CSE KUET

We Construct Computer System for Empowering & Enabling Knowledge-based Society

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CSE KUET at a Glance

- **Degrees Offered:** B. Sc. Eng., M.Sc. Eng. and Ph. D.
- **Undergraduate Program:** UG started on September, 1999 with 60 yearly intake which was increased to 120 from 2016.
- **Postgraduate Programs:** PG (M.Sc. and Ph.D.) started on 2009 with 20 yearly intake which was increased to 40 from 2018.
- **Functional Bodies:** Departmental Monitoring Committee, Academic Committee for Undergraduate Studies, Academic Committee for Postgraduate Studies, Student Adviser and Course Coordinator.
- **Research and Consultancy:** Research in Distinctive CSE Fields, Research based Collaboration, System Automation, Requirement Analysis of Automation, Database Design, Large Scale Network Design, etc.
- **Co-Curricular Activities:** Hardware Acceleration Club of KUET, Special Group Interested in Programming Contest, Bit to Byte, etc.
- **CSE Association:** Student Association to Organize Programming Contests and Arrange Tournaments, Cultural Activities, etc.
- **Other Activities:** Cisco Networking Academy Program, Training, Workshop, Seminar, etc.
Department of Computer Science and Engineering

Information Booklet

Khulna University of Engineering & Technology

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Disclaimer
The information contained in this booklet are intended to provide a guidance to those concerned with undergraduate and postgraduate studies in the Department of Computer Science and Engineering (CSE), No responsibility will be borne by the Department of Computer Science and Engineering or Khulna University of Engineering & Technology (KUET), if any inconvenience or expenditure is caused to any person because of the information of this booklet or any error in quoting the rules and regulations described herein. Also, the information contained here are subject to change at any time without any prior notification.

Preface
This Information Booklet is published for the guidance of undergraduate and postgraduate students of the Department of Computer Science and Engineering (CSE) who will follow the Course Credit System at Khulna University of Engineering & Technology (KUET), Khulna, Bangladesh. This Booklet provides valuable information to the Faculty Members, Students Advisers, and Interested Persons.

In this booklet individual gets the integrated form of general information about this University, its historical background, faculties, departments, administration, and list of Faculty members in the Department of CSE. It introduces the different aspects of the Course Credit System such as rules and regulations relating to admission, credit structure, course offering instructions, attendance, teacher-student interaction, grading system, performance evaluation, requirement for degrees, etc. This Booklet also provides the detail course outline and courses offered in different terms for the students of the Department.

The information herein may be altered or modified from time to time by the proper authority of this University to meet the modernization of science and technology. Such changes or modifications will be informed to the students by the authority of the University. However, the students are stoutly advised to be in touch with their respective advisers regarding any enquiry of this booklet and modifications or changes that may be introduced by the authority afterwards.

This edition contains the updated information about different courses according to the decisions of the 55th and 60th meeting of Academic Council. Finally, we hope that the information provided in this brochure will be huge valuable to undergraduate, postgraduate students and to all other interested.
Khulna University of Engineering & Technology (KUET)

Prelude
Khulna University of Engineering & Technology (KUET) is one of the technological universities in Bangladesh. It was established as Khulna Engineering College in 1974, it was later converted to a degree awarding autonomous institution called Bangladesh Institute of Technology (BIT), Khulna in 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 Khulna University of Engineering & Technology (KUET) in 2003. Its campus extends over an area of 101 acres. Tastefully laid out with beautiful plantation and with buildings of various nature and stature, clean and wide roads, the campus presents a spectacle of harmony in architecture and natural beauty. KUET combines traditional focus on excellent teaching and research with a desire to seek new ways of developing standardized education and intellectuals. Its mission is to flourish application of engineering knowledge through teaching, research and artistry. Its vision is to be perceived and acknowledged as the outstanding public university to the nation. KUET strives to be a community of scholars and a center for learning and developing knowledge-based capabilities which will promote academic achievements and research excellence. With such mission and vision, it is advancing to be a leading engineering university that educates students to identify and develop their individual talents for successful lives.

Location and its Surroundings
The campus is located at Fulbarigate, about 13 km north from the Khulna City near the Khulna-Dhaka highway. Govt. B. L. College is located 4 km away from this campus to the southern side of it. Teacher's Training College, Technical Training Center etc. are located at the western side and the Jahanabad Cantonment is located at the northern side of KUET campus. The Khulna-Dhaka highway is passing through the eastern side of the campus.

Faculties and Teaching Departments
Currently the University has twenty (20) teaching departments under three faculties. All departments, with the exception of the department of Humanities, offer degree programs. However, some of them offer Postgraduate (PG) degrees only and other offers both Undergraduate (UG) as well as PG degrees. Faculty wise list of the departments with the status of the degree offered is given below

<table>
<thead>
<tr>
<th>Department</th>
<th>Degree Offered</th>
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<tbody>
<tr>
<td>Dept. of Civil Engineering</td>
<td>Both UG and PG</td>
</tr>
<tr>
<td>Dept. of Urban and Regional Planning</td>
<td>Both UG and PG</td>
</tr>
<tr>
<td>Dept. of Building Engineering and Construction Management</td>
<td>UG only</td>
</tr>
<tr>
<td>Dept. of Architecture</td>
<td>UG only</td>
</tr>
<tr>
<td>Dept. of Physics</td>
<td>PG only</td>
</tr>
<tr>
<td>Dept. of Chemistry</td>
<td>PG only</td>
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<tr>
<td>Dept. of Mathematics</td>
<td>PG only</td>
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<tr>
<td>Dept. of Humanities</td>
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<tr>
<td>Faculty of Electrical and Electronic Engineering</td>
<td>Both UG and PG</td>
</tr>
<tr>
<td>Dept. of Electrical and Electronic Engineering</td>
<td>Both UG and PG</td>
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<tr>
<td>Dept. of Computer Science and Engineering</td>
<td>Both UG and PG</td>
</tr>
<tr>
<td>Dept. of Electronics and Communication Engineering</td>
<td>Both UG and PG</td>
</tr>
<tr>
<td>Dept. of Biomedical Engineering</td>
<td>Both UG and PG</td>
</tr>
<tr>
<td>Dept. of Materials Science and Engineering</td>
<td>UG only</td>
</tr>
<tr>
<td>Faculty of Mechanical Engineering</td>
<td>Both UG and PG</td>
</tr>
<tr>
<td>Dept. of Mechanical Engineering</td>
<td>Both UG and PG</td>
</tr>
<tr>
<td>Dept. of Industrial Engineering and Management</td>
<td>Both UG and PG</td>
</tr>
<tr>
<td>Dept. of Energy Science and Engineering</td>
<td>Both UG and PG</td>
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<tr>
<td>Dept. of Leather Engineering</td>
<td>Both UG and PG</td>
</tr>
<tr>
<td>Dept. of Textile Engineering</td>
<td>UG only</td>
</tr>
<tr>
<td>Dept. of Chemical Engineering</td>
<td>UG only</td>
</tr>
<tr>
<td>Dept. of Mechatronics Engineering</td>
<td>UG only</td>
</tr>
</tbody>
</table>

Academic Program
Undergraduate Program          Four (04) years Bachelor of Science in Engineering degree
Postgraduate Program           Master of Science in Engineering (M. Sc. Eng.) or Master of Philosophy (M. Phil) and Doctor of Philosophy (Ph. D.)

The postgraduate courses are designed to meet the growing needs of engineering professions as well as further development of different specialized subjects of the above-mentioned areas.

Language of Instruction
Official language of instruction and examination is English. However, teachers may use native language. Bengali occasionally if no international students are present in the class.
**Academic Facilities**

To support the excellent and high quality academic environment, KUET maintains a number of academic units.

**Central Computer Center**

The Central Computer Center (CCC) has served over the years as the hub for computer related services in the campus. With the commissioning of the University-wide network, the CCC is in a unique position in providing computing and network facilities to the campus to serve the University. Now it has strong IT infrastructure with sufficient bandwidth, a router for routing, a firewall for Internet security, nine high configuration servers as Mail server, Proxy server, Database server, DNS server, Web server, seven midlevel configuration of workstations for other servers and backup server, a core switch, several manageable and unmanageable switches for intranet connectivity. At present there are about 600 network nodes through LAN connection. Internet service is also available to specific users through Wi-Fi. CCC maintains campus wide optical fiber backbone network which provides connectivity to all Faculties, Institutes, Departments, Centers, and Main Administrative Building, Web-based Email that enables all the faculty members and officers to access their mailbox from anywhere via the Internet. The CCC provides services daily from 9:00 am to 9:00 pm except weekends (Fridays & Saturdays) and holidays, though some services are available until late hours.

**Library Facility**

The library subscribes huge journals and materials. KUET operates two types of library system, General Library and Reference Library. The General Library provides in house reading and short duration borrowing opportunity of book and other reference material to the students and faculties. The Reference Library provides the in place reading. All students and faculties can enjoy these facilities for more than 10 hours in every working day. Audio-visual systems are available for studying audio and video documents. Right now the General Library System has more than 53,342 books and 3,126 Journals and periodicals in its collection. The library operations are full automated by KOHA integrated library system. Moreover, Central Library enriches every year by collecting recent books and journals. Besides the general library system, each academic department maintains rent-based library from which students can borrow textbooks at a nominal rate for one semester. There is a digital library access center at the library to access e-journals and materials with modern computers, servers and switches.

**Campus Life**

The university has 101 acres large campus with nice green landscape blended with beautiful architectural constructions. The Khulna City is the third largest metropolitan city of Bangladesh having population around 1.5 million. The city is surrounded by nice countryside and the river Rupsha. Newly constructed Khan Jahan Ali bridge connected the city with Mongla port and south-west region of Bangladesh. Sundarbans, the world's largest mangrove forest, is prevailing near the city. The city has also housed with some of the major industries of Bangladesh.

**Climate**

Being a part of tropical climate region, Bangladesh has warm and humid weather. The three main seasons prevailing in this country are winter (November-February), summer (March-June) and rainy (July-October). However, there are three more seasons available in between these seasons namely spring, autumn and late autumn, but their effects are not predominant. The warmest days in Khulna region are between April and June with temperature ranging from 30°C to 37°C. Winter temperatures usually vary between 8°C to 20°C. Humidity is high (70-90%) in summer and rainy seasons but moderate in winter (50-70%).

**Accommodation**

Six nice residential halls can accommodate more than 2000 male students and one female hall can accommodate 400 female students in the campus. Four students have to share a large room and common rest room in the residential halls. Each residential hall is equipped with modern recreational facilities like Cable TV connection, common room, reading room, library and a well-equipped guestroom. Social, cultural and other co-curriculum activities are scheduled throughout the semester/term to offer breaks in tedious study routine. One Provost and one/more Assistant Provost are appointed from the faculty members to look after the administration of each hall.

**Sports and Entertainment**

Both indoor and outdoor sports facilities are available for refreshment of the students. The physical education section of the university under the control of Director of Students Welfare (DSW) arranges central indoor and outdoor sports competition annually. The university also organizes annual cultural competitions and occasional cultural programs on some special events like celebration of different national days, university foundation day, New Year’s Eve etc. Besides, a number of cultural and social groups like theater group, debating society etc. are also active in the campus. The university team also attends different national level sports and cultural competitions and shows excellent performance.
Transportation
For the convenience of the students, faculty members, officers and staffs, KUET operates its own Shuttle Bus Service between Khulna city and the campus. In weekends special services are also provided to meet the weekend recreational and other needs.

Student Union
The Student Union of KUET is a student organization to promote the interests and welfare of the student body. All full-time students are members of the student union who vote for the office bearers of it. The DSW is the President of the Student Union as ex-officio appointed by the university authority from the senior faculty members. One more faculty member is appointed by the university authority as the treasurer of the student union. Moreover, a strong student welfare committee is also available for looking after the students’ facilities in some special cases. Sports, cultural and social activities, indoor and outdoor games are organized regularly to keep the students’ campus life pleasing.

Medical Center
The university operates a medical center for meeting the needs of students’ health care and medical facilities. The center is equipped with necessary medical equipment, a modern ambulance and full time experienced medical doctors, nurses and assistance. Mostly medical counseling and in some cases, medicine are supplied to the students free of cost.

Food and Stationeries
Each residential hall has its own cafeteria, which serves two meals per day. Each hall authority maintains the cafeteria. Students are also involved in their daily menu. Special menus are provided in different occasions in the hall cafeteria. One annual grand dinner is also arranged in each hall in honor of outgoing students. Besides these a large central cafeteria and a fast food shop offers breakfast, meals and snacks etc. Moreover, in Khulna city, there are number of nice restaurants which serve a wide variety of food including oriental and western flavor. Any sorts of alcohol or alcoholic drinks are completely forbidden in the campus. A Departmental Store is also housed in the campus for the benefit of all.

Other Facilities
In the campus there is a water treatment plant to treat the water. There is also a large Mosque, a bank and a post office in the campus. To provide uninterrupted power supply an electrical substation is located in the campus. There are also Gymnasium and a large well-equipped auditorium.

Admission
The admission process of Khulna University of Engineering & Technology emphasizes to identify students who will be able to successfully complete the degree requirements of various disciplines of engineering as well as contribute to the social and technoeconomical environment of the nation.

Undergraduate Admission
Applicants for the undergraduate program must pass the Higher Secondary Certificate (H.S.C.) or equivalent examination from any education board with science and must obtain a required minimum CGPA in Physics, Chemistry and Mathematics courses. The candidates who have completed a-level examination can also apply. The applicants have to go through a rigorous entry examination to be qualified for admission. The entry examination named as Admission Test consists of MCQ questions and short questions which covers current syllabus of Higher Secondary level Physics, Chemistry, Mathematics and English. The undergraduate admission is conducted once in each academic session.

Postgraduate Programs
Applicants for the masters programs must have B.Sc. Eng. degree or equivalent in the relevant field from a recognized University/Institute with good academic records. Students who have higher research aptitude are welcome to the program. KUET invites application twice in a year (January Term and July Term). The respective departments arrange an interview at a suitable time to select candidates for this program. The selected candidates have to take admission by depositing prescribed amount of money to the bank. Full-time and part-time students are there in this program. For full time meritorious students financial help can be provided. A part-time student must have consent from his employer to pursue postgraduate studies.

International Applicants
International applicants for both undergraduate and postgraduate program can apply throughout the year. Application materials and other information are available in the admission office. Inquiries can be directed to the Registrar. According to the present policy of KUET, international student does not have to go through the entry examination procedure. However, they should have an excellent high school record or equivalent to be qualified for admission. The admission committee and equivalence committee (if necessary) takes decision about the eligibility of admission of the applicants. KUET always encourage international students to maintain wide cultural and social diversity in its campus. Students from SAARC (India, Pakistan, Nepal, Bhutan, Sri Lanka and Maldives) countries can apply through their concern ministries to the Ministry of
Education of Bangladesh to avail the special quotas, which are reserved under SAARC countries educational and cultural contract. These positions are limited. However, students from these countries can also apply independently. International applicants are required to submit two copies of official credentials and certificates along with two copies of passport size photographs. The completed application and above-mentioned documents should be reached to the Registrar's office along with $20 application-processing fee. For the postgraduate program applicants also have to submit two letters of recommendation. Inquires can be directed to:

Registrar
Khulna University of Engineering & Technology (KUET)
Khulna 920300, Bangladesh.
Tel: +880 41 774403, Fax: +880 41 774403

Administration
The university Syndicate is the supreme body for policymaking and other operational procedures. The syndicate forms different policy under the recommendation of different committees namely the Academic Council, Planning and Development Committee and the Finance Committee. Nationally and internationally recognized academicians, planners, and economists as well as distinguished faculties from KUET form these committees. The Vice-Chancellor is the administrative and academic head of the university. A non-formal advisory executive committee and advisory committee, formed by the senior faculties of different academic disciplines and hall provosts, helps the Vice-Chancellor in various decisions making. For the proper operation of different administrative services, the office of the Vice-Chancellor maintains various administrative sections namely Academic Section, Engineering Sections (maintenance and repairs), Establishment section, Accounts section, Security section, Procurements Section etc. Registrar is the custodian of records, the properties, the common seal and such other property of the university as the Board may commit to his charges. The Vice-Chancellor and the Comptroller control the fund of the university.

Department of Computer Science and Engineering (CSE)
The department of CSE provides an outstanding opportunity for students to get a quality education in Computer Science and Engineering. It started its academic activities from 26th September 1999 with 60 yearly intake which was increased to 120 from 2016. The department started postgraduate programs (M.Sc. and Ph.D.) in 2009 with 20 yearly intake which was increased to 40 from 2018. From the beginning, the department has been widely recognized for its excellent research and teaching capabilities. Students are enrolled in this department through a highly competitive entrance exam and only top rank students of the country get the change to admit.

The department maintains several functional bodies which are Departmental Monitoring Committee, Academic Committee for Undergraduate Studies, Academic Committee for Postgraduate Studies, Student Adviser and Course Coordinator. All the functional bodies work actively to enhance research and education quality of this department. The graduates from the department are heavily recruited by both academia and industry of home and abroad.

The department provides an outstanding research environment. Research outcomes of this department regularly publish in world-recognized journals/conferences. The major areas of research include Soft Computing, Robotics, Artificial Intelligence, Speech Processing, Natural Language Processing, Image Processing, Embedded Systems, Data Mining, Machine Learning, Computer Networks and Security, Networks, etc. Besides theoretical research, faculty of the department also maintain strong ties with many reputed national and international institutions and are involved in a large number of projects in the forefronts of cutting edge technology.

There are different clubs and groups in CSE department for co-curriculum activities such as Hardware Acceleration Club of KUET, Special Group Interested in Programming Contest, Bit to Byte, etc. Students are actively involved in the clubs and groups to explore their proficiency in different branches of CSE nursing their academic knowledge. The co-curriculum activities are performed based on established rules and regulations of the department. Computer Science and Engineering Association, another student body of the department, is also active in organizing lecture series, practical demos, tournaments and cultural activities.

Besides, the department also provides different Consultation Services which include Requirement Analysis of Software or Hardware, Database Design, Large Scale Network Design, Development of Automation System, etc. Others activities of this department include Cisco Networking Academy Program, Training, Workshop, Seminar, etc.
Vision of the Department
One of the visions of the department is to emphasize on developing analytical ability along with technical skills of the students. The department also thrives constantly for acquisition of knowledge towards development of computer technology and nurture the spirit of innovation in design and development of computer systems with superior performance.

Mission of the Department
As a scholarly community, both teachers and students are continuously engaged in innovative research and development. We have a commitment to be pioneer in research community in the various fields of Computer Science and Engineering. Advanced Computer Architecture, Bioinformatics, Computer Vision and Graphics, Computer Networks, Database and Data Warehouse, Evolutionary Algorithms, Interconnection Networks, Pattern Recognition and Machine Intelligence, Photonic Switching Network, and so on, this will be helpful for all the research community, both national and international arena. We would like to open the new frontiers of Computer Science and Engineering. We always try for the development of a Research Quality Framework (RQF). The aim of the RQF initiative is to develop the basis for an improved assessment of the quality and an effective process to achieve this.

We maintain the highest standard of teaching both for theory and laboratory courses. To develop quality teaching materials, we effectively utilize various educational tools and technologies. We highly encourage the collaboration with other technical institutes and industries for sharing our expertise. We instill students with professional ethics and moral values, critical and independent thinking, sound judgment, prolonged thirst for lifelong learning, and communication ability.

Student Clubs and Groups
There are different clubs and groups in CSE department for co-curriculum activities. Students are actively involved in the clubs and groups to explore their proficiency in different branches of CSE nursing their academic knowledge. The co-curriculum activities are performed based on established rules and regulations of the department. Head of the department is the Chief Patron of all the clubs and groups and two/three teachers are involved as moderators in each group.

Special Group Interested in Programming Contest (SGIPC)
SGIPC arranges workshops and contests on a regular basis to develop the skills of the members. Moreover, it offers a platform to the Competitive Programming Community of KUET by training members on algorithms, data structure, mathematics, geometry, probability theory, game theory and different problem-solving paradigms which helps them in their academic and professional life.

Hardware Acceleration Club of KUET (HACK)
The aim of HACK is to develop skills in different aspects related to hardware especially in real-life hardware project development. HACK always encourages its members with essential guidelines to build up their career as an expert hardware engineer. It organizes hands-on workshops on robotics, embedded systems development and many more.

Bit to Byte (B2B)
The central perspective of B2B club is to encourage the members on software development. B2B arranges various sessions where members can learn the different tips and techniques for software development. It also organizes multiple workshops, boot camps and practice sessions related to programming and software development.

Internet of Things Club (IoTC)
IoTC helps its members understanding the underlying concept of the Internet of Things. This club shows how to start with IoT and how to proceed effectively. IoTC not only inspires members but also provides them with necessary suggestions and helps.

Animation and Game Development Club (AGDC)
AGDC assists members to develop a game successfully. It provides a guideline on how to design games and animations, how to make them more attractive and how to advertise for the game. It highly encourages members to build up their career in this challenging industry.

Machine Learning and Computing Intelligence Group (MLCIG)
MLCIG makes its members acquainted with machine learning and computer intelligence to address complex real world problems. It encourages members to build up their career through research and development intelligent systems.

Robotics and Artificial Intelligence Club (RAIC)
RAIC aims to support and foster interest in various aspects related to robotics. The main goal of this club is to understand the basic principles of robotics, its control and participating in the various competitions. RAIC provides necessary information about robotics and guidelines on how to build a robot in real life.
Cyber Security Club (CSC)
CSC focuses on developing skills on cyber security. It helps members to understand the underlying security standards and their implementation. It also provides members necessary resources to obtain the technical expertise.

English Speaking and Career Club (ESCC)
A considerable percentage of CSE graduates opt scholarships for higher education and jobs in abroad. With regular seminars and workshops, ESCC ensures that the members never lag with the fast-moving world. The club also provides necessary suggestions and helps for getting good IELTS or GRE score.

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Laboratory Facilities
The department has eight laboratories which are well equipped and getting more resourceful day by day. Those are:

<table>
<thead>
<tr>
<th>Computer Language &amp; Computing Laboratory</th>
<th>Networking &amp; Multimedia Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software &amp; Web Engineering Laboratory</td>
<td>Mobile Games &amp; Apps Development Center</td>
</tr>
<tr>
<td>Computer Hardware &amp; Interfacing Laboratory</td>
<td>VDI Multi-Purpose Laboratory</td>
</tr>
<tr>
<td>Digital Systems &amp; VLSI Laboratory</td>
<td>Mobile Computing Laboratory</td>
</tr>
</tbody>
</table>

Computer Language & Computing Laboratory

Computer Language & Computing Laboratory provides computing facility to the students. This Laboratory consists of a Windows 2012 Server and thirty client machines which are configured in both windows and Linux operating systems. These machines have high speed Intel processors. All clients are connected to Internet facility. Software like Java (JDK), JSP, Visual Basic, Visual C++, CodeBlocks, Prolog, PHP, ASP and RDBMS like Oracle and SQL Server are installed in this Laboratory.

Software & Web Engineering Laboratory

The purpose of Software & Web Engineering Laboratory is to develop students’ knowledge about software engineering which involves computer-assisted method to organize and control the development of software, especially on large, complex projects. For this purpose this laboratory consists of a Windows 2012 Server and thirty clients which are connected by Local Area Networks and Internet facility. The clients are Dell brand machines model Optiplex-380 having Intel Core 2 duo Processors. Software installed in this Laboratory are Java (JDK), JSP, Visual Basic, Visual C++, CodeBlocks, Prolog, PHP, ASP and RDBMS like Oracle and SQL Server.
Computer Hardware & Interfacing Laboratory

Computer Hardware & Interfacing Laboratory is equipped with different latest tools to accomplish various hardware related design, testing and interfacing peripherals with microprocessors/ microcomputers. This laboratory has a rich collection of such devices for that purpose. The main equipment of this laboratory includes Microprocessor Trainer Kit 8088 (MTS-88C K&H), Microprocessor Trainer Kit 8086 (MDA-8086), Basic Computer Interface Control (C10-100),Scope Multimeter (DMM-740), Stepper Motor (MDA-012), AD/DA Experimental Board, Multi I/O Lab Card, Power Supply Unit Experimental System (AT-700), Oscilloscope, Analog Multimeter (ST-505), Digital Multimeter, Electronic Sensors Trainer, Portable EPROM Eraser, Function Generator, Digital Function Generator, Portable EPROM Programmer, Digital Portable Oscilloscope, DCA/ACA Clamp Meter (ST 3600), AC/DC Labtype Voltmeter (MSMB-3), Digital Earth Tester (4105), Fiber Optic Power Meter (EFO-1102), Scope Card (Model 2100), Data Acquisition Card etc. This laboratory also has a Server and twenty workstations connected by Local Area Network.

Digital Systems & VLSI Laboratory

The purpose of Digital Systems & VLSI Laboratory is to design and implement digital circuits and to gain adequate knowledge about digital systems. This Laboratory is equipped with a variety of modern tools which helps the students to experiment different digital systems.

The main equipment of this Laboratory includes Scope Multimeter (DMM-740), Digital Experimental Trainer Kit (LT-1000), Portable Digital IC Tester, Portable Linear IC Tester, Digital Signal Processing Controller (MDA-DSP), Power Supply Unit Experimental System (AT-700), Oscilloscope (AL210), Logic Probe (LP-2800), Analog Multimeter (ST-505), Digital Logic Circuit Trainer (K&H-OLS-2000), Portable EPROM Eraser, Logic Pulsar, Function Generator, Digital Function Generator, Digital LCR Meter, Portable EPROM Programmer, Digital Storage Oscilloscope, Digital Multimeter, Frequency Counter, Digital Earth Tester, EPROM Programmable. Besides, there are a huge number of ICs, Diodes, Capacitors, Resistor, to implement different digital circuits.
Networking & Multimedia Laboratory

Networking & Multimedia Laboratory is one of the most resourceful Laboratories of this department. This Laboratory consists of two COMPAQ Proliant ML550 Servers and Intranet Backbone Fiber Optic switch Model 3 COM Superstack 4900 by which the whole university is connected together.

There are a number of CISCO equipment in this laboratory. These equipment enable advanced networking facility to this laboratory. It includes CISCO 10/100 Ethernet Routers (model 2600), CISCO Dual 10/100 Ethernet Routers, CISCO Catalyst Switches, Transceivers etc.

Besides, the laboratory has a good number of tools like RJ45 Crimp Tools, Punch Down Tools, Wire Strippers, Side Cutters, LAN Cable Testers etc. and some networking software which helps student to gain knowledge and to develop advance networking based projects.

Mobile Games & Apps Development Center

Mobile Games & Apps Development Center is one of the most resourceful laboratories of this department. The main focus of this center is to build new apps, games and test them in different environment. This lab consists of 12 HP desktop computer, 8 iMAC, 2 Samsung VR Gear, 1 iPad pro, Iphone 8 plus, Android Tab, Android Phone, 5 Wacom Intuos Pro Medium, Oculus Rift, Xbox One, Sony Play Station 4 Pro, Nintendo Entertainment System, Smart TV (Android) and many other things. The lab can accommodate 32 students.
VDI Multi-Purpose Laboratory

VDI Multi-Purpose Laboratory provides programming facility for students. This Laboratory consists of a Vnopn Server and sixty client machines which are configured in windows. All clients are connected to Internet facility. The clients can be monitored using Vnopn Server. The lab consists of 10 Raspberry Pi. Software like Java (JDK), JSP, Visual Basic, Visual C++, CodeBlocks are installed in this Laboratory.

Mobile Computing Laboratory

Mobile Computing Laboratory studies design principles and evaluation methodologies for understanding and building systems supports mechanisms for mobile computing systems including mobile ad hoc and sensor networks for achieving the goal of anytime, anywhere computing in wireless mobile environments. The primary research focuses of the lab are in mobility management, data and service management, security and dependability aspects in mobile computing environments. This lab consists of 12 MACs and other highly configuration PCs.
1. Definitions

1.1. ‘University’ means the Khulna University of Engineering & Technology.
1.2. ‘Syndicate’ means the Syndicate of the University.
1.3. ‘Academic Council’ means the Academic Council of the University.
1.4. ‘Vice-Chancellor’ means the Vice-Chancellor of the University.
1.5. ‘Dean’ means the Dean of a Faculty of the University.
1.6. ‘Head of the Department’ means the Head of a Department of the University.
1.7. ‘Central Equivalence Committee’ means the Central Equivalence Committee of the University.
1.8. ‘Academic Committee’ means the Academic Committee for Undergraduate Studies (ACUG) of a degree awarding department of the University.
1.9. ‘Degree’ means the degree of Bachelor of Science in Engineering or Bachelor of Urban & Regional Planning offered by the University.
1.10. ‘Senior most Head/Dean’ means the most senior teacher among Heads/Deans.

2. Departments

2.1. Degree Awarding Departments:

The University shall have the following degree awarding departments:

i) Department of Civil Engineering
ii) Department of Electrical and Electronic Engineering
iii) Department of Mechanical Engineering
iv) Department of Computer Science and Engineering
v) Department of Electronics and Communication Engineering
vi) Department of Industrial Engineering and Management
vii) Department of Energy Science and Engineering
viii) Department of Biomedical Engineering
ix) Department of Urban and Regional Planning
x) Department of Leather Engineering
xi) Department of Textile Engineering
xii) Department of Building Engineering and Construction Management
xiii) Department of Architecture
xiv) Department of Material Science and Engineering
xv) Department of Chemical Engineering
xvi) Department of Mechatronics Engineering

Any other department to be instituted by the Syndicate on the recommendation of the Academic Council from time to time.

2.2. Teaching Departments:

The University shall have the following teaching departments:

i) Department of Civil Engineering
ii) Department of Electrical and Electronic Engineering
iii) Department of Mechanical Engineering
iv) Department of Computer Science and Engineering
v) Department of Electronics and Communication Engineering
vi) Department of Industrial Engineering and Management
vii) Department of Energy Science and Engineering
viii) Department of Biomedical Engineering
ix) Department of Urban and Regional Planning
x) Department of Leather Engineering
xi) Department of Textile Engineering
xii) Department of Building Engineering and Construction Management
xiii) Department of Architecture
xiv) Department of Material Science and Engineering
xv) Department of Chemical Engineering
xvi) Department of Mechatronics Engineering

Any other department that may be instituted by the Syndicate on the recommendation of the Academic Council from time to time.

3. Degrees Offered

The University shall offer courses leading to the award of the following degrees:

i) Bachelor of Science in Civil Engineering, abbreviated as B. Sc. Eng. (CE)
ii) Bachelor of Science in Electrical & Electronic Engineering, abbreviated as B. Sc. Eng. (EEE)
iii) Bachelor of Science in Mechanical Engineering, abbreviated as B. Sc. Eng. (ME)
iv) Bachelor of Science in Computer Science & Engineering, abbreviated as B. Sc. Eng. (CSE)
v) Bachelor of Science in Electronics & Communication Engineering, abbreviated as B. Sc. Eng. (ECE)

vi) Bachelor of Science in Industrial & Production Engineering, abbreviated as B. Sc. Eng. (IPE)

vii) Bachelor of Urban & Regional Planning, abbreviated as BURP

viii) Bachelor of Science in Leather Engineering, abbreviated as B. Sc. Eng. (LE)

ix) Bachelor of Science in Textile Engineering, abbreviated as B. Sc. Eng. (TE)

x) Bachelor of Science in Building Engineering and Construction Management, abbreviated as B. Sc. Eng. (BECM)

xi) Bachelor of Science in Biomedical Engineering, abbreviated as B. Sc. Eng. (BME)

xii) Bachelor of Science in Energy Science and Engineering, abbreviated as B. Sc. Eng. (ESE)

xiii) Bachelor of Architecture, abbreviated as BArch

xiv) Bachelor of Science in Materials Science and Engineering, abbreviated as B. Sc. Eng. (MSE)

xv) Bachelor of Science in Chemical Engineering, abbreviated as B. Sc. Eng. (Chemical)

xvi) Bachelor of Science in Mechatronics Engineering, abbreviated as B. Sc. Eng. (Mechat)

Any other degree that may be awarded by a department on the recommendation of the Academic Council and approval of the Syndicate from time to time.

4. Students Admission

4.1 The four academic years of study for the degree of Bachelor of Science in Engineering (B. Sc. Eng.)/ Bachelor of Urban & Regional Planning (BURP) and five years of study for Bachelor of Architecture (BArch) shall be designated as first year, second year, third year, fourth year and fifth year class in succeeding higher levels of study. Students shall generally be admitted into the first year class.

4.2 An Admission Committee shall be formed in each academic year/session by the Academic Council for admission into first year B. Sc. Eng./ BURP/BArch class consisting of the following members:

i) One of the Deans in order of seniority (as Professor) for each year by rotation

ii) All other Deans

Chairman

Member

iv) Registrar

Secretary

The Committee is empowered to co-opt member/members (if required) not below the rank of a professor.

4.3 A candidate for admission into the first year class must have passed the H.S.C. Examination from an Education Board in Bangladesh (after 12 years of schooling) with Physics, Chemistry and Mathematics as his/her subjects of examination in Higher Secondary level or examination recognized as equivalent thereto, and must also fulfill all other requirements as may be 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 Central Equivalence Committee.

4.4 The rules and conditions for admission into different departments shall be framed by the Academic Council on the recommendation of the Admission Committee in each year.

4.5 All candidates for admission into the courses of B. Sc. Eng./BURP/BArch must be citizens of Bangladesh unless the candidature is against the seats those are reserved for foreign students. Candidates for all seats except the reserved ones, if any, shall be selected on the basis of merit. The rules for admission into the reserved seats shall be framed by the Academic Council on the recommendation of the Admission Committee.

4.6 No student shall ordinarily be admitted in the first year class after the start of the corresponding classes or after the call goes out for the admission whichever is later. The date of commencement of classes for the newly admitted students will be announced in advance.

4.7 Admission of a newly admitted student in the first year class will be cancelled if he/she remains absent without prior permission of the Registrar through the Head of the Department for first 2 (two) consecutive weeks after the start of class. If any student fails to report due to unavoidable circumstances within the stipulated first two weeks, he/she may appeal within the next 2 (two) weeks to the Academic Council through the Head of the Department. The decision of the Academic Council will be final.

4.8 Prior to admission to the University every student shall be examined by a competent medical officer as prescribed in the admission rules.

5. Admission on Transfer

5.1 There shall be no admission on transfer in the first year class. In special cases, students may be admitted into a higher class.
5.2 A student may be allowed to transfer a maximum of 50% of the required theory courses of this University completed by the student at other public universities/institutions. The candidate must have a minimum CGPA of 3.0 without any F grade in any course and there should not be any discontinuity of study.

5.3 A candidate seeking admission on transfer from other public university should apply to the Registrar of this University. The Registrar will refer the case to the Head of the Department concerned and also to the Central Equivalence Committee. On receiving the opinions of the Departmental Monitoring Committee, the Central Equivalence Committee will consider the matter and it will be placed before the Academic Council. The decision of the Academic Council will be final and it will be communicated to the Head of the Department and the candidate.

5.4 Central Equivalence Committee
The Central Equivalence Committee will be formed as follows:
i) One of the Deans (by rotation CE, EEE and ME) Chairman of this University
ii) All other Deans Member
iii) All Heads of the Undergraduate Departments Member
iv) Deputy Registrar (Academic) of this University Secretary
Duration of Chairman of this committee will be 2 (two) years.

6. Academic Calendar
6.1 The academic year shall ordinarily be divided into two regular Terms, each ordinarily having duration of not less than 13 (thirteen) weeks of classes.

6.2 There shall be a final examination at the end of each Term and the examination will be conducted as per Academic regulations.

6.3 The Head of the Department will announce the academic schedule for each Term ordinarily before the start of the class subject to the approval of the Academic Council.

6.4 Academic schedule may be prepared according to the following guidelines based on two regular Terms:

<table>
<thead>
<tr>
<th>Term I</th>
<th>No. of weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes</td>
<td>13</td>
</tr>
<tr>
<td>Recess before examination/Preparatory leave</td>
<td>1.3*</td>
</tr>
<tr>
<td>Term Final Examination</td>
<td>3.1*</td>
</tr>
<tr>
<td>Publication of results including Term break</td>
<td>2.3*</td>
</tr>
</tbody>
</table>

Sub-Total: 20

<table>
<thead>
<tr>
<th>Term II</th>
<th>No. of weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes</td>
<td>13</td>
</tr>
<tr>
<td>Recess before examination/Preparatory leave</td>
<td>1.3*</td>
</tr>
<tr>
<td>Term Final Examination</td>
<td>3.1*</td>
</tr>
<tr>
<td>Publication of results including Term break</td>
<td>2.3*</td>
</tr>
</tbody>
</table>

Sub-Total: 20

Recess 1**
Vacations throughout the session 11
Total: 52 Weeks

* The digit after the decimal point indicates number of days.
** This recess may be utilized near the mid position of a Term when no vacation of minimum 7 (seven) days will be available during 13 (thirteen) week classes in that Term.

7. Duration and Credit of Courses
7.1 The B. Sc. Eng./BURP courses shall be extended over a period of four academic years and that for BArch shall be five academic years, each with a normal duration of one calendar year. Each academic year will be divided into two Terms for the purpose of academic programs and conducting of examinations.

7.2 The curricula of the B. Sc. Eng./BURP/BArch degree in the different departments shall be as proposed by the concerned ACUG through the Executive Committee of the concerned Faculty and approved by the Academic Council.

7.3 The ACUG may review the curricula once in every academic year and put forward suggestions to the Academic Council through the Executive Committee of the concerned Faculty.

7.4 Teaching for the courses is reckoned in credits and the credits allotted to various courses will be determined by the ACUG with the following guidelines:

<table>
<thead>
<tr>
<th>Type of Course</th>
<th>Contact Hour (in a Term)</th>
<th>No. of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Theory/Lecture</td>
<td>1 hour/week</td>
<td>1.00</td>
</tr>
<tr>
<td>ii) Tutorial</td>
<td>1 hour/week</td>
<td>1.00</td>
</tr>
<tr>
<td>iii) Independent Design/Studio/Seminar/Special Study/Project/Thesis</td>
<td>3/2 hours/week</td>
<td>0.75</td>
</tr>
<tr>
<td>iv) Field work</td>
<td>2 weeks of field work</td>
<td>1.00</td>
</tr>
</tbody>
</table>

7.5 The minimum number of credits that a student has to complete successfully for the award of B. Sc. Eng./BURP degree will be 160 and that for BArch degree will be 200 of which a maximum of 150 credits and 185 credits, respectively to be assigned as core courses.
7.6 The total contact hours for students including lecture, tutorial and laboratory/sessional should be around 30 periods per week, each period being of 50 minutes duration.

7.7 A course plan for each course proposed by the course teacher with the consultation of the Head of the Department showing details of lectures is to be announced at the start of each Term.

7.8 Project/Thesis should preferably be of 1.5 to 3.0 credits in each Term. Credit in any theory course should not exceed 4.0 and that in sessional/laboratory course should not exceed 3.0 and for studio should not exceed 10.

8. **Course Designation and Numbering System**

Each course is designated by a two to four letter code (e.g. CE, EE, ME, Hum, Math, Ch, Ph, etc) identifying the course offering department followed by a four-digit number with the following criteria:

8.1 The first digit will correspond to the year in which the students normally take the course.

8.2 The second digit will correspond the Term (1 for 1st Term, 2 for 2nd Term and 0/1/2 for both Terms in case of optional courses only) in which the course is normally taken by the students.

8.3 The third and fourth digits will be reserved for departmental use, of which the last digit will be odd for theoretical and even for sessional/laboratory course.

8.4 The course designation system is illustrated by the following example:

```
CSE 2201
```

Course Title:

3rd and 4th digits are reserved for departmental use. Last digit designates a course (odd No. for theoretical and even No. for sessional/laboratory course).

Second digit signifies Term number (1 for 1st Term, 2 for 2nd Term and 0/1/2 for both Terms in case of optional courses only).

First digit signifies year (Second year).

Departmental identification code (Computer Science and Engineering).

**N.B.:** There will be one blank space after departmental identification code.

8.5 Project/thesis courses for B.Sc. Eng/BURP shall be designated by the departmental identification code followed by 4000 (Example: CE 4000) applicable for both the Terms. For BArch the code shall be 5000.

9. **Classification of Courses**
The courses included in undergraduate curricula are classified as follows:

9.1 Core Courses
In each department a number of courses will be identified as core courses which form the nucleus of the respective Bachelor’s degree program. A student has to complete all the designated core courses for his/her degree.

9.2 Pre-requisite Courses
Some of the core courses are identified as pre-requisite courses. A pre-requisite course is one which is required to be completed/appeared at the examination before some other course(s) can be taken. Any such course, on which one or more subsequent courses built up, may be offered in each of the two regular Terms (if possible).

9.3 Optional Courses
Apart from the core courses, a student will have to take a number of courses which he/she can choose from a specified group/number of courses to complete the credit requirements.

9.4 Non Credit Courses
Non credit course(s) may be offered to a student to improve his/her knowledge in some specific fields. The credits in these courses will not be counted for GPA and CGPA calculation but will be reflected in the transcript as satisfactory (S)/unsatisfactory (U). Non-credit course(s) may be offered under the following circumstances:

If a student's Thesis/Project supervisor feels that the study/design is highly related to course(s) offered by any department for their students, he can recommend to the concerned Head of the Department for participation of the student(s) in the course(s). Such registration of course(s) will not affect the normal course registration of the student.

9.5 Backlog Courses
The course(s) which a student registered in a Term but after Term final examination he/she obtained ‘F’ grade in that course(s) and also the withdrawal courses as defined by Article 23.1(ii).

9.6 Withdrawal Courses
The courses which were withdrawn by a student due to some reasons as mentioned in Article 11.8.

9.7 Incomplete Courses
The unregistered course(s) and the course(s) that a student has registered but cancelled according to Article 11.3 will be defined as incomplete course(s).
10. **Departmental Functional Bodies**

10.1 **Departmental Monitoring Committee**

Each degree-awarding department will form a Departmental Monitoring Committee with Head of the Department as Chairman and 4 (four) senior most teachers of the department as members. The Committee may propose any change and modifications time to time needed for upgrading/changing the Undergraduate Course Curriculum to ACUG. The Committee will also nominate Course Coordinator and Advisers for the student.

10.2 **Student Adviser**

An Adviser (normally not below the rank of Assistant Professor) will be nominated for one or more students for the entire period of study by the Departmental Monitoring Committee. He/She will advise each student on the courses to be taken in a Term. However, it is the student’s responsibility to keep contact with the Adviser who will review and eventually approve the student’s specific plan of study and monitor on subsequent progress of the student.

For a student of second and subsequent Terms, the type of courses for which he/she can register will be decided on the basis of his/her academic performance during the previous Term. The Adviser will advise the students to register the courses during the next Term within the framework of the guidelines in respect of minimum/maximum credit hours limit. He/She may advise the student to change one or more courses among the offered courses based on student’s academic performance.

10.3 **Course Coordinator**

In each degree-awarding department, one of the Teachers (normally not below the rank of Assistant Professor) nominated by the Departmental Monitoring Committee, will act normally for 2 (two) Terms as Course Coordinator and Member Secretary to the ACUG.

11. **Course Registration for Regular/Incomplete/Withdrawal Course(s)**

11.1 **Pre-condition for Registration**

A student will be allowed to register courses, depending upon his/her performance. If a student fails in a pre-requisite course in any term, he can register for a course which builds on the pre-requisite course provided his attendance does not fall below 60%. A student having outstanding dues to the University or a Hall of Residence shall not be permitted to register.

11.2 **A regular student can register a maximum of 5 (five) theoretical courses in addition to sessional/project/thesis/field work/seminar/sessional related courses in a Term those offered in that Term in any Year. No student will be allowed to register courses from different Terms in any Term (For example: In case of registration for 1st Year 1st Term, a student can register maximum five theoretical courses in addition to sessional courses/sessional related courses among the offered courses for 1st Year 1st Term only). No student can register any backlog course along with the regular courses in a Term. The total number of credit hours shall generally be between 15 to 24 credits in a Term. However, a student may be allowed to register less than 15 (fifteen) credits in a Term if—

i) the number of credits required for graduation is less than 15 (fifteen) in that Term and

ii) he/she cannot find appropriate courses for registration.

11.3 **If a student fails to attend 60% of the classes of any registered course in a Term whatever be the reasons, then the registration will be cancelled for that course and the course be treated as Incomplete course.**

11.4 **Registration Procedure**

The date and time for registration will be announced in advance by the Registrar’s office. Students will register his/her courses in a Term according to following guidelines:

i) A student must pay Hall dues before the course registration of a Term.

ii) The student must pay the course registration fees as per rule.

iii) The student will finalize courses to be taken in consultation with his/her Adviser from the courses offered by the respective Department.

iv) The student will complete the registration and respective Adviser and Head of the Department will confirm it.

The Registrar’s office will distribute course-wise list of registered students to the concerned department and Controller of examinations.

11.5 **Registration Deadline**

A student must register for the courses to be taken within first 8 (eight) working days of each Term. However, late registration will be permitted within next 7 (seven) working days of class on payment of late registration fee. No registration will be accepted after first 15 (fifteen) working days of class of each Term.

For the newly admitted first year students, relaxation up to a maximum of 10 (ten) working days of class from the beginning of the Term may be allowed. Late registration of first year student will not be accepted after these days unless the student submits a written appeal to the Registrar through the concerned Head of the Department and can document extenuating circumstances such as medical problems (Physically incapacitated and not able to be present) or some other academic commitments which precluded enrolling prior to the last date of registration. Proper certificates from concerned authorities must be submitted along with the application.
11.6 Penalty for Late Registration
Students who fail to register within the specified dates for registration will be charged a late registration fee (an amount as may be decided by the authority). This extra fee will not be waived whatever be the reason for late registration.

11.7 Course Adjustment Procedure
A student would have some limited options to add or delete courses from his/her registration list. Addition of course is allowed within the 10 (ten) working days of class from the beginning of the Term. Dropping of a course is allowed within 15 (fifteen) working days of class from the beginning of the Term. Adjustment of initially registered courses in any Term can be done only by duly completing the Course Adjustment Form.

Any student willing to add or drop courses will have to fill up a Course Adjustment Form in consultation with his/her Adviser. The original copy of the Course Adjustment Form will be submitted to the Registrar's office through the Adviser and Head of the Department.

11.8 Withdrawal from a Term
If a student is unable to complete the Term Final Examination due to illness, accident or any other valid reason, etc. he/she may apply in prescribed form to the Registrar through his/her Adviser and Head of the Department for total withdrawal from the Term within 7 (seven) working days after the end of the Term final examination. However, he/she may choose not to withdraw any laboratory/sessional/design/Studio course if the grade obtained in such a course is ‘D’ or better and that he/she has to indicate clearly in his/her withdrawal application. In case of illness the withdrawal application must be supported by a medical certificate from University Medical Officer. The Academic Council will take final decision about such an application.

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 after having cleared all dues.
   iv) A student failing to earn a minimum of 36 (thirty six) credits in the first 4 (four) consecutive Terms or 54 credits in the first 6 (six) consecutive Terms will cease to be a student of this University. However, any student forced to discontinue his/her studies under Article 12.6(iii), the period of discontinuance should be excluded in calculating the time (4 consecutive Terms or 6 consecutive Terms).
   v) 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 (seven) consecutive academic years.

12.2 Every student whose name has been struck off from the rolls by exercise of the clause (ii) of Article 12.1 seeking readmission 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 readmission. The Head of the Department shall forward the application to the Vice-Chancellor of the University with his remarks. If the readmission is allowed, the student will be required to get him/her self-admitted on payment of all dues not later than one week from the date of permission given by the Vice-Chancellor. All re-admission should preferably be completed before the Term starts.

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

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

12.5 In case a student whose name has been struck off from the rolls under clause (i) of Article 12.1 seeks readmission before the start of the next Term he/she shall be readmitted on payment of all arrear fees and dues (excluding course registration fees). But if he/she seeks readmission in any subsequent year the procedure for his/her readmission will be the same as described in Article 12.2.

12.6 Readmission for discontinuance of studies
A student will be considered to discontinue his studies under the following conditions:
   i) Non-payment of University fees and other dues for Terms concerned.
   ii) Withdrawal from a Term/absent in the Term final examination.
   iii) Forced to discontinue under disciplinary rules.

The maximum allowable period of discontinuance is 4 (four) regular Terms during his/her whole studentship whatever may be the reason as specified above and at the same time s/he will have to fulfill the conditions of Article 12.1 (iv). A student seeking readmission within the allowable period of discontinuance may be readmitted after payment of all arrear fees and dues.

12.7 In case any application for readmission is rejected, the student may appeal to the Academic Council for re-consideration. The decision of the Academic Council shall be final.
13. **Grading System and Calculation of GPA and CGPA**

13.1 **Grading System**

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

<table>
<thead>
<tr>
<th>Numerical Grade</th>
<th>Letter Grade</th>
<th>Grade Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% or above</td>
<td>A+</td>
<td>4.00</td>
</tr>
<tr>
<td>75% to less than 80%</td>
<td>A</td>
<td>3.75</td>
</tr>
<tr>
<td>70% to less than 75%</td>
<td>A-</td>
<td>3.50</td>
</tr>
<tr>
<td>65% to less than 70%</td>
<td>B+</td>
<td>3.25</td>
</tr>
<tr>
<td>60% to less than 65%</td>
<td>B</td>
<td>3.00</td>
</tr>
<tr>
<td>55% to less than 60%</td>
<td>B-</td>
<td>2.75</td>
</tr>
<tr>
<td>50% to less than 55%</td>
<td>C+</td>
<td>2.50</td>
</tr>
<tr>
<td>45% to less than 50%</td>
<td>C</td>
<td>2.25</td>
</tr>
<tr>
<td>40% to less than 45%</td>
<td>D</td>
<td>2.00</td>
</tr>
<tr>
<td>Less than 40%</td>
<td>F</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Continuous assessment X

Withdrawal W

Incomplete I

Non Credit Course S/U (Satisfactory/Unsatisfactory)

13.2 **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 Term. 'F' grades will not be counted for GPA calculation. GPA of a Term 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.

Cumulative Grade Point Average (CGPA) gives the cumulative performance of the student from first Term up to any other Term to which it refers and is computed by dividing the total weighted grade points (\( \sum C_i G_i \)) accumulated up to the date by the total credit hours (\( \sum C_i \)).

Both GPA and CGPA will be rounded off to the second place of decimal for reporting.

14. **Distribution of Marks**

14.1 The distribution of marks for a given course will be as follows:

i) Theory courses:

- Class participation, attendance and assignments 10%
- Class tests, Quizzes, Spot test, etc. 20%
- Term Final Examination (3 hours duration) 70%

Total: 100%

ii) Independent laboratory/design/Studio/field work courses:

- Class participation and attendance 10%
- Quizzes, Viva-Voce conducted in lab class 20%
- Viva-Voce conducted centrally 20%
- Performance and reports 50%

Total: 100%

iii) Project/thesis: (Continued for two Terms)

a) At the end of 1st term of 4th year B.Sc. Eng./BURP and 5th year BArch:

- 30% of total marks to be evaluated as follows:
  - Presentation and viva-voce (conducted by a viva voce committee) 10%
  - Supervisor 20%

b) At the end of 2nd term of 4th year B.Sc.Eng/ BURP and 5th year BArch:

- 70% of the total marks to be evaluated as follows:
  - Presentation and viva-voce (conducted by a viva voce committee) 20%
  - Supervisor 40%
  - External examiner (any other teacher of the Department/a member of examination committee) 10%

Total (in two Terms): 100%

14.2 **Attendance**

i) Eligibility for Scholarship/stipend/grant

The students whose percentage of attendance will fall short of 75% in any of the theory, lab/sessional/Studio courses for which he/she has registered in any Term of an academic year shall not be eligible for the award of any type of scholarship/stipend/grant for the following academic year.

ii) Basis for awarding marks for attendance will be as follows:

<table>
<thead>
<tr>
<th>Attendance</th>
<th>Marks (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>90% and above</td>
<td>100%</td>
</tr>
<tr>
<td>85% to less than 90%</td>
<td>90%</td>
</tr>
<tr>
<td>80% to less than 85%</td>
<td>80%</td>
</tr>
<tr>
<td>75% to less than 80%</td>
<td>70%</td>
</tr>
<tr>
<td>70% to less than 75%</td>
<td>60%</td>
</tr>
<tr>
<td>65% to less than 70%</td>
<td>50%</td>
</tr>
<tr>
<td>60% to less than 65%</td>
<td>40%</td>
</tr>
</tbody>
</table>
15. **Class Tests, Quiz and Spot Test**  
15.1 For theory courses 3 class tests will be taken. Normally no more class tests will be taken on any course.  
15.2 The class teacher will assign problems to the students and take spot test and quiz examination for assessment.  
15.3 The date of class tests/quiz shall be fixed by the course teacher in consultation with the Head of the Department.  
15.4 Duration of class tests should be 20-30 minutes and quizzes and spot tests should be 10-20 minutes.  
15.5 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, Backlog and CGPA Improvement**  
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 calculation. A student who obtains an ‘F’ grade in any core course in any Term, he/she will have to repeat the course. If a student obtains an ‘F’ in an optional course he/she may choose to repeat the course or take a substitute course, if available. F grades will not be counted for GPA calculation but will stay permanently on the grade sheet and transcript. When a student will repeat a Backlog course in which he/she previously obtained ‘F’ grade, he/she will not be eligible to get a grade better than B+ (B plus) in such a course.  
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. A student obtaining ‘C’ or a better grade in a course will not be allowed to repeat the course for the purpose of grade improvement if CGPA of the student falls below 2.20. Absence in Term final examination will result ‘F’ grade unless he/she has withdrawn from the Term as per Article 11.8.

17. **Performance Evaluation**  
The minimum CGPA requirement for obtaining a B. Sc. Eng./BURP/BArch degree is 2.20. The performance of a student will be evaluated in terms of two indices, viz. GPA and CGPA. Students will be considered to be making normal progress toward a degree if their CGPA for all courses passed is 2.20 or more. Students whose GPA will fall below 2.20 will have to appeal to the Head of the Department through his Adviser for the course registration so that the necessary remedial measures can be taken.

18. **Honors, Dean'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 better.

18.2 **Dean's List**  
In recognition of excellent performance, the names of students who maintains an average GPA of 3.75 or above in two regular Terms of an academic year may be published in the Dean's List in each Faculty and he/she will be given a certificate from respective Dean as recognition. Students who have received an ‘F’ grade in any course during any of the two consecutive regular Terms will not be considered for Dean's List in that year.

18.3 **University Gold Medal**  
University Gold Medal for outstanding graduates will be presented to the students who secure the 1st position in each Department and whose CGPA is above or equal to 3.75. The student must have completed his/her undergraduate course work within four consecutive academic years for B.Sc. Eng./BURP and five consecutive academic years for BArch with no ‘F’ grades and have a satisfactory attendance to his credit.

19. **Student Classification**  
Regular students of the University are normally classified according to the number of credit hours earned from first admission in the University. The following year wise classification applies to the students.

<table>
<thead>
<tr>
<th>Year</th>
<th>Earned Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year</td>
<td>&gt; 0 to 30</td>
</tr>
<tr>
<td>Second Year</td>
<td>&gt; 30 to 60</td>
</tr>
<tr>
<td>Third Year</td>
<td>&gt; 60 to 90</td>
</tr>
<tr>
<td>Fourth Year</td>
<td>&gt; 90 For B.Sc. Eng./BURP</td>
</tr>
<tr>
<td></td>
<td>&gt; 90 to 120 for BArch</td>
</tr>
<tr>
<td>Fifth year</td>
<td>&gt; 120 for BArch</td>
</tr>
</tbody>
</table>

20. **Probation and Suspension**  
Students who fail to maintain minimum GPA of 2.20 and could not complete the minimum credit requirements may be placed on academic probation.  
The status of academic probation is a reminder/warning to the student that satisfactory progress towards graduation is not being made. A student may be placed on academic probation when either of the following conditions exists:
i) The GPA falls below 2.20, or

Students on probation are subjected to such restrictions with respect to courses and extracurricular activities as may be imposed by the respective Head of the Department. The minimum period of probation is one Term, but the usual period is one academic year. A student must improve himself during this period and will be required to pass the backlog courses. Any student who does not improve himself/herself during probation period may be suspended on receiving report from the Head of the Department.

A student on academic probation who fails to maintain a GPA of at least 2.20 during two consecutive academic years may be suspended from the University. A student who has been suspended may apply for consideration to the Vice-Chancellor.

Petitions for reinstatement must indicate clearly the reasons for the previous unsatisfactory academic record. It must describe the improved conditions that have been created to prevent the recurrence of such work. Each such petition will be considered individually on its own merits.

After consideration of the petition and after consultation with the student Adviser and the respective Head of the Department, the Vice-Chancellor in some cases may reinstate the student if this is the first suspension. However, a second suspension case will be placed before the Academic Council for final decision.

21. Measures to complete Backlog courses

The following provisions will be made as far as possible to help the students to enable them to complete their studies within the maximum period of seven consecutive years (fourteen Terms) for BArch and BSc. Eng./BURP and Eight consecutive years (Sixteen terms) for BArch. In this context, the students may be allowed to take backlog courses subject to the approval of his/her Adviser and Head of the Department based on the following rules:

i) The Backlog examination will be held once in an academic year.

ii) A student can register backlog courses normally during 6th to 8th weeks of classes of each even Term from 1st Year 2nd Term to 4th year 1st term for BSc. Eng./BURP and 1

th year 2nd term to 5th Year 1st Term for BArch as self-study (i.e., retaining the already obtained marks of class tests and class attendance with class performance & assignments).

iii) A student can register maximum 12 (twelve) credits among the backlog courses of previous all Terms and the name of backlog examination is Backlog Examination with the year of examination same as regular examination.

iv) The backlog examination will be started after 10 (ten) days from the last examination of the regular even Term courses of the concerned department and the interval between the backlog courses will be same as regular examination.

v) The date and time for registration will be announced in advance by the Registrar’s office.

22. Special Backlog Examination

The Special Backlog Examination on only backlog courses may be conducted for the students who have participated in their 4-year (up to 4th year 2nd Term) for BSc. Eng./BURP and five-year (up to 5th year 2nd term) for BArch degree course and have a shortage of maximum 12 (twelve) credits to obtain Bachelor degree. The special backlog examination will be arranged in a convenient time by the Head of the Department after 30 (thirty) days of publication of results of the 4th Year 2nd Term for B Sc. Eng./BURP and 5th year 2nd Term for BArch regular examination. The evaluation system will be the same as backlog with self-study. The students willing to appear at the special backlog examination have to apply to the Head of the Department and with his permission must register within 7 (seven) working days of publication of 4th Year 2nd Term for B Sc. Eng/BURP and 5th year 2nd Term for BArch and Backlog examination results (whichever is later). A student who has failed in the special backlog examination will register the course(s) in the regular Terms.

23. Rules for Backlog/Withdrawal/Incomplete Courses

In addition to that mentioned in Article 21 students having Backlog/Withdrawal/Incomplete courses may register the courses according to the following rules. Any Backlog course (theory) will be registered as self-study or backlog; but in sessional/sessional related Backlog/Withdrawal/ Incomplete course(s) he/she must attend the classes and secure minimum 60% attendance.

23.1 Students having Withdrawal/Incomplete Courses

i) If any student withdraws all the courses or only theoretical courses in any Term, he/she may be allowed to register all the withdrawal courses or theoretical courses in any subsequent Term when those courses are offered for regular students.

ii) If any student fulfilled the attendance requirement of 60% in any withdrawal course, in that particular case, he/she may be allowed to register those courses as backlog courses with the evaluation system same as backlog courses.
iii) If any student has Incomplete courses and the number of courses is more than 2 (two), he/she may be allowed to register the courses in any Term as mentioned in 23.1(i).

23.2 Students having Backlog/Withdrawal/Incomplete Courses after participating 4th year 2nd Term for B.Sc. Eng./BURP and 5th year 2nd Term for BArch.

i) A student can register maximum 5 (five) theory courses from the backlog courses in addition to sessional/other sessional related backlog courses of all previous 1st Terms in any 1st Term or of all previous 2nd Terms in any 2nd Term with a total maximum credit hour limit of 24.0. In no situation, courses of both (1st & 2nd) Terms can be registered in any Term.

ii) A student will not be allowed to register any withdrawal or incomplete course as self-study in any Term. He/She can register one or more withdrawal or incomplete courses from the courses as mentioned in 23.2(i).

iii) He/She will follow the rules for registration of regular students as mentioned in Article 11.4.

23.3 Final Examination for the Backlog/Withdrawal/Incomplete courses

Final examination for the backlog/withdrawal/incomplete courses should be conducted with the regular students in the same question paper and on the same date and time, if possible. Otherwise, final examination for the backlog/withdrawal/incomplete courses will be arranged by the respective Head of the Department as soon as possible at an interval not more than the interval given for regular examination.

24. Minimum Earned Credits and GPA Requirements for Obtaining Degree

The credit requirements for the award of Bachelor degree will be decided by the respective ACUG following Article No.7.5. The minimum CGPA requirement for obtaining a Bachelor degree is 2.20.

A student may take additional courses with the consent of his/her Adviser in order to improve CGPA, but he/she may take a maximum of 15 (fifteen) such additional credits beyond respective credit requirements for the degree during his/her entire period of study.

25. Time Limit for Completion of the Degree

A student must complete his studies within a maximum period of 7 (seven) consecutive academic years (fourteen regular Terms) for B.Sc. Eng./BURP and 8 (eight) consecutive years (sixteen regular terms) for BArch for completion of the degree.

26. Industrial/Professional Training Requirements

Depending on each Department’s requirement a student may have to complete a prescribed number of days of industrial/professional training in addition to minimum credit and other requirements, to the satisfaction of the concerned Department.

27. Absence during Term

A student should not be absent from quizzes, class tests, and spot tests etc. during the Term. Such absence will naturally lead to reduction in points/marks that count towards the final grade. Absence in Term final examination will result in ‘F’ grades.

A student who has been absent for short periods, up to a maximum of 3 (three) weeks due to illness or participating in extra-curricular activities outside of the University (sent by the University authority) should approach to the course teacher(s) on the recommendation of his Adviser and Head of the Department for a make-up class tests, quizzes, spot tests, sessional classes or assignments immediately on returning to the classes. Such request should be supported by medical certificate from University Medical Officer or the relevant office order. The medical certificate issued by a registered medical practitioner and endorsed by University Medical Officer will also be acceptable only in those cases where the student has valid reason for his/her absence from the University. The course teacher will take necessary measures.

28. Application for Graduation and Award of Degree

A student who has fulfilled all the academic requirements for the degree will have to apply to the Controller of Examinations through his/her Adviser and Head of the Department for graduation. Degree will be awarded on completion of the minimum Credit and CGPA requirements subject to the approval of the Academic Council.

29. Grade Conversion

CGPA of any student may be converted into percentage of marks using following rules:

\[
\% \text{ of Marks} = 79 + 80 \times (\text{CGPA} - 3.75) \quad \text{for } 3.75 \leq \text{CGPA} \leq 4.00
\]

and

\[
\% \text{ of Marks} = 44 + 20 \times (\text{CGPA} - 2.00) \quad \text{for } 2.20 \leq \text{CGPA} < 3.75
\]
**Syllabus for Undergraduate Study**  
Department of Computer Science and Engineering (CSE)**

**Summary of 1st Year 1st Term Courses**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Pre-Req.</th>
<th>Theory Hrs/week (L)</th>
<th>Laboratory Hrs/week (P)</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 1100</td>
<td>Introduction to Computer Systems</td>
<td></td>
<td>3</td>
<td>15</td>
<td>1.5</td>
</tr>
<tr>
<td>CSE 1107</td>
<td>Discrete Mathematics</td>
<td>None</td>
<td>3</td>
<td>3</td>
<td>3.0</td>
</tr>
<tr>
<td>EEE 1107</td>
<td>Basic Electrical Engineering</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3.0</td>
</tr>
<tr>
<td>EEE 1108</td>
<td>Basic Electrical Engineering Laboratory</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3.0</td>
</tr>
<tr>
<td>HUM 1107</td>
<td>English and Human Communication</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3.0</td>
</tr>
<tr>
<td>HUM 1108</td>
<td>English Skills Laboratory</td>
<td></td>
<td>3/2</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>MATH 1107</td>
<td>Differential and Integral Calculus</td>
<td>None</td>
<td>3</td>
<td>3</td>
<td>3.0</td>
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<tr>
<td>PHY 1107</td>
<td>Physics</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3.0</td>
</tr>
<tr>
<td>PHY 1108</td>
<td>Physics Laboratory</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>15</td>
<td>10.5</td>
<td>20.25</td>
</tr>
</tbody>
</table>

Weekly Contact Hour = 15L + 10.5P = 25.5 Hrs/week

**Syllabus of 1st Year 1st Term Courses**

**CSE 1100: Introduction to Computer Systems**

Credits: 1.5  
Prereq.: None  
Contact Hours: 0L + 3P Hrs/Week

**Introduction to Computers:** Types and generation of computers, Basic organization and functional units of computers.

**Number Systems:** Binary, Octal, Hexadecimal, Codes and arithmetic operations, Complements and its applications.

**Hardware:** Operations and functions of processor, Memory, I/O devices.

**Software and its Applications:** Types of software and concept of operating systems, System software, Algorithms and flow charts, Programming algorithms, Flow chart construction and Intranet.

**Basic Programming:** Basic concepts and techniques of programming.

**Program Development Stages:** Flow charts and pseudo code.

**Programming Constructs:** Data types, Operators, Expressions, Statements.

**Computer Security Issues:** Viruses, Trojans and Passwords.

**CSE 1107: Discrete Mathematics**

Credits: 3.0  
Prereq.: None  
Contact Hours: 3L + 0P Hrs/Week

**Introduction:** Review of sets and functions, Relations, Sequences and summations, Number theory, Combinatorics, Recurrence relations and Generating functions.

**Algebraic Structures:** Semi groups, Groups and Permutation groups, Ring, Field, Prepositional calculus and Predicate calculus.

**Mathematical Reasoning:** Induction, Contradiction and recursion.

**Graph Theory, Trees**

**EEE 1107: Basic Electrical Engineering**

Credits: 3.0  
Prereq.: None  
Contact Hours: 3L + 0P Hrs/Week

**Direct Current:** Voltage and current, Resistance and power, Laws of electrical circuits and methods of network analysis, Principles of D.C. measuring apparatus.

**Alternating Current:** Instantaneous and r.m.s. current, Voltage and power, Average power for various combinations of R, L, and C circuits, Phasor representation of sinusoidal quantities, Introduction to three phase circuits.

**Magnetism:** Laws of magnetic fields and methods of solving simple magnetic circuits.

**Electrical Machines:** DC generators and alternators, Introduction to transformer and its operating principles; Operating principles of DC and stepper motors.

**EEE 1108: Basic Electrical Engineering Laboratory**

Credits: 1.5  
Prereq.: None  
Contact Hours: 0L + 3P Hrs/Week

Laboratory works based on EEE 1107

**HUM 1107: English and Human Communication**

Credits: 3.0  
Prereq.: Nil  
Contact Hours: 3L + 0P Hrs/Week

**Introduction:** Vocabulary building, Rules of syntax, Grammatical principles, Sentence structure, Correction of errors, Transformation of sentences, Phrases and idioms, Prefixes and suffixes, notions/functions of language, classes, antonyms and synonyms.

**Written Communication:** Comprehension, Construction of paragraphs on scientific and other themes, Precis writing, Technical and official correspondence, Technical report writing, Research paper writing, Tender notice, Free composition, Personal filing system.

**Oral Communication:** Listening skills, Oral presentation, Audio-visual communication, Interviewing skills.

**HUM 1108: English Skills Laboratory**

Credits: 0.75  
Prereq.: None  
Contact Hours: 0L + 3/2P Hrs/Week

**Grammar:** Tense, Article, Preposition, Subject-verb agreement, Clause, Conditional and sentence structure.

**Vocabulary Building:** Correct and precise diction, Affixes, Level of appropriateness, Colloquial and standard, informal and formal.
Developing Reading Skill: Strategies of reading – skimming, scanning, predicting, inferring, analyzing and interpreting variety of texts, Practicing comprehension from literary and nonliterary texts.

Developing Writing Skill: Sentences, Sentence variety, Generating sentences, Clarity and correctness of sentences, Linking sentences to form paragraphs, Writing paragraphs, essays, reports, formal and informal letters.

Listening Skill and Note Taking: Listening to recorded texts and class lectures and learning to take useful notes based on listening.

Developing Speaking Skill: Oral skills including communicative expressions for personal identification, life at home, giving advice and opinion, instruction and directions, requests, complaints, apologies, describing people and places, narrating events.

MATH 1107: Differential and Integral Calculus
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Differential Calculus: Limit, Continuity and differentiability, Significance of derivatives, 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, Partial differentiation of different multivariable functions, Evaluation of indeterminate forms, Tangents, Normals, Subtangents and subnormals in cartesian and polar coordinates, Determination of maximum and minimum values of functions, Points of inflection with applications, Curvature and radius of curvature, Asymptotes, Curve tracing.
Integral Calculus: Definitions of integration, Integration by the method of substitution, Integration by parts, Integration by the method of successive reduction, Definite integrals, Definite integral’s properties and use in summing series, Walli’s formulae, Improper integrals, differentiation and integration under sign of integration, Beta function and gamma function, Jacobian, multiple integrals and their applications.

PHY 1107: Physics
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Quantum Mechanics: Inadequacy of classical concepts, History of quantum mechanics, Planck’s quantum theory, Photoelectric effect, Compton effect, Wave-particle duality, De-Broglie waves, Uncertainty principle and its applications, Sommerfeld relativistic atomic model, Orbital angular momentum, Spin angular momentum, Total angular momentum, Orbital magnetic quantum number and spin magnetic quantum number, Magnetic moment of an electron, Pauli’s exclusion principle, Time-dependent and time independent Schrödinger equation, Interpretation of wavefunction, Expectation values, Probability density and probability current density, Energy eigen values and eigen functions, Stationary states.
Optics: Aberrations: Spherical aberration, Coma, Distortion, Astigmatism, Curvature of the field, Chromatic aberration and dispersion, Interference of light, Huygens principle and construction of wavefront, Young’s double slit experiment, Fresnel’s bisector, Interference due to multiple reflections, Newton’s rings.

PHY 1108: Physics Laboratory
Credits: 1.5  Prereq.: None  Contact Hours: 0L+3P Hrs/Week
Laboratory works based on PHY 1107
Summary of 1st Year 2nd Term Courses

<table>
<thead>
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<th>Course No.</th>
<th>Course Title</th>
<th>Pre-Req.</th>
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<td>MATH 1207</td>
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Weekly Contact Hour = 15L+10.5P= 25.5 Hrs/week

Syllabus of 1st Year 2nd Term Courses

CSE 1201: Structured Programming

Credits: 3.0 Prereq.: None Contact Hours: 3L+0P Hrs/Week

Programming Concepts and Structured Programming Language:
Data types, Variables, Operators, Type of expressions, Control structures.

Functions and Program Structures:
Function basics, Parameter passing conventions, Scope rules and storage classes, Recursion, Header files, Preprocessor, Arrays.

String and Pointers:
Pointers and memory addressing, Arrays and pointer arithmetic, Strings, algorithms.

User Defined Data Type:
Structure, Structure bit fields, Structure padding, Unions, Enumeration.

Input and Output:
Standard input and output, Formatted input and output, File access, Dynamic memory allocation, Valgrind, Garbage collection, Variable length argument list, Command line parameters, Error handling, Introduction to graphics routines, Compiling, Makefile, Debugging.

CSE 1202: Structured Programming Laboratory

Credits: 1.5 Prereq.: None Contact Hours: 0L+3P Hrs/Week

Laboratory works based on CSE 1201

CSE 1203: Digital Logic Design Laboratory

Credits: 1.5 Prereq.: None Contact Hours: 0L+3P Hrs/Week

Laboratory works based on CSE 1203

CHEM 1207: Chemistry

Credits: 3.0 Prereq.: None Contact Hours: 3L+0P Hrs/Week

Crystal Symmetry:
Different methods for the determination of structure of crystals, Structures of the metallic elements and certain compounds with three dimensional lattices, Defects in solid, Structures of Si, Ge, N, and P.

Chemical Bonding:
Valence bond theory, Molecular orbital theory, Metallic bonding, Theory of resonance.

Electrochemistry:
Electrolytic Solution, Nernst theory of electrode potential, Nernst Equation, Electrode potentials, EMF, Measurement of EMF, Polarization and over potential, Transport number, Electrical double layer, Mechanism of electrode reactions, Lithium ion battery, Ni-battery.

Spectroscopy:
Quantization of energy, Basic elements of spectroscopy.

Photochemistry:
Laws of photochemistry, Quantum yield, Photosensitized reaction.

Chemistry of Polymerization:
Polymerization reaction, some synthetic and natural polymers and their electrical and electronic properties, Polymers used as engineering materials, Conducting polymer and fiber, Synthesis, Structure and properties of polymer.
CHEM 1208: Chemistry Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CHEM 1207

EEE 1217: Analog Electronics
Credits: 3.0  Prereq.: EEE 1107  Contact Hours: 3L+0P Hrs/Week
Introduction to Semiconductors: P-n Junction diode characteristics, Diode applications: half and full wave rectifiers, Regulated power supply.
Bipolar Junction Transistor: Operation principles, Characteristics, Small-signal low frequency h-parameter model, Hybrid pie model, Amplifiers, Switches, Darlington pairs,
Field Effect Transistor (FET): Introduction to different FETs such as JFET, MOSFET, NMOS, PMOS and CMOS, Biasing and applications.
Operational Amplifiers: Gain, Input and output impedances, Offset null adjustment, Frequency response and noise, Introduction to Oscillators, Rectifiers, Active filters, Regulated power supply, Stabilizer and UPS, Basic ideas about IC fabrication techniques, Linear and Nonlinear applications of Op-Amps.
Power Semiconductor Devices: SCR, TRIAC, DIAC, UJT and their applications.

EEE 1218: Analog Electronics Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3P Hrs/Week
Laboratory works based on EEE 1217

MATH 1207: Coordinate Geometry and Differential Equations
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Co-ordinate Geometry of Two Dimensions: Translation and rotation of axes, Identification of conics with their properties.
Co-ordinate Geometry of Three Dimensions: Cartesian, Cylindrical polar and Spherical polar coordinates, Distance of two points, Section formula, Projection, Direction cosines and direction ratios, Angle between two lines, Distance of a point from a line, Planes: different forms of the equation of a plane, Distance of a point from a plane, Equations of bisector of planes, Straight line: different forms of equations of straight line, Angle between a line and plane, Coplanar lines, Shortest distance between two lines, Sphere: general equation of the sphere, Tangent plane, Angle of intersection of two spheres, Cone: equation with vertex at origin, Standard equations of central conicoid.

Partial Differential Equations (PDE): Linear PDE with constant coefficients, Solution by separation of variables.
Series Solution: Solution of differential equations in series by the method of Frobenius, Bessel’s and Legendre’s differential equations and their solutions.

ME 1270: Computer Aided Design Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week
Introduction, Scale drawing, Isometric views, Orthographic view, Missing line, Solidworks, Project on engineering drawing and CAD using AutoCAD or contemporary packages.
## Summary of 2nd Year 1st Term Courses

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Pre-Req.</th>
<th>Theory Hrs./week</th>
<th>Laboratory Hrs./week</th>
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<td>MATH 2107</td>
<td>Fourier Analysis and Linear Algebra</td>
<td>MATH 1207</td>
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**Total**

|                |                |        | 15               | 9                    | 19.5   |

Weekly Contact Hours = 15L + 9P = 24 Hrs/week

## Syllabus of 2nd Year 1st Term Courses

**CSE 2101: Object Oriented Programming**

**Credits:** 3.0  
**Prereq.:** CSE 1201  
**Contact Hours:** 3L+0P Hrs/Week

**Introduction:** Philosophy of object oriented programming (OOP), Features of OOP, Advantages of OOP over structured programming, Classes and objects, Array of objects, Object references, Memory allocation of objects, Constructors, Destructors and different types of constructors, Function overloading, Operator overloading and type conversion of objects.

**Inheritance:** Types of inheritance, Composition and Aggregation.

**Polymorphism:** Abstract classes, virtual and pure virtual functions overriding, Interface, Runtime type identification (RTTI), Exception handling, Template functions and classes, Generics, Namespace, Package, Standard template library.

**CSE 2102: Object Oriented Programming Laboratory**

**Credits:** 1.5  
**Prereq.:** None  
**Contact Hours:** 0L+3P Hrs/Week

Laboratory works based on CSE 2101

**CSE 2105: Data Structures and Algorithms**

**Credits:** 3.0  
**Prereq.:** None  
**Contact Hours:** 3L+0P Hrs/Week

Internal data representation, abstract data types.

**Elementary data structures:** Arrays, Linked lists, Stacks, Queues and its variants, Recursion.

**Advanced data structure:** Heaps, Fibonacci heaps, Multivay-tree, AVL and splay trees, Sorting, Searching, Hash techniques; Memory management.

**CSE 2106: Data Structures and Algorithms Laboratory**

**Credits:** 1.5  
**Prereq.:** None  
**Contact Hours:** 0L+3P Hrs/Week

Laboratory works based on CSE 2105

**CSE 2113: Computer Architecture**

**Credits:** 3.0  
**Prereq.:** None  
**Contact Hours:** 3L+0P Hrs/Week

**Introduction:** Organization and architecture, Structure and function, Importance of studying computer architecture and organization.

**A Top-Level View of Computer Function and Interconnection:** Computer function, Interconnection structure, Bus interconnection.

**Cache Memory:** Cache memory principle, Elements of cache design.

**Internal Memory:** Semiconductor main memory, Error correction.

**External Memory:** Magnetic disk, RAID, Optical memory.

**Input/Output:** I/O modules, Programmed I/O, Interrupt-driven I/O, Direct memory access, Input/output processor, Universal serial bus (USB).

**Computer Arithmetic:** Arithmetic and logic unit, Integer representation, Floating-point representation.

**Instruction Sets:** Characteristics and functions, Addressing mode and formats.

**CPU Structure and Function:** Processor organization, Register organization, Instruction cycle, Instruction pipelining.

**Reduced Instruction Set Computers:** Reduced instruction set architecture, RISC pipelining, RISC versus CISC.

**Instruction-Level Parallelism and Superscalar:** Basic view, design issues.

**Control Unit Operation:** Micro-operations, Control of the processor.

**Micro Programmed Control:** Basic concepts, Microinstruction sequencing and execution.

**Introduction to High Performance Techniques:** Multiple processor organization, Multithreaded architectures, Architectures of multi-core processors and Vector supercomputers.

**EEE 2113: Digital Electronics**

**Credits:** 3.0  
**Prereq.:** EEE 1217  
**Contact Hours:** 3L+0P Hrs/Week

**Logic Gates:** Diode logic gates, Transistor gates, MOS gates.
Logic Families: TTL, ECL, IIL and CMOS logic with operation details, Propagation delay, Product and noise immunity, Open collector and high impedance gates, Electronic circuits for flip-flops, Counters and register, Memory system, PLAs, PLDs, ADC, DAC design with applications, S/H circuits, LED, LCD and optically coupled oscillators.

Wave Shaping: Diode wave shaping techniques, Clipping and clamping circuits, Comparator circuits, Switching circuits; Pulse transformers, pulse transmission, Pulse generation, Monostable, Bistable and Astable multivibrators, Schmitt trigger, Blocking oscillators and Time base circuit; Timing circuits; Simple voltage sweeps, linear current sweeps.

Instruments: Digital meters, DMM, VTVM, Q meters, Statistical methods in measurements.

EEE 2114: Digital Electronics Laboratory
Credits: 1.5  Prereq.: None  Contact Hours: 0L+3P Hrs/Week
Laboratory works based on EEE 2113

MATH 2107: Fourier Analysis and Linear Algebra
Credits: 3.0  Prereq.: MATH 1207  Contact Hours: 3L+0P Hrs/Week
Fourier Analysis: Fourier series and Fourier co-efficient, Dirichlet’s condition and Fourier expansion, Convergence of Fourier series, Exponential form of Fourier series, Change of interval, Half range series, Parseval’s identity, Fourier integrals.
Fourier Transforms: General transforms, Fourier sine and cosine transforms and their use in boundary value problems.
Linear Algebra: Matrix Operations: Field and matrices over a field, Product of matrices by partitioning, Symmetric, Diagonal and other special types of matrices with their properties, Elementary transformations and equivalent matrices, Rank, Inverse of a square matrix by elementary row operation.
Vector Spaces: General vector spaces, Column, row and null Spaces, Basis and Dimension.
Eigen Systems: Eigen values and Eigen vectors, Estimation of the size of Eigen values.
Inner-Product Vector Spaces: Inner-Product Spaces, Orthogonality.
CSE 2202: Algorithm Analysis and Design Laboratory
Credits: 1.5  Prereq.: None  Contact Hours: 0L+3P Hrs/Week
Laboratory works based on CSE 2201

CSE 2203: Microprocessors and Microcontrollers
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Introduction: Microprocessors, Microcomputers and microcontrollers, Different types of microprocessors and its applications.
Microprocessors: 8086 internal architecture, Processor status and flag registers.
Machine and Assembly Language Programming: Instruction format, Instruction sets, Opcode, Addressing modes, Branching and looping, Traps and interrupts, I/O operation, Interrupt controller, An overview of Intel 80186, 80286, 80386 and Pentium processors, RISC processors, Parallelism in microprocessor, Bit-slice processor.
Co-processors and DMA: Arithmetic co-processor, I/O processor, Programmable timer, DMA data transfer, DMA Controller.
Microcontrollers: Introduction to micro-controllers, Overview/review of microcontroller architecture, Data representation and memory usage, Microcontroller programming.
Microcontroller Based System Design: Hardware design, Building, Debugging, Testing and linking program modules, Hardware implementation and I/O support.
Analysis of Application Examples: Recursion and stack usage, Traffic light controller, Input / Output architecture, Analysis of timing and memory requirements, Real time operation.

CSE 2204: Microprocessors and Microcontrollers Laboratory
Credits: 1.5  Prereq.: None  Contact Hours: 0L+3P Hrs/Week
Laboratory works based on CSE 2203

CSE 2207: Numerical Methods
Credits: 3.0  Prereq.: MATH 1207  Contact Hours: 3L+0P Hrs/Week
Numbers and Errors: Significant figures, Absolute and relative error, Rounding error in functional evaluation, Propagation of error in arithmetic process and Truncation errors (Taylor’s series).
Interpolation: Difference tables, Newton forward and backward interpolation formula with error, Divided difference and central difference formula, Lagrange’s interpolation formula, Curve fitting by least squares, Cubic spline, Chebyshev polynomials and Min-max properties.
Solution of Systems of Linear Equations: Gaussian elimination, Gauss elimination with pivoting, Gauss-Jordan method.
Numerical Differentiation and (Numerical) Integration: Trapezoidal rule, Simpson’s rule, Romberg rule with error and Weddle’s method.
Least Squares Approximation of Functions: Linear and polynomial regression, Fitting exponential and Trigonometric functions.

CSE 2208: Numerical Methods Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CSE 2207

HUM 2207: Economics and Accounting
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Economics: Nature of the economics theory, Applicability of economic theories to the problem of developing countries, Some basic concepts - supply, Demand and their elasticities, The relationship among average, Margin and total and their derivation, Equilibrium - stable, Straight and Dynamic equilibrium, Producer’s equilibrium-isouquant, Production-factors of production, Production possibility curve-equilibrium of a firm, Fixed cost and variable cost, The short run and the long run, The cost curves and supply curves, Law of returns, Internal and external economics and diseconomies, Economics of development and planning, Basic concept-saving, Investment, GNP, NNP, Per capita income, Growth rate, Policy instruments of development, Fiscal policy, Monetary policy and trade policy and their relative applicability in Bangladesh, Inflation and unemployment cost-benefit analysis, International trade and comparative advantage.
Cost Accounting: Concept of cost, Classification of cost, Statement of cost, Operating and service costing, Salary and wages/payroll account.

MATH 2207: Complex variable, Vector Analysis and Statistics
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week

Complex Variable: Complex number system, General functions of a complex variable, Limits and continuity of a function of complex variable and related theorems, Analytic functions, Complex differentiation, Sufficient condition for analyticity and Cauchy Riemann equations, Harmonic functions and conjugate harmonic functions, Construction of analytic functions when either part is given (Milne-Thomson method), Different types singularities, Line integral of a complex function, Cauchy’s integral theorem and converse of Cauchy’s theorem.

Vector Analysis: Transformation of vectors on a plane: Scaling, Rotation, Translation, Linear dependence and independence of vectors, Scalar and vector fields, Differentiation of vectors together with elementary applications, Gradient, Divergence and curl of point functions and related forms, Green’s, Stokes’ and Gauss’ theorem and their applications.

Statistics: Moment, Skewness and kurtosis, Random variables, Probability mass functions and probability density functions.

Expectation: Expected value and variance with their properties.

Discrete Probability Distributions: The Bernoulli and Poisson process, Binomial and Poisson probabilities, Distribution and properties.

Continuous Probability Distributions: Normal variate and normal distribution, Properties of normal distribution, Standard normal variate and standard normal distribution, Properties of standard normal distribution, Uniform distribution and it’s properties.

Summary of 3rd Year 1st Term Courses

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<th>Course No.</th>
<th>Course Title</th>
<th>Pre-Req.</th>
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Weekly Contact Hours: 15(L) +12(P) =27 Hrs/Week

Syllabus of 3rd Year 1st Term Courses

CSE 3100: Web Programming Laboratory
Credits: 1.5  Prereq.: None  Contact Hours: 0L+3P Hrs/Week

Internet communication protocols such as TCP/IP, FTP, SMTP and HTTP, Basic networking concepts, Advanced Web page development with Dynamic HTML, JavaScript, AJAX, jQuery, and Cascading Style Sheets, Server-side development technologies such as Perl, PHP, ASP.net, Java Servlets, JSP and JSP.net, Basic SQL for database interaction.

CSE 3101: Theory of Computation
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week


Finite Automata: Deterministic finite automata, Nondeterministic finite automata, Finite automata with ε-transitions, Equivalence and conversion of deterministic and nondeterministic finite automata.

Regular Expressions and Languages: Regular expressions, Algebraic laws for regular expressions, Regular languages, Pumping lemma, Closure and Decision properties of regular languages.

Context Free Grammar and Languages: Context free grammars, Parsing (or derivation) and parse trees, Ambiguity in grammars and languages, Normal forms for
context-free grammars, Pumping lemma for CFL’s, Closure and Decision properties of CFL’s.

**Push Down Automata:** Push down automata, Acceptance by empty store and final state, Equivalence between pushdown automata and context-free grammars, Deterministic push down automata.

**Turing Machines:** Turing machines, The church-Turing machine, Techniques for Turing machine construction, Configurations, Computing with Turing machines, Restricted Turing machines, Turing machines and computers, Combining Turing machines.

**Undecidability:** Recursively enumerable language, The undecidability of the halting problem, Undecidable problems about Turing machines, Post’s correspondence problem.


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**CSE 3103: Peripherals and Interfacing**

**Credits:** 3.0  
**Prereq.:** CSE 2203  
**Contact Hours:** 3L+0P Hrs/Week

**Introduction:** Basics of Peripherals and Interfacing, General purpose peripherals and Special purpose peripherals, I/O techniques: Simple I/O, Strobe I/O, Handshake I/O, DMA controlled I/O, Hardware and software interfacing in microcomputer system design, Multi-processor configurations.

**Memory Interfacing:** Compatibility between memory and MPU system bus, Address space partitioning, Standard versus system memories, Restriction imposed by MPU architecture.

**Data Transfer Techniques and Their Implementation:** Programmed data transfer, DMA mode of data transfer, I/O port and Serial modes of data transfer.

**Common Peripherals and their Interfacing:** Interfacing I/O devices - Floppy disk, Hard disk, Solid state disk, CDROM and other optical memory, Keyboard, Mouse, Display devices, etc., Interfacing with USB.

**Programmable Peripheral Interface:** Intel 8255 pin configuration, Internal structure of a port bit, Modes of operation, Bit SET/RESET feature, Programming, ADC and DAC chips and their interfacing.

**Programmable Interval Timer:** Intel 8254 pin configuration, Internal block diagram of counter and modes of operation, Counter read methods, Programming.

**I/O Devices for Process Control and Instrumentation:** Transducers, Operational Amplifier, Optocouplers, Relays, AD and DA converters.

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**Microprocessor in Scientific Instruments and Other Applications:** Display, Protective relays, Measurements of Electrical quantities, Temperature monitoring system, Water level indicator, Motor speed controller, Traffic light controller, etc.

**CSE 3104: Peripherals and Interfacing Laboratory**

**Credits:** 0.75  
**Prereq.:** None  
**Contact Hours:** 0L+3/2P Hrs/Week

Laboratory works based on CSE 3103

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**CSE 3109: Database Systems**

**Credits:** 3.0  
**Prereq.:** None  
**Contact Hours:** 3L+0P Hrs/Week

**Database System Concepts:** Data Models, Schemas and Instances, DBMS Architectures.

**Relational Model:** Entity Relationship model, Keys, Relationships, ER diagrams, Design issues, ER to Relational mapping.

**Relational Algebra:** Basic relational algebra Operations, Additional relational operations. SQL, QBE, Query processing and optimization, Triggers and cursors.

**Relational Constraints, Functional Dependencies:** Relational constraints and relational database schema, Functional dependencies.

**Normalization:** Normal form based on primary keys, General definitions of second and third normal form, Boyce-Codd normal form.

**Database Indexing and Index Structures:** Types of single level ordered index, Multilevel indexes, Dynamic multilevel indexes, Dynamic multilevel indexes using B-trees and B’ trees, Indexes on multiple keys.

**Transaction Processing and Management:** Introduction to transaction processing, Transaction and system concepts, Properties of transaction, Schedules and recoverability, Serializability of schedules.

**Concurrency Control Techniques:** 2PL, Serializability and recoverability, Lock management, Lock conversions, Dealing with deadlocks, Specialized locking techniques, Concurrency control without locking.

**Database Security and Authorization:** Introduction to database security, Access control, Discretionary access control, Mandatory access control, Security for internet applications.

**Information Retrieval and XML Data:** Introduction to information retrieval, Indexing for text search, data model for XML, Querying XML data, Evaluation of XML queries.

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**CSE 3110: Database Systems Laboratory**

**Credits:** 1.5  
**Prereq.:** None  
**Contact Hours:** 0L+3P Hrs/Week

Laboratory works based on CSE 3109
CSE 3119: Software Engineering and Information Systems
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week

Information System Concepts: Different types of information, Quality of information, System Development Life Cycle, Information gathering tools, Structured analysis tools, System design, Project planning tools, Feasibility analysis, Cost/Benefit analysis.
Design Patterns: GRASP patterns with general principles, GoF design patterns.
Software Testing Techniques and Strategies: White box and Black box testing, Basis path testing, Cyclomatic complexity, Unit testing, Mutation, Regression, Integration, System testing, Error seeding, Stress testing, Behavior driven test, Test automation, Debugging approaches.
Security: Disaster, Recovery and ethics in system development.
Design and Analysis: Object-oriented analysis and models, SRS documentation, Design concepts and principles, Architectural design, Object-oriented design, Use Case, UML diagrams, Software case tools.
Cost Model: Cost estimation techniques, Algorithmic cost modeling, COCOMO.

CSE 3120: Software Engineering and Information Systems Laboratory
Credits: 1.5  Prereq.: None  Contact Hours: 0L+3P Hrs/Week
Laboratory works based on CSE 3119

ECE 3115: Data Communication
Credits: 3.0  Prereq.: EEE 2113  Contact Hours: 3L+0P Hrs/Week

Data and Signals: Analog signals, Digital signals, Transmission impairment, Data rate limits, Performance measures.

Telephone Networks for Data Transmission: Telephone networks, Dial-up modems, and Digital subscriber line: ADSL, HDSL, SDSL, VDSL, Cable TV networks.
Error Detection and Correction: Block coding, Linear block codes, Cyclic codes, Checksum.
Data Link Control: Fixed-size and variable-size framing, HDLC.

ECE 3116: Data Communication Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on ECE 3115
### Summary of 3rd Year 2nd Term Courses

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Pre-Req.</th>
<th>Theory Hrs./week</th>
<th>Laboratory Hrs./Week</th>
<th>Credit</th>
</tr>
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<tbody>
<tr>
<td>CSE 3200</td>
<td>System Development Project</td>
<td></td>
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<tr>
<td>CSE 3201</td>
<td>Operating Systems</td>
<td></td>
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<tr>
<td>CSE 3202</td>
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<tr>
<td>CSE 3207</td>
<td>Applied Statistics and Queuing Theory</td>
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<tr>
<td>CSE 3210</td>
<td>Compiler Design</td>
<td>CSE 3101</td>
<td>3</td>
<td>3.0</td>
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<tr>
<td>CSE 3211</td>
<td>Compiler Design Laboratory</td>
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<td>3/2</td>
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<tr>
<td>CSE 3212</td>
<td>Mobile Computing</td>
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<td>CSE 3215</td>
<td>Mobile Computing Laboratory</td>
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<td>HUM xxxx</td>
<td>Course from Optional-I Group</td>
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</table>

*Weekly Contact Hours: 15(L) + 9(P) = 24 Hrs/Week*

### Summary of Optional-I Courses

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Theory Hrs./Week</th>
<th>Lab. Hrs./Week</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUM 3207</td>
<td>Sociology and Government</td>
<td>3</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>HUM 3217</td>
<td>Business and Industrial law</td>
<td>3</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>HUM 3227</td>
<td>Professional Ethics and Moral Thoughts</td>
<td>3</td>
<td>3.0</td>
<td></td>
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<tr>
<td>HUM 3237</td>
<td>Occupational Psychology</td>
<td>3</td>
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</table>

### Syllabus of 3rd Year 2nd Term Courses

**CSE 3200: System Development Project**

*Credits: 1.5  Prereq.: None  Contact Hours: 0L+3P Hrs/Week*

Students will work in groups or individually to develop a term project. It may include I/O drivers, operating systems modules, or some practical problems. Students will develop the software using recent technologies/programming with proper documentation.

**CSE 3201: Operating Systems**

*Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week*

*Introduction:* Fundamental concepts, The role of an operating system in computer systems, Operating system structure and operation.


*Threads:* Basics concept, Multithreading models, Threading issues.

**CSE 3202: Operating Systems Laboratory**

*Credits: 1.5  Prereq.: None  Contact Hours: 0L+3P Hrs/Week*

Laboratory works based on CSE 3201

**CSE 3207: Applied Statistics and Queuing Theory**

*Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week*


*Distribution of Sampling Statistics:* Sample, Population, Sample mean & variance, Distribution of Sample mean, Markov inequality, Chebyshev’s inequality, Central Limit theorem.

*Correlation and Analysis of Variance:* Correlations, Rank correlation, One-way analysis of variance, and Two factor analysis of variance: Parameter estimation and hypothesis testing.

*Regression:* Simple linear regression model, Estimation of the regression parameters, Method of least squares, Error of random variable, Regression to the mean, Coefficient of determination, Sample correlation coefficient hypothesis testing, Tests of independence and goodness of fit.

*Parameter Estimation:* Estimation of population mean, Interval estimators & lower-upper bounds of population mean using known and unknown variance.
Hypothesis Testing: Test concerning the mean of a normal population, Testing Equality of Means of Two Normal Populations, Test concerning the variance of normal population, Statistical significance, T-Tests, Chi-Square Tests, Chi-Square Test of goodness-of-fit.


Queuing Models: M/M/1, M/M/C, M/G/1, M/D/1, G/M/1, Open and Closed Queuing Network, Network of exponential servers, Phase-dependent arrival and Service application of queuing models.

CSE 3211: Compiler Design
Credits: 3.0  Prereq.: CSE 3101  Contact Hours: 3L+0P Hrs/Week
Introduction to Compiler: Phases of compilation and overview. Compiling techniques including parsing, Semantic processing, and Optimization, Compiler- Compliers and translator writing systems.
Lexical Analysis: The ROLE of the lexical analyzer, Specification And recognition of tokens, Lexical analyzer generator.
Syntax Analysis (Parser): Top-Down Parsing, Bottom-Up Parsing, Operator-precedence parsing, Ambiguity, LL and LR parsers.
Semantic Analysis: Attribute grammar, Syntax directed definition, Evaluation and flow of attribute in a syntax tree.
Type Checking: Syntax directed translation, Error management, Error detection and recovery.
Symbol Tables: Data structures for symbol tables.
Intermediate Code Generation: Translation of different language features. Different types of intermediate forms, languages, declarations and assignment statements.
Code Improvement: Analysis: control-flow, data-flow dependence etc., Code improvement local optimization, global optimization, Garbage Collection, loop optimization, Peep-hole optimization etc. Architecture dependent code improvement: Instruction scheduling, Loop optimization etc.
Code Generation: Register allocation and target code generation.

CSE 3212: Compiler Design Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CSE 3211

CSE 3217: Mobile Computing
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Application Design: Context, Information architecture, Design Elements, Mobile web versus native applications.
Application Environments: Limited resource computing, Memory management, Low power computing, Fault tolerance and persistence, Security issues.
Wireless Communication Technologies: Cellular networks, Wireless (802.11), TCP/IP in the mobile setting, Geo-location and Global Positioning System (GPS).

CSE 3212: Mobile Computing Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CSE 3217

Syllabus of Optional-I Courses
HUM 3207: Sociology and Government
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Sociology and Scientific Approach: Methods of social research, Stages of social research.
Primary Concepts of Sociology: Society, Community, Association, Institution, group.
Social Evolution: Stages in the evolution of human civilization.
Culture: Definition, Characteristics, Culture contents (material and non-material), Cultural lag, Culture and civilization.
Industrial Revolution: The growth of capitalism, Features and social consequences, Socialism.
Social Organization: Family, Forms and functions of family, Functions of family in modern industrial society, Marriage, Forms of marriage, Functions of marriage, Urbanization and industrialization.


HUM 3217: Business and Industrial law
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Administration, Management and organization, Authority and responsibility, Scientific management, Organization structure, Organization chart, Span of control, Selection and recruitment of employees, Training and its types, Promotion, Wage system and incentive, Job-evaluation and merit rating, Plant layout, Layout of physical facilities, Transportation and storage, Material handling, Maintenance, Maintenance policy, Production control in intermittent and continuous manufacturing industry, Functions of production control, Purchasing procedures: Inventory-need and methods of control, Factors affecting inventory building-up, Economic lot size and reorder point.


HUM 3227: Professional Ethics and Moral Thoughts
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Meaning of ethics, Professional ethics codes, Psychological basis of ethics, Religion and ethics, Egoism and relativism, Utilitarianism and rational utilitarianism, Ethics and other branches of knowledge, Intuitionism, Standard as values.
Concept of moral thoughts and moral judgment, Bases of human behavior, Moral development and reasoning, Morality and social institution, Moral rights and duties, Interpersonal moral sentiment, Occupational culture and ideology, Occupational stress, Morality and religion, organizational commitment, Morality in international context.
Summary of 4th Year 1st Term Courses

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Pre-Req.</th>
<th>Theory Hrs/week L</th>
<th>Laboratory Hrs/Week P</th>
<th>Credit</th>
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<tbody>
<tr>
<td>CSE 4000</td>
<td>Project / Thesis</td>
<td></td>
<td>3</td>
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<tr>
<td>CSE 4105</td>
<td>Computer Networks</td>
<td>CSE 3201</td>
<td>3</td>
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<tr>
<td>CSE 4106</td>
<td>Computer Networks Laboratory</td>
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<tr>
<td>CSE 4109</td>
<td>Artificial Intelligence</td>
<td>CSE 2201</td>
<td>3</td>
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<tr>
<td>CSE 4110</td>
<td>Artificial Intelligence Laboratory</td>
<td></td>
<td>3/2</td>
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<tr>
<td>CSE 4120</td>
<td>Technical Writing and Seminar</td>
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<td>CSE xxxx</td>
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<td>Course from Optional-II (3.00 + 0.75)</td>
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<tr>
<td>IEM 4127</td>
<td>Industrial Management</td>
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Weekly Contact Hours = 15L+12P=27 Hrs/week

Summary of Optional-II Courses
Optional-II should be selected from the following courses:

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<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Theory Hrs/week L</th>
<th>Lab. Hrs/Week P</th>
<th>Credit</th>
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<tbody>
<tr>
<td>CSE 4103</td>
<td>VLSI Design</td>
<td>3</td>
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<tr>
<td>CSE 4104</td>
<td>VLSI Design Laboratory</td>
<td>3/2</td>
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<tr>
<td>CSE 4107</td>
<td>Digital Signal Processing</td>
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<td>CSE 4108</td>
<td>Digital Signal Processing Laboratory</td>
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<tr>
<td>CSE 4111</td>
<td>Machine Learning</td>
<td>3</td>
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<tr>
<td>CSE 4112</td>
<td>Machine Learning Laboratory</td>
<td>3/2</td>
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<tr>
<td>CSE 4115</td>
<td>Computer and Network Security</td>
<td>3</td>
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<tr>
<td>CSE 4116</td>
<td>Computer and Network Security Laboratory</td>
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<tr>
<td>CSE 4117</td>
<td>Modeling and Simulation</td>
<td>3</td>
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<tr>
<td>CSE 4118</td>
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<td>CSE 4131</td>
<td>Pattern Recognition</td>
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<tr>
<td>CSE 4127</td>
<td>Image Processing and Computer Vision</td>
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<td>CSE 4128</td>
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<td>CSE 4129</td>
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</table>

Syllabus of 4th Year 1st Term Courses

CSE 4000: Project / Thesis
Credits: 1.5
Prereq.: None
Contact Hours: 0L+3P Hrs/Week
Study and solution of a problem in the field of Computer Science and Engineering.
N.B.: The project/thesis topic selected in this term is to be continued in the next term.

CSE 4105: Computer Networks
Credits: 3.0
Prereq.: CSE 3201
Contact Hours: 3L+0P Hrs/Week
Application Layer: Principles of application layer protocols, Web and HTTP, File transfer protocol (FTP), Electronic mail, SMTP, POP3, IMAP, DNS, P2P, Socket programming with TCP and UDP.
Transport Layer: Transport layer services, Multiplexing and demultiplexing, Connectionless transport and UDP, Principles of reliable data transfer, Connection oriented transport and TCP, Principles of congestion control, Congestion and flow controls with TCP.
Network Layer and Routing: Network layer services, Routing principles, Hierarchical routing, Internet Protocol: IP4 addressing, IPv6, ICMP, DHCP and NAT, Routing, Distance vector and link state routing algorithms, Multicast routing, Router architecture.
Link Layer and Local Area Networks: Link layer services, Error detection and correction techniques, Multiple access protocols, CSMA, CSMA/CD, Slotted ALOHA, LAN address and ARP, Ethernet, Hub, Bridge and switch, Wireless links, Wi-Fi and WLAN architecture, Bluetooth, PPP, ATM, Frame relay.
Security in Computer Networks: Security issues in computer networks, Principles of cryptography: Symmetric key cryptography and public key encryption, Message integrity and digital signatures, End-point authentication, Operational security, Firewalls and intrusion detection systems.

CSE 4106: Computer Networks Laboratory
Credits: 1.5
Prereq.: None
Contact Hours: 0L+3P Hrs/Week
Laboratory works based on CSE 4105

CSE 4109: Artificial Intelligence
Credits: 3.0
Prereq.: CSE 2201
Contact Hours: 3L+0P Hrs/Week
Introduction: Definition, AI technique, Application.
Intelligent Agent: Introduction, Structure of intelligent agent, Agent programs, Goal-based agents, Environments.


Knowledge and Reasoning: Knowledge-Based agent, Representation, Reasoning and logic, Propositional logic.

First-Order Logic: Syntax and semantics, Terms, Atomic and complex sentences, Quantifiers, Equality, Extensions and notational variations, Higher-order logic, Using first-order logic, Axioms, Definitions and theorems.

Inference in First-Order Logic: Inference rules involving quantifiers, Generalized modus ponens, Canonical form, Unification, Forward and backward chaining, Completeness, Resolution inference rule, Canonical forms for resolution, Resolution proofs, Conversion to normal form.

Uncertain Knowledge and Reasoning: Uncertainty, Acting under uncertainty, Basic probability notation, Conditional probability, Axioms of probability, Bayes rules and its use, Normalization.


Communicating, Perceiving, Planning and Acting: Natural language understanding: Syntactic processing, Ambiguity resolution, Text understanding.
Action: The situation calculus, A simple solution to the framework problem, Complex actions, Planning: Planning in the situation calculus, The STRIPS representation, Planning as a reasoning task.

CSE 4110: Artificial Intelligence Laboratory
Credits: 0.75 Prereq.: None Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CSE 4109

CSE 4120: Technical Writing and Seminar
Credits: 0.75 Prereq.: None Contact Hours: 0L+3/2P Hrs/Week
Reading, writing and summarizing technical papers, Citation methodologies, Plagiarism issues, Presentation guidelines and techniques, Summarization and presentation of technical papers.

Syllabus of Optional-II Courses

CSE 4103: VLSI Design
Credits: 3.0 Prereq.: None Contact Hours: 3L+0P Hrs/Week
Introduction’s design methodology, Introduction to microelectronics and CMOS technology, Brief overview of fabrication process, Basic electrical properties of CMOS and BiCMOS circuits.

Hardware Modeling: Logic networks, state diagrams, Data flow, behavioral optimization. Introduction to GaAs technology: Ultra-fast VLSI circuits and systems.

CMOS and BiCMOS Design Process: Stick diagram and lambda-based design rules, Subsystem design processes.

Subsystem Design Layout: Gate logic, Combinational design, Clocked sequential circuits, Bus designs.

Design of Computational Elements: ALU sub-system, Adder, Multipliers, Memory, Registers and aspects of system timing, Architectural Synthesis: Circuit specification, Architectural optimization, Data-path synthesis, Control unit synthesis, Synthesis and testing of VLSI circuits, Various CAD tools for design, Simulation and verification: Introduction to hardware description languages (VHDL and Verilog), Design style: FPGA and CPLDs.

CSE 4104: VLSI Design Laboratory
Credits: 0.75 Prereq.: None Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CSE 4103.

CSE 4107: Digital Signal Processing
Credits: 3.0 Prereq.: None Contact Hours: 3L+0P Hrs/Week
Representation of discrete-time signals and systems, Sampling of continuous-time signals, Discrete Fourier transform (DFT), Computation of DFT, the z-transform, Spectral analysis of signals using DFT. Introduction to filter design, Digital filter Structure, Infinite Impulse Response filter design techniques, Finite impulse response filter design techniques, Applications of DSP in audio, Image, and Video processing.

CSE 4108: Digital Signal Processing Laboratory
Credits: 0.75 Prereq.: None Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CSE 4107
CSE 4111: Machine Learning
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Artificial Neural Networks: Neurons and biological motivation, Perceptron and solving Boolean functions, Feed forward and recurrent networks, Single layer and multilayer networks, Back-propagation training method, Radial basis function networks, Associative memory, Ensemble methods.
Support Vector Machines: Linear maximal margin classifier, Linear soft margin classifier; Nonlinear classifier.
Decision Trees: Recursive induction, Splitting attribute selection, Entropy and information Gain, Overfitting and pruning, ID3 and C4.5 algorithms.
Genetic Algorithms: Motivation from natural evolution, Genetic operators, Fitness function, Genetic algorithms for optimization.
Swarm Intelligence: Features of natural swarms, Swarm based methods for optimization: Ant colony optimization, Particle swarm optimization, Bee colony optimization.
Clustering and Unsupervised Learning: Learning from unclassified data, Clustering, Hierarchical agglomerative clustering, K-means partitional clustering.
Dimensionality Reduction: Curse of the dimensionality, Empty space phenomenon, Linear and nonlinear techniques for dimensionality reduction.

CSE 4112: Machine Learning Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CSE 4111.

CSE 4115: Computer and Network Security
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Introduction and Mathematical Foundations: Introduction, Overview of modern cryptography, Number theory, Probability and information theory.
Cryptography: Mechanisms and cryptanalysis of classical cryptosystems, Shannon’s theory, Symmetric key cryptography including AES and DES, Asymmetric key cryptography including RSA and ElGamal cryptosystems, Digital signature including ElGamal and DSA, Hash functions including MD and SHA, Message authentication codes.

CSE 4116: Computer and Network Security Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CSE 4115.

CSE 4117: Modeling and Simulation
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Basic Simulation Modeling: 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 models, 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, Simulation and analytical methods for analysis of computer systems and practical problems in industry, Introduction to the development of simulation packages, Introduction to petri nets and their applications to computing systems.

CSE 4118: Modeling and Simulation Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CSE 4117.

CSE 4127: Image Processing and Computer Vision
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Morphological Image Processing: Basic morphological concepts, Thinning, Thickening, Opening and closing operations.
Images Enhancement: Point processing, Spatial filtering, Frequency domain filtering, Multi-spectral image enhancement.

Image Restoration: Degradation and observation models, Inverse filtering, Geometric transformation.

Image Segmentation: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region-oriented segmentation.

Image Compression: Lossy and lossless compression schemes, Predictive compression methods, Vector quantization, JPEG and MPEG image compression.

Image Perception and Physical Modeling: Human visual system, Light, Brightness, contrast, Color modeling and representation.

Recognition and Analysis: Object recognition, Edge detection, Linking and representation, 2D motion analysis, Stereo and multi-view analysis.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 4128</td>
<td>Image Processing and Computer Vision Laboratory</td>
<td>0.75</td>
<td>None</td>
<td>0L+3/2P Hrs/Week</td>
</tr>
<tr>
<td>CSE 4129</td>
<td>Ubiquitous Computing</td>
<td>3.0</td>
<td>None</td>
<td>3L+0P Hrs/Week</td>
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<tr>
<td>CSE 4130</td>
<td>Ubiquitous Computing Laboratory</td>
<td>0.75</td>
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<tr>
<td>CSE 4132</td>
<td>Pattern Recognition Laboratory</td>
<td>0.75</td>
<td>None</td>
<td>0L+3/2P Hrs/Week</td>
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<tr>
<td>CSE 4134</td>
<td>Pattern Recognition</td>
<td>3.0</td>
<td>None</td>
<td>3L+0P Hrs/Week</td>
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</table>

Introduction: Basic concepts of pattern recognition, Importance of pattern recognition.

Statistical and Neural Pattern Recognition: Bayesian classifier, Bayes decision theory, Discriminator functions and decision surfaces, Parametric and non-parametric classification methods.

Linear Classifiers: Discriminating functions and decision hyper-planes, Perceptron algorithm and its variants, Kessler’s construction.


Template Matching: Optimal path searching techniques, Dynamic programming methods, Correlation based matching and 2D log search algorithm for image matching.

Context Dependent Classification: Viterbi algorithm, Observable and hidden Markov models (HMMs), HMMs and their application in speech recognition.

Syntactic Pattern Recognition: Introduction to syntactic pattern recognition, Grammar-based approach, Parsing, Graph-based approach.

Unsupervised Classification: Basic concepts of clustering, Proximity measures, categories of clustering algorithms, Sequential clustering algorithms, Vector quantization, Feature extraction for representation and classification.

CSE 4127: Industrial Management

Introduction: Basic theories of management, Management functions.

Organization: Theory and structure, Co-ordination, Span of control, Authority, Delegation, Centralization and decentralization.

Personnel Management: Need hierarchy, Motivation, Leadership, Performance appraisal, Wages and incentives, Organizational change and conflicts.

Cost and Financial Management: Elements of cost, Asset depreciation, Break event analysis, Investment analysis.

Operations Management: Demand forecasting, Inventory management systems, Master production schedule, MRP, Basic scheduling techniques, CPM and PERT, Plant location and layout, Maintenance management, Management Information System (MIS), Computer aided process planning (CAPP).
### Summary of 4th Year 2nd Term Courses

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Pre-Req.</th>
<th>Theory Hrs./week</th>
<th>Laboratory Hrs./Week</th>
<th>Credit</th>
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<tr>
<td>CSE 4000</td>
<td>Project/Thesis</td>
<td></td>
<td>6</td>
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<tr>
<td>CSE 4207</td>
<td>Computer Graphics</td>
<td>MATH 2207</td>
<td>3</td>
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<tr>
<td>CSE 4208</td>
<td>Computer Graphics Laboratory</td>
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<td>3/2</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>CSE 4223</td>
<td>Digital System Design</td>
<td>CSE 1203</td>
<td>3</td>
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<tr>
<td>CSE 4224</td>
<td>Digital System Design Laboratory</td>
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<td>3/2</td>
<td>0.75</td>
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<tr>
<td>CSE xxxx</td>
<td>Course from Optional-III (3.00)</td>
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<td>Course from Optional-III (3.00)</td>
<td></td>
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<td>3.0</td>
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</table>

**Total**

15 9 19.50

*Weekly Contact Hours = 15L+9P=24 Hrs/week*

NB: The Courses, CSE 4000 will be evaluated at the end of second term

### Syllabus of 4th Year 2nd Term Courses

**CSE 4000: Project / Thesis**

Credits: 3.0  Prereq.: None  Contact Hours: 0L+6P Hrs/Week

**CSE 4207: Computer Graphics**

Credits: 3.0  Prereq.: MATH 2207  Contact Hours: 3L+0P Hrs/Week

**Graphics Hardware:** Display devices, Input devices, Basic raster graphics algorithms for drawing 2D primitives, Polygon filling, Basic and composite transformations of 2D and 3D objects, viewing, clipping, and transformations, Normalization and projection.

**Three Dimensional Object Representations:** Polygon surface, Curves and surfaces, BSP trees, Fractal geometry methods, Illumination models.

**Surface Rendering Methods:** Polygon rendering, Ray tracing, Terrain visualization with height mapping, Modeling surface details with texture mapping, Color models, Computer animation.

**CSE 4208: Computer Graphics Laboratory**

Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week

Laboratory works based on CSE 4207.

**CSE 4223: Digital System Design**

Credits: 3.0  Prereq.: CSE 1203  Contact Hours: 3L+0P Hrs/Week

**Register Transfer Logic:** Inter register transfer, Arithmetic, Logic and shift micro-operations, Conditional control statements, Fixed-point binary data, Overflow, Arithmetic shifts, Decimal data, Floating-point data, Non-numeric data, Instruction codes, Design of simple computer.

**Processor Logic Design:** Processor organization, Arithmetic logic unit, Finite state machine-design and implementation. Design of arithmetic circuit, Design of logic circuit, Design of arithmetic logic unit, Status register, Design of shifter, Processor unit, Design of accumulator, Introduction to hardware description languages (VHDL and Verilog).

**Control Logic Design:** Control organization, Hardwired control, Micro-program control, Control of processor Unit, PLA control, Micro-program sequencer.

**Computer Design:** System configuration, Computer instructions, Timing and control, Execution of instructions, Design of computer registers, Design of control, Register load and inter register transfer, Bus buffer and memory cycle of microprocessors.

**Memories:** ROMs, RAMs, Small TTL Memory.

CSE 4224: Digital System Design Laboratory
Credits: 0.75  Prereq.: None  Contact Hours: 0L+3/2P Hrs/Week
Laboratory works based on CSE 4223

Syllabus of Optional-III Courses
CSE 4211: Algorithm Engineering
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Randomized Algorithms: Las Vegas and Monte Carlo Algorithms.
Randomized Data Structures: Skip lists.
Amortized Analysis: Different methods.
P-Completeness reOnline Algorithms: Competitive analysis, Online paging problem, Randomized online algorithms, Adversary models, Marker algorithm view Multithreaded algorithms, Van Emde Boas tree algorithms for massive data sets, External memory algorithms, Cache-Oblivious algorithms.
Quantum Algorithms: Quantum bits (Qbits), Quantum gates and circuits Quantum algorithms, Quantum parallelism, Approximation algorithms, LP based approximation algorithms, Experimental algorithmic.

CSE 4213: Fault Tolerant system
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
Introduction: Definition of fault tolerance, Redundancy, Applications of fault-tolerance.
Dependability Evaluation Techniques: Common Measures: Failures rate, Mean time to failure, Mean time to repair, etc., Dependability model types, Dependability computation methods.

Information Redundancy: Coding Theory: Parity codes, Hamming codes, Cyclic codes, Checksum, M-of-N codes, Berger codes, Arithmetic codes, etc., Encoding and decoding techniques, Applications, Algorithm based fault tolerance.
Time Redundancy: Check-pointing and roll-back, Analysis and optimality, Alternating Logic.
Software Redundancy: Single-version techniques, Multi-version techniques, Software testing, Self-checking software.
Case Studies: Stratus systems, IBM Sysplex.
Soft Error: Overview of soft errors, Sources of soft errors, Soft error mitigation techniques.
Reading of Some of the State-of-the-Art Research Material.

CSE 4215: E-Commerce
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week
E-Governance: Introduction to e-governance, Understanding the relationship - governance and e-governance.
CSE 4217 Principles of Programming Languages
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week

Specification of Programming Languages: Syntax, semantics: operational semantics, Denotational semantics, Axiomatic semantics and attribute grammars.
Issues in Language Design: Names, Scope and binding, Types, Control flow, Subroutines and control abstraction, Modules, Mutation, Laziness, Polymorphism, Objects, Classes and inheritance in object-oriented languages.
Programming Language Paradigms: Data abstraction and object oriented, Programming, Non-imperative paradigms: Functional languages, Logic programming, Dynamic and scripting languages, Concurrent programming.
Runtime Management: Runtime structure and operating environment, Practical and implementation issues in run-time systems and environment.
Concurrency: Subprogram-level concurrency, Semaphores, Monitors, Message passing, Statement-level concurrency.
Exception Handling: Design issues, Evaluation of exception handling in C++ and Java.

CSE 4219: Distributed Database Systems
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week

Introduction to distributed database management, Distributed architectures, Integrating data from distributed sources, Distributed database design, Distributed query processing and optimization, Distributed concurrency control, Distributed reliability protocols, Pervasive and mobile distributed database systems, Web data management, Interoperability and distributed recovery techniques.

CSE 4221: Natural Language Processing
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week

Introduction to natural language processing, Regular expressions and automata, Morphology and FSTs, Phonetics, Phonology and text-to-speech, N-grams and machine learning, Word pronunciation and spelling, Automatic speech recognition, Word classes and POS tagging; CFGs for English, Basic parsing with CFGs, Parsing problems and some solutions, Probabilistic and lexicalized parsing.
Meaning representations and semantic analysis, Lexical semantics, Word sense disambiguation, Robust semantics and information retrieval, Hidden Markov and maximum entropy models.
Text coherence and discourse structure, Reference resolution, Information status, Spoken dialogue systems, Intonation in TTS systems, New approaches to story modeling for understanding, Generation and summarization, Machine translation, Summing Up: NLP applications.

CSE 4225: Embedded Systems
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week

Overview of Embedded Systems and Their Specific Requirements: (e.g. Robust design, Temporal constraints, Technological constraints, Developmental constraints), The product design cycle, Evaluation and justification of the available levels of system integration (Custom chip design through to turnkey-systems) and technological choice, Development of a system specification, Including case studies, Overview of the software and hardware design tools/techniques applicable to such systems such as UML, VHDL, Verilog, etc.
Software Issues: Real time operating systems, Software design methodologies pertinent to real-time embedded systems, Designing, implementing and testing software for embedded systems including multiprocessor and system-on-chip (SoC) devices, Verification strategies for embedded software development.
Hardware Issues: Choice of: processor, Memory, I/O, Level(s) of integration, Development environments, Hardware acceleration devices such as DSPs and FPGAs, Interfacing to commonly used I/O devices, Types of interconnection, Sensors for measuring physical phenomena, Output devices such as power actuators and motors.
Software/Hardware Co-design Issues: Design, Implementation and verification considerations for the simultaneous design of both hardware and software.

CSE 4227: Human Computer Interaction
Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week

Introduction and overview: Definition and Importance of HCI, Usability Requirements, Understanding users, Requirements analysis.
User Centered Design and Prototyping: System centered design, User centered design, Case studies, Participatory design, Design rationale, User interface prototyping, Paper-based prototypes, Software-based prototypes, Sensation.
Experimental Design and Analysis: A model of usability factors, Ethics, Experimental planning, Basic terminology, Experimental design, Statistical analysis (t-test, F-Test, correlation/regression), Anova, Non-parametric analysis.
CSE 4231: Control Systems Engineering  
Credits: 3.0  
Prereq.: Nil  
Contact Hours: 3L+0P Hrs/Week  
Introduction to control systems, Dynamic systems modeling, Mathematical description of systems: taxonomy of systems, linear time invariant systems, discrete-time systems, Basic elements in control systems – open and closed loop systems, Block diagram and signal flow graph models, Transfer functions of linear systems, Mason’s gain formula, Reduction of parameter variation and effects of disturbance by using negative feedback, Analysis and synthesis of continuous and sample data linear feedback control systems, Properties and advantages of feedback systems, Time domain and frequency domain performance measures, Stability and degree of stability of linear feedback systems, Frequency response methods and Nyquist stability, Root locus method, Compensation techniques.

CSE 4233: Robotics  
Credits: 3.0  
Prereq.: None  
Contact Hours: 3L+0P Hrs/Week  
Introduction: History, Definitions, Robotic systems design, Applications.  
Coordinate Systems: Cartesian coordinates, Degrees of freedom, Reference frames, orientation, Bi-dimensional and tridimensional transformation matrices, Relative and general transformations, Homogeneous transformations, Inverse transformations, Graphs.  
Robots Systems and Structures: Robot architectures, Technical concepts of robotics, Actuation.  
Robot Kinematics (velocity and acceleration): Derivatives, Velocity and acceleration of rigid bodies, Differential movement, Jacobian, Singularities.  
Sensors and Perception: Internal and external sensors, Sensors hierarchy, Interfaces, data fusion, Classification, Localization, Machine vision, Applications.  
Control: Classical approaches for robot control, Feedback loops, Position and force control, Compliance, Fuzzy logic control.  
Task and Path Planning: Action-level planning, Modeling, Motion planning in R-space and C-space, Path tracking.  
Different Types of Robots: Legged robots and Zero Momentum Point (ZMP), Humanoid robots, Robots, Middle sized and small sized soccer robots.

CSE 4235: Multimedia Technology  
Credits: 3.0  
Prereq.: None  
Contact Hours: 3L+0P Hrs/Week  
Fundamentals: Media and data streams, Sound/audio, Image, Graphics, Video and animation, Color science and color models.  
Data Compression: Coding requirements, Source, Entropy and hybrid coding, Lossless and lossy compression, JPEG, H.261, MPEG, MP3 and etc.  
Computer Technology Issues: Communication architecture, Multimedia workstations, cache systems, Storage systems and optical storage.  
Multimedia Synchronization: Presentation requirements, Reference model and synchronization techniques.  
Multimedia Database: Data organization, indexing and retrieval.  
Multimedia Applications: Digital libraries, System software, Toolkits, Conferencing paradigms, Structured interaction support and examples from video/audio/graphics conferencing.

CSE 4237: Computational Geometry  
Credits: 3.0  
Prereq.: None  
Contact Hours: 3L+0P Hrs/Week  
Historical perspective, Algorithmic background, Geometric preliminaries, Models of computation, Geometric searching, Point location problem and range searching problems, Divide and conquer, Amortization, Multi-dimensional search, Space sweep, Polygon triangulation, Intersection and union of rectangles.  
Proximity, Closest pair problem, Duality and randomization, Voronoi and Delaunay diagrams, Arrangements of lines and points, Geometry of rectangles, Hidden surface removal, Art gallery theorems, Shortest paths, and lower-bounds, Convex hulls: 2D& 3D proximity, Facility location and linear programming, Mobility of objects in space.

CSE 4239: Data Mining  
Credits: 3.0  
Prereq.: None  
Contact Hours: 3L+0P Hrs/Week  
Introduction: Kinds of data and patterns to be mined, Basic statistical description of data.  
Data Preprocessing: Data objects and attributes, Data similarity and dissimilarity, Data cleaning, Data integration, Data reduction, Data transformation and discretization.  
Data Warehousing: Data warehouse modeling, Design issue, Implementation and usage, Data mining, Associations, Correlations, Mining methods, Pattern evaluation.  
Data Classification: Decision tree induction, Classification methods, Evaluation and selection of classification, Classification accuracy.


CSE 4241: Biomedical Engineering

Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week

Bioelectric Phenomena and Biosignals: Cell membrane, Resting potential, Action potential.
ECG, EEG, EMG, EOG and ERG: Origin, Characteristics and applications in medical diagnosis.
Transducers: Characteristics, Classifications and applications.
Measurements: Body temperature, Blood pressure and heart rates.
Biosignal Processing: Instrumentation amplifiers, Signal conditioner, A/D and D/A converter, Computerized automatic analysis, Bio-telemetry.
Diagnostic Methods: Ultrasound, X-ray, CT, and MRI techniques: Principles, Merits, Demerits and applications, Applications of Laser and Optics in Diagnosis.
Biomedical Equipment: Surgical diathermy machines, Defibrillators, Pacemakers, Ventilators, Prosthesis and Prosthetic devices, ICU and CCU.
Electrical Safety: Physiological effects of electricity, Susceptibility parameters, Electrical shock hazards in safety aspects of biomedical instrumentation and Good grounding concepts.

CSE 4243: Parallel and Distributed Processing

Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week

Parallel and Distributed Computers: Flynn's taxonomy, Distributed memory multicomputers, Shared memory multiprocessors, Networks of workstations, Cluster and grid computing, PRAMs, Interconnection networks.
Performance Measures: Granularity, Speed up, Efficiency, Cost, Amdahl's law, Gustafson's law, Isoefficiency, Optical computing, Quantum computing.
Interconnection Networks: Interconnection networks for inter-processor communication, Permutation routing, Non uniform routing, Deadlock free routing and multicasting, Mapping and Embedding.
Distributed Processing: Distributed models and systems, Real time distributed systems.
Applications: Sorting, Searching, Matrix algorithms, Fourier transform, Finding the maximum, Image processing.

CSE 4247: Graph Theory

Credits: 3.0  Prereq.: None  Contact Hours: 3L+0P Hrs/Week

Graphs: Simple graphs, Digraphs, Subgraphs and complements, Vertex-degrees, Walks, Paths, Cycles and distance, Connectedness and components of a graph, Random graphs, Bridges and Blocks, Isomorphism and 2-isomorphism.
Matrices of a graph: Incidence matrix, Cut matrix, Circuit matrix, Orthogonality relation.
Graph Coloring: Vertex coloring and chromatic number, Chromatic polynomials, Edge coloring and chromatic index, Four-color problem, Vizing’s theorem, Planar graphs.
Graph applications: Matching, Covering and Packing, Flow NETWORKS.
Khulna University of Engineering & Technology
Academic Ordinance for Post Graduate Studies
(Effective from July-2013 semester)
(Approved by 41th meeting of Academic Council on 18/02/13 and 25/02/13 and confirmed by 43th meeting of Academic Council on 12/09/13)

1. Definitions
1.1 ‘University’ means the Khulna University of Engineering & Technology.
1.2 ‘Syndicate’ means the Syndicate of the University.
1.3 ‘Vice-Chancellor’ means the Vice-Chancellor of the University.
1.4 ‘Academic Council’ means the Academic Council of the University.
1.5 ‘CASR’ means the Committee for Advanced Studies and Research of the University.

1.5.1. The CASR shall consist of the following members:

   i) Vice-Chancellor
   ii) All Deans
   iii) Three Professors to be nominated by the Syndicate
   iv) Three teachers having research qualification and experience to be nominated by the Academic Council
   v) Three experts, at least one from outside the University, to be nominated by the Vice-Chancellor
   vi) The Director (Research and Extension)

1.5.2. The quorum for the meetings of the CASR shall be five.

1.5.3. The term of office of the nominated members shall be two years. But they will continue their duties until they are replaced by new members.

1.6 ‘EC’ means the Executive Committee of any Faculty of the University.

1.6.1. The EC shall consist of the following members:

   i) Dean of the Faculty
   ii) Head of the Departments under the Faculty
   iii) All Professors and Associate Professors of the Departments under the Faculty
   iv) Three teachers, not related to the subjects of the Faculty but closely related to the subjects according to the Academic Council, nominated by the Academic Council
   v) Two persons, having special knowledge to one or more subjects of the Faculty and not serving in the University, nominated by the Academic Council

1.6.2. At least one-third members will fulfil the quorum.

1.6.3. The term of office of the nominated members shall be three years.

1.7 ‘ACPG’ means the Academic Committee for Post-Graduate studies in a degree-awarding department of the University.

1.7.1. The ACPG shall consist of the following members:

   i) Head of the Department Chairman
   ii) All Professors and Associate Professors of the respective Department and all teachers who teach in the post-graduate classes Member
   iii) One Professor from the relevant field from any other University to be nominated by the Vice-Chancellor Member
   iv) One expert from the relevant field having experience in any industry, research or commercial organization to be nominated by the Academic Council Member

1.7.2. The Chairman will nominate one of the members from (ii) to act as the Member-Secretary.

1.7.3. At least one-third members will fulfil the quorum.

1.7.4. The term of the office of the nominated members shall be three years.

1.8 ‘DSC’ means the Doctoral Scrutiny Committee.

1.8.1. The DSC shall consist of the following members:

   i) Supervisor Chairman
   ii) Joint Supervisor/Co-supervisor (if any) Member
   iii) Head of the Department Member
   iv) Not less than three experts of which at least one from outside the Department Member

1.8.2. There shall be a DSC for each Ph. D. student proposed by the Head of the Department and approved by the CASR.

1.8.3. The committee should be formed within 3 (three) months from the date of the student’s provisional admission in consultation with the supervisor.

1.8.4. The DSC will meet from time to time (at least on three occasions) on the request of the supervisor to review the progress of the student.

1.8.5. In special circumstances, the CASR may approve any addition and/or alteration in the DSC on the recommendation of the supervisor through the Head of the Department.

2. Degree Awarding Departments
The University shall have the following post-graduate degree awarding Departments:

   i) Department of Civil Engineering
ii) Department of Electrical and Electronic Engineering
 iii) Department of Mechanical Engineering
 iv) Department of Computer Science and Engineering
 v) Department of Electronics and Communication Engineering
 vi) Department of Industrial Engineering and Management
 vii) Department of Bio-Medical Engineering
 viii) Department of Mathematics
 ix) Department of Chemistry
 x) Department of Physics
 xi) Any other Department to be instituted by the Syndicate on the recommendation of the Academic Council from time to time.

3. Degrees Offered
The Post-Graduate degrees to be offered by the University under this ordinance are as follows:

3.1. Master of Science in Engineering
 i) Master of Science in Civil Engineering abbreviated as M. Sc. Eng. (CE)
 ii) Master of Science in Electrical & Electronic Engineering abbreviated as M. Sc. Eng. (EEE)
 iii) Master of Science in Mechanical Engineering abbreviated as M. Sc. Eng. (ME)
 iv) Master of Science in Computer Science & Engineering abbreviated as M. Sc. Eng. (CSE)
 v) Master of Science in Electronics & Communication Engineering abbreviated as M. Sc. Eng. (ECE)
 vi) Master of Science in Industrial Engineering & Management abbreviated as M. Sc. Eng. (IEM)
 vii) Master of Science in Biomedical Engineering abbreviated as M. Sc. Eng. (BME)
 viii) Master of Science in Energy Science and Engineering abbreviated as M. Sc. Eng. (ESE)
 ix) Any such other degree as may be approved by the Syndicate on the recommendation of the Academic Council from time to time.

3.2. Master of Science
 i) Master of Science in Mathematics abbreviated as M. Sc. (Math)
 ii) Master of Science in Chemistry abbreviated as M. Sc. (Chem)
 iii) Master of Science in Physics abbreviated as M. Sc. (Phy)
 iv) Any such other degree as may be approved by the Syndicate on the recommendation of the Academic Council from time to time.

3.3. Master of Philosophy
 i) Master of Philosophy in Mathematics abbreviated as M. Phil. (Math)
 ii) Master of Philosophy in Chemistry abbreviated as M. Phil. (Chem)
 iii) Master of Philosophy in Physics abbreviated as M. Phil. (Phy)
 iv) Any such other degree as may be approved by the Syndicate on the recommendation of the Academic Council from time to time.

3.4. Doctor of Philosophy
 i) Doctor of Philosophy in Civil Engineering abbreviated as Ph. D. (CE)
 ii) Doctor of Philosophy in Electrical & Electronic Engineering abbreviated as Ph. D. (EEE)
 iii) Doctor of Philosophy in Mechanical Engineering abbreviated as Ph. D. (ME)
 iv) Doctor of Philosophy in Computer Science & Engineering abbreviated as Ph. D. (CSE)
 v) Doctor of Philosophy in Electronics & Communication Engineering abbreviated as Ph. D. (ECE)
 vi) Doctor of Philosophy in Industrial Engineering & Management abbreviated as Ph. D. (IEM)
 vii) Doctor of Philosophy in Biomedical Engineering abbreviated as Ph. D. (BME)
 viii) Doctor of Philosophy in Mathematics abbreviated as Ph. D. (Math)
 ix) Doctor of Philosophy in Chemistry abbreviated as Ph. D. (Chem)
 x) Doctor of Philosophy in Physics abbreviated as Ph. D. (Phy)
 xi) Any such other degree as may be approved by the Syndicate on the recommendation of the Academic Council from time to time.

4. Admission Requirements
4.1. Master of Science in Engineering
For admission to the courses leading to the award of the degree of M. Sc. Eng. in any department, a candidate must have obtained a B.Sc. Eng. or an equivalent degree with at least a CGPA of 2.65 in the scale of 4.00 or its equivalent from any recognized University/Institution in the relevant field/branch and must have obtained at least a CGPA of 3.50 in the scale of 5.00 or its equivalent both in SSC and HSC levels

4.2. Master of Science
For admission to the courses leading to the award of the degree of M. Sc. in any department, a candidate must have obtained a 4 years B.Sc. (Hon’s) or an equivalent degree with at least a CGPA of 2.65 in the scale of 4.00 or its equivalent from any recognized University/Institution in the relevant field/branch and must
have obtained at least a CGPA of 3.50 in the scale of 5.00 or its equivalent both in SSC and HSC levels.

Or

A candidate having B.Sc. Engineering degree with good academic records from relevant field/branch, as decided by the ACPG of the respective department, is also eligible; provided that he/she completes some pre-requisite courses as determined by the Selection Committee, constituted under Art 5.3 of this ordinance.

4.3. Master of Philosophy

For admission to the courses leading to the award of the degree of M. Phil. in any department, a candidate must have obtained an M. Sc. or an equivalent degree in the relevant field/branch with at least Second Class/CGPA of 2.65 in the scale of 4.00 in both B.Sc. (Hon’s/Pass) and M. Sc. with good previous academic records.

Or

A candidate having B.Sc. Engineering degree with good academic records from relevant field/branch, as decided by the ACPG of the respective department, is also eligible; provided that he/she completes some pre-requisite courses as determined by the Selection Committee, constituted under Art 5.3 of this ordinance.

4.4. Doctor of Philosophy

4.4.1. For admission to the courses leading to award of the degree of Doctor of Philosophy in any department, a candidate must have obtained an M. Sc. Eng./M. Eng./M. Sc. with 4 years B.Sc. (Hon’s)/M. Phil or its equivalent degree with good academic records in the relevant field/branch of Engineering/Science or its equivalent from any recognized University/Institution.

4.4.2. A student already working for an M. Sc. Eng./M.Sc. with 4 years B.Sc. (Hon’s)/M. Phil degree in this University and showing excellent progress and promise in thesis work may be provisionally transferred to Ph.D. program after completion of his/her M. Sc. Eng./M. Phil. course work with a minimum CGPA of 3.50 out of 4.00 on the recommendation of the ACPG and approval of the CASR.

4.5. Master of Science in Engineering

The above requirements may be relaxed for candidates on deputation or sponsored by Academic Institutions/ Research Organizations/Government and Semi-Government Organizations. Such relaxation shall be recommended by the ACPG to the CASR for approval.

5. Admission Procedures

5.1. Applications for admission to the above programs shall be invited before commence-
i) Full-time: A full-time student shall not ordinarily be an employee of any organization, however, employees serving in different organizations may be registered as full-time student with prior permission from the concerned authority/employer. A full-time student may be employed as teaching/research assistant in this University.

ii) Part-time: Students serving in different organizations may be admitted as part-time student with a written consent from the employer.

6.6. Course Registration

6.6.1. Every admitted student shall have to get himself/herself registered into the courses on payment of prescribed fees.

6.6.2. Course registration by a student must be completed within two weeks from the start of a semester; otherwise the student shall not be allowed to continue the course in that semester.

6.6.3. A full-time student must register a minimum of 12 (twelve) credit hours and a maximum of 15 (fifteen) credit hours per semester.

6.6.4. A part-time student should normally register a minimum of 6 (six)-credit hours and a maximum of 9 (nine) credit hours per semester.

6.6.5. A student may be permitted to withdraw and/or change his/her registered course within three working weeks from the commencement of that semester on the recommendation of his/her supervisor (if any) and upon approval of the concerned teacher(s) and Head of the Department.

6.6.6. No student will be allowed to register a course for grade improvement. A student having a F grade in a compulsory course (if any) shall be allowed to repeat.

6.7. Credit Transfer

On the recommendation of the respective ACPG through EC and by the approval of the Academic Council, a student may be allowed to transfer a maximum of 50% of the required theory courses of this University completed by the student at other universities/institutions where he/she enrolled earlier for M. Sc./M. Phil./Ph. D program provided that the courses were not taken earlier than 3 (three) calendar years from the date of his/her first enrollment in the respective program in this University. In addition the student must obtain a minimum Grade Point of 3.00 out of 4.00 or its equivalent in each course to be transferred and the courses should be equivalent to the approved courses of this University.

6.8. Course Duration


The minimum duration to complete the requirements of M. Sc. Eng. degree shall normally be 3 (three) semesters and generally not be more than 5 (five) academic years from the date of his/her admission.

6.8.1.2. M. Sc. Degree

The minimum duration to complete the requirements of M. Sc. degree shall normally be 3 (three) semesters and generally not be more than 5 (five) academic years from the date of his/her admission.

6.8.2. M. Phil. Degree

The minimum duration to complete the requirements of M. Phil. degree shall normally be 4 (four) semesters and generally not be more than 5 (five) academic years from the date of his/her admission.

6.8.3. Ph. D. Degree

The minimum duration to complete the requirements of Ph.D. degree shall normally be 4 (four) semesters from the date of his/her provisional admission and generally not be more than 7 (seven) academic years from the date of his/her provisional admission.

6.9. Requirements for Continuation of the Post-Graduate Program

6.9.1. A student will not be allowed to continue the program if he/she obtains F grades in three or more courses in the first two registered semesters.

6.9.2. A student will not be allowed to continue the program if his/her CGPA falls below 2.5 (including C grades) at the end of the second or any subsequent semester.

6.9.3. A Ph. D. student will not be allowed to continue the program if he/she fails to qualify the Comprehensive Examination [Art 6.10.3(iii)] in 2(two) chances.

6.10. Requirements for the Degrees


The following are the requirements for M. Sc. Eng. degree:

i) A student must obtain a minimum CGPA of 2.65 in his/her course works.

ii) A student must have to complete a minimum of 36 credit hours of which 18 credit hours shall be assigned to a thesis or 9 credit hours for a project.

iii) In addition to the successful completion of course works, every student shall have to submit a thesis on his research work or a dissertation on his project work, as applicable, fulfilling the requirements as detailed in Art. No. 9.

6.10.1.2. M. Sc. Degree

The following are the requirements for M. Sc. degree:

i) A student must obtain a minimum CGPA of 2.65 in his/her course works.
ii) A student must have to complete a minimum of 36 credit hours of which 18 credit hours shall be assigned to a thesis or 9 credit hours for a project.

iii) In addition to the successful completion of course works, every student shall have to submit a thesis on his research work or a dissertation on his project work, as applicable, fulfilling the requirements as detailed in Art. No. 9.

6.10.2. M. Phil. Degree
The following are the requirements for M. Phil. degree:
i) A student must obtain a minimum CGPA of 2.65 in his/her course works.
ii) A student must have to complete a minimum of 48 credit hours of which 24 credit hours shall be assigned to a thesis.
iii) In addition to the successful completion of course work, every student shall have to submit a thesis on his research work fulfilling the requirements as detailed in Art. No. 9.

6.10.3. Ph.D. Degree
The following are the requirements for Ph. D. degree:
i) A student must obtain a minimum CGPA of 2.65 in his/her course works.
ii) A student must have to complete a minimum of 60 credit hours of which 45 credit hours shall be assigned to a thesis.
iii) He/she must have to pass the Comprehensive Examination. Comprehensive Examination shall comprise a written examination and/or an oral examination to test the knowledge of the student in his/her field of study and research. Comprehensive Examination shall ordinarily be held after the completion of the course work by the student. The DSC on the request of the supervisor shall fix a date and time for the Comprehensive Examination. The DSC shall conduct the Comprehensive Examination.
iv) In addition to the successful completion of course work and Comprehensive Examination, every student shall have to submit a thesis/dissertation on his/her research work fulfilling the requirements as detailed in Art. No. 9.

7. Grading System
7.1. Numerical marks may be made in answer scripts, tests etc. for assessing the performance of the students but all the final grading shall be made in letter grade/grade point as follows:

<table>
<thead>
<tr>
<th>Numerical Marks</th>
<th>Letter Grade</th>
<th>Grade Point (G)</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>90% and above</td>
<td>A+</td>
<td>4.0</td>
<td>Excellent</td>
</tr>
<tr>
<td>≥80% but &lt;90%</td>
<td>A</td>
<td>3.5</td>
<td>Very good</td>
</tr>
<tr>
<td>≥70% but &lt;80%</td>
<td>B+</td>
<td>3.0</td>
<td>Good</td>
</tr>
<tr>
<td>≥60% but &lt;70%</td>
<td>B</td>
<td>2.5</td>
<td>Average</td>
</tr>
<tr>
<td>≥50% but &lt;60%</td>
<td>C</td>
<td>2.0</td>
<td>Pass</td>
</tr>
<tr>
<td>Below 50%</td>
<td>F</td>
<td>0.0</td>
<td>Fail</td>
</tr>
<tr>
<td>Incomplete</td>
<td>I</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>S</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td>U</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

7.2. The Grade Point Average (GPA) shall be computed for each semester as follows:

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

Where,
- \( n \) is the number of courses completed during the semester,
- \( C_i \) is the number of credits allotted to a particular course,
- \( G_i \) is the grade point corresponding to the letter grade awarded for that course.

A Cumulative Grade Point Average (CGPA) shall also be computed at the end of second and subsequent semesters. The CGPA will be computed as follows:

\[
CGPA = \frac{\sum_{j=1}^{m} S_j T_j}{\sum_{j=1}^{m} T_j}
\]

Where,
- \( m \) is the number of courses completed during the semester,
- \( C_j \) is the number of credits allotted to a particular course,
- \( G_j \) is the grade point corresponding to the letter grade awarded for that course.

Both GPA and CGPA will be rounded off to the second place of decimal for reporting.

7.3. On the written request from a student, a maximum of two courses, having B or C grade in each, may be ignored for the calculation of CGPA. In such case the CGPA must not be less than 2.65 in the remaining courses.

7.4. Courses in which a student gets F grade shall not be counted towards credit hour requirements and for the calculation of GPA.

7.5. A student shall get I grade in a course with prior permission from the Head of the Department if he/she is unable to complete the course due to any unavoidable circumstances. He/she has to complete the course within the next two consecutive semesters; otherwise he/she will get F grade in that course. He/she may, however,
be allowed to register that course without further payment of course registration fees. In addition to that if the incomplete course(s) do not offer in the consecutive next 2 (two) terms then the students shall have to apply to the Chairman, CASR with the recommendation of respective Head of the Department for the withdrawal of the course(s).

7.6. Satisfactory (S) and unsatisfactory (U) shall be used for grading of thesis/project and non-credit prerequisite courses. If, however, thesis is discontinued an I grade shall be recorded.

8. Conduct of Examination for Theoretical Courses

8.1. In addition to class tests, assignments, term papers etc. there shall be a written examination on all theoretical courses at the end of each semester. The Head of the Department shall announce a date of the examination generally two weeks before its commencement. The final grade in a theoretical course shall be based on the performance of all class tests, assignments, term papers and written examination.

8.2. The respective course teacher will be solely responsible for the performance evaluation of a student as detailed in Art. No. 8.1. He/she will announce the final grade of the course within three weeks from the date of examination of that course and will also submit a copy to the Head of the Department.

8.3. The Controller of Examinations shall keep up-to-date record of all the grades obtained by a student in individual Academic Record Card. A student can get an official grade sheet from the office of the Controller of Examinations on payment of prescribed fees.

9. Project/Thesis

9.1. Appointment of Supervisor/Co-Supervisor/Joint-Supervisor

9.1.1. Research works for a project/thesis shall be carried out under the supervision (Supervisor/Co-Supervisor/Joint-Supervisor) of a teacher, not below the rank of an Assistant Professor with sufficient research experience, publications and at least possess the degree which he/she is going to supervise, from the respective department or from any other department of this University proposed by the Head of the Department and recommended by the ACPG. A teacher of this University who is studying in postgraduate level shall not be allowed to supervise any Postgraduate student. A Co-Supervisor/Joint Supervisor is not encouraged in Masters Level unless there is an absolute necessity. In the Ph. D. Level, Co-Supervisor/Joint-Supervisor(s) are acceptable with proper justification by the supervisor. A Joint-Supervisor or Co-Supervisor (if necessary) may be appointed from within/ outside the University recommended by the ACPG.

9.1.2. In case of selecting a Supervisor/Joint supervisor/Co-supervisor from other than the respective department, an approval from the supervisor’s Head of the Department has to be taken.

9.1.3. The Supervisor, Joint-supervisor/Co-supervisor (if any) shall be approved by the CASR on the recommendation of the ACPG.

9.1.4. A thesis/project supervisor has to be normally appointed after the completion of the first semester for M.Sc Eng./M.Sc./M.Phil and within three months for Ph. D. students.

9.2. Research Proposal

9.2.1. M. Sc. Eng./M.Sc./M.Phil

A student shall submit a project/thesis proposal to the ACPG through supervisor(s). The ACPG shall examine the proposal and recommend it for the approval of the CASR through the Head of the Department. In special circumstances, the ACPG may recommend any subsequent changes in the research topic and forward it through the Head of the Department to CASR for approval.

9.2.2. Ph. D.

After the successful completion of the Comprehensive Examination a student shall submit a research proposal to the DSC through the supervisor(s). The DSC shall examine the proposal and recommend it for the approval of the CASR through the Head of the Department. In special circumstances, the DSC may recommend any subsequent changes in the research topic and forward it to CASR for approval through the Head of the Department.

9.3. The project/research work should normally be carried out in the University. However, if necessary, the supervisor can allow his/her student to carry out the research work outside the University with the approval of the ACPG in the case of M. Sc.Eng./M.Sc./M.Phil. student or with the approval of the DSC in the case of Ph. D. student. The work schedule and financial involvement should be mentioned in the research proposal for carrying out research work.

9.4. At the end of a student’s research work on the advice of the supervisor the student shall submit a thesis which must be an original contribution to engineering/sciences and worthy of publication. Every student shall have to submit required number of printed copies of his/her thesis/project dissertation in the approved format to the Head of the Department through his/her supervisor on or before a date to be fixed by the Head of the Department in consultation with the supervisor(s).

(7.5 Approved by 51th meeting of academic council on 19/05/16)
9.5. A student shall have to declare that he/she has carried out the project/research work and it not been submitted elsewhere for any purpose, except for publication, duly countersigned by the supervisor(s).

9.6. Project/Thesis Examination


9.6.1.1. The CASR shall constitute an examination committee for each project/thesis examination and oral examination from the panel of examiners proposed by concerned Head of the Department in consultation with supervisor(s) and recommended by the concerned ACPG. The examination committee shall be as follows:

i) Supervisor Chairman
ii) Joint supervisor/Co-supervisor (if any) Member
iii) Head of the Department Member
iv) One or two teachers from within the department/faculty not below the rank of Assistant Professor. Member
v) One external Examiner outside the University Member (External)

9.6.1.2. The supervisor(s) and the external examiner shall examine the thesis/dissertation; whereas the examination committee shall assess the performance in the oral examination only.

9.6.1.3. If any examiner is unable to accept the appointment or wants to relinquish his/her appointment before the examination, the Vice-Chancellor shall appoint another examiner from the panel in his/her place, without further reference to the DSC. The Vice-Chancellor may also appoint a third external examiner, if referred by the DSC in case of major contradiction to the external examiners’ viewpoint.

9.6.2. Ph. D. Thesis

9.6.2.1. Each student has to submit 10 (ten) copies of synopsis at the end of the research work and has to appear in an Oral Examination arranged by the Chairman of DSC. After satisfactory completion of the Oral Examination the student shall submit at least 5 (five) printed copies of the thesis in the final form to the Head of the Department through the supervisor in the approved format.

9.6.2.2. The DSC will propose a panel of external examiners for each thesis. Board of Examiners shall consist of the DSC and 2 (two) more external examiners, at least one from outside the country, from the relevant field to be appointed by the Vice-Chancellor in consultation with the thesis supervisor. The supervisor shall act as the Chairman of the Board of Examiners. A copy of the thesis is to be sent to each external examiner for evaluation and written opinion.

9.6.2.3. If any examiner is unable to accept the appointment or wants to relinquish his/her appointment before the examination, the Vice-Chancellor shall appoint another examiner from the panel in his/her place, without further reference to the DSC. The Vice-Chancellor may also appoint a third external examiner, if referred by the DSC in case of major contradiction to the external examiners’ viewpoint.

9.6.2.4. On receipt of satisfactory report from the thesis examiners, an oral examination shall be arranged on a date or dates fixed by the Chairman of DSC in which the student shall defend his/her thesis. The student must satisfy the Board of Examiners as constituted under Art. 9.6.2.2 that he/she is capable of intelligently applying the results of his/her research to the solution of the problems and of undertaking independent research work. Besides he/she should show the evidence of satisfactory knowledge related to the theory and technique used in his/her research work.

9.6.2.5. In case a student fails to satisfy the Board of Examiners in thesis and/or Oral Examination, he/she shall be given one more chance to resubmit the thesis and/or re-appear in Oral Examination as recommended by the Board of Examiners.

9.6.2.6. A student may be awarded an M. Sc. Eng./M. Phil degree on the recommendation of the supervisor, if the student fails to qualify for the award of Ph. D degree.

10. Striking off and removal of names from the rolls

The name of the student shall be struck off and/or removed from the rolls of the University on the following grounds:

i) Unsatisfactory progress of the student reported by the supervisor through the ACPG and approved by the CASR.

ii) Failing to proceed with the program according to the Art. 6.8. and 6.9 of this ordinance.

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

iv) Withdrawal of his/her name from the roll-sheet of the University.

v) Non-payment of dues of the University and the Halls of residence within a prescribed period.

11. Academic Fees

The amount of academic fees shall be decided by the University from time to time.
12. **Refund of Fees**

12.1. A student withdrawing officially from all courses and/or including thesis/project as per Art 10(iv) is entitled to get a refund of the course registration fees provided he/she withdraws in writing through the respective Head of the Department before the expiry of two working weeks from the commencement of the classes. Thesis/project registration fees in any case are not refundable.

12.2. In case of Art.10(ii) or after successful completion of the course, a student can get refund of University and Hall caution money after producing the clearance from all concerned.

13. **Admission Co-ordination Committee for Post-graduate studies**

The Post-graduate Admission Co-ordination Committee shall consist of the following members:

i) Vice-Chancellor, who shall also be the Chairman

ii) Pro-Vice-Chancellor (if any)

iii) All Deans

iv) Director (Research and Extension), who shall also be its Secretary

v) All Post-graduate degree offering Head of the Departments.

The Committee will decide upon the number of students to be admitted to any department each year on the basis of the present facilities of the said department.

14. **Extension of time for completion of Degree**

The application for extension of time span of a student should be processed through the CASR. A recommended proforma may be used for this purpose. The application must be submitted within 6 (six) months after the normal time span has elapsed.

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### Syllabus for Post Graduate Study

**Department of Computer Science and Engineering (CSE)**

(Recommended by the EC of EEE faculty at its 8th meeting on 25/01/09)

#### A. Compulsory Courses. (For M.Sc. Engineering)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 6000</td>
<td>Thesis/Project</td>
<td>18/9</td>
</tr>
</tbody>
</table>

#### B. Elective Courses

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CSE 6101</td>
<td>Advanced Graph Theory</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>CSE 6103</td>
<td>Real Time Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>CSE 6105</td>
<td>Parallel Computations and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>CSE 6221</td>
<td>Advanced Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>CSE 6223</td>
<td>Advanced Human-Computer Interaction</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>CSE 6225</td>
<td>Data Warehousing and Mining</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>CSE 6227</td>
<td>Transactional Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>CSE 6229</td>
<td>Information Management and Retrieval</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>CSE 6231</td>
<td>Web Engineering</td>
<td>3</td>
</tr>
<tr>
<td>10.</td>
<td>CSE 6233</td>
<td>Advanced Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>11.</td>
<td>CSE 6235</td>
<td>Computer Graphics and Animations</td>
<td>3</td>
</tr>
<tr>
<td>12.</td>
<td>CSE 6237</td>
<td>Enterprise Infrastructure and Management</td>
<td>3</td>
</tr>
<tr>
<td>13.</td>
<td>CSE 6239</td>
<td>Computer Vision</td>
<td>3</td>
</tr>
<tr>
<td>14.</td>
<td>CSE 6241</td>
<td>Multimedia Technologies and Applications</td>
<td>3</td>
</tr>
<tr>
<td>15.</td>
<td>CSE 6243</td>
<td>Advanced Digital Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>16.</td>
<td>CSE 6245</td>
<td>Principles of Multimedia Networking</td>
<td>3</td>
</tr>
<tr>
<td>17.</td>
<td>CSE 6247</td>
<td>Large Scale Data Management</td>
<td>3</td>
</tr>
<tr>
<td>18.</td>
<td>CSE 6351</td>
<td>Principles of Cryptography</td>
<td>3</td>
</tr>
<tr>
<td>19.</td>
<td>CSE 6353</td>
<td>Advanced Network Security</td>
<td>3</td>
</tr>
<tr>
<td>20.</td>
<td>CSE 6355</td>
<td>Advanced Cryptography</td>
<td>3</td>
</tr>
<tr>
<td>21.</td>
<td>CSE 6461</td>
<td>Advanced Artificial Intelligent Systems</td>
<td>3</td>
</tr>
<tr>
<td>22.</td>
<td>CSE 6463</td>
<td>Machine Translation</td>
<td>3</td>
</tr>
<tr>
<td>23.</td>
<td>CSE 6465</td>
<td>Soft Computing</td>
<td>3</td>
</tr>
<tr>
<td>24.</td>
<td>CSE 6467</td>
<td>Advanced Natural Language Processing</td>
<td>3</td>
</tr>
<tr>
<td>25.</td>
<td>CSE 6469</td>
<td>Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>26.</td>
<td>CSE 6471</td>
<td>Bio-inspired Computing Techniques</td>
<td>3</td>
</tr>
<tr>
<td>27.</td>
<td>CSE 6473</td>
<td>Advanced Machine Learning</td>
<td>3</td>
</tr>
</tbody>
</table>
CSE 6101: Advanced Graph Theory  
Credit: 3  
Review of fundamental concepts, Bonds, The cycle space and the bond space, Blocks, Menger’s theorem, Hamilton paths and cycles, Theorems of Dirac, Ore, Bondy; Berge's Theorem, Perfect matchings, Hall's theorem, Tutte's theorem, Konig's theorem, Petersen's theorem, Algorithms for matching and weighted matching, Independent sets and covering numbers, Turan's theorem, Ramsey theorems, Brooks theorem, Vizing's theorem; Planar graphs, Euler's formula, Kuratowski's theorem, Connectivity and strongly connected digraphs, Applications of graph theory: the Chinese postman problem, the travelling salesman problem, Graph coloring, Network flow problem, Graph algorithms in computer network security.

CSE 6103: Real-Time Operating System  
Credit: 3  
Real-time Models and Languages: Event-based, Process-based, and Graph-based models, Petri net models, Real-time languages, RTOS tasks, Real-time scheduling, Interrupt processing, Synchronization control blocks, Memory requirements.  
Real-time Kernel: Principles, Design issues, Polled loop systems, RTOS porting to a target, Comparison and study of various RTOSs like QNX, VxWorks, PSOS, and C executive, Case studies.  
RTOS Application Domains: RTOSs for image processing, Embedded RTOSs for VoIP, RTOSs for fault-tolerant applications, RTOSs for control systems.

Credit: 3  
Introduction: Modern parallel computers, Seeking concurrency, Data Clustering, Programming parallel computers.  
Parallel Architectures: Interconnection networks, Processor arrays, Multiprocessors, Multi-computers.  
Document Classification: Algorithm design, Non-blocking communications, Documenting parallel programming, Enhancements.  

CSE 6221: Advanced Database Systems  
Credit: 3  
Advanced Data and Index Structures: Hilbert curve, B and B+ trees, UB tree, Grid file, Bang file, Theta and Gamma partition, Object oriented indexing, Hash indexing.  
Physical Data Organization: Disk organization, Heap files, Sorted files, Database tuning.  
Parallel and Distributed Database Design: Distributed and multi-database design, Data allocation strategies, Global schema and fragmentation design, I/O parallelism, partitioning techniques, Architectures, Parallel and distributed query processing, Distributed recovery, Spatial data management.  
Object Databases: Problems of the relational data model, Conceptual object data model, The ODMG standard, CORBA.  

CSE 6223: Advanced Human-Computer Interaction  
Credit: 3  
Introduction to Human-Computer Interaction (HCI): Human Factors, Usability, Accessibility, Interfaces, Quality criteria, Measurements.  
Introduction to “Observing the User Techniques”: Interviews, Focus groups, Surveys, Direct observation, think aloud.  
Theories and Principles: High-level Theories, Object-action interface model, Golden rules of interface design, etc.  
Evaluation of Interface Design: Expert review, Usability testing, Acceptance tests, Experiments.
Interface Techniques and Technologies: Graphical User Interface (GUI), Direct manipulation, Menu selection, Form filling and dialog boxes, Command and natural languages, Multiple windows, Hypermedia and World Wide Web, Virtual environments.

User Interface: Interface widgets, Interactive devices, Printed and online facilities, etc.

User Interface Design: Design development process, Software tools, User and task analysis, Multimodal interfaces, Response time and display rate, Presentation style, Semiotics in interface design, etc.

Advanced Topic: Ubiquitous computing interaction, Highly interactive tools for data visualization.

CSE 6225: Data Warehousing and Mining Credit: 3
Data Warehousing and OLAP Technology: Introduction, Multidimensional data model, Data warehouse architecture and implementation.
Data Processing: Data cleaning, Data integration and transformation, Data reduction, Data discretization and hierarchy generation, Data compression techniques.
Data Warehousing and Decision support: Multidimensional database design, Aggregation queries, Views and decision support, View materialization and maintenance, Indexing on OLAP.
Data Mining Primitives: Data mining tasks, Characterization and comparison, Mining rules, Tree structured rules.
Clustering and Complex Type Data Mining: Types of clustering, Methods of clustering and its details, Mining spatial database, Mining multimedia database, Time series data, Text data and Web data.

CSE 6227: Transactional Information Systems Credit: 3
Background and Computation Models: Computational models, Notions of correctness and the page model.
Concurrency Control: Concurrency control algorithms, Multi-version concurrency control, Concurrency control on objects, Concurrency control algorithms on Objects, concurrency control on relational databases, Concurrency control on search structures.
Recovery: Transaction recovery, Crash recovery, Object model crash recovery.
Distributed Transactions: Distributed concurrency control, Distributed transaction recovery.

CSE 6229: Information Management and Retrieval Credit: 3
Introduction to Knowledge and Knowledge Management Concepts: Knowledge in organizations, Knowledge processes.
Knowledge Modeling: Ontologies, Structures, Concepts and relationships, Organization modeling, Communication and dynamics modeling, Knowledge transfer, Total knowledge management.
Information Retrieval Models: Taxonomy of IR models;
Classical IR: Boolean, Vector, Probabilistic;
Alternative Models: Bayesian networks, Neural networks, Structured text retrieval models;
Query Languages and Operations: Keyword based querying, Structural queries, Query expansion, Automatic local and global analysis.
Document Processing: Lexical analysis, Stemming and stop words, Text compression.

CSE 6231: Web Engineering Credit: 3
Distributed Systems Infrastructure and Architectural Models: Basic terminology, Networks, Internet, Intranet and extranet, Client/Server computing paradigm, Open systems and communication protocols, Communication systems and protocols.
Distributing Computing: Models and architectures, Open systems. OSI model.
Distributed Objects and Middleware: Middleware: Views, Definitions, Functions, Middleware for distribution, Distributed objects model, Interfaces and Interface Definition Language (IDL), Component Object Model (COM) and Distributed COM (DCOM), System Object Model (SOM) and Distributed SOM (DSOM).
CGI Programming Mechanism: GET and POST methods.

CSE 6233: Advanced Software Engineering Credit: 3
Object-Oriented Modeling and Design: Advanced object modeling, Dynamic modeling, Functional modeling.
System design: Overview of system design, Allocating subsystems to processors and tasks, Management of data stores, Choose software control implementation, Handling boundary conditions, etc.
Object Design: Overview of object design, Designing algorithms, Design optimization, Object representation, Documenting design decisions, etc.
Software Projects Type: Software Projects Classification: According to application field, According to architectures, According to objectives, According to development conditions.
Configurable Products Classification: MIS, ERP, CRM, SCM, PRM, DSS, EIS, OA, EAI, CTI, SCADA.
Software Production Process Techniques: Techniques to Collect and Represent the End User Needs: Scenarios, BPM, Workflow, Extended examples of XML family languages use to define requirements.
Techniques for the Definition of the Contents of the Solution: Domain Analysis, Gap Analysis, Contents representation methods, Test plans.
Techniques for the Solution Architecture Definition: Design patterns, Visual inheritance, delegation, Real time system architectures.
Software Process Management Techniques: Project Set Up: technological resources selection, human resources selection, the project plan, the choice of process management tools, WBS, Techniques for change management, Techniques for controlling project progress.

CSE 6235: Computer Graphics and Animations  Credit: 3
Advanced Graphics Technique: Three dimensional drawings and fractals.
Kinematics: Articulated figures, Motion capture, Inverse kinematics, Passive Dynamics: Particle systems, Spring-mass systems, Active Dynamics: Controllers, Learning, Planning, Soft object animation and procedural animation.

CSE 6237: Enterprise Infrastructure and Management  Credit: 3
Enterprise Infrastructure: Enterprise servers, Partitioned systems, High availability, Storage arrays, Storage Area Network (SAN), Network Attached Storage (NAS), Perfect availability, Disaster tolerance, Fault tolerance, Data backup and recovery.
Service Management: Service Level Agreements (SLA), Service desk, Configuration management, Change management, Release management, Contingency management, Availability management, Capacity management, Disaster management.
Project Management: Task types and task relationships, Resource allocation, Risk analysis and management, Formal project management methods, Project Finance, Project planning and implementation, Project completion and sign off, Project review, Project crashing.

CSE 6239: Computer Vision  Credit: 3
Introduction: Goals of computer vision, Methodologies, Main approaches and directions, Applications, Relations with other fields.
Techniques for Image Acquisition: Monocular and multiple view vision, Active and passive vision, Intensity and range images
Image Processing: Sources of image degradation, Mathematical description and classification of noises, Noise filtering techniques
Feature Extraction and Grouping: Edge detection, Corner detection, Histogram and thresholding techniques, Curve fitting, Hough transform, Active contour, Grouping and segmentation techniques.
Stereo: 3D Shape from Two or More Images: correspondence problem, Sparse and dense stereo, Common assumptions used in matching, Dynamic programming, using visual cues.
Motion: 3D shape and motion from two or more images.
Optical Flow: Computing shape and motion from optical flow.

CSE 6241: Multimedia Technologies and Applications  Credit: 3
Multimedia data in digital format and their properties, Color image models, Color palettes, Relation of the human visual and auditory perception to the rational of the multimedia representation format and compression algorithms, Lossless and lossy compression techniques on multimedia data, Principles and techniques of animation, Creating animated scenes, Analysis of image video and audio in the frequency Domain to identify important components to be encoded, Broadcast video standards, Video capture, Recording format, Major steps in video and audio compression standards, Audio file formats MID/LSI, Sound editing, Music and rhythm analysis interactive video production, Programming multimedia system, Authoring systems.
CSE 6243: Advanced Digital Image Processing  
Credit: 3
Review of digital image fundamentals, Image enhancement and restoration, Color fundamentals, Pseudo-color and full-color image processing, Color transformations, Smoothing and sharpening, Segmentation and matching, Noise reduction, Image compression, Various coding for image compression, Video compression techniques, Pattern recognition techniques, Image segmentation, Detection, Thresholding, clustering, Decision function, Training techniques, Applications of AI-techniques, Character recognition, Automated visual inspection, Stereo imaging, JPEG, MPEG, etc.

CSE 6245: Principles of Multimedia Networking  
Credit: 3
Introduction to multimedia networking and its requirements on different network layers, Protocols in different layers supporting multimedia streaming: RTSP (Realtime Streaming Protocol) and Progressive download, Image and Audio/Video compression technique, (Session Initiation Protocol ) SIP and H.323 and SIP-H.323 interworking, RTP (Real-time Transport Protocol) and RTCP (RTP Control Protocol), Multicasting and Quality of service, Integrated and differentiated services, Resource allocation and traffic control (RSVP), Video broadcast techniques, Multimedia streaming over (peer-to-peer) P2P networks, Multimedia Content Delivery Networks, Multimedia streaming over wireless networks.

CSE 6247: Large Scale Data Management  
Credit: 3 (60th AC)

CSE 6351: Principles of Cryptography  
Credit: 3
Concept of Cryptography: Plaintext, Cipher text, Encryption process, Decryption process, encryption algorithm, decryption algorithm, key generation process, Cryptosystem, Cryptanalysis, Block cipher, Stream cipher, Concept of symmetric and asymmetric cryptosystem.
Cryptographic Hash Functions: Hash functions and data integrity, security of hash functions, Iterated hash functions, SHA-1, MD-5, RIPE-MD-160.
Asymmetric Cryptosystems: Introduction to public-key cryptography, Merkle-Hellman cryptosystem, The RSA cryptosystem, Related number theoretic algorithms, Other attacks on RSA, The Rabin cryptosystem, Semantic security of RSA.
Elliptical Curve Cryptography: Elliptical curves (EC), Operation on EC: Point addition, Doubling of a point, Addition of points over Fp, Doubling of points over Fp, Concept of elliptical curve cryptography, Elliptical curve DSA (Digital Signature Algorithm), Elliptical curve Diffie-Hellman protocol.
DNA Cryptography: Concept of DNA cryptography, DNA cryptography using one-time pads, DNA cryptography using XOR, DNA cryptography using substitution etc. Concept of quantum cryptography.
Message Authentication Code: Concept of MAC, HMAC and some other MAC schemes.
Key Exchange Scheme: Concept of key exchange, Diffie-Hellman(D-H) key exchange and some other scheme.

CSE 6353: Advanced Network Security  
Credit: 3
Issues of network security.
ID Theft: Definition of ID theft, Possible ways of ID theft, Preventing ID theft, Two-factor authentication, Authorization mode based access controls.
Firewalls: Firewall architecture, Packet filters, Stateful inspection firewalls, Application-proxy gateway firewalls, Dedicated proxy servers, Hybrid firewalls, Network Address Translation (DNAT and SNAT), Port Address Translation (PAT), Demilitarized Zone (DMZ), Virtual Private Networks (VPN), Intrusion Detection System (IDS), Intrusion Prevention System (IPS), Firewall administration, Firewall positioning policy.
Risk Management: Effective strategies, Business process protection through assessment, Planning and recovery.
Internet Vulnerabilities: Operating systems, Cross platform applications, Network devices, Security policy and personnel (Inside attacks and outside attacks), Zero day attacks prevention and recovery, Web and E-commerce security.

CSE 6355: Advanced Cryptography Credit: 3
Digital Signature and Public Key Encryption: RSA, ElGamal and Paillier cryptosystems and their attacks, Probabilistic homomorphic and commutative properties of encryption, Re-encryption, Hybrid and Threshold cryptosystems, Secret sharing, Hash functions, Applications of these mechanisms.
Blind Signature: RSA and ElGamal based schemes, Traceable and untraceable properties, Applications in digital cash and voting protocols.
Anonymous Networks: Decryption and re-encryption type mixnets and their building blocks, Unlinkability of sender and recipient in mixnets, Chaum’s mixnet, Verifiable mixnets, Voting protocols and mixnets.
Electronic Cash: Mechanisms of on-line and off-line transactions.
Electronic Voting: Homomorphic encryption, Blind signature and mixnet based voting schemes, Various requirements and formats of voting.
Zero Knowledge Proof: Properties and applications of zero knowledge, Interactive and non-interactive proof mechanisms.
Authentication: Anonymous mechanisms for non-trusted entities.
Visual Cryptography: Noar/Shamir’s mechanism and applications.

CSE 6461: Advanced Artificial Intelligent Systems Credit: 3
Intelligent Agents: Introduction to multi-agent systems.
Predicate Logic: Syntax (predicates, variables, and quantifiers), Semantics (interpretations, models), Deductive reasoning agents and practical agents.
Automated Reasoning: Deduction rules, Clausal form, Resolution rule soundness and completeness, Logic programming.
Intelligent Agents, Expert Systems and Object Oriented Systems: Comparison and applications of agents.
Agents and Search: Depth and breadth first, Hill-climbing, Best-first search, A*-search, Problem solving as search, Agent planning.

Agents and Games: Minimax procedure, Alpha-beta pruning, Planning in multi-agent systems, Reactive and hybrid agents, Multi-agent interactions, Languages for implementation of intelligent agents, Decision tree, Dimensionality reduction, Clustering problem.

CSE 6463: Machine Translation Credit: 3
Theoretical Problems: Definition, Context dependency, Interpretation and translation.
Engineering Problems of Machine Translation: Maintainability, tunability, modularity and efficiency.
Linguistics-based MT: Compositionality and isomorphism, Declarative frameworks, Constraint-based formalisms.
Knowledge-based MT: Translation and understanding, Design of interlinguas, The conceptual lexicon.
Statistics-based MT: E-M algorithms, Alignment of bilingual corpora, Translation templates.
Example-based MT: Similarity measures, Levels of comparison.
Treatment of Context Dependency: Knowledge-based transfer, Sublanguage-based MT, Translation units.

CSE 6465: Soft Computing Credit: 3
Unsupervised Learning: Clustering techniques, Self-organizing maps.
Evolutionary Computations: Genetic programming, Learning classifier systems.

CSE 6467: Advanced Natural Language Processing Credit: 3
Regular Expressions: Chomsky hierarchy, Regular languages and their limitations.
Finite-state Automata: Practical regular expressions for finding and counting language phenomena, A little morphology, In class demonstrations of exploring a large corpus with regex tools.
String Edit Distance and Alignment: String edit operations, Edit distance and examples of use in spelling correction and machine translation.
Context Free Grammars: Constituency, CFG definition, use and limitations, Chomsky normal form, Top-down parsing, Bottom-up parsing and the problems with each. The desirability of combining evidence from both directions.

Non-probabilistic Parsing: Efficient CFG parsing with CYK, another dynamic programming algorithm, Designing a little grammar and parsing with it on some test data.

Language modeling and Naive Bayes: Probabilistic language modeling and its applications, Markov models, N-grams, Estimating the probability of a word and smoothing, Generative models of language, their application to building an automatically-trained email spam filter and automatically determining the language.


CSE 6469: Bioinformatics
The biological foundations of bioinformatics, Biological databases, Sequence comparisons and Sequence-based database searches, The decoding of eukaryotic genomes, Protein structures and structure-based rational drug design.

Systems Biology: The functional analysis of genomes, Comparative genome analyses, Bioinformatics algorithms.

CSE 6471: Bio-Inspired Computing Techniques
Credit: 3
History and philosophy of bio-inspired computing.

Evolutionary Computation: Natural evolution, Principles of evolutionary algorithms, Genetic algorithms, Evolution strategies, Evolutionary programming, Genetic programming.

Molecular Computing: Molecule and Molecular computing basics, Conformation-based computing, Molecular recognition, Chemical-based computing, DNA computing, Bioelectronics and Biocomputers.


Development Systems: Rewriting systems, Synthesis of developmental systems, Artificial evolutionary developmental systems, Evolutionary rewriting systems, Evolutionary developmental programs.

Immunological Computation: Immunology basics, Theoretical models of immune processes, Immunity-based computational models, T cell–inspired algorithms, B cell–inspired algorithms.

Behavioral Systems: Behavior in cognitive science, Behavior in artificial intelligence, Behavior-based robotics, Biological inspiration for robots, Robots as biological models, Robot learning.

Collective Intelligence: Phenomena and Models of biological self-organization, Ant colony optimization (ACO), Particle swarm optimization (PSO), Artificial bee colony(ABC) algorithm.

CSE 6473: Advanced Machine Learning
Credit: 3

Learning in the Probabilistic Models: Maximum likelihood (ML) estimation, maximum a posteriori probability (MAP) estimation, Conjugate priors, Naïve Bayes, Expectation maximization (EM), Variational Bayes, Bayesian model selection.

Supervised Learning: Classification and regression problems, Bias-variance dilemma, Generative/discriminative learning, Kernels, Support vector machine.

Unsupervised Learning: Clustering, Dimensionality reduction, Principal component analysis (PCA), Kernel PCA, Independent component analysis (ICA), Kernel ICA.

Mixture Models: Gaussian mixture model (GMM), Latent Dirichlet allocation.

CSE 6475: Neural Networks and Deep Learning
Credit: 3 (60th AC)

Neural Networks: Development of artificial neuron and neural networks (NNs); Abilities of a neuron, single layer NN and multilayer NN; Activation functions; Weight initialization; Back-Propagation algorithm; Effect of batch update, dropout and ensemble construction; Complexity analysis of NNs; NNs in complex and other multidimensional domains; NNs as auto-encoder, prediction, classifier and pattern recognizer.

Deep Learning Aspects and Methods: Limitations of traditional NNs; Aspects and history of Deep Learning; Stacked Auto-Encoders (SAEs) and Stacked Denoising Auto-Encoders (SDAEs); Variational Auto-Encoders; Restricted Boltzmann Machines (RBMs) and Deep Belief Networks (DBNs); Convolutional Neural Networks (CNNs), Capsule Neural Network; Recurrent NNs, Long Short-Term Memory (LSTM), Back-Propagation Through Time; Generative Adversarial Networks (GANs).

Software Tools and Hardware Systems for Deep Learning: Demonstration of software tools for deep learning such as Matlab, Theano, Tensor Flow, pytorch, etc. Exploiting appropriate hardware systems to speed up the compute-intensive process of generating complex deep learning models, e.g. via graphics processing units.

CSE 6571: Advanced Computer Architecture Credit: 3
Instruction Sets: Classifying instruction sets, Interactions between languages and instruction sets, measuring instruction set usage, Instruction set examples.
Improving CPU Performance: Pipelining, Basic pipelining, Data and control hazards, Dynamic instruction scheduling, Branch prediction, Instruction-level parallelism, VLIW processor.
Vector Processors: Vector architecture and design, Vector performance.
Memory Hierarchies: Evaluating memory hierarchy performance, Cache design and optimization, Virtual memory design, Memory protection, Memory coherency.
Storage Systems: Types and uses of storage devices, Interfacing I/O to the rest of the system, Reliability and availability, I/O system design.
Multiprocessors: Classifying parallel architectures, Centralized vs. distributed shared memory, Interconnection topologies, Synchronization, Memory consistency.

CSE 6573: Interconnection Networks Credit: 3
Fundamentals: Overview of interconnection network, Taxonomy of network topologies, Basics of switching, routing, and flow control, Routing mechanics.
Routing Architecture: Router datapath, Arbitration and Allocation policies, Collective communication support, Quality of service, Performance analysis.
NoC Architecture: Area, energy and reliability constraints, Area and energy constraint NoC design alternatives, NoC fault models and fault-tolerant design.

CSE 6575: Photonic Switching Networks Credit: 3
Fundamentals: Overview of indirect/dynamic network, Taxonomy of indirect Network topologies, Basic analysis.

Optical Network Infrastructure: Optical networks, Wavelength conversion, Static and Dynamic wavelength division multiplexing (WDM) networks, WC in WDM networks.
A Review of WDM: WDM, Photonic switching, Switching functions and photonic implementations.

CSE 6577: Advanced Embedded-Systems Credit: 3 (49th AC)
Introduction: Embedded-systems overview, Characteristics of embedded computing applications, Embedded-system design challenges-Optimizing design metrics, Constraint-driven design, IP-based design, Hardware, Software co-design, Processor technology, IC technology, Design technology, Embedded-systems on Chip (SOC) technology.
Development Environment: Execution environment, Memory organization, System space, Code space, Data space, Unpopulated memory space, I/O space, System start-up, Interrupt response cycle, Function calls and Stack frames, Runtime environment, Object Embedded computing platform: CPU bus, Memory devices, I/O devices, Component interfacing, Designing with microprocessors, Development and debugging, Design examples, Design patterns, Data-flow graphs, Assembly and linking, Basic compilation techniques, analysis and optimization.
Distributed Embedded-System Design: Inter-process communication, Signals, Signals in UML., Shared-memory communication, Accelerated design, Design for video accelerators, Networks for embedded systems, Network-based design, Internet-enabled systems.
Design techniques: Design methodologies and tools, Design flows, Designing hardware and software components, Requirement analysis and specification, System analysis and architecture design, System integration, Structural and behavioral description, Case studies.
Embedded Software Development Process and Tools:
Host and target Machines, getting embedded software into the target systems.
Real-time Operating Systems: OS services, Timer functions, Event functions.
Design Examples and Case studies.
CSE 6579: Advanced Ubiquitous Computing Credit: 3 (49th AC)

The Ubiquitous Computing Vision: Introduction to ubiquitous computing.

Ubiquitous Computing Visionaries: Introducing the mouse and Early ubiquitous computing, Parc, MIT, Ethics, Privacy, Responsibility.

Architecture: Autonomic computing, Distributed computing, Cloud computing, Peer to peer, Mobility, Mobile computation and Agents, Smart places, Wearable computing, Service-orientation, Sensors and Actuators, Augmented reality.


Ubiquitous Theory: Location, Spatial databases, Topological reasoning, Mobile computation, Data structures and Metadata, Security and Privacy, Ambient calculus, Relational models, Specifications, UML, OMG, Ontologies.

Context Awareness: GPS, Location and Tracking, Ontologies, Reasoning.

Privacy: Problems of authentication, Confidentiality, Total information awareness, Credentials, Access control.


CSE 6581: Soft Error Tolerance Credit: 3

Definition of soft errors.

Types of soft errors: Benign faults, Detectable unrecoverable errors, Silent data corruption, Soft error rates, Critical charge.

Sources of Soft Errors: External sources- alpha particle from package delay, Cosmic rays induced neutron interaction, Low energy neutron interaction with BPSG, Internal sources- IR or L di/dt supply noise, Power transients, Capacitive or inductive crosstalk, Risks of soft errors, Soft error’s impact on system reliability, Affected computing structures.

Soft Errors Mitigation Approaches: Comparison between model based mitigation approach and mitigation in implemented system, Process technology solutions, Software based approaches, Hardware based approaches.

Analyzing Soft Errors Risks Minimization at the System Design Phase: Complexity analysis, Severity analysis, Criticality analysis and Ways to minimize criticality.

CSE 6583: Advanced Digital Signal Processing Credit: 3

Main features and applications of digital signal processing, Parametric methods for power spectrum estimation, FIR adaptive filters, Steepest descent adaptive filter, LMS algorithm, Convergence of LMS algorithms, Applications.

Decimation in multirate signal processing, Interpolation, Filter design and implementation for sampling rate conversion, Digital models for speech signal, Mechanism of speech production, Time domain processing of speech signal, Linear predictive coding, Wavelet transform, Perfect reconstruction filter banks and wavelets, Recursive multi-resolution decomposition, Haar wavelet, Daubechies wavelet. Z-transform, Inverse Z-transform and properties, Discrete Fourier transform, Inverse discrete Fourier transform and their properties.

CSE 6585: Cloud Computing Credit: 3

Fundamental cloud computing terminology and concepts, Similarities and differences between cloud computing, Grid computing and cluster computing, Basics of virtualization, Specific characteristics that define a Cloud, Understanding elasticity, Resiliency, On-demand and Measured usage, Benefits, Challenges and Risks of contemporary cloud computing, Platforms and Cloud services, Cloud resource Administrator and Cloud service owner roles, Cloud service and Cloud service consumer roles, Software as a service (SaaS), Platform as a service (PaaS) and Infrastructure as a service (IaaS), Cloud delivery models, Combining cloud delivery models, Public cloud, Private cloud, Hybrid cloud and Community cloud deployment models, Business cost metrics and Formulas for comparing and Calculating cloud and On-premise solution costs, Service level agreements (SLAs) for cloud-based IT resources, Formulas for calculating and Rating SLA quality of service characteristics, Cloud security and Trust.

CSE 6587: Advanced Wireless Networking Credit: 3 (49th AC)

Introduction: Wired vs. Wireless Network Architectures, Basics of Wi-Fi, WiMAX, cellular and satellite wireless, Infrastructure based Wireless Networks.

Ad hoc Wireless Networks: Mobile Ad hoc Networks (MANETs), Vehicular Ad hoc Networks (VANETs), Wireless Sensor Networks (WSNs); Characteristics and Applications of Ad hoc Wireless Networks.

Medium Access Control (MAC) Protocols: MAC protocols for Wireless Networks; Challenges in designing wireless MAC protocols, Common MAC protocols for Wireless Networks, Major sources of energy wastage in WSNs, MAC protocols for WSNs and VANETs.

Node Localization in WSNs: Node Localization, Issues in localization algorithms, Ranging techniques, Localization in Mobile WSNs.

CSE 6901: Special Study in Computer Science and Engineering  
Credit: 3

The course will be based on advanced and special topic in the field of computer science and Engineering. The course context should be designed by the teacher offering the course with a view to introducing a special course not included in this list as a regular course to help the students to be acquainted with fast developing special area or may be required for conducting post graduate research. The course may be designed with the permission of the head of the department and context accepted by the ACPG. The course must be approved as regular course as soon as possible by Academic Council. A maximum of two courses may be allowed in a semester.
The text appears to be a page from a book, possibly a textbook or a technical manual, written in a language that uses the Bengali script. The content is dense and appears to be explaining a complex topic, possibly related to a scientific or technical subject. The page contains numerous paragraphs and sections, each with intricate details and possibly including mathematical equations or technical diagrams that are not visible in the text provided.

Given the nature of the content, it is likely that the text is discussing a detailed process or a set of instructions. However, without being able to see the actual text, it is challenging to provide a precise translation or a detailed summary of the content. The page seems to be part of a larger body of work, possibly a textbook or a manual, which would require a comprehensive reading to fully understand the context and the meaning of each section.

In summary, the page contains a dense block of text in a script that appears to be Bengali, discussing a complex topic, possibly related to science or technology, but without further context or visible equations, it is difficult to provide a coherent translation or summary.
<table>
<thead>
<tr>
<th>অং</th>
<th>অন্তর্ভূক্ত অপারেশন</th>
<th>প্রদর্শিত শব্দিকারী কর্ত্তব্য ও তথ্যগুলোর ক্ষমতাকৃতি</th>
</tr>
</thead>
<tbody>
<tr>
<td>(২)</td>
<td>যদি পরিষেবক/পরিষেবনীর সংহিত কথা লেখা/যোগ্যতায় চেষ্টা করা।</td>
<td>১ম বারে সংহিতকরণ/সিট পরিতীক্রন এবং যদি কলায় ৫% মার্ক কাউন্সিল লাভ। এই বারে প্রথম প্রাক্ষেপকের অনুমোদনের মাধ্যমে প্রথম কথা লেখ। এটি বিষয়।</td>
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<td>(৬)</td>
<td>পরিষেবক হল সংস্থাটি পরিষেবা সাধনের কার্যকরতার নিদর্শন প্রকাশ করণ বা যদি উপস্থিত নকল করণ বা অন্য কেন্দ্র পরিষেবক(১ম কথা) স্বনাম লিখন।</td>
<td>পরিষেবক হল ইতিহাস সহ এই প্রথম পরিষেবা বার্ষিক এবং ৬ মাস ইতিহাস সহ বিশ্ববিদ্যালয় ইতিহাস বিষয়।</td>
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<td>(৪)</td>
<td>পরিষেবকের শাসন, কার্যমূলকতা সহ পরিষেবা ব্যবস্থা ক্ষেত্রে বিভাগিত স্বপ্নাতিক লেখা সহ হল প্রবেশ।</td>
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<td>(৩)</td>
<td>পরিষেবকের স্বরূপ এবং পরিষেবা পরিকল্পনা করে কেন্দ্র কথা লিখিত প্রাপ্ত করায়।</td>
<td>পরিষেবক হল ইতিহাস সহ সংহিতায় এই পরিষেবা বার্ষিক এবং সর্বমূলক বিশ্ববিদ্যালয় ইতিহাস বিষয়।</td>
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<td>(৫)</td>
<td>প্রাক্ষেপক বা পরিষেবকের প্রতি উচ্চ বাক্য ব্যবহার করলে প্রাক্ষেপক/পরিষেবককে মেক-ইঁঁড়ি প্রবণ।</td>
<td>প্রতি সংহিতায় প্রাক্ষেপক/পরিষেবককে সংস্থাটি বিষয়।</td>
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<td>(২)</td>
<td>পরিষেবকের সকল পরিকল্পনা সহ যোগাযোগের এবং পরিষেবা সর্বমূলক লেখা।</td>
<td>পরিষেবক হল ইতিহাস সহ সংহিতায় এই পরিষেবা বার্ষিক এবং সর্বমূলক বিশ্ববিদ্যালয় ইতিহাস বিষয়।</td>
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<td>(৬)</td>
<td>পরিষেবা সাধনের সম্পূর্ণতা নয় এরপর কেন্দ্র কথা লিখিত প্রাপ্ত করায়।</td>
<td>এই পরিষেবা বার্ষিক সহ পরিষেবার হল ইতিহাস বিষয়।</td>
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<td>(৪)</td>
<td>পরিষেবক এর প্রক্রিয়া নিয়ন্ত্রণ।</td>
<td>পরিষেবক হল ইতিহাস সহ পরিষেবার হল ইতিহাস বিষয়।</td>
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<td>(১)</td>
<td>জন্য মাধ্যমে পরিকল্পনা লেখা বা পরিকল্পনা প্রশ্নের জন্য চেষ্টা করা।</td>
<td>এই পরিকল্পনা বিষয়।</td>
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<tr>
<td>(৪)</td>
<td>পরিষেবার সাধনের উভয় সিদ্ধান্ত পরিষেবার মাধ্যমে নিয়ন্ত্রণ প্রকাশ করা।</td>
<td>ইতিহাস সহ পরিষেবা বার্ষিক এবং সর্বমূলক বিষয়।</td>
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</tbody>
</table>

সেমিটরি দায়িত্ব, প্রাইম অধিকার সহ পরিষেবার জন্য উপরে উল্লিখিত বিবিসমূহ প্রয়োজন হইতে।

<table>
<thead>
<tr>
<th>কর্ত্তব্য</th>
<th>কর্ত্তব্য সম্পর্কের প্রয়োজনীয় কর্ত্তব্য ও তথ্যগুলোর ক্ষমতাকৃতি</th>
</tr>
</thead>
<tbody>
<tr>
<td>(৬)</td>
<td>প্রাক্ষেপক</td>
</tr>
<tr>
<td>(২)</td>
<td>ক্ষেত্র-চায়েপার</td>
</tr>
<tr>
<td>(২)</td>
<td>অর্ঘ্যের উণ্ঠি/বিশ্বকার্য প্রণালী/প্রাক্ষেপক</td>
</tr>
<tr>
<td>(২)</td>
<td>প্রাক্ষেপক</td>
</tr>
<tr>
<td>Year/Term</td>
<td>Term-Wise Course Distribution &amp; Related Information</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td><strong>1ST Year 1ST Term</strong></td>
<td>CSE1100 Introduction to Computer Systems 3 hrs/wk 0.5 Credit</td>
</tr>
<tr>
<td><strong>1ST Year 2ND Term</strong></td>
<td>CSE 1201-CSE 1202 Structured Programming 3 hrs/wk 1.5 Credit</td>
</tr>
<tr>
<td><strong>2ND Year 1ST Term</strong></td>
<td>CSE 2101-CSE 2102 Object Oriented Programming 3 hrs/wk 1.5 Credit</td>
</tr>
<tr>
<td><strong>2ND Year 2ND Term</strong></td>
<td>CSE 2200 Advanced Programming Design 3 hrs/wk 1.5 Credit</td>
</tr>
<tr>
<td><strong>3RD Year 1ST Term</strong></td>
<td>CSE 3100 Programming 3 hrs/wk 1.5 Credit</td>
</tr>
<tr>
<td><strong>3RD Year 2ND Term</strong></td>
<td>CSE 3200 System Development Project 3 hrs/wk 1.5 Credit</td>
</tr>
<tr>
<td><strong>4TH Year 1ST Term</strong></td>
<td>CSE 4000 Project / Thesis 3 hrs/wk 0.5 Credit</td>
</tr>
<tr>
<td><strong>4TH Year 2ND Term</strong></td>
<td>CSE 4200 Project / Thesis 3 hrs/wk 0.5 Credit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Remarks</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. Theory Courses per Term = 5.00</td>
<td>2. Average Contact Hours per week/Term = 25.31</td>
<td>3. Average Credit per Term = 20.16</td>
<td>4. Total Credit = 161.25</td>
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</tbody>
</table>