameter Tuning.

Clustering: K-means, K-medoids, Density-based Hierarchical Clustering, Mixture of Gaussians, Expectation Maximization.

Ensemble Methods: Bagging, Boosting: Adaboost, Random Forests.

Application: Students should develop a predictive modeling application on imaging, natural language or IoT data.

CSE 4204 **Contact Hours/Week: 3/2 Hours**
Machine Learning Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Machine Learning: Introduction, Classification and Regression, Artificial Neural Networks, Decision Tree Learning, Bayesian Learning, Support Vector Machine, Clustering, Ensemble Methods, Application.

CSE 4205 **Contact Hours/Week: 3 Hours**
Security and Privacy **Credit Hour: 3.00**

Course Contents:

Security Fundamentals: Confidentiality, Integrity and Availability, Assurance, Authenticity and Anonymity, Threats and Attacks, Security Principles.

Privacy: Why Does Privacy Matter, Defining Privacy, Protecting Privacy, Privacy Threats, Privacy in Media, Surveillance and Data, Privacy Laws.

Cryptography: Encryption and Decryption, Substitution Cipher, Transposition Cipher, One Time Pads, Symmetric Cryptography,

Public Key Cryptography, Authentication Protocol 1.0 to 5.0, Cryptographic Hash Functions, Digital Signature, Digital Certificates, Key Distribution Center, Different Symmetric Key Algorithm, Certificate Authority, Security Standards: DES, RSA, Digital Signature Algorithm (DSA), SHA, AES.

Malicious Software: Types of Malware, Infected Content, Vulnerability Exploits, Social Engineering, System Corruption, Bots, Zombie, Key Loggers, Phasing, Viruses, Spyware, Backdoors, Software Security Issues, Counter Measures, Forensics Analysis.

Network Security: Secure Socket Layer (SSL), Transport Layer Security (TLS), IPSec, AAA Standards, E-Mail Securities, PGP, S/MIME, Denial of Service (DOS) Attack, Eavesdropping, IP Spoofing, Firewall, Intrusion Detection and Prevention.

Other Security: Operating System Security, Database Security, Software Security, Web Security, Physical Security, Security for E-Commerce, Security for LAN and WAN, Penetration Testing.

CSE 4206 **Contact Hours/Week: 3/2 Hours**
Security and Privacy Sessional **Credit Hour: 0.75**

Course Contents:

Sessional on Security and Privacy: Fundamentals, Cryptography, Malicious Software, Network Security, Penetration Testing.

CSE 4208 **Contact Hours/Week: 3/2 Hours**
Seminar **Credit Hour: 0.75**

Course Contents:

Students will work in groups or individually to prepare review papers on topics assigned by the teachers and will present before the audience.

Optional III/IV Courses

CSE 4209 **Contact Hours/Week: 3 Hours**
VLSI Design **Credit Hour: 3.00**

Course Contents:

VLSI Design Methodology: Top-down Design Approach, Technology Trends.

MOS Technology: Introduction to Microelectronics and MOS Technology, Basic Electrical Properties and Circuit Design Processes of MOS and Bi CMOS Circuits, MOS, NMOS, CMOS Inverters, Pass Transistor and Pass Gates, DC and Transient Characteristics.

Overview of Fabrication Process: NMOS, PMOS, CMOS, Bi-CMOS process.

NMOS and CMOS Layout: Color Plate Stick Diagram and Design Rules.

CMOS Circuit Characteristics: Resistance and Capacitance, Rise and Fall time, Power Estimation.

Introduction to Bi-CMOS circuits: Shifter, an ALU Subsystem, Adder, Counter, Multipliers, Multiplexer, Data Path and Memory Structures, Buffer Circuit Design, DCVS Logic.

Design and Test-Ability: Circuit Partitioning, Floor Planning and Placement, Routing, Practical Aspects of Design Tools and Test-Ability MOS Design, Behavioral Description, Structural Description, Physical Description and Design Verification.

CSE 4211 **Contact Hours/Week: 3 Hours**
Parallel and Distributed Processing **Credit Hour: 3.00**

Course Contents:

Parallel Processing: Multiple Processor Organizations, Symmetric Multiprocessors, Cache Coherence, Multithreading and Chip

Multiprocessors, Clusters, Hybrid, Grid, NUMA, Cloud Computing, Multicore Computers, General-Purpose GPU, Performance Measures: Amdahl's law.

Parallel Programming: Motivation for Parallelism, Concurrency and Synchronization, Data and Work Partitioning, Common Parallelization Strategies, Granularity, Load Balancing, Shared-Memory Programming: pthreads, OpenMP, Distributed-Memory Programming: MPI, GPU Programming: CUDA, OpenCL. Examples: Parallel Search, Parallel Sorting, etc., MapReduce.

Distributed Processing: System Architecture, Communication, Mid-session Recess, Replication & Consistency, Distributed Transactions, Distributed Shared Memory, Synchronization & Coordination, Concurrency issues, Middleware, Fault Tolerance, Security, Naming, Distributed File Systems.

CSE 4213 **Contact Hours/Week: 3 Hours**

Impact of Computer on Society **Credit Hour: 3.00**

Course Contents:

Introduction: History of Computer Hardware, Software, Networking; Overview of Technological Change; Impact of Information Technology on Some Sectors.

Privacy and Personal Information: Personal Privacy, Computer Technology Effect Privacy, Moral Problems from Privacy Violation, Privacy Protection: Ethical and Legal Basis, Technological Strategies, Implications of Database Systems.

Freedom of Expression in Cyberspace: Offensive Speech and Censorship in Cyberspace, Pornography, Anonymity, Spam.

Computer & Software Reliability: Liability in Hardware and Software Failure, Responsibility s. Liability vs. Accountability, Historical Software Risks (such as the Therac-25 Case).

Intellectual Property: Intellectual Property, Copyrights, Patents, and Trade Secrets, Software Piracy, Software Patents, Pirated Software, Use of Licensed Software.

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.

Computer and Work: Impact of Employment, Work Environment, Employee Monitoring, Health Issues.

Professional Ethics and Responsibilities: Ethics, Computer Ethics, Ethical Guidelines for Computer Professionals, Examine and Discuss Professional Codes of Ethics, Conduct, and Practice (IEEE, ACM, SE, AITP, and so forth).

CSE 4215 **Contact Hours/Week: 3 Hours**
Decision Support System **Credit Hour: 3.00**

Course Contents:

Introduction to Decision Support System: DSS Characteristics, Applications of Decision Support Systems, Capabilities of Decision Support Systems, Components of Decision Support Systems, Benefits of using DSS Systems.

Making Decisions in the Decision Support Systems Environment: Activities in the Decision Support Systems Environment, the Decision-Making Process, Information Use for Strategic Management, Making Decisions in the Decision Support Systems.

Environment: Strategic Analysis for the Organization, Types of Problems in the Decision-Making Process.

Developing Decision Support System: Approaches to DSS Development, DSS Software Tools, DSS Hardware and Operating System Platforms, Building and Implementing Decision Support

Systems. Decision Support Systems in Detail: Types of Decision Support Systems, DSS Models, Data Mining, Group Decision, Support Systems, Executive Information Systems (EIS). Artificial Intelligence and Expert Systems, Systems Integration and the Future of DSS: Brainstorming.

CSE 4217 **Contact Hours/Week: 3 Hours**
Network Planning **Credit Hour: 3.00**

Course Contents:

Introduction: Network components, Theoretical Network, Real World Networks. Network Architectural Design: Designing the LAN, Configuring the Network Server and Client, Network Administration, Remote Access, Expanding the Network, Wide Area Network Troubleshooting, Major Protocol Suites.

Network Simulation: Network Simulation and Optimization, Network Operations, Control and Maintenance, Network Administration, Network Management Database and Tools, Capacity Planning.

Network Optimization: Network Security and Integrity, Linear Programming and Network Algorithms for Planning, Reliability Theory and Network Planning.

CSE 4219 **Contact Hours/Week: 3 Hours**
Human Computer Interaction **Credit Hour: 3.00**

Course Contents:

Process and Model: Introduction to Human-Computer Interaction (HCI), Human Information Processing Systems, Models of Interaction, Approaches to HCI, User Interface, HCI in Software Process, Cognitive Models.

Issues and Requirements: Socio-organizational Issues and Stakeholders Requirements, Communication and Collaboration Models, Task Analysis, Dialog Notation and Design, Groupware, CSCW and Social Issues.

User System Interaction: Analysis and Design, User Interface Design, Interface Technique and Technology, Case Studies

CSE 4221 **Contact Hours/Week: 3 Hours**
Switching Systems **Credit Hour: 3.00**

Course Contents:

Evolution of Switching Systems: The Role of Switching Systems in Telecommunication Networks, Step by Step and Crossbar, Stored Program Control (SPC), Digital Switching, ATM Switching.

Switching System Architecture: Subscriber and Line Interface, Switching Network: Matrix and Channel Graph Representations, Blocking, Non-Blocking, and Rearrangeable Networks, Control Unit, Operation and Maintenance, Switching Process: Call Detecting, Number Analysis, Call Routing, Supervision, and Metering, Signaling Equipment.

Hardware and Software Structure of the Digital Switch: Time Switches and Space Switches, Path Searching, Processor Systems Architecture and Functions, Reliability and Fault Recovery, Man Machine Interface (MMI), Examples of the Present Digital Switching Systems.

ATM Switching Architectures and Performance: ATM Switch Architectures, Full-, and Partial-Connection Multistage Networks, Self-Routing Networks, ATM Switching.

Structures: Minimum-Depth Blocking Networks, Non-Blocking Single-, and Multiple-Queuing Networks, Arbitrary-Depth Blocking Networks, Fault-Tolerant ATM Switching Architectures.

New Trends in Switching: Photonic Switching, IP Switching.

CSE 4223 **Contact Hours/Week: 3 Hours**
Control System Engineering **Credit Hour: 3.00**

Course Contents:

Introduction to Control System: Conventional Control System, Steady State Response to Step, Ramp, and Parabolic Inputs, Transient Response, Poles and Zeros, Frequency Response from Pole-Zero Diagram, Routh's Stability Criterion; Block Diagrams, Canonical Forms, Transfer Functions and Signal Flow Graph, Root Locus, Frequency Response, Nyquist's Stability Criterion.

Modern Control System: Introduction, State Variable Analysis, Controllability and Observability, Application of Eigen Value, Linear Control System Design by State Feedback.

Controller Design: On-Off, Fuzzy, P, PI, PD and PID Types, Introduction to Programmable Logic Controllers (PLC), Temperature Control System, Position Control System.

The End