University of Asia Pacific (UAP)

Department of Computer Science & Engineering

Prospectus (Undergraduate Program)

2017-18

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Disclaimer

The information contained in this prospectus is subject to change at the discretion of the Department of Computer Science & Engineering, UAP.

University of Asia Pacific (UAP) was established in 1996 under the Private University Act 1992 as a private university with the vision of providing quality education and fulfilling the needs of our motherland, Bangladesh. This university started its journey in 1996 and offered four years bachelor degree programs in **Computer Science & Engineering** and **Business Administration** only, thus the very step of publishing the thirteenth edition of the prospectus for Undergraduate Studies of the **Department of Computer Science & Engineering** makes us proud.

This department established in 1996, with the full support of the Administration and the UAP Foundation Members, is thriving forward in disseminating knowledge in this emerging field. Such endeavor is not only helping in developing the human resources of this country but also in earning foreign exchange by exporting skilled manpower abroad. Till to date, B.Sc.Engg. Degree has been conferred on 2200 graduates and these graduates are making positive contributions in the field of Computer Science and Engineering.

To enhance the quality of education even further, the Department is planning to take some crush programs, some of which are mentioned below:

- Faculty Search Team has been formed to attract Senior Faculty Members in the CSE Department of UAP.
- All the Programming Lab PCs are regularly updated with the latest computer configuration.
- A project lab has already been established for project/research work.
- Mobile Games and App Development Lab has been approved to be built in CSE, UAP by government fund.

CSE Department has several clubs namely **UAP Software and Hardware Club**, **Programming Contest Club**, **Cultural and Debating Club**, **Robotics Club, Film and Photography club, Research and Publication unit** and **Sports Club** to integrate the students in different co-curricular and extra-curricular activities. The University authority always provides financial help for the clubs to achieve goals.

UAP Software and Hardware Club aims to develop students' skills in software and hardware development and to produce marketable products. UAP Software and Hardware club conduct training programs for students to prepare them to develop different attractive hardware/software projects. To improve analytical ability of the students, the club arranges training programs and workshops. To improve programming skills of the students, UAP software and Hardware club arranges Intra and Inter University Software and Competition with the participation of various universities as well as software companies.

Programming Contest Club works on developing students' skills in programming and prepares them for various programming contests across the globe, especially the ACM Programming Contest. Programming Contest club conducts coaching and workshops to improve the problem solving ability of the students. Faculty attended in the ACM ICPC world final conducts these coaching. The club arranges Intra UAP programming contests on a regular basis and also planning to arrange an Inter University Programming Contests with the participation of all universities of the countries.

Cultural and Debating Club arranges cultural week in every semester to hunt talents in different cultural fields. In every semester there is a grand cultural show participated by the students and teachers.

Sports Club arranges sports week in every semester to arrange competitions in different events like Cricket, Bad Minton, Table Tennis, Football, etc.

Robotics Club arranges interesting sessions on modern robotics and reveals a new world of electronics and computer programming.

Film and Photography Club aims to organize events on artistic work of film industry of home and abroad as well as photography of contemporary materials.

The Research & Publication Unit arranges Seminar at least once in every month on various important topics on Science & Technology. Also, Research & Publication unit publishes International Journal of Computer and Information Technology (IJCIT). The first issue was published in August, 2010.

Department has also Master's Program '**Master in Computer Science & Engineering (MCSE**)'. Currently 50 students are continuing in our MCSE program. The Department also offers two other Masters Programs: Master in Computer Applications (MCA) and Master in Computer Science (MCS).

Besides, every student enjoys the right to join any club activity organized through any other department of UAP. They enjoy a range of central club activities such as Career Club.

Formation of IEERD

(The Institute for Energy, Environment, Research and Development)

The Institute for Energy, Environment, Research and Development (IEERD) is established at University of Asia Pacific as a constituent research and academic institute or center with a separate administrative structure. The purpose of the "Institute" is to keep pace with regional and global research of development and education in energy including clean energy, increasing energy efficiency of equipment and appliances, work on quality of materials, environment, water resources and water management and other related fields at the University. The aims and objectives of the" Institute" are to undertake and promote research and teaching in the fields of energy with emphasis on new and renewable energy development, energy conservation and energy management, assessing quality of materials, environment, water resources, water management, development and to develop human resources in the relevant fields. The head of the "Institute" is the Director designated who is appointed by the Vice Chancellor. Director is appointed on a two-year term from among the Professors/Research Professors of UAP.

CISP (Center for IT Security and Privacy)

CISP is the first ever center of its kind in Bangladesh. The mission of CISP is to enhance and extend the university's existing technological strength in IT, with demonstrated potential for Bangladesh. In pursuing this mission the center will conduct interdisciplinary research on IT security, data privacy, and trusted systems; on software for fault tolerant and dependable systems; and on product

reliability. The center will hold research seminars/meetings related to security and privacy, and work under collaborations with different domestic and international universities or research laboratories. Moreover, the center is willing to research with a view to developing effective cyber security and privacy policy for our country. Furthermore, CISP plans to offer security training services to government/non-government organizations and individuals.

IEB Affiliation

Department of CSE has received the Certificate of Accreditation from the Engineers Institution Bangladesh (IEB) for the BSc in CSE program starting from August 2014. This will enable the CSE students to enjoy the privileges offered by Engineers Institution Bangladesh (IEB) including membership.

About

UAP

1. Introduction

University of Asia Pacific (UAP) was established in 1996 with a vision to enhance the opportunities for higher education in Bangladesh. The University, under the Private University Act 1992, started its operation in 1996 by offering four-year Bachelor Degree Programs in Computer Science & Technology and Business Administration only. Now UAP offers undergraduate programs in nine disciplines and post-graduate programs in eight disciplines. Its curriculum has been approved by the University Grants Commission of the Government of the People's Republic of Bangladesh.

UAP is sponsored by University of Asia Pacific Foundation, a non-profitable, non-commercial organization based in Dhaka, Bangladesh. The Foundation has been established in 1995 by a group of eminent educationalists, Industrialists and administrators who share the same vision and social commitments to promote improve and innovative educational opportunities to the society. UAP is the project of such noble goals. Mr. Qayum Reza Chowdhury is the current Chairperson of this foundation.

1.1 Aim

The principal aim of this privately funded University is to provide quality education at undergraduate and post-graduate levels relevant to the needs of a dynamic society. The courses and curricula are so designed as to prepare a student with sound academic background either to enter into the competitive professional job market or to continue further higher academic studies at home or abroad. The overall academic goal of the University is to equip its students with the means to become skilled and productive resources of the community

1.2 University Administration

Vice-Chancellor

Prof. Dr. Jamilur Reza Choudhury

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Structural Engineering), Ph.D. (University of Southampton),
Doctor of Engineering (Honoris Causa) Manchester University, UK. Fellow,
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Former Associate Professor, Department of Administration, UAP

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Deputy Controller of Examinations

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M. Sc (Karlsruhe University, Germany),

M.Sc (JU), B.Sc (Hons)

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1.3 Schools and Departments

At present, UAP has five schools comprising of relevant departments:

School of Engineering

- Department of Computer Science and Engineering
- Department of Civil Engineering
- Department of Electrical and Electronic Engineering

School of Business

- Department of Business Administration

School of Environmental Science and Engineering

- Department of Architecture

School of Science

- Department of Pharmacy

School of Social Science and Arts

- Department of Law and Human Rights
- Department of Basic Science and Humanities
- Department of English
- Department of Mathematics

These departments of UAP offer undergraduate programs in nine disciplines and post-graduate programs in eight disciplines.

1.4 Academic Programs

Undergraduate Studies

Currently UAP is offering undergraduate programs in the following seven disciplines

Architecture

Business Administration

Civil Engineering

Computer Science and Engineering

Electrical and Electronic Engineering

Law and Human Rights

Pharmacy

English

Basic Science and Humanities

Other than Architecture, all the courses are four-year programs. Architecture is a five-year course. Academic programs are conducted on semester basis. There are two semesters of 18 weeks each - Fall and Spring in each year. At present the University has roughly 5,500 students, with sufficient number of faculty members on full time basis. Besides, a good number of renowned educationists of different disciplines are involved in teaching on part time basis. The faculty is a blend of senior teachers with wide experience both at home and abroad and Young teachers with fresh and innovative ideas.

Postgraduate Studies

The Department of Business Administration is presently offering an Executive MBA program in conjunction with US / Australian Universities. It is full time program of 60 credit hours spread over two years.

The Department of Pharmacy is now offering Master's Program in Pharmaceutical Technology (MS in Pharm. Tech.). It is a full time program of 24 credits having one- year duration.

The Department of Computer Science and Engineering is offering Masters in Computer Science, Masters in Computer Science and Engineering.

The Department of Civil Engineering is also offering Masters in Civil Engineering program.

1.5 Academic Council

Academic council is the highest academic body of the University. It is chaired by the Vice Chancellor of UAP and comprises of the departmental Heads, Deans and eminent academicians of the country.

1.6 The Campus

UAP Administration

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Library

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Medical Center

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FAX:+8802-58157097
Email: naim@uap-bd.edu

1.7 Resources

Library

The University has a fairly well stocked central library. Adequate facilities exist with a large number of text books, reference books (currently more than 10,000), and journals, periodicals for study in the reading room of the library in a quiet and congenial environment. A number of local daily newspapers and international news magazines are also subscribed for the benefit of students. The library is being enriched day by day. Students can borrow books from the library. There is also CD library for the students. In the seminar library, books and technical journals relevant to the respective disciplines are available.

Laboratory

UAP provide laboratory facilities for the students of respective departments. The laboratories are self-sufficient and rich in instruments and other facilities to carry out sessional / practical classes for different courses. Unlike many other private Universities, UAP does not depend on any other institutions for its laboratory classes. Other than sessional / practical classes, the faculties of UAP do their research work in these laboratories also.

Website and Internet Facility

University of Asia Pacific (UAP) provides twenty-four hour high-speed Internet facilities to its students. All the computers of lab and other places of each department of UAP are connected under a LAN and high-speed Internet line. There is a web site of UAP that contains important information about faculty members, ongoing research, admission, faculty search, exam of UAP etc., which is updated each week and URL is www.uap-bd.edu. Each student of UAP is given an individual email account at uap-bd.edu domain that recognizes the UAP students. Student can submit their assignments through Internet.

Other Facilities

The University runs a well-equipped Medical Center for medical consultation, free of cost for students. The University has its own canteen, which provides hygienic foods at reasonable cost for the students, faculty and staffs. In near future, the University plans to provide transport facilities for students and also to provide residential facility, especially for female students.

1.8 Academic and Technical Collaborations

1. Foreign Academic and Technical collaborations

With increasing internationalization of education, particularly at the university level, there is a strong compulsion to promote interaction, especially with institution of higher education in the industrial countries. Such interaction provides access to ever-changing scenarios of modern education delivery system and the most up-to-date innovative developments in teaching-learning methodology. Recognizing this imperative, UAP has already initiated a number of collaborative programs with universities in the USA, Australia and Canada.

An agreement between the University of Baltimore, USA and University of Asia Pacific has already been signed to collaborate in a joint undergraduate studies program in Business Administration. The objective of this program is to offer a collaboration baccalaureate degree to students of UAP through a course of studies pursued at UAP and in the USA at the University of Baltimore.

An exchange program and academic cooperation agreement has been signed with Virginia Polytechnic Institute (VPI) and State University (SU), USA, which provides for exchange of students and visits of faculty members between UAP and VPI, SU; transfer of credits for courses taken by UAP students: undertaking joint research programs and joint supervision. Under the agreement, UAP students may pursue their studies as exchange students or seek transfer to VPI and SU after studying two years at UAP. Similar agreements for academic collaboration had been undertaken with South Dakota School of Mines and Technology (SDSMT) in the USA and University of Western Sydney and University of Canberra in Australia. An exchange program and academic cooperation agreement has already been signed with Griffith College Dublin, Ireland. Recently, another MOU has been signed with Purdue University Calumet, USA, to provide for an exchange of faculties and students and other collaborations.

Discussions are continuing with few other universities in Australia, Canada. UK and USA. It is expected that the arrangement for credit transfer, technical collaboration etc., with some of them will be finalized in near future.

2. National Academic and Technical collaborations

MoU signed between University of Asia Pacific and Bangladesh Computer Council

MEMORANDUM OF UNDERSTANDING ("MoU") is made on 4th June, 2016 between University of Asia Pacific and Bangladesh Computer Council, Govt, of Bangladesh (BCC) and Top-Up lT and Foundation Skills Project implementation Unit.

The purpose of this association is to enable Foundation Skills and Top up lT Training projects to be implemented at UAP for their students leveraging their facilities while for UAP the value proposition is to enable its students to get a quality employability enhancing training, with certification/ accreditation to a

government/ industry body or university and enhance their employment opportunities through the job-connect component of the project. It will help UAP become a project partner for this program and also enhance faculty development opportunities for the university.

MoU signed between University of Asia Pacific and BRAC Bank

University of Asia Pacific (UAP) signed a Memorandum of Understanding (MoU) with BRAC Bank for cash collection service on 24th July 2015, with a view to expanding and introducing a more systematic, improved and efficient collection. Under the MoU, BRAC Bank — through its real-time online branch network and SME sales service centre network — will collect cash from the students of UAP. Cash deposit through BRAC Bank's own branch network and SME sales and service network will be instantly credited in the collection account of UAP, maintained with the bank.

UAP

Rules

&

Regulation

Academic Rules

To meet the growing technological challenges confronting the nation and the world as a whole, University of Asia Pacific has designed the curricula and syllabi of the subjects offered in the undergraduate courses accordingly. The curricula and syllabi are relevant to the current needs, and are responsive to the emerging challenges. The rules and regulations for undergraduate curricula through course system are applicable for all students.

Semester System

There will be two semesters- Fall and Spring Semester in an academic year. In addition to these two regular semesters, there may be a short semester (Summer) in the intervening period between the end of Spring Semester and commencement of Fall Semester.

Regular Semester	
Classes	15 Weeks
Recess before examination	1 Week
Semester final examination	2 Weeks
Total	18 Weeks

Course Pattern and Credit Structure

The entire undergraduate program is covered through a set of theoretical and laboratory courses, fieldwork, design and project/thesis work.

Assignment of Credits:

Theoretical Courses: One lecture per week per semester will be equivalent to one credit. Thus, a three (3) credit hour course will have three (3) lectures per week throughout the semester.

Laboratory/Field/Design/Project/Thesis Work: Credits for laboratory/field work or design work usually will be half of the class hours per week per semester. Credits are also assigned to project and thesis work taken by the students. The amount of credits assigned to each of these may vary from discipline to discipline.

Type of Courses:

Core Courses: In each discipline, a number of compulsory courses will be identified as core courses, which form the nucleus of the bachelor degree program.

Optional Courses: Apart form the core courses, students will have to complete a number of courses, which are optional in nature. Hence students may have some choices in selecting courses from a specific group or a number of courses.

Registration Process

For the Second and Subsequent Semester

A student is normally required to earn at least 15 credits (out of 17.5 to 20 credits) in a semester. At the end of each semester, the students will be classified into one of the following three categories:

Category 1:

Students, who have passed all the courses prescribed for the semester and have no backlog of courses. A student of Category-1 is eligible for registration in all courses prescribed for the next or following semesters.

Category 2:

Students, who have earned at least 15 credits in a semester but do not belong to Category 1. These students are advised to take at least one course less in the following semester than those offered for students of Category 1, subject to the condition that, they will register for such backlog courses as prescribed by the respective adviser.

Category 3:

Students, who have failed to earn 15 credits in a semester, belong to this category. Students of this category are advised to take at least two courses less in the following semester than those offered for students of Category -1 subject to the registration for a minimum of 15 credits and maximum 24 credit hours. However, they are required to register for such backlog courses as would be prescribed by the adviser.

any course in any semester will have to repeat the course for the purpose of grade improvement. F grades will not be counted for GPA calculation but shall be mentioned on the grade sheet and transcript.

Grading System

The total performance of a student in a given course is based on a scheme of continuous assessments. For theoretical courses this continuous assessment is made through homework, assignments, attendance, quizzes etc., a mid semester and a semester final examination of three/two hours duration. The distribution of marks for a given course is as follows:

Assessment	30%
Mid Semester	20%
Final Exam	50%
Total	**100%**

- The assessment in laboratory/field work courses is made by observing the student in the respective lab classes and also by taking viva-voce and quizzes.

Each course has a letter grade equivalent to a certain number of grade points. Letter grades and their corresponding grade points are as follows:

Numeric Grade	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00
Incomplete Works	I	—
Satisfactory (only for 7th semester project/thesis)	S	—
Exempted (For credit transfer courses)	E	—

Grade ‘F’: If a student fails to achieve at least 40% marks in a course, he/she will get ‘F’ grade in that course. Besides, absence in final examination at the end of each academic semester will also result

‘F’ grade.

Grade ‘E’: A student transferred to UAP from another university or academic institution will earn ‘E’ grades in the courses exempted at UAP.

Grade ‘I’ : Grade ‘I’ may be given when a course, according to the syllabus is extended to two consecutive semesters and grade ‘S’ is given in the first semester to mean satisfactory progression.

GPA Calculation:

A student's performance is measured by the number of credits that he/she has completed satisfactorily and the weighted average of the grade points that he/she has maintained. A minimum GPA is required to be maintained for satisfactory progress and a minimum number of earned credits should be acquired in

$$GPA = \frac{\sum(GradePoints \times Credits)}{\sum Credits}$$

Where grade points are points against letter grades A+, A, A-, B+, B, B-, C+, C, D and F. Credits are only for those courses attempted at this university.

Attendance

All students are expected to attend classes regularly. The University of Asia Pacific believes that regular attendance is essential for effective learning. A student is required to attend at least 70% of all the classes held in every course in order to sit for the final examination.

Absence during Semester

A student shall not be absent in quizzes, tests, mid semester examinations etc., during the semester. Such absence will naturally lead to reduction in points/marks, which shall count towards the final grade. Absence in the final examination held at the end of each academic semester will result in F grades.

Performance Evaluation

The performance of a student will be evaluated in terms of semester GPA and cumulative grade point average (CGPA), which is the grade point average for the semesters under consideration. A candidate will be awarded a degree with honors if his/her CGPA is 3.75 or above. A student will be considered to be making normal progress towards a degree if his/her CGPA for all work attempted is 2.25 or better and is in good standing with the university.

Students who fail to maintain this minimum rate of progress will fail to be in good standing. Such circumstances may prevail under one or more of the following conditions:

- Semester GPA falls below 2.25,
- Cumulative GPA falls below 2.25.
- Earned credits fall below 15 times the number of semesters studied.

Conduct and Discipline

A student should conform to the highest standard of discipline and shall be herself/himself within and outside the premises of the university in a manner befitting the student of a university of national importance. She/he shall show due courtesy and consideration to the teachers and other employees of the university and render sincere co-operation to his/her fellow students. The students also pay due attention and courtesy to the visitors.

Examination Rules

Re-examination or Re-scrutiny of Answer Scripts

Re-examination of final examination answer scripts may be permissible. A candidate can apply for re-examination of any answer script of final examination to the Controller of Examinations through their advisor and the head of the department on payment of Taka 200/- (Tk. Two Hundred) only per script within 7 (seven) working days from the publication of final results. No such application shall be entertained after the mentioned time. No such re- examination is allowed for practical/sessional courses. While re-examining such answer scripts the examiner shall re- examine the scripts thoroughly and shall award a grade, which shall be treated as final.

Rules for Repeat Examination

A student would be allowed to appear at the Repeat Examination in case s/he fails in three theory courses or less but not exceeding 10 credit hours. The results of Repeat Examinations would be published within three weeks from the date of publication of the results of the Semester Final

Examination concerned. The respective departments would arrange such Repeat Examinations. Candidates willing to appear at such Repeat Examinations must apply to the respective heads of departments through the advisors stating their willingness to appear at the said examination with the receipt of payment @ Taka3000/- per course. Repeat examination would be held before next semester would start.

Repeat Examinations on theory courses would be held on 50 percent of marks for each course and the marks for Class Assessment and Mid Semester Examination would be carried. There shall be no repeat examinations for sessional courses. The maximum grade to be obtained by a student in a repeat examination would be 'B' (equivalent to 60%). The following grading system would be followed in the repeat examinations:

Numeric Grade	Letter Grade	Grade Point
60% and above	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00

Any student who fails to successfully complete any sessional course has to repeat that course in the following semester.

Provisions for Improvement of Grades:

Category – A

1. The Provision for Improvement of grades applies to those only who obtained a grade C or lower in any course. Such candidates may be allowed to improve their grades by surrendering the earlier grade obtained by him/her.
2. For grade improvement purpose, a student will be allowed to repeat a maximum of four courses.
3. For availing such provision of grade improvement, a candidate shall apply to the Controller of Examinations through the Head of the Department concerned with a fee @ Tk. 3000/- (Tk. Three Thousand) only per credit hour. A student may apply for such provision any time during his/her study period in the university but not beyond two weeks after the publication of his/her final semester results.

Category - B

1. A Cumulative Grade Point Average (CGPA) of minimum 2.25 is required for graduation. A candidate whose CGPA is below 2.25 shall have to increase his/her CGPA to the minimum requirement within two consecutive semesters failing which s/he shall be placed under academic probation.
2. Candidates requiring to increase their CGPA under this category (Category - B) shall apply to the Controller of Examinations through the head of the department concerned with a payment of @ Tk. 3000/- (Tk. Three Thousand) per credit hour.

Advising System

Department of Computer Science & Engineering has a strong student advisory system. One advisor will normally be appointed for a group of students by the concerned department. The advisors usually perform the following responsibilities:

1. Maintain regularly scheduled office hours for academic advising as needed throughout the semester.
2. Assists the students in selection of courses on a short-term and long-term basis.
3. Monitor advisees' academic progress as well as behavior, manner in the campus and initiate contact with advisees those are failing to progress satisfactorily.
4. Inform students the changes in academic policy, rules and curriculum in the university.
5. For students with excellent academic background and for needy students, advisor recommends to the higher authority for financial assistance.

Students' Responsibilities Regarding Advising

1. Participate in all scheduled pre-enrollment and orientation programs for incoming students at university.
2. Prepare in advance for academic advising meetings. Map out courses they want and need to take for their degree and present this to their concerned advisor.
3. Make and honor academic advising appointments.
4. Make advisor aware of any special needs or problems encounter at UAP. Concerned advisor is there to guide students through any problems that may hinder their academic success and continued enrollment in the following semester. Advisors are equipped with a plethora of resources to help the students.
5. Know academic policies, procedures, and regulations such as withdrawal, repeat & improvement examination, retakes, academic probation/dismissal, financial aid, etc.
6. Know degree requirements and remain informed about changes in their curriculum. Map out a plan of action for academic career and review it with concerned advisor.
7. Make the effort to get to know the advisor personally, the better they know one another and the more comfortable they will be.

Waiver Policy

3% of total seats are reserved for the children of Freedom Fighters and another 3% for meritorious but poor students from remote areas of Bangladesh. They will be offered full free education opportunity.

1. Top 3% students in each department will be offered 100% tuition waiver based on semester results.
2. Vice Chancellor's special tuition fee waiver will be offered in amount 10%-100% to poor but meritorious students.
3. 50% waiver for students with individual GPA of 5.00 in S.S.C and H.S.C.
4. 25% waiver for students with individual GPA of 4.50 in S.S.C and H.S.C.

5. 10% waiver for students with individual GPA of 4.00 in S.S.C and H.S.C.

Criteria for semester based tuition fee waiver

(including Vice Chancellor's Special Tuition fee waiver)

1. Has to be regular throughout all the semesters(i.e. no break of studies or lower than acceptable credit hours enrolled un any semester)
2. Has a record of good conduct
3. Has no outstanding dues
4. Is not availing any other concession/waivers
5. Is not financially solvent
6. Has been recommended by the Head of the Department and Advisor
7. Has obtained one of the following GPAs

GPA	Percentage of Tuition fee waived
3.5-3.74	25%
3.75-3.89	50%
3.90-3.99	75%
4.0	100%

Students taking repeat exams or with "F" grade in previous semester, are not eligible for merit-based waiver/scholarship.

Department

Of

CSE

Vision

The department of CSE, UAP is striving for pioneer role in ICT through excellence in education, research and development towards preparing graduates as a global leader with quality education, innovative ideas, extra-curricular activities and collaboration between industry and academia.

Mission

Department of CSE believes in the pursuit of excellence by developing students in creating, applying and imparting knowledge of ICT. Educational curriculum, research and collaboration between academia and industry are given highest priority. CSE, UAP aspires to produce graduates capable of taking leadership on the field of their best interest. We nurture graduates in

- **Understanding the basic principles of computational, electronic and modern technologies**
- **Promoting creativity by applying their theoretical knowledge in practical problem solving**
- **Enabling them to communicate ideas clearly and concisely both in written and verbal forms**
- **Creating awareness about environment, social responsibility, and economic development within the ethical boundaries**
- **Engaging for further research or professional involvement**

The ever-increasing needs and applications of computers in almost every walk of life need no overemphasis. Computers nowadays are being widely used in all fields conceivable. To keep pace with the advancement in computer science and engineering in more developed countries than Bangladesh it is essential that efforts are made both in the public and private sectors to develop human resources in this particular field.

Opportunities to pursue academic programs in computer engineering are rather limited in Bangladesh. The prime objective in establishing the Computer Science & Engineering Department at University of Asia Pacific is to make a concerted effort towards achieving the goal of providing quality education for the duration of 4 years at the undergraduate level. Later it is to be followed by higher academic degree programs such as MS/Ph. D.

The courses in the undergraduate programs are designed to give students a rigorous and comprehensive academic training on both the fundamental and advanced aspects of Computer Science & Engineering (CSE). It would concentrate both on software and hardware aspects. A student in CSE must not only have a sound basis in the fundamentals of computer but also should be aware of socio-economic problems of the country. Therefore, courses in science, humanities, economics, accounting, finance and management are also included in the curricula. The last two semesters will offer the students a number of alternatives to choose from and to specialize in a particular one. Theory and seasonal work will be supplemented by Project/Thesis work, Seminars and visits to relevant research and development organization.

Laboratory Facilities

1.1 Computer Laboratories

Computer Science & Engineering Department of University of Asia Pacific has three outstanding micro–computer labs and one project lab. These labs are networked with each other and the other PCs of the department through LAN. A server room is arranged to administrate the proper functioning of the lab and to accommodate LINUX server, Oracle Server, Windows 2000 server and other sophisticated resources like a scanner, a high resolution digital camera, etc. Each lab is equipped with twenty-five updated PCs. Department ensures reliable computing as each PC is attached with an UPS. There is a heavy-duty printer stationed in each lab to provide printing facility to the students. Each student is given separate account in CSELAB domain. Students have to logon to their respected accounts to avail the existing network resources. A student can browse from any PC free of charge for unlimited period. Wi-Fi internet access is available 24 hours for all .The Department has provided students with constant broadband Internet browsing facility also.. The department has already established a Project Lab for project work and research work. The lab is equipped with 7 PCs and a number of electrical and electronic trainer boards, D.C. power supplies, signal generator etc. There are in total 17 full-time faculty members in CSE department. Moreover, 9 faculty members are on study leave currently pursuing higher studies abroad. Each faculty member is provided with a PC and is networked through LAN. During office hour (a time slot earmarked for students), these PCs are used for attending from a small group of students; clarification of any point won the undergraduate projects of the students etc. Also, these PCs are used by the teachers to carry out the research work.

1.2 Electrical Circuit Laboratory

There is a rich circuit lab in CSE Department, which is equipped with modern tools. The purpose of this lab is to design various electrical and electronic circuits. Also this lab is used to study the behavioral characteristics of the different electrical and electronic projects. This lab has full-fledged 5 equipment set-ups so that 5 groups of students can carry on any electronic and electrical experiment and project simultaneously. Each equipment set-up includes modern Oscilloscope, dc generator, signal generator, trainer board, high-configured PC. This lab also has sufficient amount of all necessary electrical and electronic components including ICs (Digital and Analog), resistors, capacitors, inductors, transformer, variac etc. DSO card and electrical machines (motor-generators) are under procurement.

1.3 Microprocessor and Digital Laboratory

Digital lab has a number of highly sophisticated modern equipments such as trainer boards, 8086 microprocessor kits, digital IC tester, PC etc. Also it has a huge resource of digital and analog ICs and other electronic components. In this lab students can design and implement starting from small digital circuits to 8-bit microprocessor. Also, they can acquire the technical know-how of 8086 microprocessor and its peripherals. Furthermore, students can easily interface any personal computer with analog world for adaptive control and automation. This lab has also full-fledged 5 equipment set-ups so that 5 groups of students can carry on any digital and interfacing experiment and project simultaneously.

1.4 Other Laboratories

Besides the core labs, students of the CSE Department have to attend in two other labs: Physics Lab and English Language Lab. The Physics lab is used to perform the various experiments based on physics courses. The English Language lab is provided to enhance the skill of the students in both oral and written communication in English.

1.5 Departmental Library

There is a departmental library which has various book and journals. Different books related to the core subject and others related to interdepartmental courses are available in the library and also the different current journals and thesis books are there.

Clubs of CSE Department

Seven (7) separate clubs have been formed to ensure and enhance students' involvements in different activities in an organized manner. Each club is headed by General Secretary and consists of convener and organized by some members along with advisory council.

1. Research and Publication Unit

Research and Publication Club publishes a national Journal each semester named **International Journal of Computer and Information Technology (IJCIT)**, ISSN 2078-5828. The IJCIT only publishes articles of the highest quality. It is scholarly, peer-reviewed journal that provides a forum to the academics, scholars and advanced level students for exchanging significant information and productive ideas associated with all Computer Science disciplines. It helps the students and faculty members to improve their research capability producing quality computer professionals who can make positive contribution in the development of this country. Most of the faculty members and students of UAP are engaged to publish their researches at IJCIT.

2. Sports Club

Aim:

- To promote and develop individual interests in various sports and recreational activities.
- In addition to the development of specific skills, Sport Clubs are designed to be a learning experience for their members and, through involvement in leadership, responsibility, decision-making, public relations, organization, and fiscal management.
- Uphold the name and fame of the CSE department as well as UAP by promoting the excellence of the students in different sports competitions.
- Develop the skills of the students in teamwork, critical thinking, quick decision-making and prompt logical response to arguments.

Activities:

The Activities of this club are as follows:

- The Club arranges at least one intradepartmental sports competition in an academic year on regular basis.
- This club usually selects the participants from the CSE department for UAP Sports Competitions or any Sports event outside the university.
- The Club arranges training for the participants of both indoor and outdoor games if required.

3. Cultural and Debating Club

Aim:

University is the highest seat of learning. A university student is to learn socio-interaction, etiquette, exercise tolerance towards the opinions of the others and as a whole promote the intellectual ability beyond the domain of his/her main study.

Apart from the rigorous CSE subjects, extracurricular activities like Cultural programs and Debate will broaden students' minds and enhance their worth appreciating qualities that will ultimately express the excellence of the CSE Department in particular and the UAP in general.

With a pragmatic view to encouraging extracurricular activities, creating and sustaining a congenial environment for such activities, the CSE

Department of the UAP has formed the CSE Cultural & Debating Club.

The prime objectives of the CSE Cultural & Debating Club are to:

- Uphold the name and fame of the UAP by promoting the excellence of the students in cultural programs and debate.
- Promote the cultural spirit and social etiquette among the students
- Develop the skills of the students in stage performance, speaking for or against a motion by articulating their respective views.
- Develop the skills of the students in teamwork, critical thinking, quick decision-making and prompt logical response to arguments.
- Enhance their ability to defend and prove their ideas through reasoning, improvising and presence of mind.
- Exercise the tolerance towards the arguments of the others
- Pave the way for being interested all the more in their study by surmounting the monotony of the rigorous CSE subjects

Activities:

- Whenever a national event is to be observed on behalf of the UAPCC, the CSE Cultural and Debating club will represent the Department.
- Arrangement of the Orientation program on behalf of the department in every semester.
- This club will reserve the right to select cultural/debating participants from the CSE department for competitions to be held both inside/outside the university.
- Arranging Inter/ Intra department debating competitions on regular basis in the department.
- Arranging Workshop or Training program on cultural/debating activities to enhance the relevant talents of the student members.
- Arranging various cultural festivals on the basis of demand.

4. Programming Contest Club

Aim:

Having a considerable skill in programming is essential for every student studying in CSE. Programming Contests present a great opportunity for the students to exhibit and at the same time enhance their programming skills and creativity. During the last decade programming contest has become one of the most challenging and prestigious events in Computer Science arena throughout the world. The ACM International Collegiate Programming Contest (ICPC) is undoubtedly the most honored and spectacular event among all. Since 1998 universities from Bangladesh have participated in all the ICPC World Finals, which is certainly an outstanding feat. Achievements in international arena have led to a surge of enthusiasm regarding programming contests in our country. Now-a-days national level programming contests are arranged regularly exposing a great deal of healthy competitions among the universities.

The goal of this club is to encourage students of UAP to improve their programming skills, to prepare them for participating in different national and international contests and to arrange programming contests of both national and international level in the UAP campus.

Activities:

To achieve the goal, the club will undertake following activities:

- Arrange weekly training sessions for junior and senior students..
- Arrange both individual and team practice contests using an online judge installed on a dedicated server maintained by the club.
- Arrange intra-department programming contests on regular basis.
- Prepare selected students for participating in different National and International level programming contests.
- Arrange inter-university programming contests in the UAP premises.

5. Software and Hardware Club

Aim:

- The aim of the Club is to develop and improve student skills through the developments of various Software and Hardware projects regularly.
- The Club will collect and preserve all the academic projects (current and previous ones) developed by the students of the department that include Term Projects, Lab Projects, Research Projects etc. and will further work on some selected projects make them compliant to the industry standards. The Club will also work on the development of new projects with the help of the member students.
- The Club will arrange at least one Software Fair per year with the developed projects. Through this, it aims to
- Give the students of the department the exposure to the outside world and the job market presenting their developed projects before the various Firms and Organizations.
- Enhance the University image in education sector.
- Introduce students before the latest and more recent technologies in the market.

Activities:

UAP Software & Hardware Club initiated several programs to achieve its goal. Till now the club organized the following events

- CSE Carnival May 2011.
- Three-day workshop on C and C++ before midterm examination of Fall – 2009 in order to help junior students to strengthen their knowledge in programming language.
- Software & Hardware Fair on CSE – DAY 2009.
- Oracle Certified Programmer (OCP) training course to make students more competitive in job market.

6. Film and Photography club

Aim:

- To promote and develop individual interests about short film and photography.
- In addition to the development of specific skills, photography Clubs are designed to be a learning experience for their members through involvement in leadership, responsibility, decision-making, public

relations, organization, and fiscal management by arranging different workshop , photo walk and film festival .

- Uphold the name and fame of the CSE department as well as UAP by promoting the excellence of the students in different competitions.
- Develop the skills of the students in teamwork, critical thinking and quick decision-making and prompt logical response to arguments.

Activities:

The Activities of this club are as follows:

- This Club arranges at least one intradepartmental competition in an academic year on regular basis.
- This club usually selects the participants from the CSE department for UAP Film club and photography club Competitions or any event outside the university.
- This Club arranges training photo walk for the students.

7. Robotics Club

Aim:

- To promote and develop individual interests in robotics.
- In addition to the development of programming skills, Robotics Club have designed to be a learning experience for their members and, through involvement in electronic circuits, embedded systems, artificial intelligence, sensing and decision-making.
- Uphold the name and fame of the CSE department as well as UAP by promoting the excellence of the students in different robotic competitions.
- Develop the skills of the students in teamwork, critical thinking, decision-making and prompt logical response to arguments.

Activities:

The Activities of this club are as follows:

- The club arranges at least one intradepartmental robotic competition in an academic year on regular basis.
- This club usually selects the participants from the CSE department for any Robotic event outside the university.
- The Club arranges training as well as workshops for the interested students to spread robotics.

Developments and progress achieved

For the last 20 years, the Department has maintained a steady trend of improvement. Our students are proudly contributing towards the development of our country. Further research and development work is being carried out by many of our graduates. Some of the students are employed in different prestigious multi-national, cellular and software companies. This reflects the quality of students being produced by CSE, UAP. A good number of students are pursuing higher studies in Italy, UK, USA, Sweden, Japan, Germany and Korea. Starting from 4 students in 1996 the Department has experienced a massive intake of students,

Spring 2017 saw 167 students admitted. At present, there are around 850 undergraduate and graduate students in the Department. For the last five years, new programming labs with brand machines (1 Student: 1 Computer) have been established, circuit lab and digital lab have been restructured and reinforced with latest equipment and computers, new project lab has been established to encourage the students to take practical hardware & software oriented projects. All class rooms are air conditioned with multimedia projector support.

Industry-Institution Interaction

We have got the Spectrum Engineers Consortium and Plasma Plus involved with us. Similar articulation with some other organizations is still underway. This collaborative effort will include training students, guiding students' projects and industry-related suggestions to be incorporated while developing programs and curricula. The above organizations have come up with their suggestions and training programs. To enhance the quality of education even further, Department of CSE of UAP has established an Industry-Academia Collaboration with QUBEE, Augere Wireless Broadband Bangladesh Ltd (AWBBL). As part of the collaboration, following activities are performed by the two parties on a regular basis:

1. UAP-CSE visits selected Hub Sites, Aggregation Sites and Access Sites with the final year students as part of a one-day long Industrial Tour (twice in a year). A representative from QUBEE demonstrates the practical side of the theoretical aspects.

2. UAP-CSE invites QUBEE delegates in some of the Networking and Security related seminars, workshops and conferences organized by UAP.

3. Network and Communication Research Group (NCRG) of CSE Department is conducting research on real-life, industry-oriented problems. QUBEE will share necessary relevant information, if any. The outcome of the research can be accessed by both parties.

3 Faculty Members

3.1 Full Time Faculty

Aloke Kumar Saha,

Associate Professor & Head

M. Sc. (CS), DU, 1996

B. Sc. (APE), DU, 1995

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Aloke Kumar Saha is Associate Professor and Head of Computer Science and Engineering Department of University of Asia Pacific (UAP), Dhaka, Bangladesh. He joined UAP on March 1999 as a Lecturer. Before, he was a Lecturer at Queens University from June 1997 to March 1999. He completed B.Sc. (Hons.) in Applied Physics & Electronics from the University of Dhaka in 1995. He received his M.Sc.(Thesis) in Computer Science from University of Dhaka in 1997. And he is now pursuing his Ph.D. from Jahangirnagar University, Savar, Dhaka, Bangladesh. He has twenty four (24) Journal publications and sixteen (16) Conference publications. He usually teaches courses on Digital Logic Design, Numerical Methods, Data Structures, Discrete Mathematics, Computer Graphics and Basic Electrical Engineering. His current research interests are Algorithm, Artificial Intelligence and Universal Networking Language (UNL). For more than 18 (Eighteen) years, he is working with the undergraduate and master's students of UAP as a supervisor or co-researcher of their project and thesis works. He is Chief of Organizing Committee of International Journal of Computer and Information Technology (IJCIT), published by department of CSE, UAP. He is also Convener of Departmental Quality Assurance Unit (DQAU) of the department of CSE, UAP. He is Member of Academic Council UAP, Chairman of Examination Committee of CSE, Advisor of Research & Publication unit, Programming Contest club, Hardware& Software Club, Sports Club and Cultural & Debating Club of the department of CSE, UAP.

Dr. Bilkis Jamal Ferdosi

Associate Professor

PhD, University of Groningen, the Netherlands

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Dr. Bilkis Jamal Ferdosi is working as Associate Professor in the department of Computer Science and Engineering, University of Asia Pacific (UAP), Dhaka, Bangladesh. She joined UAP on February 1, 2016 as Associate Professor. After she completed her B.Sc.(4 year) in Electronics and Computer Science from Jahangirnagar University, she started her teaching carrier in 1998 as a Lecturer in the Department of CSE, Shahjalal University of Science and Technology (SUST), Sylhet and later she promoted to Assistant Professor in 2004. After serving SUST for five and half years, she went to OVG-University of Magdeburg, Germany to complete her M.Sc. in Computational Visualistics. After that she completed her PhD degree from University of Groningen, the Netherlands in 2011. From September 1, 2012 – February 26, 2014 she worked as Assistant Professor and Head in the department of CSE, State University of Bangladesh. From February 27, 2014 - January 20, 2016, she worked as Associate Professor and Head in the same department. From June 01, 2016 – November 30, 2016, she also worked as Head (currently on leave) in the department of CSE, UAP. She also worked as visiting researcher in the University of Missouri-Columbia, USA and as research assistant in prestigious Max Planck Institute, Germany, teaching assistant in University of Magdeburg, Germany, and teaching assistant in University of Groningen, the Netherlands. She also worked as a coordinator of the 2016 ACM-ICPC Asia Dhaka Regional Contest organized by UAP. She has eight papers published in different international/national journals/conferences. She usually teaches courses on Data Structures, Discrete Mathematics, Computer Graphics, Simulation and Modeling etc. Her current research interests are Information Visualization, Computer Graphics, Image Processing, Pattern Recognition and Machine Learning.

Dr. Md. Rashedul Islam

Associate Professor,

Dept. of CSE, UAP

PhD in Computer Engineering, University of Ulsan, South Korea, 2016

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Dr. Md. Rashedul Islam is an Associate Professor at Department of Computer Science and Engineering, University of Asia Pacific (UAP), Bangladesh. He received the **Bachelor of Science (B.Sc)** in Computer Science and Engineering at University of Rajshahi, **Bangladesh on 2006**, **M.Sc. in Informatics** from Högskolan i Borås (University of Boras), **Sweden on 2011**, and **Ph.D. in Computer Engineering**, University of Ulsan (UoU), **South Korea on August 2016**. He has one (1) book publication, twenty one (21) Journal publications and seventeen (17) Conference publications. His research interests are Signal & Image processing, Feature selection schemes, Machine learning, Data Clustering, Data-driven bearing fault diagnosis and prognostics, parallel algorithm/processing, and GPS positioning. His is currently working on HCI, Online Fault detection and diagnosis of induction motor using signal analysis, clustering, and machine learning, Feature selection for supervised and unsupervised learning, Supervised and Unsupervised machine learning, Enhancing supervised classification algorithm, Real-time Smoke and fire detection, Parallel algorithm for Signal processing. For more than 5 (Five) years, he is working with the undergraduate and master's students of UAP as a supervisor or co-researcher of their project and thesis works. He is: a) Head, Self-Assessment Committee of Dept. of CSE, Under IQAC UAP, b) Convener, UAP Website Development Committee, UAP, c) Member, Central Admission Committee, UAP, d) Convener, Software and Hardware Club, Dept of CSE, UAP, e) Reviewer of Three international Journal, f) Judge of Mobile game idea generation under ICT division Bangladesh, g) Treasurer, Bangladesh Advanced Programming Community (BAPCo). He usually teaches courses on Pattern recognition, Database System, Software Development, Software Engineering, Parallel Algorithm, Data Structure, Structured Programming (C), Object Oriented Programming(C++), Compiler Design, Microprocessor.

Mohammad Shahriar Rahman, PhD

Associate Professor

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Dr. Mohammad Shahriar Rahman is currently working as an associate professor at the department of computer science and engineering of University of Asia Pacific, Bangladesh.

Dr. Rahman has over 10 years of teaching and research experience, within both academia and industry, resulting over 40 research papers and patents on cyber security and privacy. He worked at KDDI Research in Japan from 2015 to 2017 as a research engineer. His research ranges from secure protocol construction to security modeling in order to solve real-world problems in Cyber Security domain.

He also focuses on privacy as an information security paradigm in an increasingly knowledge-based connected world facilitated by the Internet of Things (IoT) and cloud computing.He was an expert member of the Japanese national body for International Organization for Standardization (ISO), ISO/IEC JTC 1 SC 27.

Dr. Rahman completed B.Sc. (Hons) from University of Dhaka, Bangladesh, in 2006. He received M.Sc. and Ph.D. from Japan Advanced Institute of Science and Technology (JAIST) in 2009 and 2012, respectively. Dr. Rahman is the recipient of Japan Government's Monbukagakusho scholarship from October 2006 to March 2012 for M.Sc. and PhD studies, the IEICE Excellent Student Award 2008, the Best Paper Award at the 6th International Conference on Advanced Data Mining and Applications (ADMA'10), and Outstanding Performance Award from JAIST for PhD studies. He is a member of the International Association for Cryptologic Research (IACR).

Shaila Rahman,

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Shaila Rahman completed her masters in Computer Science from DU. She joined in UAP after her graduation. She secured 4th position in M.Sc. She also secured the 4th position in B.Sc (Hons) in Applied Physics & Electronics from the same institution. She teaches Microprocessors, Assembly Language, Computer Interfacing, Digital System Design, C/C++, Data Structure and Algorithms. She has conducted the courses Mobile Communications, Advanced Networking and thesis in Master's Program of CSE (MCSE),. Her current research interest includes Computer Networks and Distributed System, Wireless Networks, Wireless Ad hoc network, Sensor Network, Network Security, IPV6 network etc. She supervised the thesis works of several undergraduate students at UAP. It is praiseworthy to mention that more than thirty thesis groups in undergraduate level completed successfully under her acute supervision. Her research works published in IEEE, ICCIT, NCCPB, ICCPB, IJCIT conference and journal papers. Ms. Rahman has also published two journals on Cryptography, Outsourcing and location management. Ms. Rahman serves as acting head when the head of the department remains on leave. She also serves as an external examiner in the CSE department of Dhaka University. Moreover, She is the convener of the Cultural and Debating club. She is also advisor of other departmental Clubs. She is member of UAP Central Cultural Committee, Convocation Volunteer committee and Complain Committee.

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Shammi Akhtar science and engineering of the University of Asia Pacific, Bangladesh. She joined UAP in 2003 as lecturer after obtaining her B.Sc. degree in is currently working as an assistant professor at the department of computer computer Science & Engineering with Honors from the University of Asia Pacific. She completed her M.Sc. degree in computer Science & Engineering from the same university. She teaches courses on Operating system, Assembly Language, Computer Architecture, Computer Graphics, Data structure, Information System Design, Compiler Design, Microprocessor, Basic Electrical Engineering, Digital System Design, and Computer Interfacing. Her research interests include Computer Network, Graph theory, E-Commerce & Web performance Technologies, Data Mining.

Dr. Muhammad Firoz Mridha

Assistant Professor

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Dr. Muhammad Firoz Mridha is currently working as an assistant professor in the department of Computer Science and Engineering of the University of Asia Pacific. He is also working as a **co-ordinator of Master of Science in Computer Science and Engineering Program (MCSE) program**, UAP. He completed **B.Sc. (Hons.)** in Computer Science and Engineering from the Khulna University of Engineering and Technology (KUET), in 2004. He received his M.Sc. in Computer Science and Engineering in 2010 and **Ph.D. in Computer Engineering**, Jahangirnagar University **on May 2017**. He joined as a Lecturer at the department of Computer Science and Engineering, Stamford University Bangladesh in June 2007. He was promoted as a Senior Lecturer at the same department in October, 2010 and also promoted as an assistant professor at the same department in October, 2011. Then he joined UAP on May, 2012 as an Assistant Professor. He has Twenty (20) Journal publications and Twenty two (22) Conference publications. His research interests include Artificial Intelligence (AI), Machine learning, Natural Language Processing (NLP) and Universal Networking Language (UNL).

He is currently working on Machine Translation (MT), Bangla Language Processing (BLP), Solving Ambiguity of Bangla words, WordNet and supervised and unsupervised learning. For more than 10 (Ten) years, he is working with the master's and undergraduate students as a supervisor of their thesis works. He has served as a reviewer of various **IEEE conferences like ICCAIE, ICSIPA, SCORED, ISIEA, APACE, ICOS, ISCAIE, BEIAC, ISWTA, IC3e, ISWTA, CoAST, icIVPR** etc.

Shahera Hossain, Ph.D.

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Shahera Hossain is an Assistant Professor in the Dept. of Computer Science and Engineering, University of Asia Pacific, Bangladesh. Her research interests are image processing and medical image processing. She did her B.Sc from the Dept. of Computer Science & Engineering, Islamic University Chittagong, Bangladesh, M.E. and Ph.D. from the Dept. of Electrical Engineering & Electronics, Kyushu Institute of Technology, Japan. She is the *Editor-in-Chief*, International Journal of Computer and information Technology (IJCIT) http://www.ijcit.org; *Associate Editor*, International Journal of Computer Vision & Signal Processing http://cennser.org/IJCVSP; *Program Co-chair*, 6th International Conference on Informatics, Electronics & Vision (ICIEV) http://cennser.org/ICIEV; *Guest Editor*, special issue in Journal on Multimodal User Interfaces, Springer; *Program Co-chair*, International Conference on Imaging, Vision & Pattern Recognition (icIVPR) http://cennser.org/ICIVPR.

Md. Akhtaruzzaman Adnan,
Assistant Professor

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Md. Akhtaruzzaman Adnan is currently working as an Assistant Professor at the Department of Computer Science and Engineering (CSE) of the University of Asia Pacific (UAP), Dhaka, Bangladesh. He completed B.Sc. (Hons.) from Islamic University of Technology (IUT), Gazipur, Bangladesh in 2009 and M.Sc. from Universiti Teknologi Malaysia (UTM), Johor, Malaysia. His research interests include but not limited to Wireless Sensor Networks, Computer Networking, Health IT, IoT, and Metaheuristic Algorithms. Adnan is the recipient of OIC Scholarship for B. Sc. studies and Malaysian Government Scholarship for M. Sc. studies.

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A S Zaforullah Momtaz is currently serving as Assistant Professor in the Department of Computer Science and Engineering, University of Asia Pacific, Dhaka, Bangladesh. He joined in this department in November, 2011. He completed his B Sc (Hons) in CSE from the University of Asia Pacific in 2010. His research interests are Microprocessor, Embedded Systems, Arduino, Robotics, IoT, Data-mining, Big Data, Web as well as Mobile app development.

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Molla Rashied Hussein is currently working as an Assistant Professor at the Department of Computer Science and Engineering (CSE) in University of Asia Pacific (UAP), Dhaka, Bangladesh. He completed his Bachelor of Science in Computer Engineering from North South University, Dhaka, Bangladesh in 2007. Then he worked for a Danish-Bangladeshi software firm, followed by the IT Division of a reputed private bank of Bangladesh. After that, he went to USA to pursue Master of Engineering in Computer Engineering from Old Dominion University, Norfolk, Virginia, USA in 2011. After that, he came back to Bangladesh and joined UAP as a Lecturer, and afterward, promoted as an Assistant Professor. He has taught a variety of courses including Artificial Intelligence and Expert System, Computer Networking, Computer Graphics, Database Systems, Numerical Methods, Computer Programming and many to name. His research interests include but not limited to Big Data, Data Mining, Internet of

Things (IoT) and Natural Language Processing (NLP). He has published 04 (four) International Journal papers and 02 (two) International Conference paper. He has supervised 08 (eight) B.Sc. Thesis and is currently supervising 03 (three) B.Sc. Thesis. He is an active member of Institute of Electrical and Electronics Engineers (IEEE) and Internet SOCiety (ISOC) Bangladesh Dhaka Chapter.

Md. Asiful Hossain,

Assistant Professor

B.Sc. in CSE, BUET, 2013

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Md. Asiful Hossain is a Lecturer at the Department of Computer Science and Engineering (CSE), University of Asia Pacific (UAP) since April 2013. He graduated from Bangladesh University of Engineering and Technology, Palashi, Dhaka, 2013. His research interests include Cloud Computing, Algorithm, Data Structure, Image Processing . Right now he teaches courses on Computer Programming II and Computer fundamental. He has 2 conference papers, one of them on cloud computing and another on is image processing. He is now member of Research and Public group, Sports and Programming contest club.

Nadeem Ahmed

Assistant Professor

M.Sc. in CS, Queen Mary, UK

MBA, IUB

B.Sc. (CSE), DU

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Nadeem Ahmed is currently working as an Assistant Professor at the Department of Computer Science and Engineering (CSE) in University of Asia Pacific (UAP), Dhaka, Bangladesh. He completed his Bachelor in Computer Science and Engineering from University of Dhaka in 2007. Then he worked in different Software and Multination Organizations as a software engineer for the next several years. He has working experience and knowledge in the web related technologies, database system management, project management, client communications etc. Meanwhile he achieved MBA from Independent University, Bangladesh. In 2012, he joined in Dhaka International University as a lecturer and shortly he went to London, UK for Masters Program from Queen Mary, University of London. He returned home in 2014 and immediately joined in Daffodil International University followed by University of Asia Pacific. Generally he teaches courses including but not limited to DBMS, Software Development, Information System Design, Compiler Design, Software Engineering, Computer Programming (C/C++ Lab), Discrete Mathematics. His research interests include Data Science, Data Mining and Cyber Security.

Dr. Nasima Begum

Assistant Professor

Postdoctoral Research Fellow, Okayama University Japan (2014~2016)

Ph.D., Okayama University Japan, September 2014

M. Sc. (CSE), Jahangirnagar University, 2010

B. Sc. (CSE), Jahangirnagar University, 2006

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Dr. Nasima Begum is currently working as an Assistant Professor in the Department of Computer Science and Engineering at University of Asia Pacific (UAP), Dhaka, Bangladesh. She joined UAP on November, 2016 as an Assistant Professor. Before, she was an Assistant Professor at Manarat International University from June 2016 to October 2016. She received her Ph.D. in Cryptography and Information Security from Okayama University, Japan in 2014. She received the B.Sc. and M.Sc. in Computer Science and Engineering from Jahangirnagar University, Bangladesh in 2006 and 2010 respectively. She joined as a Lecturer at the department of Computer Science and Engineering, Manarat International University (MIU), Bangladesh in January 2007. She was promoted as a Senior Lecturer at the same department in February, 2010. She has worked as a Visiting Researcher at the Dept. of Information and Communication Systems, Okayama University, Japan, from July 2011 to September 2011.

She received Government Talent pool Scholarship on Secondary School Certificate Examination Result by the Government of Bangladesh (1999). She received University Supplementary and Talent pool Scholarship award by the Government of Bangladesh on Bachelor of Science result (5^{th} Position) in 2006. She received Research Grant Award for Encouragement of Students, Okayama University, Japan (2012-2014). She also received Research Grant Award for Conference Publications, Okayama University, Japan (2012-2013). She has worked as a session chair and a member of reviewer panel in several international conferences. She has total twenty three (23) publications, among them eight (8) journal publications, thirteen (13) conference publications and one poster. She has a Book Chapter (Book Title: Information Security and Cryptology-ICISC 2012) in Lecture Notes in Computer Science by Springer Berlin Heidelberg (ISBN: 978-3-642-37681-8). She is a member of Self-Assessment Committee (SAC), dept. of CSE, UAP. Her research interest includes cryptography and information security, image processing, and artificial intelligence. She is a member of IEEE, ACM and IEICE.

Dr. Md. Rajibul Islam

Assistant Professor

Ph.D. (Photonics), University of Malaya (UM), Malaysia.

M.Sc. in IT (by Research), Multimedia University (MMU), Malaysia.

Bachelor of Computer Applications (BCA), Indira Gandhi National Open University (IGNOU), India.

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Dr. Md. Rajibul Islam was born in a small town in the northern part of Bangladesh. He is currently Assistant Professor at the University of Asia Pacific (UAP), Bangladesh. Prior to this, he was Visiting Ph.D. Researcher at the University of Limerick, Ireland under Erasmus Mundus INTACT Program. Besides, he worked as Research Assistant at the Photonics Research Centre, University of Malaya, Software Engineer at London English Academy (LEA), Research Assistant (RA) in the R&D at Clarify Consulting Sdn Bhd., and Research Assistant at the Ibnu Sina Institute for Fundamental Science Studies, University Technology Malaysia (UTM). Dr. Islam received his Ph.D. in Photonics from the Photonics Research Centre, University of Malaya (UM) in February, 2017. He received his M.Sc. in IT (Image Processing: Biometrics) from Multimedia University, Malaysia (MMU) and Bachelor of Computer Applications (BCA) Degree from Indira Gandhi National Open University, India, in 2010 and 2004, respectively. His research interests include signal and image processing, parallel computing, augmented reality (AR), optical fiber sensors for IoT. He has published more than 60 peer-reviewed scientific articles in international journals and conferences together with books and book chapters. Dr. Islam volunteers as a reviewer of several international journals and he is also a regular scientific committee member of several international conferences. He is a member of IAEng, IACSIT, ASTRC-I, MIR Labs and Optical Society of America (OSA).

Jahir Ibna Rafiq

Lecturer

B.Eng in ECE (UK)

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Jahir Ibna Rafiq is currently working for UAP as a lecturer in the CSE department. He has completed his undergraduate degree from University of Surrey, UK. Academic excellence and proactive engagement have earned him multiple scholarships from Bangladesh Government, University of Cincinnati, USA and University of Surrey, UK. Formerly worked as a software engineer at a reputed UK financial software company; possessing strong interpersonal and varied knowledge of the industries across first world countries. His Research interest includes Network Security, Software Design, Quality Assurance, Embedded systems and Sensors.

Abdul Kawsar Tushar

Lecturer

B. Sc. (Engineering) in CSE, BUET, 2016

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Abdul Kawsar Tushar is presently employed as a Lecturer at Department of Computer Science and Engineering of University of Asia Pacific, Dhaka. He completed his graduation with honors from Bangladesh University of Engineering and Technology (BUET) in 2016 and shortly joined CSE, UAP. His thesis was titled “On Finding Optimal Number of Divisions for Divide and Conquer Method for Finding Convex Hull” which is a sub-section of Computational Geometry. The list of his published papers include: “Handwritten Arabic Numeral Recognition using Deep Learning Neural Networks”, “Chord Angle Deviation using Tangent (CADT), an Efficient and Robust Contour-based Corner Detector”, and “Efficient Bearing Fault Diagnosis by Extracting Intrinsic Fault Information using Envelope Power Spectrum”, all published in IEEE conference. His research interests include (but are not limited to) Deep Learning, Image Processing, and Human Computer Interaction. He secured numerous scholarships throughout his undergraduate life for academic excellence, including multiple Dean's List awards as well as University Merit Scholarships.

He serves as member of UAP CSE Self-Assessment Committee which is governed by IQAC, UAP under HEQEP. He is a member of Research and Publication Unit at CSE, UAP and has served as a co-chair of Publicity and Media Committee for ACM-ICPC Asia Dhaka Regional 2016. He is a core member of Bangladesh Open Source Network (BdOSN) and facilitates various technology-related programs for them. He is currently pursuing his M. Sc. Degree from CSE, BUET.

Risul Islam

Lecturer

B.Sc., CSE, BUET

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Risul Islam is a lecturer of UAP. He had completed his undergrad from Department of Computer Science and Engineering, Bangladesh University of Engineering and Technology (BUET). His research Interests are Computer Networks and Network Security, IoT, Image Processing and VoIP. He has contributed in writing a book called "Sohoje Shikhi C". Moreover, IT professional passers examination certificate (ITFE) organized by Japan Govt, BCC and BDiTEC is also in his bag. He was a proactive member of System, Kits Distribution and Logistics committees for ACM ICPC 2016. Now, he is acting as a member of different committees for ICCIT 2017 and ICPC 2017. His favorite dialogue is "Valar Morghulis".

Anika Anwar

Lecturer

M.Sc. in CSE, BUET (continue)

B. Sc. in CSE, BUET, 2014

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http://dblp.uni-trier.de/pers/hd/a/Anwar:Anika

Anika Anwar is a Lecturer at the Department of Computer Science and Engineering (CSE), University of Asia Pacific (UAP) since June 2016. She has completed her B. Sc. from Bangladesh University of Engineering and Technology and is currently pursuing her Master's degree from there. She worked as a Lecturer in Eastern University for the duration of one and a half years. Her research interests include Human-Computer Interaction, Artificial Intelligence and Big Data.

Suman Bhadra,

Lecturer

B.Sc. in CSE, JU, 2015

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Suman Bhadra is a Coach of Programming Contest and Lecturer at the Department of Computer Science and Engineering (CSE), University of Asia Pacific (UAP) since MAY 2016. He graduated from Jahangirnagar University, Savar, Dhaka-1342. He participated in ACM-ICPC World Finals – 2015 (Morocco). He is now member of Programming contest club. His research interests include Algorithm, Data Structure, Pattern recognition.

Hanif Bhuiyan

Lecturer

M. E. (CIE), Inha University,

South Korea, 2016

B. Sc. (CSE), AUST, 2013

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Hanif Bhuiyan joined the department of Computer Science and Engineering of the University of Asia Pacific (UAP), Bangladesh on November 2016 as a Lecturer. Before, as a Lecturer he worked at Southeast University from April 2016 to October 2016. At the same time he was an adjunct lecturer in Ahsanullah University of Science and Technology. During his study period in Inha University he has experience to work as RA (AI Lab) and TA at Computer and Information Engineering Department of Inha University. Mr. Hanif also worked as a software engineer back in 2013/2014 at POWER GP BD LTD., Dhaka. He completed B.Sc. in Computer Science and Engineering from Ahsanullah University of Bangladesh in 2013. He received his masters in Computer and Information Engineering from Inha University in 2016 under Jungseok International Scholarship. His research skills includes multiple sections of computational and information technology, particularly in Augmented Reality, Semantic Web, Recommendation, Data Mining and Natural Language Processing.

Md. Imran Bin Azad

Lecturer

MS in CSE, DU
B.Sc. in CSE, DU

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Md. Imran Bin Azad is a Lecturer of Computer Science and Engineering Department at University of Asia Pacific (UAP), Dhaka, Bangladesh. He joined UAP on January 2017. Before that, he was a Lecturer at Eastern University from September 2014 to January 2017. He completed B.Sc. (Hons.) in CSE from University of Dhaka in the examination year of 2013. He received his MS degree (securing 1st position) in CSE also from University of Dhaka in 2015. He has served as Problem Setter and Judge in various national and international Competitive Programming Contests. To mention a few: ACM ICPC ASIA Kolkata Regional Contest 2016, National Collegiate Programming Contest 2016 and National Girls' Programming Contest 2015. He was a trainer at BAPS-BUBT National Programming Camp 2016. He usually teaches courses on Programming Fundamentals, Object Oriented Programming, Computer Graphics and Computer Peripherals etc. His current research interests are Machine Learning, Data Analysis and Bioinformatics. He is Member of Programming Contest Club, Hardware & Software Club and Sports Club of the department of CSE, UAP.

Gazi Md. Hasnat Zahan

Lecturer

B.Sc. (CSE), IUT

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Gazi Md. Hasnat Zahan joined as a Lecturer in the department of Computer Science and Engineering of the University of Asia Pacific (UAP), Bangladesh on April 2017. Before that he worked as a Lecturer in Ahsanullah University of Science and Technology (AUST), Bangladesh University of Business and Technology (BUBT) and Green University of Bangladesh (GUB).

He finished his B.Sc in CSE from IUT in 2013. His undergraduate thesis was on Simultaneous Localization and Mapping (SLAM), a problem emerged from the "Kidnapped Robot" problem. After graduation, he joined BUBT as a lecturer in CSE in October, 2013. He was a supervisor and a co-founder of BUBT Robotics Club. He supervised the team "BUBT Mongolchari" who reached the Final in the UK University Rover Challenge (UKURC) 2016.

Gazi Md. Hasnat Zahan has been involved in a lot of co-curricular and extra-curricular activities since his Cadet College life. He participated in National level inter-college Debate competition. In university, he became champion in IUT 22nd and runner up in IUT 23rd Annual

Athletic Competition. He was the Unit Face Coordinator in IUT Engineering Students' Association of Bangladesh (ESAB) and the President of IUT computer Society (IUTCS).

His research interests span the areas of Artificial Intelligence (Robotics, Computer Vision, Machine Learning, Natural Language Processing, Virtual Reality, Image Processing) and Human Computer Interaction (HCI).

Afia Afrin

Lecturer

B. Sc., BUET, 2017

E-mail: meghla1011@uap-bd.edu

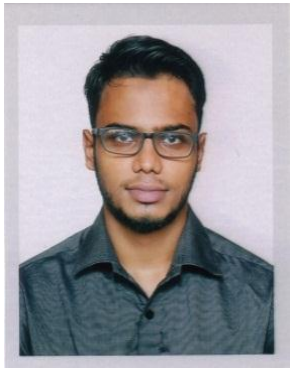
Afia Afrin is Lecturer of Computer Science and Engineering Department of University of Asia Pacific (UAP), Dhaka, Bangladesh. She joined UAP on April,2017. She completed B.Sc. (Hons.) in Computer Science & Engineering from Bangladesh University of Engineering and Technology (BUET) in 2017. Her current research interests are: Artificial Intelligence, Graph Theory and Algorithm.

Abdullah Al Omar

Lecturer

B.Sc. (CSE), UAP, 2016

E-mail : omar.cs@uap-bd.edu



Abdullah Al Omar is lecturer of Computer Science and Engineering Department of University of Asia Pacific (UAP), Dhaka, Bangladesh. He joined UAP on 10th November, 2016 as a Teaching Assistant and started working as a Lecturer in this department from 16th April, 2017. He completed his B.Sc. in Computer Science and Engineering from University of Asia Pacific in 2016. And he is now pursuing his M.Sc. from Bangladesh University of Engineering and Technology (BUET). He is a highly motivated researcher in the fields of his interest. He have one Conference publication. His areas of interest for research are - Security, Internet of Things (IoT), Robotics. Currently he is working on Blockchain Technology. He is a member of ICCIT 2017 and ICPC 2017 organizing committee.

3.2 Faculty Members on Study Leave

Name	Designation
Dr. Khan Md. Anwarus Salam	Assistant Professor
Kazi Chandrima Rahman	Assistant Professor
Tania Rahman	Lecturer
Shebuti Rayana	Lecturer
Mohammad Majharul Islam	Lecturer
Md. Anit Khan	Lecturer
Taslima Akter	Lecturer
Md. Mohaimenul Hossain	Lecturer
Hasan Mahmood Aminul Islam	Lecturer

3.3 Guest Faculty

Name	Designation
Dr. Jugal Krishna Das	Professor, JU
Dr. Sadia Sharmin	Associate Professor, BUET
Sukarna Barua	Assistant Professor, BUET
Jamil Siddiquee	MBA (Shefield)
Md Ataur Rahman	Assistant Professor, The Higher Institute of Electronics, Libya

Supporting Officer & Staff

Md. Faruk Hossain
MSS(Eco.) DU, MBA, UAP
PGDCS, BIM
Sr. Administrative Officer

Molla Hasanul Kabir
MBS (Management)
Asst. Administrative Officer

Md. Abdul Matin
Lab Assistant

Md. Mofizur Rahman
Lab Assistant

Md. Anowar Hossain
Lab Assistant

Md. Shorif Hossen
Lab Assistant

Md. Amir Hossain
Lab Attendant

Md. Kamrul Islam
Lab Attendant

Md. Abdul Ali
Messenger

Md. Sajal Islam
Messenger

4. Summary of Undergraduate Course

The undergraduate students of different years of the Department of Computer Science and Engineering have to follow the course schedule given below. The letter prefix in any course number indicates the discipline/subject offering the course viz. HSS for Humanities and Social Science, Business, Management Studies, Language etc., PHY for Physics, CHEM for Chemistry, MTH for Mathematics, ECN for Economics, ACN for Accounting and CSE for Computer Science and Engineering. The first digit in the number indicates the year/level for which the course is intended; the second digit is assigned by the department and the last digit, if odd, indicates a theory course and if even, indicates a laboratory course.

Core Courses

First Year First Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 101	Introduction to Computer Science & Programming Methodology	3.00	Nil
CSE 102	Introduction to Computer Sc. & Programming Methodology Lab	1.50	Nil
HSS 101	English I: Written and Spoken English	3.00	Nil
HSS 111(A)	Bangladesh Studies: Society and Culture	2.00	Nil
HSS	Bangladesh Studies: Bangladesh	2.00	Nil

First Year First Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
111(B)	History		
PHY 101	Physics	3.00	Nil
PHY 102	Physics Lab	1.50	Nil
MTH 101	Math I: Basic Calculus, Co-ordinate Geometry	3.00	Nil
Total		19.00	

First Year Second Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 103	Structured Programming	3.00	CSE 101
CSE 104	Structured Programming Lab	1.50	Nil
CSE 105	Discrete Mathematics	3.00	Nil
EEE 121	Electrical & Electronic Engineering I	3.00	Nil
EEE 122	Electrical & Electronic Engineering I Lab	1.50	Nil
MTH 103	Math II: Linear Algebra	3.00	Nil
CHEM 111	Chemistry	3.00	Nil
CHEM 112	Chemistry Lab	1.50	Nil
Total		19.50	

Second Year First Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 203	Object Oriented Programming I: Java	3.00	CSE 103
CSE 204	Object Oriented Programming I Lab: Java Lab	1.50	Nil
CSE 205	Data Structures	3.00	CSE 101, CSE103, CSE 105
CSE 206	Data Structures Lab	1.50	Nil
MTH 201	Math III: Multivariable Calculus	3.00	MTH 103, MTH 101
EEE 221	Electrical & Electronic EngineeringII	4.00	Nil
EEE 222	Electrical & Electronic EngineeringII Lab	1.50	Nil
MTH 203	Probability & Statistics	3.00	Nil
Total		20.50	

Second Year Second Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 207	Algorithms	3.00	CSE 103, CSE 205
CSE 208	Algorithms Lab	1.50	Nil
CSE 209	Digital Logic & System Design	4.00	Nil
CSE 210	Digital Logic & System Design Lab	1.50	Nil
CSE 211	Database Systems	3.00	Nil
CSE 212	Database Systems Lab	1.50	Nil
MTH 205	Math IV: Differential Equations and Fourier and Laplace Transformations.	3.00	MTH 201
ECN 201	Economics	2.00	Nil
Total		19.50	

Third Year First Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 303	Data Communications	3.00	ECE 201, PHY 101, MTH 205
CSE 304	Data Communications Lab	0.75	Nil
CSE 305	System Analysis and Design	3.00	CSE 211
CSE 306	System Analysis & Design Lab	0.75	CSE 212
CSE 307	Theory of Computation	3.00	CSE 207
CSE 309	Object Oriented Programming II:Visual and Web Programming	3.00	CSE 203, CSE 211
CSE 310	Object Oriented Programming II Lab:Visual and Web Programming Lab	1.50	Nil
CSE 311	Microprocessors& Assembly Language	3.00	Nil

Third Year First Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 312	Microprocessors& Assembly Lab	1.50	Nil
HSS301	English II : English for Communications	2.00	HSS 101
Total		21.50	

Third Year Second Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 313	Numerical Methods	3.00	MTH 205, CSE 205
CSE 314	Numerical Methods Lab	0.75	CSE 206
CSE 315	Peripheral & Interfacing	3.00	CSE 209, CSE 311
CSE 316	Peripheral &Interfacing Lab	1.50	CSE 210, CSE 312

Third Year Second Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 317	Computer Architecture	3.00	CSE 209
CSE 319	Computer Networks	3.00	CSE 303
CSE 320	Computer Networks Lab	1.50	Nil
CSE 321	Software Engineering	3.00	CSE 305
CSE 322	Software Engineering Lab	0.75	CSE 306
CSE 330	Industrial Training	1.50	Nil
Total		21.00	

Fourth Year First Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 401	Mathematics for Computer Science	3.00	CSE 207, MTH 203

Fourth Year First Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 403	Artificial Intelligence and Expert Systems	3.00	Nil
CSE 404	Artificial Intelligence and Expert Systems Lab	1.50	Nil
CSE 405	Operating Systems	3.00	CSE 207, CSE 317
CSE 406	Operating Systems Lab	1.50	Nil
CSE 407	ICTLaw, Policy and Ethics	2.00	Nil
CSE 410	Software Development	1.50	CSE 321
CSE …	Option I	3.00	Nil
CSE 400	Project/ Thesis	3.00	Nil
Total		21.50	

Fourth Year Second Semester			
Course Code	**Course Title**	**Credits**	**Pre-Requisite**
CSE 425	Computer Graphics	3.00	Nil
CSE 426	Computer Graphics Lab	1.50	Nil
CSE 429	Compiler Design	3.00	Nil
CSE 430	Compiler Design Lab	1.50	Nil
CSE …	Option II	3.00	Nil
CSE …	Option II Lab	0.75	Nil
CSE 400	Project/ Thesis	3.00	Nil
BUS 401	Business and Entrepreneurship	3.00	Nil
BUS 402	Business and Entrepreneurship Lab	0.75	Nil
Total		19.50	

Total Credits: 162

Option I		
Course Code	**Course Title**	**Credits**
CSE 411	Mobile Communications	3.00
CSE 413	Cloud Computing	3.00
CSE 415	Parallel and Distributed Systems	3.00
CSE 417	Management Information Systems	3.00
CSE 419	Sensor Networks	3.00
CSE 421	Graph Theory	3.00
CSE 423	Bioinformatics	3.00
CSE 425	Environment and Green Technology	3.00
CSE 427	Topics of Current Interest	3.00

Option II		
Course Code	**Course Title**	**Credits**
CSE 431	Simulation and Modeling	3.00
CSE 433	Fault Tolerant Systems	3.00
CSE 435	Pattern Recognition	3.00
CSE 437	Multimedia Technology	3.00
CSE 439	Wireless Networking	3.00
CSE 441	Introduction to Computer Vision	3.00
CSE 443	UNIX and Systems Programming	3.00
CSE 445	Human Computer Interaction	3.00
CSE 447	Distributed Operating System	3.00
CSE 449	Digital Signal Processing	3.00
CSE 451	Object Oriented Database	3.00
CSE 453	Software Design Pattern	3.00
CSE 455	E-commerce and Web Engineering	3.00

Option II		
Course Code	**Course Title**	**Credits**
CSE 431	Simulation and Modeling	3.00
CSE 457	Design and Testing of VLSI	3.00
CSE 459	Natural Language Processing	3.00
CSE 461	Robotics	3.00
CSE 463	Embedded Systems	3.00
CSE 465	Computer and Network Security	3.00
CSE 467	Data Mining & Machine Learning	3.00
CSE 469	Topics of Current Interest	3.00

Option II Lab		
Course Code	**Course Title**	**Credits**
CSE 432	Simulation and Modeling Lab	0.75
CSE 434	Fault Tolerant System Lab	0.75
CSE 436	Pattern Recognition Lab	0.75
CSE 438	Multimedia Technology Lab	0.75
CSE 440	Wireless Networking Lab	0.75
CSE 442	Introduction to Computer Vision Lab	0.75
CSE 444	UNIX and Systems Programming Lab	0.75
CSE 446	Human Computer Interaction Lab	0.75
CSE 448	Distributed Operating System Lab	0.75
CSE 450	Digital Signal Processing Lab	0.75
CSE 452	Object Oriented Database Lab	0.75
CSE 454	Software Design Pattern Lab	0.75
CSE 456	E-commerce and Web Engineering Lab	0.75

Option II Lab		
Course Code	**Course Title**	**Credits**
CSE 458	Design and Testing of VLSI Lab	0.75
CSE 460	Natural Language Processing Lab	0.75
CSE 462	Robotics Lab	0.75
CSE 464	Embedded Systems Lab	0.75
CSE 466	Computer and Network Security Lab	0.75

Option II Lab		
Course Code	**Course Title**	**Credits**
CSE 468	Data Mining & Machine Learning Lab	0.75
CSE 470	Topics of Current Interest Lab	0.75

Course

Outline

(Core)

4. Core Course Outline

5.1 First Year First Semester

Course Code: CSE 101

Course Title: Introduction to Computer Science & Programming Methodology

Credits: 3.00

Prerequisite: None

Introduction to computer science, what is computer, Fundamental parts of a computer, storage and memory management (RAM, ROM, Hard disk) system overview of a computer, I/O devices, software and hardware, basic knowledge of computer, Files and folders, Command prompt, Microsoft office, Shortcut command keys, web ideas, **Number System:** Binary, Decimal, Octal, Hexadecimal number system and their conversion. Introduction to structured programming, **Flowchart:** what is flowchart, expressions of flowchart, importance of flow chart. **Pseudo code:** pseudo code and expression of pseudo code. **Algorithm:** Algorithm writing, relationship among algorithm, pseudo code and flow chart, code to flowchart and vice versa conversion. Introduction to C program, Skeleton of C program, **Compiler:** overview of compiler, importance and functionality, output standard library function as printf(), input standard library function as scanf(), **Data types and Variable:** different data types, variable types and their sizes, conversion among them, **scope:** global variable, local variable, static variable, auto variable . **Operators:** Types of operator in C, functionality of operators, increment – decrement operators, precedence of operators. Header files, library files, object files and their importance. **Conditional Operators:** if-else structure, switch-case structure, selection structure, statement and expression. **Control Flow:** for loop structure, while loop structure, do-while structure, sum of the series, co-ordinate geometry, design pattern using loop. **Debugging**: debug a sample program using compiler. **Function:** argument and parameter of a function, return types, inline declaration, forward declaration of a function. **Macro:** types of macro, sample macro program, macro as preprocessor, difference between macro and function, advantages and disadvantages of macro. **Bitwise operator:** introduction to bitwise operators, their functionality and truth table of basic and, or, xor, nor algebraic functions**. Arrays:** introduction to array, declaration and definition of an array, types of array, multidimensional array, size calculation of different types of array, scanning array, programs using array, matrix multiplication using array, insertion, deletion, replacement, search from an array, advantages of array over variable. Scientific calculator using C program.

References:

1. Teach yourself C by Herbert Schildt.
   Publisher: Osborne McGraw-Hill
2. C programming Language by Brian W. Kernighan, Dennis M. Ritchie
   Publisher: Prentice Hall

3. Discovering Computers Fundamentals: Your Interactive Guide to the Digital World (Shelly Cashman)
   Publisher: Cengage Learning
4. Computer Fundamentals by Kevin Wilson
   Publisher: CreateSpace Independent Publishing Platform

Course Code: CSE 102

Course Title: Introduction to Computer Science & Programming Methodology Lab

Credits: 1.50

Prerequisite: None

Objective: Laboratory works and assignments will be based on CSE-101

Course Code: HSS 101

Course Title: English I: Written and Spoken English

Credits: 1.50

A. Written English:

Writing Mechanics & Grammar: Spelling, Capitalization, Punctuation, Vocabulary

Writing skills for formal and informal communications: Paragraph/ Essay/ Story Writing, Opinion Writing, Letter Writing – Formal and Informal, Memo Writing, Report Writing, E-mail Writing, Web Content Writing.
Editing & Proofreading: Headings, Correct use of capitals and other elements of consistency, Sentence Construction, Italics and Bolding, Spacing and Layout, Common Editing and Proofreading Errors.

B. Spoken English:

Conversation skills: Starting a conversation, Introducing oneself and others, Responding.

Speaking skills in a formal and informal setting: Casual conversation, Discussion, Giving Opinions, Apologizing, Expressing Wishes and Regrets, Giving and seeking Permission/Advice/Suggestions.

Presentation skills and Interview skills. Anchoring: Tips and tricks for anchoring in University events, Department events, Cultural events.

References:

1. John & Liz Soars: New Headway Intermediate, Publisher: Oxford University Press
2. Langan J.(2005) College Writing skills with Readings, Sixth Edition, Publisher: McGraw-Hill
3. Judith R. & Wiener, Harvey (editor) Lambert: The Advancing Writer Book Reading and Writing Essays, Publisher: HaperCollins College
4. Philip Binham: How to Say It? Publisher: Longma

Course Code: HSS 111 A & B

Course Title: Bangladesh Studies

Credits: 4.00

HSS 111 A : Society and Culture:

The Sociological Perspective: Definition, nature. Sociology as a scientific discipline, relation with other social sciences. Primary Concepts: Society, Community, Association, Institution, Group, Culture, Norms & Values. Social Structure and Process: Social Stratification Social classes, Caste system, Social Mobility. Social Institutions: Family, Marriage, Economic Institutions – Property, Ownership; Political Institutions – Forms of State and Forms of Government; Local Government; Religious and Cultural Institutions. Culture, Cultural diffusion and change, Bengali culture.

Problems of Society, Social Problems of Bangladesh. Social Change, Theories of Social Change, Social Change in Bangladesh. Urbanization process and its impact on Bangladesh society.

HSS 111 B: History of Bengal:

The land: Geographical factors, the people. Historical perspectives: Ancient Bengal: Sasanka-Rise of the Palas – the Senas. Early Medieval Bengal: Coming of the Muslims. The Independent Sultanate of Bengal: Ilyas Shahi and Hossein Shahi Bengal. Development of Bengali language and Bengali literature. Late Medieval Bengal: the establishment of Mughal rule in Bengal – the Bara Bhuiyans: Subedars and Nawabs. Coming of the Europeans. New approach in Bengal architecture. Beginning of British rule in Bengal: Battles of Palassey and Buxar. Diwani (1765). The Dual government. Permanent Settlement (1793). Nineteenth century Bengali Renaissance: areas of social and religious reforms – Raja Rammohan Roy, Ishawar Chandra Vidyasagar, Titu Meer. Partition of Bengal (1905). Its annulments(1911). Partition of Bengal (1947). Language Movement (1952). Movement for autonomy; 6-point and 11 point programs. The 1970 election-military action, genocide in the then East Pakistan. The Liberation War: The emergence of Bangladesh as a sovereign independent state in 1971.

Books Recommended:

1. Richard T. Schaefer "Sociology" McGraw Hill, New York, 2003
2. Metta Spencer and Alex Inkeles " Foundations of Modern Sociology" Prentice Hall, Canada, 1996
3. C. N. Shankar Rao "Sociology" S Chan & Company Ltd., New Delhi,2009
4. Anthony Giddins "Sociology" Polity Press, Delhi, 2008
5. C. Calhoun, D. Light, S. Keller: "Sociology" McGraw Hill, New York, 1997
6. G. J. Bryjak& M. P. Soroka: "Sociology", Allyn & Bacon, 1997
7. T. B. Bottomore: "Sociology" Blackie & Son (India) Ltd, 2001
8. Sirajul Islam (ed.), *History of Bangladesh*
9. Bangla Pedia, Asiatic Society of Bangladesh

Course Code: PHY 101

Course Title: Physics

Credits: 3.00

Prerequisite: None

Heat and Thermodynamics: Principle of temperature measurements: platinum resistance thermometer, thermo-electric thermometer, pyrometer; Kinetic theory of gases: Maxwell's distribution of molecular speeds, mean free path, equipartition of energy, Brownian motion, Van der Waal's equation of state, review of the First Law of thermodynamics and its application, reversible and irreversible processes, Second Law of thermodynamics, Carnot cycle; Efficiency of heat engines, Carnot's Theorem, entropy and disorder, thermodynamic functions, Maxwell relations, Clausius-Clapeyron Equation, Gibbs Phase Rule, Third Law of thermodynamics. **Structure of Matter:** Crystalline and non-crystalline solids, single crystal and polycrystal solids, unit cell, crystal systems, co-ordinations number, crystal planes and directions, sodium chloride and CsCl structure, packing factor, Miller indices, relation between interplanar spacing and Miller indices, Bragg's Law, methods of determination of interplanar spacing from diffraction patterns; Defects in solids: point defects, line defects; Bonds in solids, inter-atomic distances, calculation of cohesive and bonding energy; Introduction to band theory: distinction

between metal, semiconductor andinsulator. **Waves and Oscillations:** Differential equation of a simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, Lissajous' figures, spring-mass system, calculation of time period of torsional pendulum, damped oscillation, determination of damping co-efficient, forced oscillation, resonance, two-body oscillations, Reduced mass, differential equation of a progressive wave, power and intensity of wave motion, stationary wave, group velocity and phase velocity, architectural acoustics, reverberation and Sabine's formula. **Physical Optics:** Theories of light; Interference of light, Young's double slit experiment; Displacements of fringes and its uses; Fresnel Bi-prism, interference at wedge shaped films, Newton's rings, interferometers; Diffraction of light: Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit & N-slits-diffraction grating; Polarization: production and analysis of polarized light, Brewster's law, Malus law, Polarization by double refraction, retardation plates, Nicol prism, optical activity, polarimeters, polaroid.

Books:

1. Physics Part I & II, Robert Resnick & David Halliday, New age International Publishers.
2. Concepts of Modern Physics, Arthur Beiser, Mc Graw Hill International Student Editions.
3. Heat and thermodynamics, Brij lal & Subramanyum, S. Chand & Company Ltd.
4. Properties of matter, Brij lal & Subramanyum, S. Chand & Company Ltd.
5. A Text Book of Sound, Brij lal & Subramanyum, S. Chand & Company Ltd.
6. A text Book of Optics, Brij lal & Subramanyum, S. Chand & Company Ltd.

Course Code: PHY 102

Course Title: Physics Lab

Credits: 1.5

Prerequisite: None

Lab work based on theory, assigned by the course teacher.

Course Code: MTH 101

Course Title: Math I

Credits: 3.00

Prerequisite: N/A

Three dimensional geometry: Co-ordinates in three dimensions, direction cosines and direction ratios, planes, sphere, straight line and conicoids (basic definition and properties only). **Concept of functions**: Function, domain and range of a function, graphs of simple functions (exponential, logarithmic and trigonometric), inverse function, function of several variables. **Limit and continuity for single and several variables**: Existence of limits, limits at infinity, properties and computational techniques of limits, properties of continuous functions, L' Hospital's rule. **Differentiation and its applications**: Tangent lines and rates of change, differentiability, techniques of differentiation, successive differentiation, Leibnitz's theorem, Rolle's theorem and mean value theorem, Taylor and

Maclaurin polynomials, error analysis. **Partial differentiation**: Chain rule, successive partial derivatives, Euler's theorem on homogeneous functions, change of variable and jacobians, maxima and minima (single and several variables). **Indefinite integration:** Antiderivative, techniques of integration, reduction formulae involving one and two parameters. **Definite integrals and its applications**: Integration as the limit of a sum, basic properties of definite integrals, fundamental theorem of calculus, evaluation of area, length of (plane, parametric and polar) curves, surface area and volume using definite integrals, triple integral in cylindrical and spherical coordinates, moments and center of mass, Infinite (improper) integrals, Gamma and Beta functions, and their application. **Vectors and Scalars:** Vectors, scalars, representation and notation of a vector, laws of vector algebra, collinear and coplanar vectors, scalar and vector fields, dot and cross products.

Books Recommended:

1. A. F. M. A. Rahman and P. K. Bhattacharjee, Analytic Geometry and Vector Analysis.
2. K. Mohammad, Analytic Geometry and Vector Analysis.
3. H. Anton, I. Bivens and S. Davis, Calculus.
4. E. Swokpwski, Calculus, Boston, USA: PWS Publisher.
5. B. C. Das and B. N. Mukherjee, Differential Calculus.
6. B. C. Das and B. N. Mukherjee, Integral Calculus.
7. M. R. Spiegel, Vector Analysis, Schaum Outline Series.

5.2 First Year Second Semester

Course Code: CHEM 111

Course Title:

Credits: 3.00

Prerequisite: N/A

Atomic structure, quantum numbers, electronic configuration, periodic table; Properties and uses of noble gases; Different types of chemical bonds and their properties; Molecular structure of compounds; Selective organic reactions; Different types of solutions and their compositions; Phase rule, phase diagram of monocomponent system; Properties of dilute solutions; Thermochemistry, chemical kinetics, chemical equilibria; Ionization of water and pH concept; Electrical properties of Solution.

Text Books:

1. Physical Chemistry, Author: Bhall and Tully
2. Inorganic Chemistry, Author: Haider

Course Code: CHEM 112

Course Title: Chemistry Lab

Credits: 1.50

Objectives: Laboratory works and assignments will be based on CHEM – 101

Volumetric analysis: acid-base titration, oxidation-reduction titration, determination of Fe, Cu, Ca volumetrically

Course Code: MTH 103

Course Title: Math II: Linear Algebra

Credits: 3.00

Prerequisite: None

Introduction to Vectors: Vectors and Linear Combinations, Lengths and Dot Products. **Solving Linear Equations**: Linear Equations, The Idea of Elimination, Elimination Using Matrices, Rules of Matrix Operations, Inverse Matrices, Elimination=Factorization: A = LU, Transposes and Permutation. **Vector Spaces and Subspaces:** Spaces of Vectors, The Nullspace of A: Solving Ax = 0, The Rank and the Row Reduced Form, The Complete Solution of Ax = b, Independence, Basis and Dimension. Dimension of the Four Subspaces. **Orthogonality:** Orthogonality of the Four Subspaces, Projections, Least Squares Approximations, Orthogonal Bases and Gram-Schmidt. **Determinants:** The Properties of Determinants, Permutations and Cofactors, Cramer's Rule, Inverses, and Volumes. **Eigenvalues and Eigenvectors:** Introduction to Eigenvalues, Diagonalizing a Matrix, Applications to Differential Equations, Symmetric Matrices, Positive Definite Matrices, Similar Matrices, Singular Value Decomposition (SVD). **Linear Transformations:** The Idea of a Linear Transformation, The Matrix of a Linear Transformation, Diagonalization and the Pseudoinverse. **Applications:** Matrices in Engineering, Graphs and Networks, Markov Matrices, Population, and Economics, Linear Programming, Fourier Series: Linear Algebra for Functions, Linear Algebra for Statistics and Probability, Computer Graphics. **Numerical Linear Algebra:** Gaussian Elimination in Practice, Norms and Condition Numbers, Iterative Methods for Linear Algebra. **Complex Vectors and Matrices:** Complex Numbers, Hermitian and Unitary Matrices, The Fast Fourier Transform.

Books Recommended:

1. Gilbert Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press and SIAM.
2. L. Seymour, Linear algebra, New Delhi: Mc-Graw Hill.
3. M. A. Rahman, Linear Algebra, Dhaka: Nahar Book.

Course Code: EEE 121

Course Title: Electrical & Electronic Engineering I

Credits: 3.00

Prerequisite: None

Basic concepts: current, voltage, emf, Ohm's law, Kirchoff's Current and Voltage Laws, Current and voltage divider rules, types of sources, source conversion methods, equivalent resistance, star-delta conversion; **Network analysis and theorems**: loop and nodal analysis, Superposition, Thevenin's, Norton's and Maximum Power transfer theorems; Introduction to Faraday's Law, Lenz's Law, Fleming's Left Hand and Right Hand Rules, Inductor and Capacitor; **AC fundamentals**: Amplitude, frequency, phase, power, Form factor, Crest factor, power factor, average value and effective value; AC analysis using phasor algebra; DC Transient analysis in RL and RC circuits; **Introduction to semiconductors**: Diode: characteristics, rectification; Zener diode: characteristics and applications; Bipolar Junction Transistor: characteristics, biasing, introduction to hybrid model, ac analysis; Field Effect Transistor: Characteristics.

Books:

1. Electrical Technology – B L Thereja, Chand (S) & Co Ltd, India.
2. Introductory Circuit Analysis – R L Boylestad, Prentice Hall.
3. Circuits, Devices and Systems: A First Course in Electrical Engineering, Ralph J Smith & Richard C Dorf, Wiley.
4. Electronic Devices and Circuit Theory, R L Boylestad & Louis Nashelsky, Prentice Hall.
5. Schaum's Outline of Basic Circuit Analysis, John O'Malley, McGraw-Hill.

Course Code: CSE 103

Course Title: Structured Programming

Credits: 3.00

Prerequisite: CSE 101

Character Strings: Variable length character strings, String manipulation, Dynamic memory allocation.**Recursive functions:** Defining and working procedure, base condition. **Structures**: Concepts, Accessing members, Arrays of structures. **Pointers**: Fundamentals, declarations, Pointers and structures/arrays, Operations on Pointers, Pointers to function, Pointer and memory address, Arrays of Pointers. **File Operations**: opening and closing a file, Operation on a file, Binary I/O, Random access. **Additional features**: Low level programming, Bitwise operations, The preprocessor, Compiler directives, command line arguments. **C++**: Introduction to C++ and Object Oriented Programming, I/O system in C++, file system in C++, Array, Pointers, References and Dynamic memory allocation in C++.

Text Books:

1. C++ The Complete Reference (5^{th} Edition) – Herbert Schildt – McGraw-Hill Education
2. Programming in ANSI C (3^{rd} Edition) – E. Balagurusamy - Tata McGraw-Hill Education

Reference Books:

1. Teach yourself C+ + (3^{rd} Edition) - Herbert Schildt - McGraw-Hill Education
2. C++ - How to Program – Deitel & Deitel - Prentice Hall

Course Code: CSE 104

Course Title: Structured Programming Lab

Credits: 1.50

Prerequisite: None

Objectives: Laboratory works and assignments will be based on CSE – 103

Course Code: CSE 105

Course Title: Discrete Mathematics

Credits: 3.00

Prerequisite: None

Mathematical Models & Foundations: Logic, Proposition, Propositional Equivalence, **Propositional and Predicate Calculus:** Predicates, predicate formulas, Quantifiers, Statements and Compound statements, tautologies and contradictions, logical equivalence, algebra of propositions and conditionals, arguments and theory of inference of prepositional calculus. **Methods of proof:** Mathematical Induction. **Sets:** Set theory--Basic concepts of sets and elements, Venn diagram and membership table, set operations, algebra of sets duality classes of sets, power set. Relations between sets, Operations on sets. **Functions:** Basic properties. Classifications of functions. **Counting:** The basics of Counting, The Pigeonhole principle, Permutations and Combinations, Discrete Probability, Probability Theory. **Advanced Counting Techniques:** Recurrence Relations, Solving Recurrence Relations, Generating Functions. Functions and counting, inclusion-exclusion principle. **Number Theory:** Division Algorithms-GCD, LCM, Prime numbers and prime factorization, modular arithmetic and congruence, modular exponentiation, Eucledian algorithm. Introduction to groups, rings and fields.

Relations: Relations and Their Properties, Representing Relations, Composition of relations, Closures of Relations, Closure operations on relations, Equivalence Relations, Partial Orderings. **Graphs:**Basic definitions and different types of graphs, Representation of Graphs and Graphs Isomorphism, Connectivity, Planner Graphs, Euler's Formula, Kuratowski's Theorem, Euler and Hamilton Circuits and Paths and their Properties, Digraphs, Graph Coloring techniques and applications. **Tree:** Properties of Tree, rooted trees, tree traversal, spanning tree.

Course Materials:

1. Keneth H. Rosen, Discrete Mathematics and its Applications, McGraw Hill, 1995.
2. Elements of Discrete Mathematics,C. L. Liu., McGraw Hill.
3. Discrete Mathematics in Computer Science, Donald F. Stanat, David F. McAllister
4. Schaum's Outline of Discrete Mathematics, Seymour Lipschutz
5. Discrete Mathematics: A Bridge to Computer Science and Advanced Mathematics,Olympia Nicodemi, West Group.
6. Concrete Mathematics, Ronald L. Graham, Donald E. Knuth, and Oren Patashnik (Reading, Massachusetts: Addison-Wesley.)

Course Code: EEE 122

Course Title: Electrical & Electronic Engineering I Lab

Credits: 1.50

Prerequisite: None

Laboratory work based on EEE 121

5.3 Second Year First Semester

Course Code: MTH 201

Course Title: Math III: Multivariable Calculus

Credits: 3.00

Prerequisite: MTH 103, MTH 101

Vectors and the Geometry of Space: Cylinders and Quadric Surfaces. Vector Functions: Vector Functions and Space Curves, Derivatives and Integrals of Vector, Functions, Arc Length and Curvature, Motion in Space: Velocity and Acceleration. Partial Derivatives: Functions of Several Variables, Limits and Continuity, Partial Derivatives, Tangent Planes and Linear Approximations, The Chain Rule, Directional Derivatives and the Gradient Vector, Maximum and Minimum Values, Lagrange Multipliers. Multiple Integrals: Double Integrals over Rectangles, Iterated Integrals, Double Integrals over General Regions, Double Integrals in Polar Coordinates, Applications of Double Integrals, Surface Area, Triple Integrals, Triple Integrals in Cylindrical Coordinates, Triple Integrals in Spherical Coordinates, Change of Variables in Multiple Integrals. Vector Calculus: Vector Fields, Line Integrals, The Fundamental Theorem for Line Integrals, Green's Theorem, Curl and Divergence, Parametric Surfaces and Their Areas, Surface Integrals, Stokes' Theorem, The Divergence Theorem.

Books Recommended:

1. James Stewart, Multivariable Calculus, Cengage Learning.
2. Edwards, Henry C., and David E. Penney. Multivariable Calculus, Prentice Hall.

Course Code: EEE 221

Course Title: Electrical & Electronics Engineering II

Credits: 4.00

Prerequisite: None

Electrical Drives: 3-φ balanced and unbalanced circuit analysis, DC Generator: Principles, operations and characteristics study; DC Motor: Principles, operations and characteristics study, Transformer: Principles, operations and characteristics study, 3-φ induction motor: Principles, operations and characteristics study, Stepper motor: Principles, operations and characteristics study. **Instrumentation:** Transducers, Solenoids, Relay, Stepper Motor, Digital-Multi-meter, Digital-Watt-meter. **Digital Electronics:** Introduction to MOSFET, Basic terminology; TTL, NMOS and CMOS logic; Digital to analog converter: specifications, weighted and R-2R ladder; Analog to Digital converter: specifications, Flash, Successive Approximation, Dual-slope converters, etc.; Memory elements: ROM, static RAM and dynamic RAM, memory expansion. **Pulse Techniques:** Operational amplifier: linear applications, dc performance, ac performance; Design of Active filters: low pass, high pass and band pass; Square, triangular and saw tooth wave generation techniques, 555 timers and their applications, application of Schmitt triggers in wave shaping, application of diodes in clipping and clamping, application of inverter, chopper, rectifier, and switch mode power supply.

Books:

1. A Text Book of Electrical Technology II – B L Thereja, Chand (S) & Co Ltd ,India.
2. Power Electronics, Daniel Hart, McGraw-Hill.
3. Digital System Principles and Applications – Ronald j Tocci, Neal Widmer & Greq Moss, Prentice Hall.
4. Operational Amplifier Circuits: Theory and Applications, E J Kennedy, Oxford University Press, USA

Course Code: CSE 205

Course Title: Data Structures

Credits: 3.00

Prerequisite: CSE 101, CSE 103, CSE 105

Introduction to Data Structures, Purposes of data structure, operations. **Complexity of Algorithms:** Asymptotic Notation and Runtime Analysis of Algorithms, **Array:** Insertion, Deletion, Matrix representation of arrays, Multidimensional arrays, Pointers arrays, Record structures, Representation of records in memory; parallel arrays. Sparse matrices. Usefulness of sparse matrices. **Strings:** implementations and developing algorithms using strings. **Linked List:** Singly Linked Lists, Doubly Linked Lists and Circular Linked Lists. Basic Operations on Linked List (Insertion, Deletion, Searching, Sorting and Traverse). **Stack:** Basic Stack Operations (Push and Pop Operations), Infix, Postfix and Prefix Notation of Arithmetic Expressions, Conversions and Evaluations of Arithmetic Expressions Using Stack, **Recursion:** Direct and indirect recursion, Simulation of recursion, Depth of recursion, Removal of recursion. Towers of Hanoi using recursion. **Queue:** Basic Queue Operations (Insertion and Deletion), types of Queue, Linear Queue, Priority Queue, Circular Queue and Double-ended Queue, **Searching** – Sequential Searching, Binary Searching, **Basic Sorting:** Quick Sort, Merge Sort, Selection Sort, Inserting Sort, Radix Sort, Counting Sort, External Sort, **Trees:** Basic terminology, **Binary Tree:** Binary tree representation**,** Traversal of Binary Tree (Inorder, Preorder and Postorder), Application of Binary Trees. Set Representation, Counting Binary Trees, **Binary Search Tree:** BST representation, Basic

Operations (Creation, Insertion, Deletion and Traversing), **Heap** – Max and Min Heap, Operations on Heap(Insertion and Deletion), Heap sort, **General Tree:** Representation of General Tree, Conversion Algorithm (General Tree to Binary Tree), **Balanced Tree:** Basic Concepts of 2-3 Tree, 2-3-4 Tree, AA Tree and AVL Tree, B-Tree and Basic Operations on B-Tree, Huffman Codes and Compression Algorithm, Disjoint Set and Operations and Disjoint set forests, Red-Black tree: Properties of R-B tree, operations on R-B tree. **Graphs:** Graph Representation (Using Adjacency Matrix and Adjacency List), Basic Operations on Graph (Node/ Edge Insertion and Deletion), Traversing a Graph: Breadth-first Search, Depth-first Search. Topological Sorting. Single Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths: Floyd Warshall's Algorithm, Cycle Detection, **Hashing:** Hash Function and Overflow Handling, theoretical evaluation of overflow techniques. Open Hashing and Close Hashing, Linear Probing, Quadratic Probing, Double Hashing, randomize hash. **Files:** File queries sequential organization. Indexing Technique: Cylinder + surface indexing, Hash indexes trees, Indexing-Btrees, Tree indexing. **Case study**: (Based on a real problem) use of different data structures, their impacts on basic operations and comparisons.

Course Code: CSE 206

Course Title: Data Structures Lab

Credits: 1.50

Prerequisite: None

Objectives: Laboratory assignments will be based on Course CSE-205. Students will be able to implement different data strcutures; like Array, String, Linked List, Stack, Queue, Tree, and Graph in any programming language. They will be introduced with different sorting algorithms and advanced data structures.

Text Book:

1. Data Structures, Seymour Lipschutz, Schaum's outlines, 2nd edition.
2. Data Structures and Program Design, Robert L. Kruse, Prentice Hall.
3. Data structures and problem solving using C++, Second edition Mark Allen Weiss, Pearson Addition Wesley Education.
4. Data Structures Using C and C++, Yedidyah Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, Prentice Hall.
5. Data Structures, Edward M. Reigngold. Wilfred J. Hansen, Addison Wesley Publishing Company

Course Code: EEE 222

Course Title: Electrical & Electronics Engineering II Lab

Credits: 1.50

Prerequisite: None

Laboratory work based on EEE 221.

Course Code: MTH 203

Course Title: Probability & Statistics

Credits: 3.00

Prerequisite: None

Probability: Static and random variables (discrete and continuous), occurrence of random variables, concept of population and using statistics to make inference on characteristic(s) of population. Experiments, events, sample space, probability. Conditional probability, partitions, total probability, Bayes' theorem. Mutually exclusive events and independent events. Probability distributions: binomial, multinomial distribution,

Poisson, hyper geometric, uniform, normal, exponential; introduction to Gamma and Weibul distributions. Concept of expected value, variance, standard deviation. Presence of the distributions in different fields particularly in engineering fields. Probability density function and (cumulative) distribution function. Normal approximation to binomial; Poisson approximation to binomial. Functions of random variables, expected value, variance, standard deviation. Two-dimensional variates, marginal distributions conditional distributions, covariance, correlation, conditional expectation, central limit theorem. **Statistics:** Frequency distribution: nature of data, methods of data collection, and representation of statistical data; histogram, arithmetic mean, geometric mean, harmonic mean, median, mode and other measures of central tendency; quartiles, deciles, and percentiles. Standard deviation, mean deviation and other measures of dispersion. Moment, skewness and kurtosis. Estimation: point estimation, interval estimation, estimation of mean and standard deviation, confidence intervals, sample size. Hypothesis testing; regression analysis, correlation, chi-square and non parametric statistics; time series. Application of statistics in queuing theory and simulation, introduction to queuing models: M/M/1, M/D/1, M/G/1.

Books Recommended:

1. Walpole and Mayers, Probability and Statistics for Engineering and Scientists, Pearson.
2. R.V. Hogg and E. Tanis, Probability and Statistical Inference, Pearson.
3. W. Mendenhall, Statistics for Engineering and the Sciences,Pearson.
4. J. L. Devore, Probability and Statistics for Engineering and Sciences, Int' Edition.
5. L. L. Lapin, Probability and Statistics for Modern Engineering, Wadsworth Publishing Co Inc.
6. M. R. Spiegel and L. J. Stephens, Statistics, Schaum's outlines.

Course Code: CSE 203

Course Title: Object Oriented Programming I: Java

Credits: 3.00

Prerequisite: CSE 103

Course Contents:

Object-Oriented Fundamentals, Encapsulation, Polymorphism, Inheritance, Class, Object, Java Language Introduction, Variable Types and operators, Casting, Arrays, Introducing classes, Adding methods to class, constructor, String Handling, Garbage collection, Inheritance, Inner Class, Abstract Classes, Interfaces and Packages, Exception Handling, Java Input / Output, Multithreaded Programming and Synchronization, Applet, Event Handling, Networking with Java, Introducing the Swing, Utility Classes, Java Generics, Introduction to Android.

Books:

1. Java The Complete Reference, 8th Edition by Herbert Schildt; McGraw-Hill Osborne
2. Effective Java (2nd Edition) by Joshua Bloch; Addison-Wesley

Course Code: CSE 204

Course Title: Object Oriented Programming I: Java Lab

Credits: 1.50

Prerequisite: None

Laboratory work based on Object Oriented Programming: JAVA(CSE 203)

5.4 Second Year Second Semester

Course Code: ECN 201

Course Title: Economics

Credits: 2.00

Prerequisite: None

Micro:

1. **Introduction:** Definition and scope of economics, Basic concept and tools used in economics, Economic problems- scarcity and resources.
2. **Demand, Supply and Market:** Concept of demand, supply and equilibrium, Determinants of demand and supply, Shifting of demand and supply curves, Applications of demand and supply, Elasticity of demand and supply.
3. **Theory of Consumer Behavior:** Concepts of utility, Paradox of value, Law of diminishing marginal utility, Indifference curve, Budget constraint, Consumer's equilibrium.
4. **Theory of Firm:** Production function, Law of diminishing return, Stages of production, Law of variable proportion, Short run and long run production and costs.
5. **Market:** Taxonomy of markets, Characteristics of different types of markets.

Macro:

6. **Money and Banking:** Definition and functions of money, Different kinds of money,commercial bank and the money stocks, Functions of central bank, Money supply.
7. **Introduction to Inflation and Unemployment:** Types and costs of inflation and unemployment.

Books Recommended:

1. Roger A Arnold: Economics. West publishing company, 1989
2. P.A. Samuelson and WD. Nordhaus: Economics, McGraw-Hill, latest edition

Course Code: CSE 207

Course Title: Algorithm

Credits: 3.00

Prerequisite: CSE 103, CSE 205

Introduction: The role of algorithms in computing. **Complexity analysis**: Growth of function, asymptotic notations, orders, designing worst case and average-case. **Recurrence relations**: Substitution method, iteration method, master method. **Divide and Conquer**: Basic idea, control structure properties of D & C, applications of D & C. **Dynamic Programming**: Elements of Dynamic Programming, Comparison with D & C. Application of Dynamic programming in: Optimal binary search tree, 0/1 Knapsack problem. **Greedy Method**: Elements of greedy method, basic control structure, Application of Greedy method in: Minimum cost spanning tree, Huffman code, Job sequencing with deadline. **Backtracking:** Basic idea behind backtracking, control structure. Application of backtracking in: graph coloring problem, n -queens problems. **Branch and Bound**: Basic idea and control structure of Branch and Bound. FIFO branch and Bound, LC Branch and Bound, the l5-puzzle problem. **Graph related algorithms**: Breadth First search, Depth First search, Topological sort, Dijkstra's shortest path algorithm, The Bellman-Ford algorithm for single source shortest path, The Floyd-War shall algorithm for all pair shortest path, Johnson's algorithm for sparse graph, Flow networks, the Ford-Fulkerson

method. **Number theory algorithms**: Factorization problem, discrete logarithm problem, RSA, ElGamal, Diffie-Hellman. **String Matching**: Naïve string matching algorithm, the Rabin-Karp algorithm. **Computational Geometry**: Line segment properties, finding the convex hull. **NP-Completeness**: Polynomial time, polynomial time verification, NP-completeness and reducibility, NP- completeness proofs, NP complete problems. **Approximation Algorithms:** Introduction, the vertex-cover problem, the traveling-salesman problem, the subset-sum problem.

Texts Recommended:

1. Introduction to Algorithms – Cormen, Leiserson, Rivest, Stein. Prentice Hall.
2. Fundamental Algorithms (Vol-I) (The Art of Computer Programming) – Donald E. Knuth. Addison-Wesley
3. Fundamentals of Computer Algorithms – Ellis Howrowuz & Sartaj Sahni. Computer Science Press.

Course Code: CSE 208

Course Title: Algorithm Lab

Credits: 1.50

Prerequisite: None

Objectives: Laboratory assignments will be based on Course CSE-207. Students will be given various algorithmic problems based on different algorithm domains. They will be able to learn algorithmic techniques and their relative performances.

Course Code: MTH 205

Course Title: Math IV: Differential Equations and Fourier and Laplace Transformation

Credits: 3.00

Prerequisite: MTH 201

Basic Concepts: Introduction and First Definitions, Direction fields. **First Order Differential Equations:** Linear Equations, Separable Equations, Exact Equations, Bernoulli Differential Equations, Substitutions, Intervals of Validity, Modeling with First Order Differential Equations, Equilibrium Solutions, Euler's Method. **Laplace Transforms:** Laplace Transforms, Inverse Laplace Transforms, Step Functions, Solving Initial Value Problems with Laplace Transforms. **Systems of Differential Equations:** Second Order Equations and Systems, Euler's Method for Systems, Qualitative Analysis, Linear Systems (Vector Representations of Solutions of Linear Systems, Eigenvalues and Eigenvectors Technique, Qualitative Analysis of Linear Systems), Nonlinear Systems (Equilibrium Point Analysis: Linearization Technique). **Series Solutions:** Series Solutions, Euler Equations. **Higher Order Differential Equations:** Basic Concepts for n^{th} Order Linear Equations, Linear Homogeneous Differential Equations, Undetermined Coefficients, Variation of Parameters, Laplace Transforms, Systems of Differential Equations, Series Solutions. **Boundary Value Problems & Fourier Series:** Boundary Value Problems, Eigenvalues and Eigenfunctions, Periodic Functions and Orthogonal Functions, Fourier Sine Series, Fourier Cosine Series, Fourier Series, Convergence of Fourier Series. **Partial Differential Equations:** The Heat Equation, The Wave Equation, Terminology, Separation of Variables, Solving the Heat Equation, Heat Equation with Non-Zero Temperature Boundaries, Laplace's Equation, Vibrating String.

Books Recommended:

1. Morris Tenenbaum,and Harry Pollard, Ordinary Differential Equations, Dover Books.
2. Stanley J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Books.
3. Paul Blanchard, Robert L. Devaney, Glenn R. Hall, Differential Equations, PWS Publishing.
4. William H. Boyce and Richard C. Diprima, Elementary Differential Equation and Boundary Value Problmes.

Course Code: CSE 209

Course Title: Digital Logic & System Design

Credits: 4.00

Prerequisite: None

Boolean Algebra: truth tables, canonical and standard forms of functions, logic operations; Simplification of functions: Karnaugh map, SOP and POS methods, non-degenerate terms, don't care conditions, tabulation method; Logic gates: AND, OR, NOT and universal gates, NAND, NOR, wired-OR and wired-AND implementation; Combinational logic: half and full adder and subtractor, binary parallel adder, BCD adder, encoder and decoder, multiplexer and demultiplexer, Boolean function implementation using decoder and multiplexer; design and implementation of logic circuits; Sequential logic: latches, flip flops, flip flop excitation table; Counters: asynchronous and synchronous binary and BCD counters, Johnson counters and ring counters; Synchronous sequential circuits: state diagrams, state tables, state equations, Mealy and Moore type circuits, state reduction, state assignment, incompletely specified diagrams; Asynchronous Sequential circuits: fundamental and pulse mode circuits, race and cycles, methods of secondary assignment.

Design the various Components of a Computer: Flag Registers Shift and Parallel Registers Memory Units, Control Unit. Design of Simple Microprocessor, (SAP1 & SAP2): Architecture, Instructions Set, Instruction Cycle, Programming Model)

Text Book:

1. Digital Electronics- Author: Ronald J. Tocci, Publisher: Prentice Hall
2. Digital Logic and Computer Design- Author: M. Morris Mano, Publisher: Pearson Prentice Hall
3. Digital Computer Electronics- Author: Malvino- Brown, Publisher: TaTa-McGraw Hill

Course Code: CSE 210

Course Title: Digital Logic & System Design Lab

Credits: 1.50

Prerequisite: None

Laboratory work will be based on the theory classes.

Course Code: CSE 211

Course Title: Database Systems

Credits: 3.00

Prerequisite: None

Introduction: Purpose of Database Systems, Data Abstraction, Data Models, Instances and Schemes, Data Independence, Data Definition Language, Data Manipulation Language, Database Manager, Database administrator, Database Users, Overall System Structure, Advantages and Disadvantage of a Database Systems. *Data Mining and analysis, Database*

Architecture, History of Database Systems

Relationship Entity-Model: Entities and Entity Sets, Relationships and Relationship Sets, Attributes, *Composite and Multivalued Attributes*, Mapping Constraints, Keys, Entity-Relationship Diagram, Reducing of E-R Diagram to Tables, Generalization, *Attribute Inheritance*, Aggregation, *Alternative E-R Notatios*, Design of an E-R Database Scheme.

Relational Model: Structure of Relational Database, *Fundamental Relational Algebra Operations*, The Tuple Relational Calculus, The Domain Relational Calculus, Modifying the Database.

Relational Commercial Language: *SQL, Basic structure of SQL Queries, Query-by-Example, Quel., Nested Sub queries, Complex queries, Integrity Constraints, Authorization, Dynamic SQL, Recursive Queries.*

Relational Database Design: Pitfalls in Relational Database Design, *Functional Dependency Theory*, Normalization using Functional Dependencies, Normalization using Multivalued Dependencies, Normalization using join Dependencies, *Database Design Process*.

File And System Structure: Overall System Structure, Physical Storage Media, File Organization, *RAID*, Organization of Records into Blocks, Sequential Files, Mapping Relational Data to Files, Data Dictionary Storage, Buffer Management.

Indexing And Hashing: Basic Concepts, *Ordered Indices,* B+ -Tree Index Files, B-Tree Index Files, Static and Dynamic Hash Function, Comparison of Indexing and Hashing, Index Definition in SQL, Multiple Key Access.

Query Processing *and Optimization*: Query Interpretation, Equivalence of Expressions, Estimation of Query-Processing Cost, Estimation of Costs of Access Using Indices, Join Strategies, Join Strategies for parallel Processing, Structure of the query Optimizer, *Transformation of Relational Expression*

Concurrency Control: Schedules, Testing for Serializability, Lock-Based Protocols, Timestamp-Based Protocols, Validation Techniques, Multiple Granularity, Multiversion Schemes, Insert and Delete Operations, *Deadlock Handling*

Distributed Database: Structure of Distributed Databases, Trade-off in Distributing the Database, Design of Distributed Database, Transparancy and Autonomy, Distributed Query Processing, Recovery in Distributed Systems, Commit Protocols, Concurrency Control.

Reference Books:

1. Database System Concepts – Abraham Silberschratz, Henry K. Korth, S. Sudarshan, McGraw-Hill Publisher
2. Fundamentals of Database Systems - RamezElmasri,Shamkant B. Navathe,The Benjamin/Cummings Publishing Company, 1994
3. Database Principles, Programming, Performance - Patrick O'Neil, Morgan Kaufmann Publishers, 2001
4. A First Course in Database Systems -Jeffrey D. Ullman, Jennifer Widom, Prentice Hall Publisher, 1997

Course Code: CSE 212

Course Title: Database Systems Lab

Credits: 1.50

Prerequisite: None

Laboratory works based on theory classes.

5.5 Third Year First Semester

Course Code: HSS 301

Course Title: English II : English for Communications

Credits: 2.00

Prerequisite: HSS 101

Introduction: Issues of technical writing and effective oral presentation in Computer Science and Engineering; **Writing styles of definitions:** propositions, theorems and proofs; **Preparation of reports**: research papers, technical papers etc. **Theses and books**: abstract, preface, contents, bibliography and index; Writing of book reviews and referee reports;

Writing tools: LATEX; Diagram drawing software; presentation tools.

Theory and Process of communication; Barriers to Effective communication; Communication **skills:** Reading, Writing, Listening, and Speaking skills;

Written communication: The writing process, writing formal letter, resume/CV, memos and formal reports etc. Tender writing, Job Vacancy Announcement, Auction Announcement.

Oral communication: Use of visual aids in communication; Communicating in today's workplace: Professionalism, Teamwork, speaking skill. Effective Business Meeting; Internal Communication. Oral reports /reporting work place data, Presentation skills, interviews, and communication over telephone etc.

Reading: Reading for main ideas, using contexts for vocabulary, scanning for details, making inferences, reading reports and various articles, papers, etc.

Recommended Texts:

1. Writing and presenting reports, Author: Eunson B, John Wiley
2. Writing Tools: 50 Essential Strategies for Every, Author: Roy Peter Clark
3. How to Write Technical Reports: Understandable Structure, Good Design, Convincing Presentation, Author: Lutz Hering, Heike Hering
4. LaTeX: A Document Preparation System, Author: Leslie Lamport
5. Basic Business Communication (7^{th} edition), by Rayomond V. Lesikar, John D. Petit, Marie E. Flatley
6. Effective Business Communications, by Murphy, Herta A, Hildebrandt, Herbert W, and Thomas, Jane P.
7. The Business Communication handbook Author: Dwyer J, Prentice-Hall
8. Essentials of Business Communication Author: Mary Ellen Guffey, Dana Loewy

Course Code: CSE 305

Course Title: System Analysis and Design

Credits: 3.00

Prerequisite: CSE 211

Introduction to System analysis, concepts, understanding and modeling organization Systems, System development life cycle(SDLC), structured analysis and structured design, object oriented analysis and design, Different types of information, Qualities of information, Analysis of Information requirements for modern organizations, Role, tasks and attributes of a Systems Analyst, Sources of information, Information gathering techniques, Requirements specifications; Steps of systems analysis; System analysis toolkit: CASE tools, prototyping, software life cycle, SOW(statement of work), CB analysis, value(cost of money), NPV analysis, CPM , PERT, Requirement modeling, Agile modeling, Data and process modeling, Object modeling, Development strategies, Output and user interface design, Data design, Designing input/output, Designing file, database, user interface, Dataflow diagram, System architecture, Analysis process: Object oriented System analysis, introduction to UML, Use case

modeling, sequence diagram, domain model, interaction diagram, Gantt charts, Cocomo model, tree model, introduction to software design pattern, Project management.

Texts Recommended:

1. System Analysis and Design – Elias M. Awad, Richard D. Irwin, Inc.
2. System Analysis and Design (A case study approach) – Robert. J. Thierauf, Merrill Pub Co
3. System Analysis and design - Alan Dennis, Barbara Haley Wixom, Wiley
4. System Analysis and Design - Kenneth E. Kendall, Julie, Prentice Hall Information system development: methodologies, Techniques and tools - D.E Avison and G.Fitzgerald, McGraw Hill Higher Education

Course Code: CSE 306

Course Title: System Analysis & Design Lab

Credits: 0.75

Prerequisite: CSE 212

This Lab consists of practice and presentation of the system analysis and designing tools. Students demonstrate the techniques and skills of analyzing and designing a system in order to build an automated solution (software). The software project will be fixed at the beginning of the semester, preferably pre-defined from Database Systems Course. In every lab, students go through formal presentation of their software analysis and design - starting from information gathering up to any modeling tool.

Course Code: CSE 309

Course Title: Object Oriented Programming II:Visual and Web Programming

Credits: 3.00

Prerequisite: CSE 203, CSE 211

Framework Platform: Introduction, features, components, architecture of a Framework platform (like dot NET), programming Languages to support Framework (like C#). **Inheritance and Polymorphism:** The Basic mechanics of Inheritance, Programming for Containment/Delegation, Polymorphic support in framework based languages, understanding Base Class/Derived Class Casting rules , The Master Parent Class i.e. System.Object. **Delegates and Events**: Understanding the Delegate Type, Defining a Delegate, The System.MulticastDelegate and System.Delegate Base Classes, The Simplest Possible Delegate Example, Creating Generic Delegates, Understanding Events. **Indexers, Operators, and Pointers**: Understanding Indexer Methods, Understanding Operator Overloading, Understanding Custom Type Conversions, Working with Pointer Types. **Interfaces**: Understanding Interface Types, Implementing an Interface, Invoking Interface Members at the Object Level, Interfaces as Parameters, Interfaces as Return Values, Building Enumerable Types (IEnumerable and IEnumerator). **File I/O and Isolated Storage:** Exploring the System.IO Namespace, The Directory(Info) and File(Info) Types, Working with the DirectoryInfo Type, Working with the Directory Type, Working with the DriveInfo Class Type, Working with the FileInfo Class, Working with the File Type, The Abstract Stream Class,Working with StreamWriters & StreamReaders , Working with BinaryWriters & BinaryReaders. **Windows Forms:** Introduction to Windows forms like simple window, text editor, List View, Tree View controls etc.

Web Platform: Introduction to web server and web programming, introduction to any scripting language (such as PHP, JSP), Configuring web server, HTML and Scripting language Tags, Statements and

Whitespace web programming, Comments, Functions, Variable Types and Operators, Control Flow, Arrays, HTML forms, Retrieve data from form elements using Get and Post Methods, String Manipulation, Database Connection, Executing SQL queries, Session Control and Cookies, File Handling.

Reference Books:

1. Pro C# 2008 .NET 3.5 Platform- Andrew Troelsen, Fourth Edition - Apress
2. C# .NET Web Developer's Guide – Turtschi, Werry, Hack, Albahari - Syngress
3. PHP and MySQL Web Development (4th Edition) by Luke Welling and Laura Thomson - Addison-Wesley Professional
4. PHP Solutions: Dynamic Web Design Made Easy by David Powers - friendsofED

Course Code: CSE 310

Course Title: Object Oriented Programming II Lab:Visual and Web Programming Lab

Credits: 1.50

Prerequisite: None

Laboratory work based on Visual and Web Programming (CSE 211).

Course Code: CSE 311

Course Title: Microprocessors& Assembly Language

Credits: 3.00

Prerequisite: None

Microprocessors and Microcomputers, Evolution of microprocessors, Microprocessor applications. Architecture of a general purpose Microprocessor and its operation Common instruction types, addressing modes intel 8086 Microprocessor: Internal architecture, register structure, the processor status and the flag registers, programming model, addressing modes, instruction set; I/O Pin diagram and Control signals; I/O port organization and accessing; Interrupts and Interrupt Handing system design using 8086. Architectural overview of Intel Family of general purpose Processors. Cache Memory, TLB Structure. Memory Management in Intel 80X86 Family; segmentation and Real Mode Memory Management: segmentation and segmented to physical address translation, segment wraparound; Protected Mode Memory Management; segmentation and virtual addressing, segment selectors segment descriptor tables, segment descriptor, Intel 80386 and 80486 segment register formats, Paged memory operation, page Directory and page table address translation. Linear to physical address translation. Interrupts and Exception in Intel 80 x 86 family of processors, type of Interrupts, Maskable and Non-maskable interrupts exception classes and processor defined exceptions. Interrupts in real mode and protected mode. Interrupt descriptor tables, Interrupt Gates and Trap Gates, Task Gates. Interrupts Priorities. Protection :Segment level, Page level, privileges. Task Switch Segment and Taste switching, virtual 86 Mode. Input and Output: I/O address spaces, Port organization, Memory mapped I/O, Handshaking I/O instruction, memory mapped I/O in protected mode, Protection issues in Intel 80x86 family-privilege levels, Introduction to IBM PC assembly language, , Flow control instructions, Logic, shift and rotate instructions, The stack and introduction to procedures, Multiplication and division instructions, Arrays and addressing modes, The string instructions, text display and keyboard programming,

Macros, BIOS and DOS interrupts, Disk and file operations, Memory management.

Text Book:

1. Microprocessors and Interfacing, programming & hardware by Douglas V. Hall, 2nd Edition, McGraw-Hill
2. Introduction to Microprocessor and Micro computer - Md. M. Rafiquzzaman. Publisher: Prentice Hall;
3. IBM PC Assembly Language and Programming- Author: Peter Abel. Publisher: Prentice Hall;

Course Code: CSE 312

Course Title: Microprocessors& Assembly Lab

Credits: 1.50

Prerequisite: None

Laboratory work will be based on the theory classes.

Course Code: CSE 303

Course Title: Data Communications

Credits: 3.00

Prerequisite: ECE 201, PHY 101, MTH 205

Introduction to data communication model, Data communication task, Data communication standards and organization, protocol architecture, TCP/IP model and OSI model : data representation, signal encoding and signal analysis; Data Transmission Channel: channel capacity, transmission line characteristics, Baseband and Broadband transmission; Guided and unguided transmission media; Transmission networks; Transmission modulation techniques, modems and interfaces; Multiplexing techniques; Introduction to error handling and switching techniques. Introduction to modulation techniques: pulse modulation, pulse amplitude modulation, pulse width modulation and pulse position modulation; pulse code modulation: quantization, delta modulation; TDM, FDM, OOK, FSK, PSK, QPSK; representation of noise, threshold effects in PCM and FM; asynchronous and synchronous communications; Data link control: Line configurations, flow control and error control techniques- sliding window, stop and wait ARQ, selective reject ARQ and HDLC protocol.

Reference Books:

1. Behrouz A. Forouzan, Data Communications and Networking, 4th Edition. McGraw-Hill.
2. William Stallings, Data and Computer Communications, Published by Pearson, 8th Edition

Course Code: CSE 304

Course Title: Data Communications Lab

Credits: 3.00

Prerequisite: None

Laboratory works based on theory classes

Course Code: CSE 307

Course Title: Theory of Computation

Credits: 3.00

Prerequisite: CSE 207

Concepts of Automata Theory: Alphabet, strings, languages, problems. **Finite Automata (FA):** Deterministic FA (DFA) and Non-Deterministic

(NFA), Equivalence and Conversion of NFA to DFA (the Subset Construction Algorithm),FA with epsilon transitions. **Regular Expressions:** Identities for regular expressions, Conversion between regular expressions and NFA & DFA, FA with output: Mealy machines and Moore machines. **Properties of Regular Languages:** Pumping lemma & its application, Closure properties, Decision Algorithms, Minimization of DFAs. **Grammars:** The Chomsky hierarchy, Regular grammars and regular languages, Context Free Grammars (CFGs) and Languages (CFLs), Application of CFG, Reduction of CFLs, Normal forms CNF and GNF. Pushdown Automata (PDA), DPDAs, Equivalence of PDAs & CFLs. **Properties of CFLs:** pumping lemma, decision algorithms, CYK algorithm. **Turing Machines**: Computation with Turing Machines, Turing computable functions and partial and total recursive functions. Equivalence of Unrestricted Grammars and Turing Machines, Equivalence of Context sensitive grammars and Linear Bound Automata. Recursive and Recursively Enumerable languages and their properties. **Undecidability:** Diagonalization method, Halting problem, undecidable problems from language theory, Reducibility, Self reference and the Recursive theorem. **Intractable Problems:** Polynomial-time reductions, restricted satisfiability problem, problems solvable in polynomial space, language classes based on randomization.

Texts Recommended:

1. Automata Theory, Languages, and Computation. John Hopcroft, Rajeev Motowani, and Jeffrey Ullman. Pearson, ISBN: 978-81-317-2047-9
2. Introduction to The Theory of Computation. Michael Sipser, Cengage Learning, ISBN: 1-133-18779-X.
3. An Introduction to Formal Languages and Automata. Peter Linz, Jones & Barlett Learning, ISBN: 0-669-17342-8
4. Various online sources to be determined by the instructor.

5.6 Third Year Second Semester

Course Code: CSE 313

Course Title: Numerical Methods

Credits: 3.00

Prerequisite MTH 205, CSE 205

Numerical Methods in Computer Science, Errors and Accuracy: Truncation, rounding off and algorithmic errors, absolute and relative errors, propagation of errors, error estimation. Iterative process: Solution of f(x)=0, existence and convergence of a root, convergence of the iterative method, geometrical representation, Aitken's Δ^2-process of acceleration. System of Linear Equations: Cramers rule, Gauss elimination method, Gauss- Jordan elimination, Triangularisation method of factorization process (Choleski's process), Iterative methods- Jacobi's method, Gauss-Seidel method, Comparison of various methods. Solution of Non – Linear equations: Interval Bisection Method, Newton- Raphson method, Secant method, Regula- Falsi method, Newton- Raphson method for polynomial evaluation, Nested multiplication. Finite Differences and Interpolation: Difference Operators, Factorial Notation, Differences of zero Definition and Differences of $x^{(-n)}$, Forward and Backward Differences, Shift Operator, Central Difference Operators, Averaging Operator, Divided Differences, Finite differences and differentiation, Errors in a difference table.

Finite difference Interpolation: Newton's forward interpolation formula, Newton – Gregory formula for backward interpolation, Newton's formula

for Divided Differences, Lagrange's polynomial Interpolation, Gauss forward and backward formula for central differences, Stirling's formula, Bessel's formula, Everett's formula, Choice of interpolation formula, Errors in interpolation. Numerical Differentiation: Differentiation based on equal- interval interpolation, Second-order derivatives using Newton's backward difference formula, Derivatives using central difference formula, Differentiation based on Lagrange's interpolation formula. Numerical Integration: General Quadrature formula, Trapezoidal rule, Simpson's rule, Three-eighths rule, Weddle's rule, Errors in Quadrature methods, Romberg Integration, Gauss Quadrature formula, Lobatto's formula, Central Difference Quadrature formula, Use of the quadrature formula.

Differential Equations: Taylor's series method, Picard's method, Euler's method, Improved Euler method, Euler's predictor- corrector method, modified Euler method, Runge-Kutta method, Extensions of Runge-Kutta method, Eigen value problems for matrices, Use of computer to implement projects in numerical methods.

Texts Recommended:

1. Numerical Methods for Engineers - Steven C. Chapra, Raymond P. Canale, McGraw-Hill
2. Numerical Methods – S. Balachandra Rao & C.K. Shantha, Orient Longman Limited
3. Numerical Mathematical Analysis – James B. Scarborough, Johns Hopkins Press
4. Various online sources to be determined by the instructor

Course Code: CSE 314

Course Title: Numerical Methods Lab

Credits: 0.75

Prerequisite: CSE 206

Objectives: Laboratory assignments will be based on Course CSE-313.

Course Code: CSE 319

Course Title: Computer Networks

Credits: 3.00

Prerequisite: CSE 303

Introduction to Networking, Networking Devices, Network architectures. Network Classification, Industry , Network Model and Protocols, Network Topology, Error Detection & Correction Schemes and Implementation of those Schemes, IP Overview, IPv4, IPv6, Transition from IPv4 to IPv6, IPv6 Facilities, Subnetting and supernetting- CIDR, Routing and Routing Protocols, Transport Layer Protocols: TCP and UDP ,Local Area Networks, Satellite Networks, Servers: DNS-Mail-Proxy-DHCP, Firewalls, ISP-IIG-IGW-ICX-ITC-SMC, Configuration and Design Concept, ATM Network, VoIP, Security Issues in Networking, Different Security Protocols, Hacking, Ethical Hacking, Encryption, VPN, IPSec, Firewall, SSL.

Text Books:

1. Computer Networking: A Top-Down Approach - James Kurose and Keith Ross, Addison-Wesley
2. Computer Networks - Andrew S. Tanenbaum and David J. Wetheral, Prentice Hall
3. Data Communications and Networking - Behrouz A. Forouzan,
4. Data and Computer Communications, William Stallings, Pearson

Course Code: CSE 320

Course Title: Computer Networks Lab

Credits: 1.50

Prerequisite: None

Laboratory work based on theory course.

Course Code: CSE 315

Course Title: Peripheral & Interfacing

Credits: 3.00

Prerequisite: CSE 209, CSE 311

Interfacing Basics: Interfacing components and their characteristics. **Storage devices**: RAM, ROM, Cache memory, Hard disk drive, CD, DVD, Blue Ray and Flash memory. **Controllers**: Programmable interrupt controller and DMA controller. **Computer Ports**: Parallel, Serial, USB and FireWire. **Basic I/O**: I/O systems & I/O devices. **Converters**: Programmable peripheral interface, Interface to A/D and D/A converter. **Input devices**: Keyboard, Mouse, Touchpad, Webcam, Barcode reader, Thumb scanner, 2D scanners: Flatbed, Sheet-fed, Handheld, Drum; 3D scanner. **Output devices**: 2D monitors: LCD, TFT and LED; 3D monitor; 2D printers: Dot Matrix, Ink jet, LASER; 3D printer; CNC. **Computer cards**: Graphics, Sound and LAN; **Interfacing Components**: Transistor, MOSFET and Chips; Bridge Circuits: Relay and Opto-isolator; Motors: DC, Stepper, Servo; Solenoids.

Books recommended:

1. Computer Peripherals - Barry Wilinson, McGraw-Hill.
2. Microprocessor & Interfacing – Dauglas V Hall, McGraw-Hill.

Course Code: CSE 316

Course Title: Peripheral &Interfacing Lab

Credits: 1.50

Prerequisite: CSE 210, CSE 312

Assigned by Course teacher based on theory, CSE 315.

Course Code: CSE 317

Course Title: Computer Architecture

Credits: 3.00

Prerequisite: CSE 209

Introduction: Computer Architecture and Organization. **Instruction set architecture:** Overview of MIPS, basic instruction, high level to MIPS conversion of instruction, MIPS control and data path design. **Computer arithmetic and number system:** Binary review; floating point number representation; basic addition and multiplication algorithm and hardware. **Advanced computer arithmetic:** Booth multiplication scheme, recoding process, best and worst multiplier, average gain. **Computer system performance and performance matrices:** Execution time, clock rate, processor speed, CPI-clock per instruction, mathematical problems. **Memory and cache hierarchy:** Primary memory, secondary memory, memory hierarchy, virtual memory, caching scheme: direct addressed caching, other policies, **Control design:** Processor control Unit design and data path analysis, **Pipelining:** Pipelined data path and control, super scalar and dynamic pipelining. **I/O organization: Introduction, bus control, I/O systems, p**rogrammed IO, DMA and interrupts, I/O processors, multiprocessor system: UMA, NUMA etc.

Books Recommended:

1. J. P. Hayes, Computer Architecture and Organization, McGraw-Hill.
2. W. Stallings, Computer Organization and Architecture, Mc-Millan.
3. K. Hwong, Advanced Computer Architecture, McGraw-Hill.
4. M. M. Mano, Computer Architecture and Organization, Pearson.
5. Patterson & Hennessy, Computer Organization and Design -- The Hardware/Software Interface, Morgan- Kaufmann Publishers.
6. C. Hamacher et. al., Computer Organization, McGraw-Hill.

Course Code: CSE 321

Course Title: Software Engineering

Credits: 3.00

Prerequisite: CSE 305

Concepts of Software Engineering, Software Engineering paradigms, Different phases of software system development, Different types of information, qualities of information, Project Management Concepts, Software process and project Metrics, Software Project Planning, Risk Analysis and management, Project Scheduling and Tracking, Visualizing concept classes, UML diagrams, Interaction and Collaboration Diagram for designing Software, Designing Objects with responsibilities, GRASP patterns with General Principles in assigning responsibilities: Information expert, Creator, Low Coupling and High Cohesion, Creating design class diagrams and mapping design to codes. Advanced GRASP patterns: Polymorphism, Pure Fabrication, Indirection, Project Variation, GoF Design Patterns: Adapter, Factory, Singleton, Strategy, Composite, Observer. Software Testing: White Box and Black Box testing. Basis Path Testing, Testing for specialized environment, Software testing strategies: Unit Testing, Integration Testing, Validation Testing, System Testing, Art of debugging. Analysis of System Maintenance and upgrading: Software repair, downtime, error and faults, specification and correction, Maintenance cost models, documentation, Software Quality Assurance, Quality factors, Software quality measures, Cost impact of Software defects, Concepts of Software reliability, availability and safety, Function based metrics and bang metrics, Metrics for analysis and design model, Metrics for source code, testing and maintenance

Texts Recommended:

1. Software Engineering a practitioner's approach - Roger S. Pressman, McGraw-Hill Book Company
2. Object Oriented Modeling and Design – Michael Blaha, James Raumbugh, Prentice Hall
3. The Unified Modeling Language User/Reference Guide - Grady Booch, James Raumbugh, Pearson Education INC
4. Applying UML and Patterns - Craig Larman, Prentice Hall
5. Design Pattern – Erich Gamma, Richard Helm, Ralph Jhonson, John Vlissides, Addison-Wesley Professional
6. Various online sources to be determined by the instructor

Course Code: CSE 322

Course Title: Software Engineering Lab

Credits: 0.75

Prerequisite: CSE 306

The material presented in this course is intended to acquaint students with some of the elementary software testing methods, tools and techniques currently being used by different software testing organizations in the industry. Students learn and apply different Black Box software testing tools followed by some ideas on White Box testing as well. As the tools for Black Box Testing, Selenium, QTP etc tool will be used and necessary platforms and language essentials, if necessary to complete the task, are demonstrated to the students. For testing purpose, students use the

same software projects those they have completed in Software Development course. Black Box Testing tools are not limited to the mentioned ones and can be designed as course instructor wants to.

5.7 Fourth Year First Semester

Course Code: CSE 401

Course Title: Mathematics for Computer Science

Credits: 3.00

Prerequisite: MTH 203, CSE 207

Recurrent problems; Manipulation of sums; Number theory; Special numbers; Generating functions. Random variables; Stochastic process; Markov chains: discrete parameter, continuous parameter, birth-death process; Queuing models: birth-death model, Markovian model, open and closed queuing network; Application of queuing models.

Books Recommended:

1. Concrete Mathematics: A Foundation for Computer Science, by Ronald Graham, Donald Knuth, and Oren Patashnik. 2nd Edition, Addison-Wesley Professional.
2. The Art of Computer Programming, Volume 1 and 2, by Donald E. Knuth. Third Edition, Addison-Wesley.
3. Introduction to Probability Models, by Seldon M. Ross, 10th Edition, Academic Press.
4. Probability and Statistics with Reliability, Queing, and Computer Science Applications, by Kishor S. Trivedi. Wiley-Interscience.

Course Code: CSE 403

Course Title: Artificial Intelligence and Expert Systems

Credits: 3.00

Prerequisite: CSE 205, CSE 207

Overview of AI: Introduction, Definition, Foundation, **Agent:** Characteristics, Environments, Agent Types, **First Order Logic:** Basic Elements, Quantifiers, Proof Tree, Forward Chaining, Backward Chaining, Resolution, **Searching: Uninformed Search:** Breadth-First Search (BFS), Depth-First Search (DFS), Uniform-Cost Search (UCS), Depth-Limited Search (DLS), Iterative Deepening Search (IDS), Bi-Directional Search (BDS), **Informed Search:** Greedy Best-First Search, A* Search, Memory-Bounded Heuristic Search, **Local Search:** Hill-Climbing Search, Simulated Annealing, Local Beam Search, Genetic Algorithm, **Game Playing:** Game Definition, Game Theory, Zero Sum Game, Minimax Algorithm, Alpha-Beta Pruning, **Planning and Acting:** Action Schema, Preconditions and Effects, PDDL Description, **Uncertainty and Reasoning:** Rational Decision, Probability Theory, Utility Theory, Decision Theory, Bayes' Rule, **Decision Making:** Axioms of Utility Theory, Allais Paradox, Ellsberg Paradox, **Learning:** Factors, Components, Types, Unsupervised Learning, Supervised Learning, Semi-supervised Learning, Deductive Learning, Inductive Learning, Reinforcement Learning.

Textbook:

1. **Artificial Intelligence – A Modern Approach (3rd Edition)**-Stuart Russell and Peter Norvig

Reference Book:

1. **Artificial Intelligence (3rd Edition)**-Elaine Rich, Kevin Knight and Shivashankar B Nair

Course Code: CSE 404

Course Title: Artificial Intelligence and Expert Systems Lab

Credits: 1.50

Prerequisite: None

Laboratory work based on CSE 403.

Course Code: CSE 405

Course Title: Operating Systems

Credits: 3.00

Prerequisite: CSE 207, CSE 317

Operating system overview: OS functions, evolution of OS functions, batch processing systems, single user multiprogramming systems, time sharing systems, real-time operating systems, OS structure. Processes: Process definition, process control, interacting processes, implementation of interacting processes, threads. Scheduling: Scheduling policies, job scheduling, process scheduling, process management in UNIX, scheduling in multiprocessor OS, queuing in scheduling, scheduling algorithms, priority control, introduction to multiprocessor and real-time scheduling. Deadlocks: Definitions, resource status modeling, handling deadlocks, deadlock detection and resolution, deadlock avoidance, mixed approach to deadlock handling. Process synchronization: Implementing control synchronization, critical sections, classical process synchronization problems, evolution of language features for process synchronization, semaphores, critical regions, conditional critical regions, monitors, concurrency. Interprocess communication: Interprocess messages, implementation issues, mailboxes, interprocess messages in UNIX, interprocess messages in Mac. Memory management: Principles, requirements and design of memory management system, program loading and linking. Virtual Memory: locality, page table, translation lookaside buffer, segmentation, software implementation, load control. I/O Management and disk scheduling: Organization of the I/O function. Direct memory access. Design issues. I/O buffering. Disk I/O. Disk cache. Example systems. File management: Overview. File management systems. File organization and access, file directories. Sharing of files. Record blocking. Secondary storage management, file systems protection and security; design and implementation methodology. Example systems.

Reference Books:

1. A. S. Tanenbaum, Modern Operating Systems, Prentice Hall.
2. A. Silberschatz, P. B. Galvin, Operating System Concepts, John Wiley & Sons.
3. B. Hausen, Operating System Principles, Prentice-Hall of India.

Course Code: CSE 406

Course Title: Operating Systems Lab

Credits: 1.50

Prerequisite: None

Laboratory works based on CSE 405.

Reference Books:

1. Graham Glass and King Ables, *UNIX for Programmers and Users*, Published by Pearson, 3rd Edition.

Course Code: CSE 400

Course Title: Project/ Thesis

Credits: 2.00

Prerequisite: Based on field of interest

Students will work in groups or individually to produce high quality software in deferent languages. Students will write structured programs and use proper documentation. Advanced programming techniques in assembly language.

Rules: No overlapping with CSE 410

Course Code: CSE 407

Course Title: ICTLaw, Policy and Ethics

Credits: 2.00

Prerequisite: None

Ethics: Introduction to ethical theories and principles, Ethics and critical reasoning in computer science, Privacy, personal information, and trust, Software piracy, Music and video piracy, Misuse of software, Viruses and hacking, Computer communication and freedom of expression, Security and encryption, Content control and censorship, Computer crime, Professional issues and decision-making, Intellectual property and licensing, ACM Code of Ethics and Professional Conduct Software Engineering, Code of Ethics and Professional Practice as recommended by the ACM/IEEE-CS Joint Task Force. **Law and Policy:** National ICT Act, National ICT Policy, National e-services rules, National Information security policy guideline, National Copyright, patent, trademark related laws, Laws on document & records retention, UN conventions/Laws related to internet or cyber security, Rights to know, Freedom of Information. **Case Study:** Methods for case analysis, Analysis of Cases, Minutes of Annual Meetings of ITU, WTC, UN on ICT policy, Report/Presentation.

Texts Recommended:

1. Computer Ethics, Deborah G. Johnson. ISBN 0-13-111241-4, Pearson Publishers.
2. A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet, Sara Baase. ISBN: 0136008488, Prentice Hall.
3. Ethics for the Information Age, M. J. Quinn.ISBN: 0132855534, Addison-Wesley.
4. Readings in Cyber Ethics, R. A. Spinello and H. T. Tavani. ISBN: 0763724106. Jones and Bartlett Learning.
5. Various online sources to be determined by the instructor.

Course Code: CSE 410

Course Title: Software Development

Credits: 1.50

Prerequisite: CSE 321

Students are instructed to develop on real life oriented projects in this course. Web technologies (ASP. Net, PHP, Ajax, Java Script, Joomla, and so on) and Database (DB2, Oracle, SQL Server, MySQL, and so on) are preferred for the development.Open Source projects are also preferred as Open source code is typically created through a collaborative effort in which programmers improve upon the code and share the changes within the community. Moreover, documentation is a major concern for the project to ensure the Software Quality Assurance (SQA). Hence at the end of semester students submit their projects including the documentation.

Rules: No overlapping with CSE 400: Thesis / Project

5.8 Fourth Year Second Semester

Course Code: CSE 425

Course Title: Computer Graphics

Credits: 3.00

Prerequisite: MTH 205. CSE 103

Standard Graphics Primitives, Graphical User Interface; **Graphics Hardware:** Display devices, Raster refresh graphics display Use of frame buffer and look up table. **Coordinate convention:** Device coordinate and wild coordinate system . **Raster Scan Graphics :** Mid-point Line and Circle Creation Algorithms, Animalizing . **Polygons :** Difference type of polygons, Point location, polygon filling, triangulation Windowing and Clipping, Window Viewpoint, Zooming, panning, line text and polygon, clipping. **Transformation:** Homogeneous coordination, Transformation matrices, Transformation in 2D, Translation, rotation, sealing, Transformation in 3D translation, rotation, scaling. **Projection:** Parallel and perspective, isometric projection. **Three Dimensional Viewing and representation:** Curves, surfaces and volumes with cubic and bi cubic spines, B-Reb, CSG, Spatial Occupancy Representations. **Hidden Lines and Surface removal:** Painter's algorithm, Z-Buffering. **Rendering:** Light Models, Shading Interpolation Technique constant, Ground and Phong, Ray Tracing. **Image File Format:** PPM file, BMP file. **Introduction to Graphics Programming:** The nature of computer animation, simulation, kinematics, barometries, dynamics, and metamorphosis.

References:

1. Computer Graphics: Principles and Practice in C (2nd Edition) by James D. Foley, Andries van Dam, Steven K. Feiner and John F.
2. OpenGL Programming Guide: The Official Guide to Learning OpenGL, Version 2, 5th Edition, OpenGL Architecture Review Board (Author), Dave Shreiner (Author), Mason Woo (Author), Jackie Neider (Author), Tom Davis.

Course Code: CSE 426

Course Title: Computer Graphics Lab

Credits: 1.50

Prerequisite: None

Tool to use for lab: OpenGL. Laboratory work based on CSE 425.

Tool to use for lab: OpenGL

1. Line Drawing: Bresenhams
2. Region Filling: Scan Line Algorithm
3. Transformation: 2D and 3D translation, Rotation, Scaling
4. Clipping: Line and Polygon
5. Projection: Perspective and Parallel
6. Animation: Morphing

Course Code: CSE 400

Course Title: Project/ Thesis

Credits: 2.00

Prerequisite: None

Students will work in groups or individually to produce high quality software in deferent languages. Students will write structured programs and use proper documentation. Advanced programming techniques in assembly language.

Rules: No overlapping with CSE 410

Course Code: BUS 401

Course Title: Business and Entrepreneurship

Credits: 3.00

Prerequisite: ECN 101

Management and Organization: Fundamentals of Management, Organization of Business in Software Industries, Managing production and operation. Managerial Constraints/Environment, Managerial Skills in Software Industries. **Financial Management:** Present Value and Future Value Calculation and Residual Earnings, Payback Period, Net Present Value (NPV) Calculation, Internal Rate of Return (IRR) Calculation. **Risk Exposures**: Market Risk, Business Risk, Foreign Exchange Risk. **Human Resources and Strategic Management:** Human Relations, Motivation, Communication between Software Developers, Managing Human Resources and Labor Management Relations in Software Projects, Strategic Positioning of the Software Firm. **Marketing:** Marketing Strategies, Product & Price, Distribution and Promotion of Software. **Accounting Principles:** Accounting Fundamentals, Accounting in perspective of Software Industries, Transaction Analysis, Accounting Cycle, Principles of Journal Entries, Ledger, Trial Balance, Adjusting Entries in Software Industries. **Financial Statement:** Income statement, Cash flow statement, Balance sheet, Analysis of Financial Statements for Software Industries. **Managerial and Cost Accounting**: Cost concepts; Cost of Goods Manufactured Statement, Cost-Volume-Profit analysis, Costing for Decision making and reporting, Flexible budget and standard costing. **Entrepreneurship:** Introduction to Entrepreneurship, Forms of Entrepreneurship in Software Industries, Social responsibility and Entrepreneurship Ethics, Entrepreneurship Law and Government. **Business Plan:** Target Market, The Competition, Risk Assessment, Technology Plan, Exit Plan, Cash-Flow Projection, SWOT (Strengths/Weaknesses/Opportunities/Threats), **Case Study:** Various case studies relevant to the course for better understanding of the topics covered in this course.

Books:

1. Management, Harold Koontz, McGraw-Hill.
2. Account Principle, Weygandt,Kieso& Kimmel, John Wiley & Sons, Inc.
3. Entrepreneurship Development, Nazrul Islam and Muhammad Z Mamun, The University Press Limited.
4. Entrepreneurship Development, An Indo-German Technical Co-operation Project.

Course Code: BUS 402

Course Title: Business and Entrepreneurship Lab

Credits: 0.75

Prerequisite: None

Lab Work (alternative week) based on Theory.

Course Code: CSE 429

Course Title: Compiler Design

Credits: 3.00

Prerequisite: CSE 103, CSE 205, CSE 311

Introduction to compilers: Introductory concepts, types of compilers, applications, phases of a compiler. **Lexical analysis:** Role of the lexical analyzer, regular expressions, regular languages. **Parsing:** Parser and its role, context

free grammars, bottom-up parsing; LR (O) parsing, SLR parsing, LR (I) parsing, LALR (1) parsing, classification of context-free grammars and language. **Syntax-directed translation:** syntax directed definitions, attributes evaluation, Abstract syntax trees. **Type checking:** symbol Tables type checking, syntactic error recovery, Semantic checks for Inheritance, Sub typing and for overloading Generation of intermediate code. **Run-time organization:** runtime structures, storage strategies. **Intermediate code generation:** Intermediate languages, declarations, assignment statements. generation of inter mediate code-translation of Boolean expression, switch/case statements. **Code optimization:** Basic concepts of code optimization, principal sources of optimization, Generation of optimized target code. **Advanced Topic:** control flow graphs, live-variable analysis allocation optimization register allocation by graph coloring Available expression analysis, Global common expression elimination, Dominators, Loops in control flow graphs, Defuse & use-def chains, Loop invariant, code-notion, Partial redundancy elimination, constant propagation, optimizing Object-oriented programs, copy propagation, phase ordering of optimization, Instruction Scheduling optimizations for memory hierarchies.

Books:

1. Compilers: Principles, Techniques, and Tools – Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman. Second Edition.
2. Compiler Design and Construction (Electrical/computer science and engineering series) by Arthur B. Pyster.
3. Modern Compiler Design by D. Grune, H. Bal, C. Jacobs and K. Langendoen .

Course Code: CSE 430

Course Title: Compiler Design Lab

Credits: 1.50

Prerequisite: None

Objectives: Laboratory assignments will be based on Course CSE 429. Student will learn how to use scanner and parser generator tools (e.g., Flex, JFlex, CUP, Yacc, etc). For a given simple source language students have to design and implement lexical analyzer, symbol tables, parser, intermediate code generator and code generator.

Course Code: CSE 400

Course Title: Project/ Thesis

Credits: 2.00

Prerequisite: None

Students will work in groups or individually to produce high quality software in deferent languages. Students will write structured programs and use proper documentation. Advanced programming techniques in assembly language.

Rules: No overlapping with CSE 410

Course

Outline

(Optional)

Fourth Year First Semester: Option I

Course Code: CSE 411

Course Title: Mobile communication

Credits: 3.00

Prerequisite: CSE 319

Introduction to mobile communications networks; wireless transmission; frequencies; regulations; antennas; wireless signal propagation; modulation; spread spectrum; cellular system; media access; different types of wireless communication networks; different generations; mobile communication systems: GSM, HSCSD, GPRS, and EDGE; wireless telecommunication systems; TETRA; CDMA2000; satellite communication system; broadcast systems; digital radio; localization systems; wireless LANs; Wi-fi and WiMAX technologies; bluetooth; network protocols; mobile IP; ad-hoc networking; wireless sensor networks; transport protocols; reliable transmission; flow control; support for mobility, wireless WWW; WAP and i-mode; wireless security; mobile programming using J2ME.

Reference Books:

1. Stallings W., Wireless Communications and Networking, Prentice Hall, 2nd Ed., 2005
2. Forouzan B.A., Data Communication and Networking, McGraw-Hill, 4th Ed., 2006
3. Rappaport T.S., Wireless Communications: Principles and Practice, Pearson Education Inc., 2nd Ed., 2002

Course Code: CSE 413

Course Title: CLOUD COMPUTING

Credits: 3.00

Perquisite: CSE 207, CSE 319

Introduction to different types of computing: Edge computing, Grid computing, Distributed Computing, Cluster computing, Utility computing, Cloud computing. Cloud computing architecture: Architectural framework; Cloud deployment models; Virtualization in cloud computing; Parallelization in cloud computing; Green cloud. Cloud Bus; Cloud service models: Software as a Service (SaaS); Infrastructure as a Service (IaaS); Platform as a Service (PaaS). Foundational elements of cloud computing: Virtualization; Cloud computing operating System; Browser as a platform; Advanced web technologies (Web 2.0, AJAX and Mashup); Introduction to autonomic systems; Service Level Agreements(SLA); Security/Privacy; Cloud economics; Risks assessment; Current challenges facing cloud computing. Case studies. Practical sessions: Creating Windows servers on the cloud; Creating Linux servers on the cloud; Deploying applications on the cloud; Major cloud solutions.

Reference Books:

1. Sosinsky, B., Cloud Computing Bible, Wiley, 2011.
2. Velte, A., Velte, T., Elsenpeter, R., (2010), Cloud Computing: A Practical Approach, McGraw-Hill Osborne (Primary book to be used).
3. Reese, G., (2009), Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly

Course Code: CSE 415

Course Title: Parallel and distributed System

Credits: 3.00

Prerequisite: None.

Introduction to Parallel Architectures: Shared memory, VLSI, Message-Passing. Relation between architectures. Introduction to multithreaded, parallel, and distributed programming. A concurrent programming language. Process and synchronization. Locks and barriers. Semaphores. Monitors. Message-Passing. RPC and Rendezvous. Paradigms for process interaction. Parallel programming for science and engineering. Introduction to parallel programming, Distributed object systems; retrieving and caching of distributed information; distributed data replication and sharing; performance issues; algorithms for deadlock detection; concurrency control and synchronization in distributed system; models for distributed computation; networking facilities and resource control; management methods in network; distributed operating systems; collaborative applications; wide area network computing; web based commerce; agent systems and market based computing.

Reference Books:

1. Silberschatz A., Korth H., Sudarshan S., *Database System Concepts*, McGraw-Hill, 6th Ed., 2010
2. Xavier C., Iyengar S.S., Introduction to Parallel Algorithms, Wiley-Inter Science, 1998
3. Jaja J., An Introduction to Parallel Algorithms, Addison-Wesley, 199

Course Code: CSE 417

Course Title: Management Information Systems (MIS)

Credits: 3.00

Prerequisite: N/A

Introduction to MIS: Management Information System Concept, Role and Importance of MIS, Approaches of MIS Development, IT industry Scenario: Study on various types of IT organizations (Software Companies, Networking Companies etc.), IT status in various countries, Organogram, Infrastructure, Administration and Management scenario of an IT organization, MIS and Computer: Computer Hardware for Information System, Computer Software for Information System. Application of MIS: Applications in Manufacturing Sector, Applications in service sector, Decision Support System (DSS), Evolution of DSS, Future development of DSS, Expert System, Executive Information System, Enterprise Management System, Electronic Commerce (e-commerce), Fundamentals of e-commerce, Models of e-commerce, Technology in Management Information System, Business Process Re-engineering, Business Process Outsourcing (BPO), Case Studies.

Texts Recommended:

1. Fundamentals of management - Stephen P. Robbins, David A. Decenzo, Prentice Hall, 2007
2. Managing Information Technology Projects - Dick Billows, Hampton Group, 2004
3. Essential of Project Management - Dick Billows1, The Hampton Group
4. Project, Planning, Analysis, Financing, Implementation and Review - Prasanna Chandra, Tata McGraw - Hill Education (2009)
5. Management of Information Services - Chitra Sivakumar, K S Babai, New Delhi : Tata McGraw-Hill, 2000.
6. Various online sources to be determined by the instructor.

Course Code: CSE 419

Course Title: Sensor Networks

Credits: 3.00

Prerequisite: CSE 103, CSE 207, CSE 319

Introduction/Applications: Application domains of sensor networks.Wireless Communication Fundamentals and Basic Networking Concepts: .Wireless Communication, including an introduction to the IEEE 802.15.4 protocol standard for low-power wireless networks; packet loss characteristics as a function of environment; internet integration via 6lowPAN standard for transmission of Internet (IPv6) packets over IEEE 802.15.4 networks, Wireless LANs and PANs: Bluetooth, 802.11, and HiperLAN. Wireless Internet ,MobileIP. Basics of RF communication and the role of MAC, Popular protocols (802.11, 802.15, Bluetooth). Short range radio communication standards (IEEE802.15 protocols, e.g., Bluetooth, ZigBee). Communication Model: Wireless sensor architecture and protocol stack.Architecture of wireless sensor networks (Node structure, types, and network topologies), Physical Layer and Transceiver Design Considerations,MAC protocols for sensor networks,Routing protocols for sensor networks, Transport protocols for sensor networks.Cellular and Ad Hoc Wireless Networks-Applications of Ad Hoc Wireless Networks,Issues in Ad Hoc Wireless MAC Protocols for Sensor Networks -Location Discovery-Quality of Sensor Networks Evolving Standards-Other Issues- Low duty cycle and wake up concepts- The IEEE 802.15.4 MAC Protocols- Energy Efficiency -Geographic Routing Mobile nodes,Scalability-Deployment Considerations, Ad Hoc Wireless Internet.Comparison with Adhoc wireless networks-Challenges for WSNs – Difference between sensor networks and Traditional sensor networks, Types of Applications, Enabling Technologies for Wireless Sensor Networks –Single NodeArchitectures,Hardware/software platforms, Performance metrics.Hardware Components, Energy Consumption of Sensor Nodes, Issues in Designing a Multicast Routing Protocol.Data Dissemination-Flooding and Gossiping-Data gathering Sensor Network Scenarios –Optimization Goals and Figures of Merit – Design Principles for WSNs, Gateway Concepts – Need for gateway – WSN to Internet Communication –Internet to WSN Communication –WSN Tunneling.Operating systems for wireless sensor networks:TinyOS, Contiki, Network supported process measurements. Routing: Data centric-protocols: gossiping, data centric,rumor routing, directed diffusion.Hierarchical protocols:LEACH. Location-based (Geographical) protocols and energy-aware routing: GPSR, geometric spanners, distributed topology routing (PRADA).Multipath-routing, dynamic and static routing etc.Timing/synchronization;Coverage and connectivity: properties and quality aspects.Gossiping and Agent based UnicastForwarding:Energy Efficient Unicast-Broadcastand Multicast-Geographic Routing-Mobile nodes-Security-Application Specific Support Target detection and tracking-Contour/ edge detection-Field Sampling.Localization and Coverage: Global location (GPS-based) and relative location (Beacon-based). Localization: including localization methods and ranging mechanisms, a study of various localization systems based on acoustic and radio ranging, conditions for unique localizability of a sensor network,Localization methods: anchor-free, anchor-based, range-free, range-based.Energy Management in Ad Hoc Wireless Networks: Energy Conservation, including methods to extend overall network lifetime by duty cycling individual sensor nodes,Energy Harvesting, including design of an energy-harvesting capable sensor node; methods to predict the energy storage and harvesting resources for perpetual operation.

Query Processing in Sensor Networks: Fundamentals of query approaches: push vs. pull based processing. Review of SQL.Real-time query scheduling, Integrating event-streams with signal processing operations In-network processing andaggregation: TinyDB and TAG. Statistical approaches to computing aggregates: quantile-digest. Robust aggregation: ODI synopses. Mobility and Tracking: Tracking with Binary Sensors Distributed trajectory tracking and data reduction. Selection of tracking principals. RFID Systems: Tag identification protocols. Reader anti-collision algorithms In-door localization with RFIDs. Advanced Topics: Security in WSN.Security, including cryptography for resource-constrained nodes, protocols for secure node-to-node communication; protocols for secure broadcast in wireless sensor networks; protocols for key distribution in low-power multi-hop sensor networks, Macro-programming, or aggregate programming models for sensor networks such as region-based programming models, and query-based programming models.

Text Books:

1. Holger Karl and Andreas Wiilig, "Protocols and Architectures for Wireless Sensor Networks" John Wiley & Sons Limited.
2. Ian F. Akyildiz, Mehmet Can Vuran, "Wireless Sensor Networks (Advanced Texts in Communication and Networking)", Wiley, ISBN: 978-0470036013
3. I.F .Akyildiz and Weillian, "A Survey on Sensor Networks",IEEE Communication Magazine, August 2007.
4. Wilson , "Sensor Technology hand book," Elsevier publications 2005.
5. Anna Hac "Wireless Sensor Networks Design," John Wiley& Sons Limited Publications 2003.
6. C.Siva Ram Murthy and B.S.Manoj "Ad Hoc Wireless Networks," Pearson Edition 2005.
7. C.S. Raghavendra, Krishna M. Sivalingam, TaiebZnati, "Wireless Sensor Netork", Springer, ISBN: 978-0387352695
8. NirupamaBulusu and Sanjay Jha (editors),Wireless Sensor Networks: A Systems Perspective, Artech House, July 2005.
9. F. Zhao and L. Guibas, Wireless Sensor Networks: An Information Processing Approach, Morgan Kaufman, 2004.
10. W. Stallings, Wireless Communications and Networks, 2nd Edition, Prentice Hall, 2005.
11. I. Stojmenovic (editor) Handbook of Sensor Networks: Algorithms and Architectures, John Wiley and Sons, 2005.
12. Wireless Sensor Networks: An Information Processing Approach. Feng Zhao and Leonidas Guibas. Publisher: Morgan Kaufmann, 2004.
13. G.J. Pottie and W.J. Kaiser, "Principles of Embedded Networked Systems Design" Cambridge, 2005
14. W. Dargie and C. Poellabauer, "Fundamentals of Wireless Sensor Networks", Wiley, 2010
15. RebertFaludi, Building Wireless Sensor Networks: with ZigBee, XBee, Arduino, and Processing, Oreilly.

Course Code: CSE 421

Course Title: Basic Graph Theory

Credits: 3.00

Prerequisite: CSE 207

Course Content: Introduction to graph theory: Graphs as models, Matrices and Isomorphism, Decomposition and Special graphs, Paths, Cycles and Trails : connectivity, Bipartite graph, Eulerian graphs, Hamiltonian graph, other algorithms; Vertex Degrees and counting, Directed graph; Trees: properties of trees, Distance in trees and graphs, Spanning trees, graceful labeling, counting trees ordered tree, Huffman tree; planarity: planar graphs, Euler's formula, dual graph, infinite graph; Matching and Factors: maximum matching, Min-Max theorem, independent sets and covers, edge connectivity, k-connected graph and application, Network flow problems, Maximum network flow Graph coloring: Vertex coloring, upper bound, Brooks' theorem, Structure of k-chromatic graphs, Perfect graph, spanning

trees in graph; Perfect Graph: the perfect graph theorem, Chordal graphs revisited, other classes of perfect graphs; planar Graphs: Drawings in the plane, Dual graphs, Eulers' Formula; Ramsey Theory: Ramsey's theorem, Ramsey's number, Graph Ramsey theory; Misc: , automorphism graphs, homomorphism in graphs, symmetric graphs, graph enumeration.

References:

1. Introduction to graph theory by Robin J.Wilson(4th edition), Addison Wesley
2. Introduction to graph theory by Douglas N.West(2nd edition),Pearson
Graph Theory and applications to engineering and computer science by Narshingh Deo, Prentice-Hall of India Pvt.Ltd

Course Code: CSE 423

Course Title: Bioinformatics

Credits: 3.00

Prerequisite: CSE 207

Introduction to Bioinformatics: Importance, Background of Bioinformatics, Central Dogma of Life: According to Biology, According to Bioinformatics, Online resources of Bioinformatics, DNA Sequencing: DNA sequencing methods, Sanger's method, Shortgun method, Genome mapping, Sequence Alignment: Definition, Importance of Sequence Alignment, Types of Sequence Alignment, Global Alignment, Local Alignment, Pairwise Alignment, Multiple Sequence Alignment, Tools used to Align Sequences, Basic Local Alignment Search Tool (BLAST), Phylogenetic Tree: Definition, Overview on Phylogenetic Tree, Phylogenetic Tree building methods, Tools used to build Phylogenetic Trees, Phylogenetic Tree construction using Molecular Evolutionary Genetics Analysis (MEGA), Analysis of Gene Expression & Microarray: Overview on Chromosome, DNA, Gene and Genome, Structural feature of a gene, Prokaryotic Gene, Eukaryotic Gene, Regulation and Expression of gene, Homology Modeling and 3D Structure Analysis: Definition, Importance of Homology Modeling, Online Database of 3D structures, Tools used to build 3D model, Analyze 3D model using PyMOL, Methods for Studying Proteins: Overview of Protein Structure, Amino Acid, Alpha Helix, Beta Strand, Reasons for Secondary Structure Prediction, Chou-Fasman method, Case Study: Human Genome Project, Bioinformatics and Human disease.

Textbook: Introduction to Bioinformatics
Arthur M. Lesk

Reference Book: Bioinformatics
Andrzej Polanski and Marek Kimmel

Course Code: CSE 425

Course Title: Environment and Green Technology

Credits: 3.00

Definition of terminology – technology, environment, ecosystem, society and development; Inter-dependence of technology, environment, society and development; Growth of technologies and its contribution to human development; Current state of technology and its future use as an instrument of change in twenty first century; Impact of technology upon the environment, impact of the environment upon human changes in the global climates; Environment friendly technology; Technology and environment hazards, its remedy, major hazards of industry; Pollution, different kinds of pollutions; global climate change, green house effect, sea-level rise; The improvement of working conditions in the industry; Green

technologies in computer science, current trends for environment friendly IT technology; Renewable and sustainable energy; Biological challenges and sustainability; Environmental Politics

1. Samir Botros Billatos, Nadia A. Basaly, Green Technology and Design for the Environment, CRC Press
2. Tom Worthington, Green Technology Strategies, Tomw Communications Pty Ltd.
3. Wen Chen Hu, Naima Kaabouch, Sustainable ICTs and Management Systems for Green Computing, **IGI.**

Course No: CSE 427

Course Title: Topics of Current Interest

Credit: 3.00

Prerequisite: As decided by the Instructor

As suggested by the course instructor.

Reference: As suggested by the course instructor.

Course Code: CSE 468

Course Title: Data Mining & Machine Learning Lab

Credit: 1.50

Laboratory works and assignment will be based on CSE – 427: Data Mining & Machine Learning course. Laboratory classes should cover implementation of different algorithms of Data Mining and Machine Learning.

Course No: CSE 469

Course Title: Topics of Current Interest

Credit: 3.00

As suggested by the course instructor.

Reference: As suggested by the course instructor.

Course No: CSE 470

Course Title: Topics of Current Interest Lab

Credit: 0.75

Prerequisite: As decided by the Instructor

Laboratory works will be based on CSE 465.