REGULATIONS AND COURSE DESCRIPTION

BACHELOR OF TECHNOLOGY

Computer Science & Engineering

Effective from 2016-17

COLLEGE OF TECHNOLOGY AND ENGINEERING
Maharana Pratap University of Agriculture and Technology
Udaipur (Rajasthan) – 313 001

VISION OF COMPUTER SCIENCE AND ENGINEERING DEPARTMENT

- To contribute to India and the World through excellence in the Domain of Computer Science and Engineering education and research and to serve as a valuable resource for Computer Science and Engineering based Industry and society at-large.

MISSION OF COMPUTER SCIENCE AND ENGINEERING DEPARTMENT

- Committed to excellence, the department seeks to impart knowledge to develop latest technological skills with value based education among students to facilitate their development as successful and competent professionals for the nation.
- Promote excellence, foster high standards and orient the education towards future needs and opportunities through strong Academia, Industry and Stakeholder linkages.
- Strengthen the curricula as per the current needs of the industry and academia to promote research and development in frontier areas of Computer Science & Engineering.
- Provide opportunities for research, continuing education, faculty up-gradation and development of human resources in new and cutting edge technologies, especially through national and international collaboration.
- Strengthen non-formal training to promote innovation among students and equip them to be successful future entrepreneurs.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO I:

Apply computer science theory blended with mathematics and engineering to model computing systems.

PEO II:

Design, implement, test and maintain software systems based on requirement specifications.

PEO III:

Communicate effectively with team members, engage in applying technologies and lead teams in industry.

PEO IV:

Assess the computing systems from the view point of quality, security, privacy, cost, utility, etiquette and ethics.

PEO V:

Engage in lifelong learning, career enhancement and adapt to changing professional and community needs.

Program outcome: At the end of the program the student will be able to:

PO I:

Design algorithms for real world computational problems and analyze their complexities.

PO II:

Design, develop and maintain computing systems using concepts from mathematics, engineering and program's core courses.

PO III:

Design and develop computing applications with professional expertise to solve complex problems of the computer and information technology

PO IV:

Design and develop interfaces among subsystems of computing.

PO V:

Analyze large data samples and discover knowledge to provide solutions to engineering problems.

PO VI:

Assess security, privacy, quality and cost parameters in developing software systems.

PO VII:

Communicate effectively and practice professional ethics with societal responsibilities.

PO VIII:

Engage in lifelong learning through independent study of new techniques and tools.

PO IX:

Work in teams using common tools and environment to achieve project objectives.

ACADEMIC REGULATIONS
(UNDER-GRADUATE COURSES)

The students admitted in 2016-17 shall be governed by the relevant rules as indicated below:

1.0 DEFINITIONS

1.1 'Academic Year' or 'Academic Session' of the University shall ordinarily be between July to June and shall consist of two semesters.

1.2 'Semester' is an academic term of normally 18-20 weeks including examinations.

1.3 'Course' means a unit of instruction or a segment of a subject matter to be covered in a semester. Each course is assigned a specific number, title and credits.

1.4 'Credit Hour' also written as 'Credit' means the numerical weight allotted to the course, including its theory and practical parts. One credit will represent one hour of lecture and two to three hours of laboratory/field practical in each week.

1.5 'Grade point' is a numerical number which denotes students' performance in a course. It is obtained by dividing the percentage marks obtained by ten.

1.6 'Credit point' is the product of credit and grade point obtained by the student in a course.

1.7 'SGPA' (Semester Grade Point Average) is the average of the credit points of a semester.

1.8 'OGPA' is the overall cumulative grade point average obtained by the student in the courses taken in all the semesters completed by him/her.

1.9 'Year' means an academic session consisting of two semesters. Say, first year means the first academic session of the prescribed course of a degree programme. Similarly, second year, third year, and fourth year mean second, third and fourth academic sessions, respectively.

1.10 'Equivalent percentage' is the percentage obtained by multiplying grade point, SGPA, and OGPA respectively by ten.

2.0 THE PROGRAMME AND GRADUATION REQUIREMENTS

2.1 Minimum residential requirement and maximum period for all the programmes:

Minimum residential requirement	8 semesters
Maximum period for which a student can remain on the college roll	12 semesters

Note: In case a student does not complete his/her course work satisfactorily (5.0 OGPA out of 10) within the maximum prescribed period he/she shall no longer be a student of the university and the respective Dean of the college shall drop him from the college roll.

3.0 EXAMINATION

There shall be a main theory and/or practical examination conducted by the university at the end of each semester. The theory and practical examinations shall be of three hours duration except otherwise specified. Besides this, there will be a mid-term examination.

3.1 Mid-Term Examination:

A mid-term examination of 20 maximum marks shall be held after completion of about 50% syllabus in each course. The mid-term examination shall be of one hour duration.

"If a student misses the midterm examination due to any legitimate reason including deputation by the university, then he/she will be permitted to appear in a special midterm examination before the final examination". Only one special mid-term examination per course shall be conducted for all eligible students under this rule.

Students who are deputed by the university will have to submit the information in advance to the concerned department for awarding attendance.

3.2 The distribution of marks for the mid-term examination, final theory examination and practical examination shall be as follows:

Credit (Marks T/P)	Mid-Term Examination	Final (University) Examination		Total
		Theory	Practical	
1/2/3/4+1	20(T)	50	30	100
0+1/2/3/4	20(P)	-	80	100
1/2/3/4+0	20(T)	80	-	100
1+/2/3/4	20(P)	30	50	100

3.3 The distribution of marks for the final practical examination shall be as under

	Practical with Maximum Marks	30	50	80
(a)	Practical record and day-to-day assessment (Sessional work)	5	10	15
(b)	Practical exercises (may include any exercises as decided by the external examiner)	20	30	50
(c)	Viva-voce	5	10	15

3.4 Grading System

(i) A numerical grading system is followed for evaluation. Each course has a numerical weightage known as credit. The total marks obtained in each course (including its mid-term, theory and practical parts) are converted into percentage and divided by 10 to obtain the grade point for that course. The grade point when multiplied by the total course credit, gives credit points for the course.

(ii) Semester Grade Point Average (SGPA) is simply average of the credit points for a semester. The Overall Grade Point Average (OGPA) is the average for all courses upto the current semester.

If C_i and G_i are the credit and grade points for a course, then OGPA and SGPA are given by the following formulae:

$$\text{SGPA} = \frac{\sum C_i G_i}{\sum C_i}$$ where the summation is for all courses in the semester

$$\text{OGPA} = \frac{\sum C_i G_i}{\sum C_i}$$ where the summation is for all courses of preceding semester including the current one

(iii) The percentage equivalent of OGPA shall be determined by multiplying OGPA by ten.

(iv) The division of the under graduate student shall be determined by the OGPA at the end of successful completion of program as follows:

Division	OGPA
First	6.00 and above
Second	5.00 and above

3.5 Pass Requirements:

(i) Candidates are required to pass separately in final theory and/or practical examinations in each course

(ii) For a pass, a candidate is required to obtain at least 40% marks in each theory final examination as well as in each practical final examination and 4.00 grade point in the course.

(iii) The minimum OGPA required for degree is 5.00.

3.6 Promotion to Higher Classes:

(i) The promotion to next class shall be decided only at the end of an academic year.

(ii) A student will be promoted to higher class if he/she secures an OGPA as mentioned in the table below.

Year to which promotion is being Considered	Minimum OGPA required for Promotion
Second	4.00
Third	4.50
Fourth	4.75

(iv) A student who has been promoted to the first Semester of a class as a result of above rule, shall be automatically promoted to the second semester of that class regardless of the result of the year's first semester examination.

(v) If a student is not promoted to a higher class, he/shall become an ex-student of the failed class and has to clear the backlog and/ or improve his/her OGPA to be eligible for promotion.

(vi) Provisional Promotion :

(a) The Promotion will be provisional with the permission of Concerned Dean to higher class till the result of the previous semester is declared.

(b) Student has to register as per academic calendar, i e. Date of registration without late fee and date of registration with late fees would be applicable.

(c) Student has to give an undertaking that on declaration of result, if he/ she is not eligible, the registration would stand cancelled automatically.

(d) Student should have a minimum OGPA as per existing UG rules.

(e) Per-requisite courses, if any, have to be cleared prior to the regular courses.

3.7 Clearing of Backlogs and Repeating of Courses for Improvement of OGPA:

A. Clearing of Backlog:

(a) All the students with backlog (whether promoted or ex-students) shall have to appear in the examination of backlog courses in the main examination of the semester in which such courses are regularly offered. The student will be permitted to appear in backlog examination in failed part only whether it is theory or practical or both. He/she shall not be required to attend regular classes for such courses.

(b) Midterm marks obtained by a student will not be carried over for backlog examination and proportionate marks shall be awarded.

(c) The university shall conduct final examination as per current scheme of examinations. Students offered backlog courses would be required to appear in the equivalent course in the new programme. In case of variation in the course content, student has to do self preparation.

(d) If the backlog course is the result of being detained on account of shortage of attendance, the student has to appear in both theory and practical examinations by regularly offered courses or as a contact course, if time table adjustment is not possible

B. Improvement of OGPA:

(a) Student should apply to improve the OGPA within 11 days from the date of issue of mark sheet of last semester. They should surrender the original mark sheet issued to them and submit the same along with application form.

(b) A student would be given only one chance for improvement of OGPA.

(c) Student will be allowed to repeat two courses of his/her choice irrespective of grade obtained in the course (s) or semester, provided that the course is being offered as regular course in current semester.

(d) There will be a common examination for regular students and for those who have been offered courses for improvement.

(e) Students will not be issued PDC till the result of the courses offered for improvement is declared.

(f) The repeated course shall be marked as "Repeat" in the revised mark-sheet.

(g) In case PDC has been issued to the student he/she will not be eligible for improvement.

(h) The student would be required to pay regular semester fees if he/she wishes to attend the classes. Otherwise he/she shall be treated as Ex-student.

(i) The examination fee for courses offered for improvement will be Rs. 1000.00 (Rupees one thousand only) per paper irrespective whether it is a regular course or a special paper.

(j) The student has to submit an undertaking that the marks obtained in the examinations taken for improvement will replace the marks obtained in the original examination of the paper(s), if he/she gets more than previous result.

(k) In case a student fails in the improvement course, he/she will be awarded minimum pass marks in that paper.

(l) Midterm marks in improvement courses: In such cases, the student will be awarded proportionate marks based on marks obtained in final examination.

3.8 Special Backlog Examination:

A. In case student has completed 8th Semester and has backlog in only one course:

(i) Special examination will be conducted earliest possible after the declaration of semester result i.e. September/ October of 1st semester of the academic year for only that course.

(ii) Student will be charged fee as prescribed by the university, irrespective of whether it is a regular course or a special paper.

(iii) Student has to apply for special examination within 11 (eleven) days of declaration of result of 8th semester, failing which his/her application will not be considered.

(iv) If a student fails in a special paper examination, he/she would be allowed to reappear with regular examination of next semester only i.e. once in a semester.

B. In case a student has completed 8th semester and has got backlog of up to 6 courses irrespective of semester:

(i) Backlog examination will be conducted along with regular examination of the semester.

(ii) If regular examination is being conducted for a particular paper, he/she would have to pay normal fee for that paper and special fee of Rs. 1000/- per paper will be charged for the course which are not listed for conducting the examinations in that semester.

(iii) If a student does not clear one or more backlog course, he/she will have to appear as Ex-student along with regular examination in the next semester and fee will be charged at regular rate, if the courses are listed for conducting the examination in that semester, otherwise, special fee of Rs. 1000/- will be charged

C. Other rules like maximum number of semesters, minimum passing marks, etc will be applicable as per rules.

3.9 Re-evaluation for answer book:

(i) (a) Re-evaluation is permissible only in Theory paper of semester's final examination.

(b) Re-evaluation is not permissible in the Answer book of unfair means case (s)

(ii) The candidate may apply for re-evaluation within 11 days of the issue of the mark sheet on the prescribed form through Head of the institution depositing required fee and original mark-sheet. Incomplete and late submitted application shall not be considered.

(iii) The re-evaluation fee per paper shall be as prescribed and will not be refundable on any pretext.

(iv) Re-evaluation shall be done by an examiner of the subject to be appointed by the Vice Chancellor.

(v) If the marks obtained after re-evaluation increase / decrease within 20% of the maximum marks prescribed for the paper, the same will be taken as marks obtained after re-evolution. However, if the marks awarded by the re-evaluation increase /decrease by more than 20% of maximum marks prescribed for the paper then the answer book will be referred to the second re-evaluation and the average of two closest awarded marks (the middle award in case the three awards if uniformly spread) shall be taken as the marks obtained after re-evaluation and shall be awarded. However, a student who was declared Pass prior to re-evaluation and fails after re-evaluation, shall be awarded minimum pass marks.

(vi) Marks awarded after re-evaluation of the paper will be considered for award of merit.

(vii) (a) No one shall be admitted in the next higher class and considered for any beneficial claim only on account of submission of application of the re-evaluation of Answer Book(s) in the office.

(b) A student becoming eligible for admission on account of result of re-evaluation may be admitted in next higher class without late fee. He will be required to pay full fees for the year within 7 days of declaration of the result. Attendance in such case shall be counted from the date of admission.

3.10 Moderation of Results:

The result committee shall also act as Moderation Committee to review the results for the normal distribution of marks, the percentage of pass and failure. Any moderation suggested in a paper shall be uniformly applied to all the students registered in that paper, with the approval of the Vice Chancellor. Any moderation effected should not be more than 10 % of maximum marks in a paper. However, if after moderation or otherwise, if a student is failing only by one mark in a paper, Controller of Examinations may award one grace mark to pass the student in that paper.

4.0 GENERAL RULES PERTAINING TO EXAMINATIONS

4.1 A student who has been deputed by College/University authorities to represent at a national/international meet/ championship/tournament/extra curricular activities, does not appear in the final examination due to such participation, may be permitted to take missing paper(s) at next main examination, when such course(s) are regularly offered as a special case. He/she, however, will be required to seek prior permission from the Vice-Chancellor.

4.2 No special examination shall be held for students who miss the examination on account of police custody, court attendance or fail to attend for other reason, whatsoever.

4.3 Examinations will not be postponed due to failure of electricity.

4.4 The boycotted and walked out papers shall not be recounted. This authority rests only with the Chancellor of the university.

5.0 PRACTICAL WORK EXPERIENCE REQUIREMENTS

After successful completion of all the courses including practical trainings with minimum OGPA of 5.0, a student will become eligible for the degree.

Details of practical training (Training in factory, workshop, mine, engineering works/design, office etc.) which students are to undertake in different degree programmes are given below:

Branch of Engineering	Duration	Year
(a) Agriculture*	30 + 30 = 60 days	At the end of II & III year
(b) Mechanical	30 + 30 = 60 days	- do -
(c) Mining**	30 + 30 = 60 days	- do -
(d) Electrical	30 + 30 = 60 days	- do -
(e) Computer Science & Engg.	30 + 30 = 60 days	- do -
(f) Electronics & Communication	30 + 30 = 60 days	- do -
(g) Information Technology	30 + 30 = 60 days	- do-
(h) Civil Engineering	30 + 30 = 60 days	- do-

* *In addition to the above 2 months training programme, the agricultural engineering graduates have to undergo experiential learning or Hands-on training (4 month) in the second semester of final year BE.(Ag.).*

In order to take policy decision and to solve the operational and administrative bottleneck, if any, there shall be a college level committee consisting of the followings. The committee will guide in selection of cafeteria courses and experiential learning/project.

Senior most Head of the Department	-	*Convener*
Heads of concerned Department	-	*Member*
Training Officer	-	*Member*
Class Advisor of IV year	-	*Member*

Procedure for evaluating the students on all the above practical trainings will be followed as prescribed.

** *The Mining Engineering students shall have to undergo 12 days mining camp at the end of I semester of II year and 12 days survey camp at the end of I semester of III year, in addition to 60 days practical training.*

6.0 ATTENDANCE REQUIREMENTS

6.1 The student shall be permitted to appear in the university main examination only if a minimum attendance of 75% is maintained separately in theory and practical in each course from the date of registration in that course. However, in NCC/NSS/NSO the minimum attendance requirement would be 65%. In case of sickness or any other valid reasons, the vice-chancellor may condone the attendance to an extent of 10%.

6.2 A student who is short of attendance in one or more courses will be detained form appearing in the final semester examination of all such course(s) and will be awarded zero grade point. Such courses shall be denoted by letter "DE" in the mark sheet.

6.3 En-mass absence shall be treated as absent in the attendance record of the students and will be charged a fine of Rs. 2000/- on en-mass cutting of the classes for more than 3 days.

6.4 If a student absents continuously for 7 working days in a semester in any subject, his/her registration in the semester will be cancelled and parents informed accordingly. Such students will be provided an option for re-admission in the course/ programme within 7 days of the cancellation of their registration by paying a fee of Rs. 500/-.

6.5 If a student who has been admitted to the 1st semester of a programme and fails to attend the classes continuously for a period of 30 days without the permission of the Dean of the college, the name of such a student will be removed from the college roll. No petition is permitted in this case. He/she may have to seek re-admission as a fresh candidate.

6.6 If a regular student of the college in subsequent semester fails to register on schedule time or fails to attend the class after registration continuously for 30 days without the permission of the Dean of the college, the student will be removed from the college roll and parents informed accordingly. A student so removed may apply to the Dean within 15 days of his/her removal for reconsideration for re-registration in the next academic session, giving valid and strong reasons for failing to take permission. His removal may be revoked, provided that, his/her advisor is satisfied with the performance of the student and the same is approved by the Dean. The period of removal shall be counted towards the number of semester, though no grade/marks would be awarded for this semester.

7.0 ADVISORY SYSTEM

Student will be required to report to the respective class advisors for getting registration form and examination form for the purpose of registration. Class advisors will also be responsible for distribution of marks sheet obtained from the university.

8.0 SYMBOLS AND THEIR MEANING

Following symbols would be used to designate the status of the student:

Symbol	Significance
F	Fail
DE	Detained
UM	Unfairmeans
R	Repeat

Note - *All such courses which are cleared by repeating the same or repeated for improvement of OGPA to bring it to the minimum required level shall be marked by letter 'R' in the transcript.*

9.0 WITHDRAWAL FROM SEMESTER

(a) A student shall be permitted to withdraw from a semester only two times in the degree programme, on the grounds of ill-health and personal exigencies subject to the condition that the reasons for withdrawal are convincing. For this the student has to submit a written request at least one week prior to the commencement of the main examination of the semester from which the student wants to withdraw.

(b) A student who has withdrawn from a semester has to join the same semester during next year.

(c) The period lost due to withdrawal (one year for one withdrawal) shall not be counted towards maximum permissible period for which a student can remain on the college roll.

10.0 EXAMINATION OF PRACTICAL TRAINING, PROJECT AND SEMINAR

(a) For the examination of practical training (including industry visit, mining camp, survey camp, etc.) there will be an internal board appointed by the Dean. The board will comprise of concerned Head of the Department as chairman and one or two teachers of the concerned department(s) as members. The marks will be awarded on the basis of work report, practical record, quiz. viva-voce, etc. and added to the marks list in the Final year's examination.

(b) For project viva-voce examination there shall be a Board of examiners consisting of project committee and one/two external examiners. The concerned Head of the Department will be the Chairman of the committee. However, in Agriculture Engineering discipline, the Chairman will be the Project Chairman. The Chairman will then nominate two teachers as members. The Board may meet in one or two meetings according to the availability of external examiner(s). A candidate will be assessed for the work done during semester by the Project Advisor and the Project Committee.

As the project is assigned in the first semester of the final year and the student works on it during both the semesters the assessment of the project shall be done in both the semesters. The internal viva-voce of first semester and both the seminars shall be assessed by the Project Committee. However the marks shall be counted in the second semester only. The distribution of marks shall be as follows : .

Particulars	I Semester	II Semester	Total
Day-to-day assessment by the major advisor	15	20	35
Seminar	10	15	25
Viva-voce	10 (Internal)	30 (External)	40
TOTAL	35	65	100

(c) For seminar, wherever prescribed as a course of study, there shall be a board of examiners consisting of the Head of the Department as chairman and two teachers of the department.

11.0 CHANGE OF BRANCH OF STUDY IN SECOND YEAR B.TECH.

The students, in the second year, can avail one opportunity to change their branch of study on merit basis in accordance with rules framed by the university from time to time.

12.0 ADMISSION OF DIPLOMA STUDENTS IN SECOND YEAR B.TECH.

The diploma holders from the Board of Technical Education, Rajasthan with 10+2 qualification can seek direct admission in second year B.Tech. The number of seats, admission procedure, educational and other requirement would be as specified by the Government and/or approved by the university from time to time.

13.0 GRADUATION REQUIREMENT AND AWARD OF DIVISION

(a) A student shall be awarded degree only if he has passed all the courses and completed other requirements prescribed for the programme and secured an OGPA of 5.00 or above.

(b) The division of the student shall be determined by the OGPA at the end of successful completion of the program as follows :

Division	OGPA
First	6.00 and above
Second	5.00 and above

SCHEME OF TEACHING AND EXAMINATION

(Computer Science & Engineering)

First Year B.Tech. (Common for All Branches)

I-SEMESTER

Course No.	Title	Credit		Hours/Week			Marks		
		Th.	P	L	T	P	Th.	P	MT
BS 111	Mathematics - I	3	0	3	0	0	80	-	20
ME 113	Mechanical Engg.	3	0	3	0	0	80	-	20
ME 114	Workshop Practice	0	1	0	0	3	-	80	20
CE 115	Engineering Drawing	0	1	0	0	3	-	80	20
	NCC/NSS/NSO[1]	-	-	0	0	2	-	-	-
	GROUP I								
BS 100P	Engineering Physics	2	1	2	0	2	50	30	20
CE 100	Engineering Mechanics	2	1	2	0	2	50	30	20
EE 100	Electrical Engg. - I	3	1	3	0	2	50	30	20
ENVS 100	Environmental Studies	2	0	2	0	0	80	–	20
	Total	15	5	15	0	14	800		
Total Credits/Hours/Marks		**20**		**29**			**800**		
	GROUP II								
BS 100C	Engineering Chemistry	2	1	2	0	2	50	30	20
EC 100	Electronics and Instrumentation	3	1	3	0	2	50	30	20
CS 100	Introduction to Computer Programming and Data Structure	3	1	3	0	2	50	30	20
BS 100E	English and Communication Skill	2	1	2	0	2	50	30	20
	Total	16	6	16	0	16	800		
Total Credits/Hours/Marks		**22**		**32**			**800**		

1 NCC/NSS/NSO is compulsory and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.

2 The examination (Theory and Lab) shall be conducted internally by the college.

Note: *The courses BS 100P, CE 100, EE 100, ENVS 100, BS100C, EC 100, CS 100 and BS 100E shall be offered in both the semesters. The students will be divided in two groups in I semester itself and shall remain in the same group in II semester as well. However, they have to offer all the eight courses in first year.*

II-SEMESTER

Course No.	Title	Credit		Hours/Week			Marks		
		Th.	P	L	T	P	Th.	P	MT
BS 121	Mathematics - II	3	0	3	0	0	80	-	20
CE 122	Civil Engineering	1	1	1	0	2	50	30	20
ME 123	Machine Drawing - I	0	1	0	0	3	0	80	20
ME 124	Workshop Technology	2	1	2	0	3	50	30	20
	NCC/NSS/NSO[1]	-	-	0	0	2	-	-	-
	GROUP I								
BS 100C	Engineering Chemistry	2	1	2	0	2	50	30	20
EC 100	Electronics and Instrumentation	3	1	3	0	2	50	30	20
CS 100	Introduction to Computer Programming and Data Structure	3	1	3	0	2	50	30	20
BS 100E	English and Communication Skill[2]	1	1	1	0	2	50	30	20
	GROUP II								
BS100P	Engineering Physics	2	1	2	0	2	50	30	20
CE 100	Engineering Mechanics	2	1	2	0	2	50	30	20
EE 100	Electrical Engineering - I	3	1	3	0	2	50	30	20
ENVS 100	Environmental Studies	2	1	2	0	2	50	30	20
	Total	15	7	15	0	18	-	-	-
Total Credits/Hours/Marks		**22**		**33**			**800**		

[1] NCC/NSS/NSO is compulsory and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.

[2] The examination (Theory and Lab) shall be conducted internally by the college.

SECOND YEAR B.Tech.

III-SEMESTER

Course No.	Title	Credit		Hours per Week			Marks		
		Th.	P	L	T	P	Th.	P	MT
BS211 (All Branches)	Mathematics III	3	0	3	0	0	80	0	20
CS211	Digital Logic Design	3	1	3	0	2	50	30	20
CS212	Unix and shell programming lab	0	2	0	1	4	0	80	20
CS213	Object Oriented Programming with C++	3	2	3	0	4	50	30	20
CS214	Principles of Programming Languages	3	0	3	1	0	80	0	20
EE212 (EE,CS)	Electrical Measurement and Instruments	3	1	3	0	2	50	30	20
EC219(CS)	Analog Electronics	2	1	2	0	2	50	30	20
	NCC/NSS/NSO[1]	-	-	0	0	2	-	-	-
	Total	17	7	17	2	16	-	-	-
Total Credits, Hours and Marks		**24**		**35**			**700**		

T - Tutorials do not carry any credit

IV-SEMESTER

Course No.	Title	Credit		Hours per Week			Marks		
		Th.	P	L	T	P	Th.	P	MT
BS222 (CS)	Discrete Mathematical Structure	3	0	3	0	0	80	0	20
CS221	Computer Organization	3	0	3	1	0	80	0	20
CS222	Data Structure	3	1	3	0	2	50	30	20
EC228 (CS)	Communication Systems	3	0	3	1	0	80	0	20
CS224	Microprocessors	3	1	3	0	2	50	30	20
CS225	System Software	3	1	3	0	2	50	30	20
	NSS/NCC/NSO	-	-	0	0	2	-	-	-
	Total	18	3	18	2	8	-	-	-
Total Credits/ Hours/ Marks		**21**		**28**			**700**		

T - Tutorials do not carry any credit

[1] The NCC/NSS/NSO is compulsory and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.

Note: *Students have to undergo a practical training of 30 days at the end of IV semester for which assessment will be made at the beginning of the next semester.*

V-SEMESTER

Course No.	Title	Credit Hours		Hours per Week			Marks		
		Th.	P	L	T	P	Th.	Pr.	MT
CS311	Theory of Computation	3	0	3	1	0	80	0	20
CS312	Java Programming	3	2	3	0	4	50	30	20
CS313	Data Communication and Networks	3	1	3	0	2	50	30	20
CS314 (CS,EC)	Computer Architecture	3	0	3	1	0	80	0	20
CS315	Database Systems	3	1	3	0	2	50	30	20
EC319 (CS)	Pulse, Digital & Wave Shaping	3	0	3	1	0	80	0	20
	Total	18	4	18	3	8	-	-	-
Total Credits/ Hours/Marks		**22**		**29**			**600**		

T - Tutorials do not carry any credit

VI- SEMESTER

Course No.	Title	Credit Hours		Hours per Week			Marks		
		Th.	P	L	T	P	Th.	P	MT
CS321	Principles of Compiler Design	3	1	3	0	2	50	30	20
CS322	Microprocessors, Interfacing and Applications	3	1	3	0	2	50	30	20
CS323	Design & Analysis of Algorithms	3	0	3	1	0	80	0	20
CS324	Computer Networks	3	1	3	0	2	50	30	20
CS325	Operating Systems	3	1	3	0	2	50	30	20
CS326	Software Engineering	3	1	3	0	2	50	30	20
	Total	18	5	18	1	10	-	-	-
Total Credits/ Hours/ Marks		**23**		**29**			**600**		

T - Tutorials do not carry any credit

Note: *Students have to undergo a practical training of 30 days at the end of VI semester for which assessment will be made at the beginning of the next semester.*

VII-SEMESTER

Course No.	Title	Credit Hours		Hours per Week			Marks		
		L	P	L	T	P	Th.	Pr.	MT
CS411	Mobile Computing	3	1	3	1	2	50	30	20
CS412	Advanced Database Systems	3	0	3	1	0	80	0	20
CS413	Distributed Systems	3	1	3	0	2	50	30	20
CS414	Elective-I	3	1	3	0	2	50	30	20
CS415	Elective-II	3	1	3	0	2	50	30	20
CS425	Project[1]	0	-	0	0	4	0	-	-
	Total	15	4	15	2	12	-	-	-
Total Credits/ Hours/ Marks		19		29			500		

[1] The topic for the project (CS425) will be allotted in the VII semester but assessed in both the semesters. The total credits will however be counted in the VIII semester.

ELECTIVE-I	ELECTIVE-II
CS414 (a) Digital Signal Processing	CS415 (a) The Design of Unix Operating System
CS414 (b) Expert Systems	CS415 (b) Graph Theory
CS414 (c) Neural Networks	CS415 (c) Computer Graphics
CS414 (d) Fault Tolerant Systems	CS415 (d) Numerical Methods
CS414 (e) Embedded Systems	CS415 (e) Computational Intelligence

Note: *The students have to take one elective each out of the lists (Electives I & II) given. However, the elective may not be offered if faculty expertise is not available or a minimum of 10 students do not opt for a particular elective.*

Course No.	Title	Credit Hours		Hours per Week			Marks		
		Th.	P	L	T	P	Th.	Pr.	MT
CS421	Multimedia Systems	3	1	3	0	2	50	30	20
CS422	Network Programming	0	2	0	1	4	0	80	20
CS423	Elective-III	3	1	3	0	2	50	30	20
CS424	Elective-IV	3	1	3	0	2	50	30	20
CS425	Project	0	8	0	0	12	0	100	-
CS426	Practical Training & Industrial Visit	0	4	0	0	0	0	100	-
CS427	Seminar	0	2	0	0	4	0	100	-
	Total	9	19	9	1	26	-	-	-
Total Credits/Hours/Marks		**28**		**36**			**700**		

[2] The marks of the practical trainings conducted during summer breaks (at the end of IV and VI semester) will be considered in VIII semester out of 90 marks. The industrial visit will be assessed out of 10 marks. If the tour does not undergo, the trainings will be assessed out of 100 marks.

ELECTIVE-III

CS423 (a) Network Security and Cryptography
CS423 (b) Computational Geometry
CS423 (c) Digital Image Processing
CS423 (d) Real time system
CS423 (e) Advance Computer Architecture

ELECTIVE-IV

CS 424 (a) Parallel Computing
CS424 (b) Web Computing
CS424 (c) Distributed Database Systems
CS424 (d) VLSI Design
CS424 (e) Data Warehousing and Data Mining

Note: The students have to take one elective each out of the lists (Electives III & IV) given. However, the elective may not be offered if faculty expertise is not available or a minimum of 10 students do not opt for a particular elective.

COURSE CONTENT

FIRST YEAR B.TECH. (I SEMESTER)

BS 111 MATHEMATICS – I

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcome: At the end of the course, the student will be able to:

CO1 Expand function in Taylor's and Maclaurin's series

CO2 Trace the Cartesian and Polar curves

CO3 The student will be able to apply the partial differentiation to compute the minima and maxima of functions of two variables.

CO4 The student will be able compute areas and volumes by integration.

CO5 Solve linear differential equations of higher order and homogenous differential equations with constant coefficients.

Unit-I

Differential Calculus : Taylor's and Maclaurin's expansions. Asymptotes and Curvature (Cartesian Coordinates only). Curve tracing (Cartesian and standard Polar Curves-Cardioids, Lemniscates of Bernoulli, Limacon, Equiangular Spiral).

Unit-II

Differential Calculus : Partial Differentiation, Euler's Theorem on Homogeneous Functions. Maxima & Minima of Two Independent Variables. Lagrange's Method of Multipliers. Jacobians.

Unit-III

Integral Calculus : Double Integral, Areas & Volumes by Double Integration. Change of Order of Integration. Triple integrals. Beta Function and Gamma Function (Simple Properties), Relation between Beta and Gamma functions.

Unit-IV

Differential Equations : Linear Differential Equations of Higher Order with constant coefficients. Homogeneous Linear Differential Equations with constant coefficient.

Text Books/References

1. Guar, Y.N. and Koul, C.I. (2013) Engineering Mathematics, Vols. I & II, Jaipur Publishing House, Jaipur.

2. Babu Ram (2011) Engineering Mathematics-I, Pearson Education, India.
3. B.V. Ramana (2012) Higher Engineering Mathematics, Tata McGraw Hill, India.
4. J.L. Bansal and H.S. Dhami (2012) Differential Equations, Vols. I & II, Jaipur Publishing House, Jaipur.
5. M.Ray and Chaturvedi: A Text Book of Differential Equations, Student Friend & Co. Publisher, Agra.
6. Rao V. Dukkipati (2012) Engineering Mathematics, New Age International (P) Ltd., New Delhi.

ME 113 MECHANICAL ENGINEERING

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	3	0	0
Hours	3	0	0

Course Outcome: At the end of the course, the student will be able to:

CO1 A fundamental understanding of the laws of thermodynamics and their application to a wide range of systems with work and heat interactions.

CO2 Concept of entropy and irreversibility of a process and application of thermodynamic relationships to solve practical problems.

CO3 Gas and vapour power cycles and the efficiencies.

CO4 Properties of steam and its application in power generation.

CO5 Construction and working of various boilers and IC engines.

Unit-I

Thermodynamics: Thermodynamic properties, closed and open systems, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of First Law in heating and expansion of gases in non-flow processes only.

Second law of thermodynamics: Kelvin-Planck and Claussius statements. Reversible processes, Carnot cycle, Carnot theorem. Reverse Carnot cycle. Entropy, physical concept of entropy.

Unit-II

Properties of Steam: Difference between gas and vapour, change of phase during constant pressure process. Generation of Steam, triple point and critical point. Internal energy and entropy of steam. Use of steam tables and Mollier chart, heating and expansion of vapour in non-flow processes.

Unit-III

Vapour Power Cycles: Introduction to Carnot Cycle. Rankine cycle and modified Rankine cycle.
Steam Generators: Classification of steam boilers. Cochran, Lancashire, Locomotive and Babcock-Wilcox boilers. Boiler mountings and accessories.
Steam Engines: Introduction to simple and compound steam engines.

Unit-IV

Gas Power Cycles: Introduction. Air Standard efficiency, other engine efficiencies and terms. Otto, Diesel and Dual cycles. Calculation of efficiency, mean effective pressure and their comparison.

Internal Combustion Engines: Introduction, Classification, terminology and description of IC Engines. Four stroke and two stroke petrol, gas and diesel engines. Comparison of petrol and diesel engines. Simple carburettor.

Text Books/References

1. M.L. Mathur and F.S. Mehta. Thermal Engineering, (Vol. I, SI Edition), Jain Brothers, New Delhi.
2. R.K. Purohit : Foundation of Mechanical Engineering; Scientific Publishers (INDIA), Jodhpur.
3. P.K. Nag : Engineering Thermodynamics, TMH.

ME 114 WORKSHOP PRACTICE

Cr. Hrs. 1 (0 + 1)

	L	T	P
Credit	0	0	1
Hours	0	0	3

Course Outcome: At the end of the course, the student will be able to:

CO1 Practical performance in carpentry shop.

CO2 Smithy Shop, Simple exercises involving basic operations like bending, drawing, punching, shaping, upsetting, and riveting.

CO3 Fitting Shop, Simple exercises involving basic operations like sawing, chipping, filling, drilling, reaming, threading with taps and dies.

CO4 Sheet Metal and Plumbing Shop: Demonstration of basic tools, pipe fittings and operations.

Carpentry Shop: Acquaintance with types of wood, tools and their uses. Simple exercises involving basic operations like sawing, planning, chiselling, etc. Preparation of simple joints, cross half lap joint, dovetail joint, bridle joint, tennon and mortise joint.

Smithy Shop: Acquaintance with types of tools and their uses. Simple exercises involving basic operations like bending, drawing, punching, shaping, upsetting and riveting.

Fitting Shop: Acquaintance with tools, measuring and marking tools, precision measuring tools and their uses. Simple exercises involving basic operations like sawing, chipping, filling, drilling, reaming, threading with taps and dies.

Sheet Metal and Plumbing Shop: Demonstration of basic tools, pipe fittings and operations.

Texts/References

1. S. K. Hajra Choudhury and AK Hajra Choudhury. Elements of Workshop Technology (Vol. I), Media Promoters & Publishers Pvt. Ltd., Bombay.

CE 115 ENGINEERING DRAWING

Cr. Hrs. 1 (0 + 1)

	L	T	P
Credit	0	0	1
Hours	0	0	3

Course Outcomes: At the end of the course, the student will be able to:

CO1	Select, Construct and Interpret appropriate drawing scale as per the situation.
CO2	Draw simple curves like ellipse, cycloid and spiral.
CO3	Draw Orthographic projections of points, lines and planes.
CO4	Draw orthographic projection of solids like cylinders, cones, prisms and pyramids including sections.
CO5	Layout development of solids for practical situations.
CO6	Draw isometric projections of simple objects.

Introduction and letter writing. Construction and use of plain, diagonal and vernier scale. Methods of drawing ellipse, parabola and hyperbola. Methods of drawing cycloids, spirals. Orthographic projection and projection of points.

Projection of lines, projection of planes, projection of solids. Introduction of prism, pyramid, cylinder and cone.

Section of solids, introduction of intersection of surfaces. Development of plane and curved surface. Isometric projection.

Text/Reference

1. N.D. Bhatt. Elementary Engg. Drawing, Rupalee publication, Anand.
2. Lakshmi Narayan and Vaishwanar. A Text Book of Practical Geometry, Jain Brother, New Delhi.
3. R.B. Gupta. A Text Book of Engineering Drawing, Satry Prakashan, New Delhi.
4. Fundamentals of Technical Drawing, Parkinson.

BS 100P ENGINEERING PHYSICS

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	2	0	1
Hours	2	0	2

Course Outcome: At the end of the course, the student will be able to:

CO1	Apply vector calculus approach to problems in electric field and magnetic field.
CO2	Apply laws of physics to simple LRC circuits.
CO3	Learn physics behind various types of lasers and their characteristics.
CO4	Understand the interference and diffraction from wave optics concepts and know its applications.
CO5	Understand polarization of light and its applications.

Unit-I

Electric Field: Line integral of electric field, Potential difference, Field as gradient of potential, Divergence of a vector function, Differential form of Gauss's law, Laplacian, Laplace equations, Curl of a vector function. Gauss's divergence theorem.

Magnetic Field: Curl and Divergence of a magnetic field, Magnetic scalar and vector potential.

Unit-II

Varying Field: Faraday's law-integral and differential form, Self and mutual inductance, Neumann's equation, Charge and discharge of a capacitor through register, Growth and decay of current in LR circuit, Energy stored in electric and magnetic field, Displacement current, Maxwell's equations.

Unit-III

Laser: Coherence, Einstein's coefficient, Spontaneous and stimulated emission, Population inversion, Laser gain (pumping), Spectral narrowing in laser, Coherence length, Ruby and He-Ne laser.

Interference: Division of amplitude, colour of thin films, Newton's ring, Fëbry-Perot interferometer-principle, operation, determination of wave length and difference in wave length.

Unit-IV

Diffraction: Double slit Fraunhofer diffraction pattern, Fraunhofer diffraction by a plane transmission grating, Formation of spectra.

Polarization: Analysis of linearly, circularly and elliptically polarized light (Half wave and quarter wave plates), Optical activity, specific rotations, Laurent's half shade and its use for determination of specific rotation of sugar solution.

Practicals

1. To find refractive index and dispersive power of material of prism by spectrometer.
2. To find wave length of light by Newton's ring.
3. To find wave length of light by diffraction grating.
4. To find specific rotation of sugar solution by polarimeter.
5. To find wave length of light by Fresnel Biprism.
6. To find frequency of A.C. mains.
7. To determine dielectric constant of liquid using series resonance method.
8. To study charge and discharge of condenser through a resistor (C.R. Circuit).
9. To study LCR resonant circuit, resonance, quality factor and sharpness in (i) series circuit (ii) parallel circuit.

Text Books/References

1. K.K. Tiwari. (1995). Electricity and Magnetism, S. Chand and Company, New Delhi.
2. N. Subrahmanyam and Brijlal. (1993). A Text Book of Optics, S. Chand and Company, New Delhi.
3. Ahmed and Lal. (1966). Electricity, Magnetism and Electronics, Unitech House, Lucknow.
4. D.S. Mathur. (1993). Mechanics, S. Chand and Company, New Delhi.
5. Gupta and Kumar. (1995). Practical Physics, Pragati Prakashan, Meerut.

CE 100 ENGINEERING MECHANICS

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

- CO1 Draw free body diagrams and determine the resultant of forces and/or moments.
- CO2 Determine the centroid and second moment of area of sections.
- CO3 Apply laws of mechanics to determine efficiency of simple machines with consideration of friction.
- CO4 Analyse statically determinate planar frames.
- CO5 Analyse the motion and calculate trajectory characteristics.
- CO6 Apply Newton's laws and conservation laws to elastic collisions and motion of rigid bodies.

(A) STATICS

Unit-I

Introduction of condition of equilibrium: Force, system of force, coplanar forces.

Moment and couples: Moment and parallel forces, Couples, General conditions of equilibrium

Practical Applications: Levers, Cracked levers, Steel yards. Sagging chains and toggle joints.

Centre of Gravity: Centre of parallel forces, C.G. in some simple cases, C.G. of Solids.

Moment of Inertia: Moment of inertia, Radius of gyration and perpendicular axis. Determination of moment of inertia of simple sections. Mass of moment of inertia.

Unit-II

Friction: Introduction, Critical angle of friction, Friction on horizontal planes, Friction on inclined planes, Wedge and block, Screw jacks, Rolling friction.

Machines: Introduction, Effects of friction, Loss of work, Reversible and irreversible machine, Law of machine, Wheel and axle, Differential wheel and axle, Pulley block, Screw jack, Single and double purchase crab, Worm and Worm wheel, System of pulleys.

Frames: Statically determinate plane frames, Method of joints, Method of sections, Graphical method.

(B) DYNAMICS

Unit-III

Rectilinear Motion, Motion under gravity, Projectiles equation of the path, Maximum height attained, Time of flight, Horizontal range. Angle of projection, Projectile from a given height, Projectile on an inclined plane, Problems.

Work, Power and Energy: Work, Power, Work done by torque, Energy, Law of conservation.

Unit-IV

Centripetal and centrifugal forces, Laws of motion: Newton's Law of motion and their explanation, Collision of elastic bodies; Impulse and impulsive force, Principle of conservation of momentum, Loss of kinetic energy during impact.

Practicals

1. Verification of law of polygon of forces.
2. Verification of principle of moment in case of compound level.
3. Verification of principle of moment in case of bell crack level.
4. Determination of reaction in case simply supported beam with or without overhang.
5. To determine coefficient of friction between different surfaces on horizontal plane.
6. To determine coefficient of friction between different surfaces in inclined plane.
7. Study of different wheel and Axle.
8. Study of single purchase crab.
9. Study of worm and worm wheel.
10. Study of Weston's pulley block.
11. Determination of mechanical advantage, velocity ratio and efficiency of single purchase crab.
12. Determination of mechanical advantage, velocity ratio and efficiency of double purchase crab.
13. Determination of mechanical advantage, velocity ratio and efficiency of first system of pulley.
14. Determination of mechanical advantage, velocity ratio and efficiency of second system of pulleys.
15. Determination of mechanical advantage, velocity ratio and efficiency of third system of pulleys Flywheel.

Text Books/References

1. I.B. Prasad. Engineering Mechanics, Khanna Publisher, New Delhi.
2. R.S. Khurmi. Applied Mechanics, S. Chand & Company Ltd., New Delhi
3. S.B. Junnarkar. Applied Mechanics, Charotar Publishing House, New Delhi.
4. Saluja. Applied Mechanics, Satya Prakashan, New Delhi.

EE 100 ELECTRICAL ENGINEERING – I

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course Outcome: At the end of the course, the student will be able to:

CO1	Proficiency in solving DC network.
CO2	Know-how of single phase AC circuits
CO3	Competency in solving three phase balanced AC circuits
CO4	Dexterity in using basic electrical instruments
CO5	Comprehension of transformer working principles.

Unit-I

D.C. Networks: Kirchoff's law, node voltage and mesh current methods, delta-star and star delta transformation, source conversion; solution of DC circuits by network theorems: Thevenin's, Norton's, superposition, Reciprocity and Maximum Power Transfer theorem.

Unit-II

Single Phase A.C.Ciruits: Single Phase EMF generation, average and effective values of sinusoidal and linear periodic wave forms, instantaneous and average power, power factor, reactive & apparent power, solution of R-L-C, series, parallel, series-parallel circuits, complex representation of impedances, phasor diagram, series and parallel resonance.

Unit-III

Three Phase A.C., Circuits: Three phase EMF generation, delta and star-connection, line and phase quantities, solution of the 3-phase balanced circuits, Phasor diagram, measurement of power in three phase balanced circuits.

Transformer: Faraday's laws of Electromagnetic induction, construction and principle operation of single phase transformer, EMF equation, voltage and current relationship and Phasor diagram for ideal transformer.

Unit-IV

Electrical Measuring Instruments: Introduction, type of measuring Instruments, Deflecting controlling & Damping Torque, D.C. PMMC instruments, shunts and multipliers, Moving iron ammeters and voltmeter, Dynamometers wattmeter, Induction type energy meter.

Practicals : Based on theory

Text Books/References

1. B.L. Therja. Electrical Technology, S. Chand
2. M.E. Van Valkenberg. Network analysis, PHI
3. Soni and Gupta. Introduction to Electrical Network Theory, Dhanpat Rai Publisher
4. R.A. Gupta and Nikhal Gupta. (2002). Fundamentals of electrical & Electronics Engineering, JPH, Ist Edition,
5. H.P. Tiwari. (2002). Electrical & Electronics Engineering, College Book Centre, Jaipur.
6. J.B. Gupta. (2002). Fundamentals of Electrical & Electronics. S.K. Kataria and Sons. Dehli.

ENVS 100 ENVIRONMENTAL STUDIES

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

CO1 Develop an understanding of different natural resources including renewable resources.

CO2 Realize the importance of ecosystem and biodiversity for maintaining ecological balance.

CO3 Develop an understanding of environmental pollutions and hazards due to engineering/technological activities and general measures to control them.

CO4 Demonstrate an appreciation for need for sustainable development and role of science.

CO5 Aware of important acts and laws in respect of environment.

Unit–I

The Multidisciplinary nature of environmental studies:

Definition, scope and need for public awareness. Environmental problems and their consequences

Natural Resources:

Renewable and non-renewable resources

Natural resources and associated problems

a) Forest resources: Use over-exploitation, deforestation, and case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams, benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land and a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources, Equitable use resources for sustainable lifestyles.

Unit-II

Ecosystems

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem.

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rovers, oceans, estuaries)

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity, Biogeographically classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical and aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit-III

Environmental Pollution

Definition, Causes, effects and control measures of: -

Air pollution

Water pollution

Soil pollution

Marine pollution

Noise pollution

Thermal pollution

Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides.

Unit-IV

Social Issues and the Environment - From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people: its problems and concerns, Case studies, Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

Human Population and the Environment

Population growth, variation among nations, Population explosion-Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

Text Books/References

1. K. C. Agarwal. (2001). Environmental Biology, Nidi Publications, Bikaner.
2. B.L. Chaudhary and Jitendra Pandey. (2005). Environmental Studies, Apex Publishing House, Udaipur.
3. H. Jhadav & V.M. Bhosale. Environmental Protection & Laws, Himalaya Pub. House, Delhi
4. M. N. Rao and A. K. Datta. Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd.

5. B. K. Sharma. Environmental Chemistry. Goel Publishing House, Meerut.
6. Pratap Singh, N.S. Rathore and A.N. Mathur. (2004). Environmental Studies, Himanshu Publications, Udaipur.
7. R. K. Trivedi and P. K. Goel. Introduction to Air Pollution, Techno Science Publications.

BS 100C ENGINEERING CHEMISTRY

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

CO1	Demonstrate knowledge of science behind common impurities in water and methods to treat them.
CO2	Knowledge of methods to determine the calorific value of fuels, perform flue gas analysis and combustion analysis.
CO3	Apply the science for understanding corrosion and its prevention.
CO4	Demonstrate a knowledge of superconducting and organic electronic materials.
CO5	Knowledge of Kinetics of Reactions

Unit-I

Sources of water, common impurities, requisites of drinking water in municipal water supply. Purification of water, sterilization, break point chlorination. Hardness, determination of hardness by Complexometric (EDTA) method, degree of hardness, Boiler troubles, carry over corrosion, Sludge and scale formation. Caustic embrittlement, cause of boiler troubles and their prevention.

Unit-II

Classification of fuels, solid fuels, Proximate and Ultimate analysis of coal, significance of constituents, theoretical method for calculation of Gross and net calorific values. Liquid fuels-Petroleum origin, Refining of Petroleum, knocking, octane number, anti knocking agents. Flue gas analysis by Orsat Apparatus, Calculations based on combustion.

Unit-III

Corrosion: Definition and its significance, Dry and Wet theories of corrosion, Cathodic & Anodic protection of corrosion, types of corrosion, factors affecting corrosion.

New Engineering Materials: Introduction, Properties and Applications of Super Condcutors, Organic electronic materials, Fullerenes.

Unit-IV

Chemical Kinetics: Order and Molecularity of reaction, first and second order reaction, Derivation of equations for first and second order reaction, determination of order of reaction, Energy of activation and Arrhenius equations, Numerical of first and second order reactions.

Engineering Chemistry Practical

1. Determination of viscosity of a liquid.
2. Estimation of free chlorine in a water sample.
3. Determination of temporary and permanent hardness by EDTA method.
4. Determination of Copper Sulphate iodometrically.
5. Estimation of Potassium dichromate iodometrically.
6. Determination of purity of Ferrous Ammonium Sulphate (Mohr's Salt) using Potassium Permanganate.
7. Estimation of available chlorine in Bleaching Powder sample.
8. Analysis of Brass.
9. Determination of Strength of Ferrous Ammonium Sulphate (FAS) using Potassium Ferricyanide as an external indicator.
10. Analysis of Common Salt.

Text Books/References

1. Jain and Jain. Engineering Chemistry, Dhanpat Rai Publishing Company(P) Ltd., New Delhi.
2. Jain and Gupta. A Text Book of Engineering Chemistry, Jaipur Publishing House, Jaipur.
3. B.K. Sharma. Engg. Chemistry (General), Krishna Prakashan Media (P) Ltd., Merrut.
4. S.S. Dara. A Text Book of Engineering Chemistry, S. Chand & Co., New Delhi.
5. M.M. Uppal. A Text Book of Engineering Chemistry, Khanna Publishers, New Delhi.
6. S.S. Dara. A Text Book on Experiments and Calculations in Engg. Chemistry. S. Chand & Co., New Delhi.
7. Ameta and Yasmin. Practical Engineering Chemistry, Himanshu Publications, New Delhi.

EC 100 ELECTRONICS AND INSTRUMENTATION

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

- CO1 Characterize passive electronic components.
- CO2 Characterize diodes and transistors.
- CO3 Demonstrate knowledge of concept and working of amplifier and oscillators circuits.
- CO4 Demonstrate understanding of characteristics of power supplies.
- CO5 Identify and select appropriate type of transducer for measurement of different quantities.

Unit-I

Passive Components: Construction and characteristics of carbon composition, wire wound and film resistors. Potentiometer, color codes and rating of resistors. Characteristics and rating of capacitors for electronics circuits.

Semi conductor: Basic electrical characteristics of semi conductors. Theory of p-n junction. Characteristics and ratings of junction diodes. Basics of zener diode, photo diode and LED.

Unit-II

Bipolar Junction Transistor: npn and pnp transistors,, Various configurations (CB, CC, CE) of BJT. Transistor biasing (Fixed, self, potential dividers) Basic classification of amplifier (Voltage and power amplifier). Basic concept of Class A, B , AB and C amplifiers.

Unit-III

Generation of waveforms: Concept of positive and negative feedback. Introduction of oscillators like R-C , L-C and Crystal oscillators.

Power supply: Circuit configuration and analysis of Half wave, Full wave and Bridge rectifier. Basic concept of regulation, Zener diode voltage regulator, Transistor series regulator.

Unit-IV

Transducers: Definition, classification: Active and passive transducer, primary and secondary transducers, Analog and digital transducers. Measurement of displacement, temperature, velocity, force and pressure using potentiometer, resistance thermometer, thermocouples, bourden tube, LVDT, strain gauge and techogenerator.

Practicals : Based on theory.

Text Books/References

1. Millman and Halkias. Integrated elecronics: Mc Graw Hill.
2. W.D. Cooper. Electronics Instrumentation and Measurement : PHI.
3. M.L. Gupta. Electrical Engineering Materials.
4. Malvino. Principles of Electronics.
5. Jhon D. Ryder. Electronics Fundamentals.

CS 100 INTRODUCTION TO COMPUTER PROGRAMMING AND DATA STRUCTURE

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course Outcome: At the end of the course, the student will be able to:

CO1 Understand the basic building blocks of a computer.

CO2 Learn different systems and codes to represent numbers in computers and be able to convert the numbers from one system to another.

CO3 Learn the data types and syntax of C language.

CO4 Write, compile and execute programs in C language for solving engineering problems.

CO5 Demonstrate capability to choose appropriate type of data structures and perform operations on them.

Unit–I

Computer Fundamentals: History of Computers; Organization of Computers: input unit, output unit, Storage Unit, Arithmetic Logic Unit, Central Processing Unit; CPU Operation; Memory Subsystem: RAM, ROM, Cache Memory & memory Hierarchy; Instruction Format and Instruction Execution Cycle; Number System & Codes: Binary, Decimal, Octal & Hexadecimal Number System, Conversion from one number system to another, sign magnitude, 1's Complement & 2's Complement representation of numbers; Numerical & Character codes: BCD, Excess – 3, Gray, ASCII & EBCDIC Codes.

Unit-II

Basics of Programming in C: Constants, Variables and Data Types, Operators and Expressions, Input and Output operations, Decision making & Branching: if-else, switch statement; Decision making and looping; Arrays.

Unit-III

Character Arrays & strings, User defined function, Structures & Unions, Pointer Management, Dynamic Memory allocation & linked lists.

Unit–IV

Introduction to Data Structures: Introduction to Linear Arrays & Representation of Linear Array in Memory, Traversing, Insertion & Deletion in Linear arrays, Bubble Sort, Linear & Binary search; Introduction to linked list – Representation of linked list in memory, Traversing, Searching, Insertion & Deletion in a linked list.

Practical: Lab experiments based on theory.

Text Books/References

1. E. Balagurusamy. "Programming in ANSI C", Tata McGraw Hill.
2. Kernighan and Ritchie. "The C Programming language", Printice Hall
3. P.M. Jat. "Programming with C", Apex Publishing House, Jaipur.
4. Dharm Singh. "Fundamentals of Compute Organization", Paragon International Publishers, New Delhi.
5. P.K. Sinha & P. Sinha. "Computer Fundamentals", BPB Publication.
6. Seymour Lipschutz. "Data Structure", Schaum's outline series, McGraw Hill.

BS 100E ENGLISH AND COMMUNICATION SKILLS

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	2	0	1
Hours	2	0	2

Course Outcome: At the end of the course, the student will be able to:

CO1 Understand basic grammar principles and be able to synthesise and transform sentences.

CO2 Write CVs, letters for job application, complaints and emails.

CO3 Prepare technical reports and short essays.

CO4 Learn phonetic symbols and use correct sound, stress and intonation.

CO5 Learn basic do's and don'ts of an interview.

CO6 Show enhance communication ability in English.

Unit-I

Grammar and Usage: Tense, Concord, Preposition, Common Grammatical Errors, Phrasal Verbs, Idioms, Words often misused, Synthesis of sentences, Transformation of Sentences (Simple, Compound, Complex, Voice, Speech). Analysis of sentences.

Unit-II

Comprehension-Unseen passage.

Composition: Business Letters, E-mail, Memos, Circular, Notice, Curriculum Vitae and Covering Letter, Writing of Technical Report, Essay Writing.

Unit-III

Phonetic Symbols and Transcription, Word Stress. Meaning and Characteristics of Seminar, Conference, Symposium and Work-Shop. Interview – Meaning, Types, Do's and Don'ts of Interviews.

Unit-IV

Communication Skills: Meaning and Process of Communication, Basic Forms of Communication, Verbal and Non-Verbal Communication, Communication Barriers, Principles of Effective Communication.

Language Lab Practical

Globerana Software: Listening skills, Fundamental language skills, Communication skills, Vocabulary, Phonetics, Conversation.

Group discussion on current topics, Oral presentations, Writing skills, Exercises on pronunciation.

Practical: Lab experiments based on theory.

Text Books/References

1. Thomson and Martinet. (1997). A Practical English Grammar Exercise Book, Vol. I and II. O.U.P. Publication.
2. Michal Swan. (1995). Practical English Grammar, O.U.P. Publication.
3. David Green. (1990). Contemporary English Grammar Structure Composition, Macmillan Publication.
4. S, Allen. (1997). Living English Structure, Orient Longmans.
5. Daniel Jones. Drills and Tests in English Sound, ELBS.
6. Hornby, (1990). Advanced Learners Dictionary, O.U.P. Publication.
7. Krishan Mohan. Speaking English Effectively, Macmillan Publication.
8. Audio-Video Tapes prepared by the British Council, New Delhi and Central Institute of English and Foreign Language, Hyderabad to be used in a Language Laboratory.
9. A. Adivi Reddy. Extension Education, Sree Lakshmi Press, Bapatla (A.P.).
10. G.L. Ray. (2005). Extension Communication and Management, Kalyani Publishers.

FIRST YEAR B.TECH. (II SEMESTER)

BS 121 MATHEMATICS – II

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcome: At the end of the course, the student will be able to:

- CO1 Show knowledge of vector calculus and its applications in engineering.
- CO2 Solve second order differential equations for application in their field of engineering.
- CO3 Solve partial differential equations of first order and higher orders (with constant coefficients).
- CO4 Solve simultaneous equations by matrix methods.
- CO5 Determine eigenvalues and eigenvectors.
- CO6 Diagonalise a matrix and invert a matrix.

Unit-I

Vectors Calculus: Scalar and Vector field. Differentiation of vector functions, Gradient, Divergence, Curl and Differential Operator. Integration of vector functions, Line, Surface and volume Integrals. Green's Theorem in a Plane, Gauss's and Stoke's Theorem (without proof) and their Applications.

Unit-II

Differential Equations: Second Order Ordinary Differential Equations with Variables Coefficients. Exact Forms. Part of Complimentary Function is known. Change of Dependent Variable. Change of Independent Variable, Normal Forms. Method of Variation of Parameter.

Unit-III

Partial Differential Equations: Formation of partial differential equations. Partial Differential Equations of First Order, Lagrange's Form, Standard Forms Higher order linear partial differential equations with constant coefficients.

Unit-IV

Matrices: Rank of a matrix, Inverse of a matrix by elementary transformations. Consistency and Solution of simultaneous linear equations. Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof). Diagonalization of matrix.

Text Books/References

1. Guar, Y.N. and Koul, C.I. (2013) Engineering Mathematics, Vols. I & II, Jaipur Publishing House, Jaipur.
2. Babu Ram: Engineering Mathematics-I, Pearson Education, India (2011).
3. B.V. Ramana (2012) Higher Engineering Mathematics, Tata McGraw Hill, India.
4. J.L. Bansal and H.S. Dhami (2012) Differential Equations, Vols. I & II, Jaipur Publishing House, Jaipur.
5. M. Ray and Chaturvedi: A Text Book of Differential Equations, Student Friend & Co. Publisher, Agra.
6. Rao V. Dukkipati (2012) Engineering Mathematics, New Age International (P) Ltd., New Delhi.

CE 122 CIVIL ENGINEERING

Cr. Hrs. 2 (1 + 1)

	L	T	P
Credit	**1**	**0**	**1**
Hours	**1**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

CO1	Demonstrate knowledge of various surveying methods.
CO2	Conduct a chain survey.
CO3	Conduct a compass survey.
CO4	Conduct levelling survey and be able to do RL calculations.
CO5	Demonstrate knowledge of properties of various building materials.

(A) SURVEYING AND LEVELING

Unit-I

Principle and purpose of plane surveying.

Chain Surveying: Instrument for chaining, Direct & indirect ranging. Methods of chain along plane & sloping ground, Base line, check line, Tie line, Offset, Chain angle & recording in field book.

Compass Surveying : True & Magnetic meridian, whole circle bearing & quadrantal bearing system, construction & use of Prismatic & Surveyor Compass, Local attraction.

Unit-II

Level and leveling : Definition of various terms used in leveling. Types of Bench mark and their uses. Construction and use of Dumpy and Tilting levels, Leveling staves. Temporary adjustment of Dumpy level. Simple, differential leveling, fly leveling, longitudinal and cross sectioning, plotting of profile leveling. Determination of level by line of collimation and rise and fall method, Arithmetical checks. Level book and record keeping, leveling difficulties and errors in leveling.

(B) BUILDING MATERIAL

Unit-III

Stones: Different types, properties of good building stones, common testing of stones, Dressing of stones and use of stones in construction.

Bricks: Types, raw materials, identification, composition. Properties and uses of ordinary bricks, fire resistant and chemical resistant bricks.

Limes: Definition, sources of lime, slaking of lime, ISI classification of lime.

Unit-IV

Cement: Chemical composition, types of cement, properties, uses and tests on cement.

Mortars: Proportioning, properties of ingredients and use of lime, cement and gauge mortars.

Cement Concrete: Ingredients, common proportions, properties of fresh hardened concrete, Water cement ratio, curing and consolidation of concrete.

Practicals

1. Study of accessories used in measurement of distances.
2. Ranging Direct and indirect and use of chain and tape.
3. Chining along sloping ground.
4. Chain surveying, field book recording and taking offsets for location details.
5. Study of prismatic and surveying compass and taking bearings.
6. Study of Dumpy level, temporary adjustment and R.L. calculations.
7. Study of Tilting level, temporary adjustment and R.L. calculations.

8. Simply and differential leveling operation, record in level book, practice for staff reading line of collimation and Rise and fall method calculations.
9. L-section and cross sectioning, fly leveling operation.
10. Plotting of working profile.

Practical: Lab experiments based on theory.

Text Books/References

1. S.C. Rangwala. Engineering Materials, Charotar Book Stall, Anand.
2. B.C. Punmia. Surveying & Field Work (Vol. I), Laxmi publications, New Delhi.

ME 123 MACHINE DRAWING – I

Cr. Hrs. 1 (0 + 1)

	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**0**	**3**

Course Outcome: At the end of the course, the student will be able to:

CO1 Introduction to BIS codes.

CO2 Introduction to Orthographic Projection.

CO3 How to draw the missing views and Sectional Views.

CO4 Knowledge about Riveted and Welded Joints, Screw Fastenings.

CO5 Knowledge of Conventional representation of threads, Different types of lock nuts, studs, machine screws, cap screws and wood screws.

Introduction, conventional representation of different materials used in machine drawing, Introduction to BIS codes.

Orthographic Projection: First and third angle methods of projection. Preparation of working drawing from models and isometric views. Drawing of missing views.

Dimensioning: Different methods of dimensioning.

Sectional Views: Concept of sectioning. Revolved and oblique section. Sectional drawing of simple machine parts

Riveted and Welded Joints: Types of rivet heads and riveted joints. Processes for producing leak proof joints. Symbols for different types of welded joints.

Screw Fastenings: Nomenclature, thread profiles, multistart threads, left and right hand threads. Square headed and hexagonal nuts and bolts. Conventional representation of threads. Different types of lock nuts, studs, machine screws, cap screws and wood screws. Foundation bolts.

Different types of joints: Knuckle joint, cotter joint and universal joint.

Text Books/References

1. N.D. Bhatt. Machine Drawing, Charotar Book Stall, Anand.
2. V. Laxminarayan and M.L. Mathur. A Text Book of Machine Drawing, Jain Brothers, New Delhi.
3. P.S. Gill. Machine Drawing: S.K. Kataria & Sons, New Delhi.

ME 124 WORKSHOP TECHNOLOGY

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**3**

Course Outcome: At the end of the course, the student will be able to:

CO1: Understand welding principles, equipment and tools of arc-gas and resistance welding, brazing and soldering.

CO2: Describe construction, operations and tools of lathe, shaper and drilling machines.

CO3: Understand basic hot and cold forming operations.

CO4: Demonstrate knowledge of types of patterns, cores, moulding sands and tools.

CO5: Understand sand, permanent mould and investments castings and casting defects.

Unit-I

Welding: Introduction to types of welding; Principle of Electric arc welding, welding tools and safety devices, welding positions, welding joints, types of welds, Resistance welding, Oxyacetylene gas welding, types of flames, Soldering and Brazing.

Unit-II

Lathes: Constructional details of centre lathe. Main operations and tools used on centre lathes.

Shaper: Types of shapers. Constructional details of standard shaper, shaper tools and main operations.

Unit-III

Drilling Machines: Types of drilling machines. Constructional details of pillar type and radial drilling machines. Main operations. Twist drills, drill angles and sizes.

Forming : Basic descriptions and applications of hot and cold working processes, forging, bending, shearing, drawing and forming operations.

Unit-IV

Foundry & Casting Practice : Introduction, types of pattterns, mouldings, moulding Materials, cores, moulding tools and equipments. Moulding sands, properties of moulding sands. Casting defects.

Casting methods : Permanent mould casting, investment casting.

Practicals

Practical exercises on welding, pattern making, foundry and machining operations.

Text Books/References

1. Mathur, Mehta and Tiwari : Elements of Mechanical Engineering, Jain Brothers, New Delhi.
2. S.K. Hajra Choudhury and A.K. Hajra Choudhury. Elements of Workshop Technology (Vol. I and II), Media promoters & Publishers Pvt. Ltd., Bombay.

SECOND YEAR B.TECH. (III SEMESTER)

BS 211 (All Branches) MATHEMATICS – III

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	3	0	0
Hours	3	0	0

Course Outcome: At the end of the course, the student will be able to:

CO1 Understand Finite differences, various difference operators and their relationships, factorial notation

CO2 Use of numerical methods in modern scientific computing

CO3 Find the Inverse Laplace Transform By Partial Fractions

CO4 Use the Laplace Transform to solve differential equation with constant coefficients

CO5 Numerically integrate any function by Trapezoidal and Simpson's rule

Unit-I

Interpolation: Finite differences, various difference operators and their relationships, factorial notation. Interpolation with equal intervals; Newton's forward and backward interpolation formulae, Lagrange's interpolation formula for unequal intervals.

Unit-II

Gauss forward and backward interpolation formulae, Stirling's and Bessel's central difference interpolation formulae.
Numerical Differentiation: Numerical differentiation based on Newton's forward and backward, Gauss forward and backward interpolation formulae.

Unit-III

Numerical Integration: Numerical integration by Trapezoidal, Simpson's rule.
Numerical Solutions of Ordinary Differential Equations: Picard's method, Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta methods.

Unit-IV

Laplace Transform: Laplace transforms of elementary functions; Basic properties of Laplace transform; Initial value theorem, final value theorem and convolution property of Laplace transform; Inverse Laplace transforms. Applications of Laplace transform to solve ordinary differential equations.

Text Books/References

1. H.C. Saxena. Text Book of Finite Differences and Numerical Analysis, S. Chand and Co.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain. Numerical Methods for Scientific and Engineering computation, New Age International (P) Ltd.
3. N.P. Bali and Manish Goyal. A Text book of Engineering Mathematics, Laxmi Publication Pvt. Ltd., New Delhi (VII Edition).
4. S.P. Goyal and A.K. Goyal. Integral Transforms, Jaipur Publishing House, Jaipur.

CS 211 DIGITAL LOGIC DESIGN

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course Outcome: At the end of the course the student will be able to:

CO1 Demonstrate the principles of number system, binary codes and Boolean algebra to minimize logic expressions

CO2 Analyze and design combinational circuits using standard gates and minimization methods.

CO3 Efficiently optimize and minimize logic function using k-maps.

CO4 Design common digital circuit such as - decoders, multiplexers, encoder, demultiplexer etc.

CO5 Analyze and design sequential circuit such as flip-flops, counters, registers etc.

Unit -I

Computer Number Systems and Codes: Number Systems and their conversion, Negative Numbers representation, *Codes;* Binary Coded Decimal number(BCD), Excess-3 BCD Code, Gray Codes representation.

Logic families: Characteristics of digital ICs, Diode-Transistor Logic (DTL) Transistor- Transistor Logic (TTL) TTL output structures: Totem pole output, Darlington Output, Open-Collector Outputs. Wired Logic, Tri-State

Logic, Emitter-Coupled Logic, Metal-Oxide Semiconductor (MOS) Logic, Complementary metal oxide semiconductor (CMOS) Logic.

Unit - II

Logical Operations, Logic Gates, and Boolean Algebra: Truth Table, Logical Operations and logic gates, Logic Circuits, Realizing Circuits From Boolean Expressions, *Derived Logical Functions and Gates*: The NAND Gate, The NOR Gate, he Exclusive-OR or XOR Gate, The Exclusive-NOR, or XNOR Gate, Boolean Algebra, Boolean Algebra Theorems, De Morgan's Theorems, Duality Theorem, Universal Gates, Deriving the XOR Function, Reducing Boolean Expressions by Algebraic reduction.

Unit - III

Principles of Combinational Logic Circuits: Minterm and Maxterm designations, Canonical Forms, *Karnaugh Map*: Karnaugh Map upto six variables. Prime implicant (PI), Essential Prime implicant (EPI), Simplification of Boolean expressions using K-map in POS and SOP form, Incompletely Specified Functions (Don't Care Terms), Quine-McCluskey Minimization Method, Mixed (Buble) logic Combinational Circuits. *Arithmetic Circuits*: Adders, Subtractor, 2-bit Full-Adder/Subtractor, Binary Parallel Adder, BCD Adder, Multiplier, Digital comparator, Decoders, Encoders, Priority Encoder, Multiplexers, Implementation of Boalean Function with Multiplxer, Demultiplexer.

Unit - IV

Sequential Logic Circuits: Latches, Flip-flops: SR(Set-Reset) Flip-Flop, Edge-Detector Circuits, Master-Slave S-R Flip-Flop, J-K flip-flop, Master-Slave J-K Flip-flop, D Flip-Flop, T Flip-flop, Conversions of flip-flops. Mealy and Moore Machines. *Counters*: Asynchronous (Ripple) Counters, Propagation Delay in Ripple Counter, Asynchronous Counters with Mod Numbers, Synchronous (Parallel) Counters, Design of Synchronous Counter.

Registers: Serial- in/serial- out, Serial- in/parallel- out, Parallel- in/serial- out, Parallel- in/parallel- out, Bi-directional shift register,Shift-registers counters (Ring Counter, Johnson Counter).

Practicals: Lab experiments based on theory.

Text Books/References

1. Singh. Dharm. Introduction to Digital Logic Design, Yash Publication House, Bikaner.
2. M. Morris Mano. Digital Logic and Computer Design, Prentice-Hall of India Pvt. Ltd, New Delhi.

CS 212 UNIX AND SHELL PROGRAMMING LAB

Cr. Hrs. 2 (0 + 2)

	L	T	P
Credit	0	0	2
Hours	0	1	4

Course Outcome: At the end of the course the student will be able to:

CO1 Understand the basics of unix operating system, vi editor, unix file system and directory structure.

CO2 Understand, apply and practice various unix commands in the categories of file, processes and email

CO3 Understand and practice shell programming to develop shell scripts.

CO4 Evaluate environment variables and startup scripts for bourne shell.

Introduction to the unix operating system, vi editor, unix file system and directory structure. *Basic unix commands*: who, tty, uname, passwd, pws, cd, mkdir, rmdir, ls, cat, cp, rm, mv, more, lp. *File attributes concepts and related commands*: ls-l, ls –d, chmod, chown, chgrp, chmode, ln. *Processes concepts and related commands*: sh, ps, kill, cron. *Electronic mail and related commands*: write mesg, mail, finger, pine. Shell programming concepts, environment variables, simple bourne shell programming, .profile file and other startup scripts.

Text Books/References

1. G. Mark Sobell. Practical Guide to Solaris, Pearson Education Asia.
2. H. Rosen Kenneth. et.al. Unix Complete Reference, TMH, New Delhi.
3. Sumitabha Das. Unix Concepts and Applications, TMH, New Delhi.

CS 213 OBJECT ORIENTED PROGRAMMING WITH C ++

Cr. Hrs. 5 (3 + 2)

	L	T	P
Credit	3	0	2
Hours	3	0	4

Course outcome: At the end of the course, the student will be able to:

CO1 Modularize computing problems into classes, objects and functions for implementing OOPs concepts.

CO2 Design, develop and analyze C++ programs with various concepts and constructs of OOP such as constructors, destructors, polymorphism, inheritance etc.

CO3 Demonstrate the ability to model simple data structures like arrays, strings, linked lists etc. with efficiency using suitable memory allocation concepts.

CO4 Apply various advance features of C++ such as exception handling, templates, built-in Standard Template Library, I/O streams etc. for making the program more organized, reusable and user-friendly.

CO5 Analyze a given programming problem and design its corresponding object-oriented programming solutions.

Unit -I

Concept of Object Oriented Programming, *Objects Classes*, Encapsulation, Inheritance, Polymorphism. C/C++. C++ core language. Program structure, Functions. Primitive Data types, Variables, Header and Pre-Processor Directives, cin, cout, iomanip.h. for, while, do-while loops, if, if-else, nested if-else, switch, logical and, or and not operators, break, continue, goto and exit statements, functions, declarations, definitions, returns, Parameters by values by reference, default arguments, Inline functions, Automatic, external, static, variables. Const function arguments. Structures, Defining, Accessing Members, Structure within Structure, Class, Classes and Objects, Objects as Data Types.

Unit - II

Constructors, Overloading, Copy Constructors, Objects and Memory allocations, const and Classes, Objects as Arguments to functions. Arrays and Strings, Arrays as parameters to functions, C++ String class, *Operator Overloading*: Arithmetic, Logical, Assignment. Pointers, pointer to void, pointers and arrays, pointers and functions, new and delete operators, pointers to objects, Array of pointers to objects, A Linked List example, Pointers to pointers.

Unit - III

Inheritance, Derived class and base classes, Derived class constructors, Overriding member functions, Class Hierarchies, Multiple Inheritances. Virtual Functions, Friend Functions, Static functions, Dynamic Type Information.

Unit - IV

ios, istream, ostream, iostream classes, stream errors, Disk I./O with streams, file pointers, overloading cin, cout operators, multi file programs and projects, Exceptions, Exceptions with arguments, Templates, Linked List using templates. Introduction to Standard Template Library.

Practicals: Lab experiments based on theory.

Text Books/References

1. Bjarne Stroustrup. The C++ Programming Language, Addison-Wesley, Third Edition.
2. Robert Lafore. Object Oriented Programming with C++, Techmedia Publications.

CS 214 PRINCIPLES OF PROGRAMMING LANGUAGES

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**1**	**0**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand the fundamental concepts of different programming languages & the various tradeoffs between language design and implementation.

CO2 Demonstrate the semantic issues associated with function implementations, variable binding, scoping rules, parameter passing and exception handling for different programming languages.

CO3 Understand and analyze different programming paradigms such as principles of imperative, object- oriented, functional and logic programming.

CO4 Understand and implement different parameter passing mechanisms and return semantics for subprogram calls and analyze its stack implementation.

Unit-1

Language Design Issues: why study programming languages? Brief history and features. Good programming languages. Programming environment. Impact of Machine architecture: Operation of a computer. Virtual computers & binding times.

Unit -II

Language Translation Issues: Programming language Syntax, Stages in translation. Elementary Data Types: Properties of type & objects, scalar data types, composite data types.

Unit-III

Encapsulation: structured data types, Abstract data types, Type definitions. Inheritance: Introduction, Polymorphism. Sequence control: Implicit & explicit sequence control, sequence control between statements.

Unit -IV

Subprogram control: Subprogram sequence control Attributes of data control, parameter transmission, explicit common environment. Storage management: Elements requiring storage, programmer & System controlled Storage, static storage management, heap storage management. Brief overview of C and C++ languages.

Text Books/References

1. T.W. Pratt. Programming Languages : Design and Implementation, Prentice Hall.
2. Ghezzi Carlo & M. Jizayeri. Programming Language Concepts, John Wiley & Sons.
3. Ravi Sethi. Programming Languages Concepts and Constructs, Addison Wesley.

EE 212 (EE, CS) ELECTRICAL MEASUREMENT AND INSTRUMENTS

Cr. Hrs. 3 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Ability to comprehend for the measurement of circuit quantities.

CO2 Capacity to deal with minimization of errors in measurement.

CO3 Capacity for understanding of most useful techniques in a particular case of measurement.

CO4 Ability to understand electronic instruments and related losses.

Unit-I

Measuring Instruments: Principle of operation, construction detail, torque equation, scale shape, uses and error in Moving iron, Electrodynamics and induction instruments for the measurement of voltage, current, power and energy.

Galvanometers: D'Arsonval, Vibration and Ballistic galvanometers, Dynamic equation of motion and its solution for various conditions, Relative damping, logarithmic decrement and galvanometer sensitivities.

Unit-II

Potentiometers: Theory of operation and construction of D.C. and A.C. potentiometers (polar and coordinate type), Their standardization and applications.

Measurements of Resistance: Methods of measurement of medium, low and high resistances, three and four terminal type resistance, Kelvin's double bridge, Price's guard wire and Loss of charge method.

Unit-III

A.C. Bridges-Four arm A.C. Bridge for the measurement of inductance, capacitance, quality and dissipation factor. Screening, Wagner earthing.

Instrument Transformers: Theory and construction of current and potential transformers, Ratio and phase angle errors and their minimization, effects of variation of power factor, secondary burden and frequency on errors, Testing of CTs and PTs.

Unit-IV

Magnetic Measurements-Determination of B-H curve and hysteresis loop of ring and bar specimens, Measurement and separation of iron losses.

Electronic Instruments-Transistor voltmeter, TVM using FET in input stage, Digital voltmeters: Ramp type, integrated type, Measurement of time, phase and frequency using digital counters, Principle and working ofcathode ray oscilloscope.

Wave analyzers: Frequency selective and heterodyne wave analyzers and its applications.

Practicals : Lab experiments based on theory

Text Books/References

1. A.K. Sawhney. Electrical & Electronics Measurements & Instrumentation. Dhanpat Rai & Co.
2. H.S. Kalsi. Electronic Instrumentation.
3. E.W.GoldinG. Electrical Measurements.

EC 219 (CS) ANALOG ELECTRONICS

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	2	0	1
Hours	2	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 To develop fundamental concepts of analog electronics.

CO2 To enhance the knowledge of feedback concepts and their effects on amplifier performance.

CO3 To master the basic ideas of power amplifiers and tuned amplifiers.

CO4 To understand the concept of oscillator using positive feedback systems.

CO5 To develop an knowledge of operational amplifier and various analog computation using operational amplifiers.

Unit – I

Response of Transistor Amplifier: Review of biasing, classification of amplifiers, distortion in amplifiers, frequency & phase response of an amplifier, cascaded amplifiers responses, transistors model at high frequencies for CE and Emitter follower configuration, high frequency response of two cascaded CE transistor stages.

Unit – II

Feedback Amplifier: Classification of amplifier, feedback concept, general characteristics of negative feedback amplifiers, analysis of a feedback amplifier, various types of feedback and their effects on amplifier performance.

Unit – III

Power Amplifiers: Class A large signal amplifier, second and higher harmonic distortion, transformer coupled amplifiers Efficiency of amplifiers, Push-pull amplifiers (Class A & Class B). *Tuned Amplifiers*: Single tuned capacitively coupled amplifier & its steady state response determination of Gain, Band width product. Tapped tuned, inductivity coupled single tuned.

Unit – IV

Oscillator: Criteria of oscillations, sinusoidal oscillators, Hartley, Colpits, Wains bridge, Phase shift. General form of oscillators, crystal oscillator, frequency stability. *Operational Amplifiers*: Basic op-amp, differential amplifier, IC Op-amp & its characteristics, Linear applications of IC Op-amp, Inventor, Adder, Intergrator, Differentiator, Analog computation.

Practicals: Lab experiments based on theory.

Text Books/References

1. Millman & Halkias , Integrated Electronics, McGraw Hill publication.
2. Alley & Ahwood, Engineering Electronics., John Wiley & Sons Inc, Newyork London.

SECOND YEAR B.TECH. (IV SEMESTER)

BS 222 (CS) DISCRETE MATHEMATICAL STRUCTURE

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	3	0	0
Hours	3	0	0

Course outcome: At the end of the course, the student will be able to:

CO1 Know Permutation, Combinations & logical operations.

CO2 Understand properties of relations & digraphs.

CO3 Manipulate, represent the relation & digraphs on computer.

CO4 Distinguish paths and circuits and about Boolean Alzebra.

CO5 Know about group, semi groups, products and quotients of group.

Unit - I

Fundamentals: Sets & Subsets, operation on sets, sequence, division in the integers, Matrices, mathematical structures, Logic: proposition & logical operations, conditional statements, method of proof, mathematical induction, Counting: Permutation, Combinations, pigeonhole principle, elements of probability, recurrence relations.

Unit - II

Relations & Digraphs: Product sets and partitions, relation & digraphs, paths in relation & digraphs, properties of relations, equivalence relations, computer representation of relation & digraphs, manipulation of relations, transitive closure and Warshall's algorithm, *Functions*: Functions for computer science, permutation of functions, growth of functions.

Unit - III

Graphs, Eular paths & Circuits : Hamiltonian paths and circuits, coloring graph. Relations & Structures: Partially ordered sets, extremal elements of partially ordered sets, lattices, finite Boolean algebras, Boolean functions as Boolean polynomials.

Unit - IV

Semigroups & groups: Binary operation, semigroups, products & quotients of semigroups, groups, products and quotients of group.

Text Books/References

1. Koloman and Busby. Discrete Mathematical Structures, P.H.I, New Delhi
2. Trembley Manohar. Discrete Mathematical Structure With Application to Computer Science, Tata McGraw Hill.
3. S. Lipschutz and N.L. Lipson. Discrete Mathematics, 2nd Edition, Tata Mc-Graw Hill Publication Co. Ltd.

CS 221 COMPUTER ORGANIZATION

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	3	0	0
Hours	3	1	0

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze registers and register transfers language and describe various arithmetic micro-operations.

CO2 Understand and analyze CPU organization, instruction formats and different addressing modes.

CO3 Demonstrate and analyze the applicability of Arithmetic and logic Algorithms for signed-unsigned numbers in addition to basic organization of Micro-Programmed Controller.

CO4 Understand & analyze memory organization, different types of auxiliary memories, cache memory and Associative Memory usage and design.

CO5 Understand the I/O organization and their interfacing with the processor.

CO6 Understand the basic concept of SIMD, MIMD, array & pipelined architecture of processor design.

Unit - I

Register Transfer and Microoperations: Register Transfer Language, Register Transfer, Bus and Memory transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift unit.

Unit - II

Basic Organization: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Computer Operation.

Unit - III

Arithmetic-Logic Units: Basic design of combinational ALU and Sequential ALU, Pipeline Processing: Introduction, Pipelined adder, multipliers.

Unit - IV

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms Floating-Point Arithmetic Operations, Decimal Arithmetic Unit (BCD Adder, BCD Subtraction), Decimal Arithmetic Operations.

Text Books/References

1. M. Morris Mano. Computer System Architecture, 3rd ed., Prentice Hall.
2. J. P. Hayes. Computer Architecture and Organization, 3rd ed., McGraw Hill International edition.
3. Andrew S. Tenenbaum. Structured Computer Organization; PHI, New Delhi.

CS 222 DATA STRUCTURES

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze the implementation and application of basic data structures such as arrays and linked lists.

CO2 Evaluate and analyze the implementation and application of various ADTs such as Stacks and Queues.

CO3 Evaluate and analyze the implementation and application of tree based data structures such as Binary Tree, BST, AVL Tree, B-Tree, m-way search tree, etc.

CO4 Evaluate and analyze the implementation and application of graph and hashing based data structure.

Unit - I

Concepts. Data Representation: Linear Lists, Formula based representation, Linked List Representations, Circular and Doubly Linked Lists, Indirect Addressing.

Unit - II

Stacks: Abstract Data Type, Derived Classes and Inheritance, Formula based Representation, Linked Representation. Applications. *Queues:* Abstract Data type, Formula based Representation. Linked List Representation.

Unit - III

Trees: Introduction, Binary Trees, Formula based and Linked Representation of Binary Trees, Common Operation and Traversal, Abstract Data Type *BinaryTree*. Priority Queues and Tournament Trees. *Search Trees:* Binary Search Tree, ADT (abstract Data Type)'s BSTree and IndexedBSTree. AVL Trees. B-Trees, m-way tree search, B-Tree order of m, Height, Searching, Insertion and deletion in B-Tree.Node Structure in B-Tree. Applications.

Unit - IV

Graphs: Definitions and Applications. ADTs Graph and Disgraph. Graphs Iterators, Graph Search Methods. *Skip Lists and hashing*: Dictionaries. Linear List Representation, Skip List Representation, Hash Table Representation.

Practicals: Lab experiments based on theory.

Text Books/References

1. Sartaj Sahni. Data Structure, Algorithms and Applications in C++, WCB McGraw-Hill.

EC 228 (CS) COMMUNICATION SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	3	0	0
Hours	3	1	0

Course outcome: At the end of the course, the student will be able to:

CO1 Understand the fundamental concepts of communication systems.

CO2 Understand and compare different analog modulation schemes.

CO3 Understand and compare different digital modulation schemes.

CO4 Understand the design tradeoffs and performance of communications systems.

CO5 Learn about practical communication systems

Unit - I

Modulation of Signals: Principles of Analog modulation techniques like FM, PM, SSB, Generation and Detection) Block schematics only). Frequency Division Multiplexing and Time Division Multiplexing. *Pulse Modulation:* Pulse transmission over Band limited signals, sampling theory, PAM, DYE diagram.

Unit - II

Digital Communication: PCM, DPCM, DM ADM, comparison of the above on the basis of criteria such as bit transmission, signaling rate, error probability, S/N ration, bandwidth requirement. *Digital Modulation Techniques:* Data transmission such as PSK, FSK, QPSK (QAM) MSK, Inter system comparison.

Unit - III

Coding for communications: Information theory, Capacity, Shannon's theorem, Source coding error control coding Error detection and correction, Block codes, Cyclic coder, Line code, Channel throughput and efficiency.

Modem: Principles of modems, function operation. Short and long modems Digital modems, multiplexers, and concentrators.

Unit - IV

Broad View of Communication Channel: Transmission Line, Primary and secondary line constant, telephone line and cables, Public switch telephone network (Electronics). *Fiber Optic Communication*: Principles of light communication in fiber, losses in fiber, dispersion, light sores and detectors. Satellite Communications Orbits, satellite altitude, multiple access method.

Text Books/References

1. B.P.Lathi. Modern Digital Communication, Oxford.
2. Tube and Schilling, Introduction to Communication system, McGraw Hill.
3. R. Coolen. Electronic Communication, PHI.

CS 224 MICROPROCESSORS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Demonstrate the architecture and instruction sets of 8085, 8086 microprocessor and 8051 microcontroller.

CO2 Understand the i/o organization and their interfacing with the processor.

CO3 Understand and analyze addressing modes, instruction set and timing diagram of different processor.

CO4 Demonstrate the architecture and functioning of various peripheral devices and communication buses

CO5 Demonstrate and compare the architecture and organization of various semiconductor memories such as SRAM, DRAM, and EPROM etc. with their operation.

Unit - I

Introduction to Microprocessor, Internal architecture and pin configuration of 8085A, Interrupt system of 8085A, Instruction Set of the 8085, Addressing modes of 8085A, 8085A timing diagrams. *Assembly language programming of 8085A*: Simple program, Program with loop, Counters and Time delays, Stacks and Subroutines.

Unit - II

Semiconductor Memories: Memory Types, Memory-chip organization, Random-access memory (RAM) cells, Static RAM (SRAM), Dynamic RAM (DRAM) cell. Sense amplifier, Row and column address decoder. *Memory Operation*: SRAM: SRAM architecture, Understanding the SRAM timing diagram, Read and write operation. DRAM: architecture and organization of a DRAM, Understanding the DRAM timing diagram, Read and Write operation, Fast page mode (FPM), DRAM burst mode. Refreshing the dynamic RAM. Introduction to UV-EPROM, EPROM, EE-PROM, MOS-ROM.

Unit – III

Programmable LSI ports: Functional description and programming of 8255A Programmable peripheral interface, 8353 Programmable interval timer and 8251 Programmable communication interface. *DMA and Interrupts*: Direct Memory Access, functional description of 8257 DMA controller and, Interrupts of 8085, Multiple Interrupts and 8259 Programmable interrupt controller.

Unit – IV

Interfacing Memory and I/O Devices: Address space partitioning; Address map; Address decoding, Memory mapped I/O scheme, I/O mapped I/O scheme. Memory interfacing design, Data transfer schemes, *Application of microprocessor*: frequency measurement, resistance measurement, interfacing of digital multiplexer/Data selector, generation of square waves.

Practicals: Lab experiments based on theory.

Text Books/References

1. R.S. Gaonkar. Microprocessor Architecture, Programming, and applications with the 8085/8080A, Wiley Eastern Ltd, 2nd ed.

2. Aditya P. Mathur. Introduction to Microprocessor, 3rd ed., Tata McGraw-Hill Publishing Company Limited, New Delhi.

CS 225 SYSTEM SOFTWARE

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyse the concepts of system programming and analyse job control and resource management

CO2 Understand and analyse the working, design issues and challenges of assemblers

CO3 Understand and analyse the working, design issues and challenges of macro processors

CO4 Understand and analyse the working, design issues and challenges of different types of loaders

CO5 Understand the basic phases and functions of a compiler

Unit - I

Introduction to System, System Software, and System Programming. A Simple Operating System. A user's view of the system, hardware components of the system and insider's view. Software components, the command language, system building blocks, job control, Resource management.

Unit - II

Machine and Assembly Languages. Assemblers Design methodology, functions of an assembler, major modules and interfaces; pass one symbol definition, pass two, assembly of instructions; expression evaluation; conversion of constants; table maintenance.

Unit - III

Macros and Macro Processing. Definition and use of macros; overview of macro processing Implementation of macro definitions; expansion of macro instructions, additional macro features, implementation of the additional features.

Unit - IV

Loaders An absolute loader; basic concept of relative loaders, functions of a relative loader; assembly language extensions required by the loader, a relative loader, structure of the object deck and library searching; phase two the evolution of loaders, Design of an absolute loader, Direct linking loader.

Introduction to Compilers. Different phases and their functions.

Practicals: Lab experiments based on theory.

Text Books/References

1. J.J. Donovan. Systems Programming, Tata McGraw Hill.

THIRD YEAR B.TECH. (V SEMESTER)

CS 311 THEORY OF COMPUTATION

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	3	0	0
Hours	3	1	0

Course outcome: At the end of the course, the student will be able to:

CO1 Understand the need and significance of computational theory, formal machines, languages and computations in computer engineering.

CO2 Understand, design and analyze the role of finite automaton in recognizing a regular language.

CO3 Understand, analyze and apply the Context Free Grammar and Push-Down automaton with its advantages and limitations.

CO4 Understand, analyze and design Turing machine model for computable languages with its strength and limitations.

CO5 Understand and analyze Universal Turing Machine and its undecidability issues.

Unit - I

Mathematical preliminaries: Strings, alphabet, languages; Graphs and Trees; Inductive proofs, set notation, Relations, Finite automata

Unit -II

Regular expressions, Properties of regular sets: pumping lemma, closure properties and decision algorithm for regular sets.

Unit -III

Context Free Grammars. *Properties of Context free languages (CFLs)*: Greibach's theorm, Pumping lemma, closure properties and decision algorithms for CFLs. Pushdown automata.

Unit - IV

Turing machines: Turing machine model, computable languages and functions, techniques for turing machine construction, modification of turing machines, Halting problem of turing machine, church's hypothesis, turing machine as enumerators. *Undecidability*: Problems, properties of recursive and recursively enumerable languages, universal turing machines and

undecidable problem, Rices' theorm, Post's correspondence problem, , introduction to recursive functions theory.

Text Books/References

1. John E. Hopcroft and Jeffrey D. Ullman, Introduction to Automata Theory, Laguages and Computation, 2nd edition, Pearson Education Asia.
2. K.L.P. Mishra, N. Chandrasekaran. Theory of Computer Science (Automata, Languages and Computation), 2nd edition, Prentice Hall India.
3. Harry R. Lewis and Cristos H. Papadimtriou. Elements of the Theory of Computation, 2nd edition, PHI.
4. J.C. Martin. Introduction to Languages and the Theory of Computation, McGraw-Hill International Editions, Computer Science Series.

CS 312 JAVA PROGRAMMING

Cr. Hrs. 5 (3 + 2)

	L	T	P
Credit	**3**	**0**	**2**
Hours	**3**	**0**	**4**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand fundamentals of OOPs in Java including classes, objects, datatypes, operators and programming constructs.

CO2 Understand and implement the object oriented concepts in Java such as inheritance, abstract class, interface and package.

CO3 Understand and implement exception handling and multithreading in Java, creating event-driven GUI using applets and AWT.

CO4 Understand and implement Java File I/O, network based applications, java beans and J2EE.

Unit - I

Introduction to Java, Data types, operators, programming structures in Java, Objects and Classes.

Unit - II

Packages, Inheritance, Abstract classes, Interfaces, Event handling.

Unit - III

AWT, User interface components, layout management, menus, dialog boxes, Applets, Exception handling.

Unit - IV

Streams and Files. Multithreading, synchronization, Networking, JavaBeans, Java Security system. Internationalization.

Overview of J2EE Architecture.

Practicals: Lab experiments based on theory.

Text Books/References

1. Sun Publications, Core Java Vol. I and II, Addison Wesley.
2. Java 2 Complete Reference, TMH

CS 313 DATA COMMUNICATION AND NETWORKS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand OSI and TCP/IP layered models of computer network and along with various LAN topologies.

CO2 Understand and analyze various guided and unguided Transmission medium used in physical layer of computer network.

CO3 Analyze and implement error detecting and correcting codes of data link layer.

CO4 Analyze and understand MAC layer protocols.

CO5 Understand and apply various popular Ethernet technology including fast and gigabit Ethernet.

CO6 Recognize the different Internetworking Devices and their functions such as Repeaters, Hubs, Bridges, Switches, Routers and Gateway.

Unit - I

Introduction: Categories of networks, Local area network (LAN) models, Reference models Network Topologies. *The Physical Layer*: Introduction to data communication, Guided Transmission Media, Wireless Transmission, Communication Satellites, Public Switch Telephone Network: Structure, Local Loop, Trunks and Multiplexing, SONET/SDH.

Unit - II

The Data Link Layer: Design Issues, Error Detection and Correction, Elementary data link protocols, Sliding Window Protocols. Switching, Integrated services digital network (ISDN): Architecture, Interfaces, ISDN equipments at user's premises, Reference points, Broadband ISDN.

Unit - III

The Medium Access Sub layer: Multiple Access Protocols: ALOHA, Pure ALOHA, Slotted ALOHA, Carrier sense multiple access (CSMA), CSMA with collision detection (CSMA/CD), CSMA with collision avoidance (CSMA/CA). Asynchronous transfer mode (ATM): Packet size, Virtual path identifier (VPI), Virtual circuit identifier (VCI), ATM cells, ATM Switching.

Unit - IV

Ethernet: Ethernet cabling, Manchester encoding, Ethernet MAC sub layer protocol, Ethernet performance, Switched Ethernet, Fast and Gigabit Ethernet. IEEE 802.2: Logical link control, LLC protocol. Wireless LANs, Bluetooth, Data link layer switching: Bridges from 802.x to 802.y Local Internetworking, Spanning tree bridges, Remote bridges, Repeaters, Hubs, Bridges, Switches, Routers, and Gateway.

Practicals: Lab experiments based on theory.

Text /References

1. Andrew S. Tanenbaum. Computer Networks, Prentice-Hall of India Pvt. Ltd, New Delhi.

CS 314 (CS, EC) COMPUTER ARCHITECTURE

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**1**	**0**

Course outcome: At the end of the course, the student will be able to:

CO1. Understand & analyze fundamentals of CPU organization for RISC and SISC based processors along with instruction formats and types.

CO2. Understand & analyze the micro-programmed & hardwired control design concepts of the CPU.

CO3. Understand and analyze the memory organization along with different type of memory architecture & their significance.

CO4. Understand and analyze the significance & organization of cache memories.

CO5. Understand the basic concept of SIMD, MIMD, array & pipelined architecture of processor design.

Unit - I

Processor Basics: CPU organization: Fundamentals, Concept of RISC and SISC processor and their comparison, *Data Representation*: Word length, Fixed-point numbers, Floating-point numbers, *Instruction Sets*: Format, Types.

Unit - II

Control Design: Concepts, Hardwired control, *Micro-programmed Control*: Basic structure, Address Sequencing, Design of Control Unit, Pipeline Control.

Unit - III

Memory Organization: Memory Technology: Types, performance, access modes. Random Access Memories: RAM Organization and Design. Auxiliary Memories: Access methods and Organization, Magnetic disk, tapes and Optical memories. Memories hierarchies. Associative Memory.

Unit - IV

Cache Memories: Organization and mapping. Principles of Virtual Memory, Segmentation and Paging. Introduction to SIMD, MIMD, Array processor and pipelined architecture.

Text Books/References

1. J. P. Hayes. Computer Architecture and Organization, 3rd ed., McGraw Hill International edition.
2. Andrew S. Tenenbaum, Structured Computer Organization; PHI, New Delhi.

CS 315 DATABASE SYSTEMS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Design basic database schema and corresponding ER diagram.

CO2 Understand and design relational data model with constraints

CO3 Evaluate and apply standard query language for efficient relational database access and updations.

CO4 Understand and apply normalization for relational database design

CO5 Understanding the physical file structure and access methods used in relational database systems

Unit - I

Database concepts, Data Models, Schemas, and Instances, Three schema Architecture and Data Independence, Database languages and Interfaces. Data Modeling using ER diagrams. High level Conceptual Data Models for Database design, Entity Types, Entity Sets, Attributes and Keys, Relationships, Relationship types, Roles and Structural Constraints, Weak Entity types, ER Diagrams, Naming Conventions, Design Issues. Introduction to Enhanced Entity Relationship (EER) diagrams, Specialization/Generalization, Associations, and Aggregations.

Unit - II

Relational Model Concepts, Relational Model Constraints and schemas. Basic Relational Algebra: Select, Project, Rename, Union, Intersection, Minus, Join and Division operations. Aggregate functions and Groupings. Tuple and Domain relational calculus. Relational Database Design by ER and EER to Relational Mapping. SQL-99: Schema

Definition, Basic Constraints, Queries, Nested Queries, Aggregate functions and Grouping.

Unit -III

Informal Design Guidelines for relation schemas – data redundancy and anomalies , Functional dependencies, Normal forms: 1NF, 2NF, 3NF, BCNF. Multivalued Dependencies and Fourth Normal Form. Join Dependencies and fifth Normal Form.

Unit - IV

Record Storage and Primary File Organization: Placing file records on disk, Operations on files. Heap and Sorted files. Hashing techniques. Index structures for files. Single and Multilevel indexes. Dynamic multilevel indexes using B/B++ trees. Indexes on multiple keys.

Practicals: Lab experiments based on theory.

Text /References

1. Ramez Elmasri and Shamkant Navathe. Fundamentals of Database Systems 4th Ed, Pearson Education.
2. Silberschatz, Korth, Sudarshan. Database Systems Concepts, 4th ed, International Ed, McgrawHill.

EC 319 (CS) PULSE, DIGITAL AND WAVE SHAPING

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	3	0	0
Hours	3	1	0

Course outcome: At the end of the course, the student will be able to:

CO1 To develop fundamental concepts of pulse digital and wave shaping.

CO2 To enhance the knowledge of linear wave shaping using high frequency and low frequency response of RC and RL circuits.

CO3 To master the basic ideas of diode switching and application of diode in clipper and clamper circuit.

CO4 To understand the concept transistor switching design the various multivibrator circuits practical as well as theoretically.

CO5 To develop an knowledge of time base generators and designing of blocking oscillators.

Unit – I

Linear wave Shaping: High frequency and low frequency response of RC and RL circuits to step pulse, ramp and exponential wave form inputs, Attenuators, RL A and RLC circuits, Ringing circuit pulse Transformer (Application equivalent circuit and characteristics).

Unit – II

Non-Linear wave shaping: Steady state switching characteristics of semiconductor, devices, clipping circuits, diode clippers, OPAMP. Clippers, Transistor clippers, clipping at two levels, diode comparators, Application of voltage comparators, clamping operation, Diode Clamping circuit, Clamping circuit theorem.

Unit – III

Transistor as switch, capacitively and inductively loaded transistor switch. *Generation of waveforms*: Multivibrators – Bistable , Monostable and Astable multivibrators, A Fixed- Bias and self Bias transistor binaries, commutating capacitors Methods of improving resolution, Symmetrical and non- symmetrical triggering of Binaries.

Unit – IV

Schmitt trigger circuit: Voltage time base generator, methods of generating a time base wave from: A transistor constant current sweep generator Miller and Boot surpa time base generators, Linearity improvement of current sweep: Blocking oscillators- An astable and monostable blocking oscillators, Application of Blocking oscillator.

Text Books/References

1. K.V. Ramanan. Functional Electronics, Tata Mcgraw Hill.

THIRD YEAR B.TECH. (VI SEMESTER)

CS 321 PRINCIPLES OF COMPILER DESIGN

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze various phases of compiler and implement the lexical analyzer to recognize the tokens.

CO2 Understand context free grammar and apply the top-down and bottom-up approaches to design various types of parsers such as predictive parser and LR parser.

CO3 Analyze the translations on syntax directed definitions; evaluate the S-attributed, L-attributed definitions and inherited attributes

CO4 Analyze the type checker using its specifications.

CO5 Understand storage allocation strategies and apply them to design code generator

CO6 Understand the code optimization techniques to improve the performance of code in terms of time and space complexity.

Unit – I

Introduction to Compiling: Compilers; Analysis of the source program; The Phases of a compiler; Cousins of the Compiler; The grouping of phases; Compiler- construction tools. Simple Compiler. *Lexical analysis:* Lexical Analysis; The role of the lexical analyzer; Input buffering; Specification of tokens; Recognition of tokens.

Unit - II

Parsing: The role of the parser; Context-free grammars; Writing a grammar; Top-down parsing, Bottom-up parsing, Operator-precedence parsing, LR parsers, Parser generators.

Unit – III

Syntax directed translations: Construction of syntax trees; Bottom-up evaluation of S-attributed definitions; L- attributed definitions; Top-down

translation; Bottom-up evaluation of inherited attributes. *Type checking*: Type systems; Specification of a simple type checker.

Unit - IV

Run-time Environments: Source language issues, Storage organization, Storage-allocation strategies. *Code Generation*: Issues in the design of code generator. The target machine. Run-time storage management; Basic blocks and flow graphs. Introduction to Code optimization.

Practicals: Lab experiments based on theory.

Text Books/References

1. Alfered V. Aho, Ravi Sethi, Jeffrey D. Ullman. Compliers Principles, Techniques, and Tools, by, Addison-Wesley Longman.

CS 322 MICROPROCESSORS, INTERFACING AND APPLICATIONS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Identify and explain the operations of peripherals and memories typically interfaced with microprocessors.

CO2 Analyze and understand the instruction sets of 8086 and 8088 microprocessor.

CO3 Analyze and understand time sequence of different instruction sets of microprocessor.

CO4 Apply the programming techniques in designing simple assembly language programs for 8086 based processors.

CO5 Understand and analyze the various issues in interfacing various I/O devices and memory to the 8086 based processors.

Unit – I

8086 microprocessor: Architecture of a typical microcomputer, General operation of a computer, Architecture of 8086: CPU architecture, Internal Operation, Addressing modes, Instruction formats and execution timing. 8088 microprocessor and its comparison with 8086.

Unit – II

Assembly Language Programming of 8086: Assembler instruction format, Data transfer, Arithmetic, Branch, Loop, NOP and HLT, Flag manipulation, Logical, Shift and Rotate instructions, Directives and Operators, Assembly process.

Unit – III

System Bus Structure: Bus architecture, Mode operation of 8086, System bus timing, Interrupt priority management and Bus standards.

Advance microprocessors: Functional description and comparisons of 80186, 80286, 80386, 80486, and Pentium microprocessors.

Unit – IV

Interfacing: Memory interface to an 8, 16, 32-bit data bus. Decode an 8, 16, 32-bit I/O devices. Interface LCD displays, LED displays, Keyboard displays, ADC, DAC, and various devices to 8255.

Practicals: Lab experiments based on theory.

Text Books/References

1. Liu Yu-Cheng, A.G. Gibson. Microprocessor Systems: The 8086/8088 Family, 2nd ed., Prentice-Hall.
2. Doughlas V Hall. Microprocessors and Interfacing, Programming and Hardware, Second edition, McGraw Hill.
3. Brey B. Barry. The Intel Microprocessors Architecture, Programming and Interfaceing. Pearson Education.

CS 323 DESIGN AND ANALYSIS OF ALGORITHMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**1**	**0**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze computing complexity of computer algorithm using various mathematical notations especially Big O notation.

CO2 Design and analyze various algorithm designing techniques such as Divide and Conquer, Dynamic Programming and Greedy Methods along with their associated computational complexity.

CO3 Design and analyze various popular sorting, pattern matching algorithms and graph theory along with their associated computational complexity.

CO4 Understand the significance of NP-Hard and NP-complete problems along with the computational challenges associated with the computational applications of such computationally expensive algorithms.

Unit - I

Background: Review of Algorithm, Analyses of Algorithm, Designing of Algorithm, Complexity and Order Notations, recurrences.

Unit - II

Sorting Methods: Heap Sort, Radix Sort, Bucket Sort and insertion Sort, Counting Sort. *Divide & Conquer Method:* Binary Search, Merge Sort ,Quick sort and strasen's matrix multiplication. *Dynamic Programming*: Elements of Dynamic Programming, Matrix Chain Multiplication. Longest Common Subsequence and 0/1 Knapsack Problem.

Unit -III

Greedy Method: Knapsack Problem, Minimal Spanning Trees. *Branch & Bound*: Traveling Salesman Problem and Lower Bound Theory. *Pattern Matching algorithm*: the Naive string matching algorithm, the Rabin Karp algorithm.

Unit -IV

Graph Theory: Breadth First Search, Depth First Search, Topological Sort, Single Source Shortest Path, Dijkastras Algorithm, All Pairs Shortest Paths & Matrix Multiplication. Introductory definitions of P, NP-Hard and NP-Complete Problems. Decision Problems, Flow Networks & Flow. *Approximation Algorithms*: the vertex cover problem, traveling salesman problem, the set-covering problem.

Text Books/References

1. Rivest and Cormen. Introduction to Algorithms, Prentice Hall India.
2. Aho Alfred V., John E. Hopcroft and Jeffrey D. Ullman. Design and Analysis of Algorithms, Pearson Education.
3. Baase. Computer Algorithms, Pearson Education

CS 324 COMPUTER NETWORKS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand networking OSI and TCP/IP model and describe functions associated with each layer.

CO2 Understand and Implement various routing methodologies of network layer, such as distance vector routing, link state routing etc along with QOS & congestion control issues.

CO3 Subnet a network using multi-level IP Subnetting and based on a given topology.

CO4 Understand and apply various issues of Transport Layer including issues pertaining to TCP and UDP.

CO5 Understand and apply various application layer protocols such as SMTP, POP3, IMAP, DNS etc.

Unit – I

Introduction: Overview of computer networks, Network hardware and software, Reference model-OSI and TCP/IP and their comparison. *Network Layer*: Network Layer Design Issues, Various Routing Algorithms and Congestion Control Algorithms.

Unit – II

Internetworking: Concatenated Virtual Circuits, Connectionless Internetworking, and Techniques for Achieving Good Quality of Service: Leaky and Token Bucket Algorithms. Tunneling, Internetwork Routing, Fragmentation. Network layer in the Internet: IP protocol, IP Addresses, Internet Control Protocols, IPv6.

Unit – III

The Transport Layer: Transport services, Elements of Transport Protocols, The Internet Transport Protocols: User Datagram Protocol (UDP) and Transmission Control Protocol (TCP).

Unit – IV

The Application Layer: DNS-Domain name system, Electronics Mail: Architecture and service, Message Transfer: Simple Mail Transfer Protocol (SMTP), Final Delivery: POP3, Intermessage Message Access Protocol (IMAP).

Practicals: Lab experiments based on theory.

Text Books/References

1. Andrew S. Tanenbaum. Computer Networks,Prentice-Hall of India Pvt. Ltd.; New Delhi.
2. W Stallings. Data and Computer Communication, Fifth Edition, Prentice-Hall India.

CS 325 OPERATING SYSTEM

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze the significance and basic architecture of operating systems.

CO2 Understand and analyze the various processor management issues and challenges of operating system such as process synchronization, concurrency and deadlocks.

CO3 Understand and analyze the various memory management issues and challenges including virtual memory management, paging, segmentation and thrashing.

CO4 Understand and analyze the various file system management, I/O management, secondary storage management issues and challenges in an operating system.

CO5 Design, evaluate and write various C programs to exhibit the use of various available system calls in the Linux operating system.

Unit -I

Operating system Introduction and Structure. Processes. Threads, Interprocess communication. *CPU Scheduling*: Scheduling Algorithm, Multiprocess and Realtime process scheduling, Algorithm Evaluation. *Process Synchronizations*: Semaphores, Critical Regions and Monitors.

Unit - II

Deadlocks: Handling, Prevention, Avoidance and Detection of Deadlocks, Recovery from Deadlocks. *Memory Management*: Address spaces, Swapping, Contiguous Allocation, Paging, Segmentation.

Unit - III

Virtual Memory: Demand Paging, Page Replacement, Page replacement algorithms. *File System Implementation*: File System Structure, Allocation Methods, Free space Management, Directory Implementation, Efficiency and Performance, Recovery.

Unit - IV

I/O Systems: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem. Secondary Storage Structure: Disk Structure, Disk

Scheduling, Disk Management, Swap-Space Management, Disk Reliability, Stable Storage Implementation. *Protection*: Goals, Domains, Access Matrix. *Security*: Problem, Authentication, Program Threats, System Threats, Threat Monitoring, Encryption. Case Study of Linux *Operating system design.*

Practicals: Lab experiments based on theory.

Text Books/References

1. Abraham Silerschatz and Peter Baer Galvin. Operating System Concepts, 6th Ed , John Wiley & Sons
2. D.M. Dhamdhere. System Programming and Operating System, Tata Mcgrawhill, New Delhi

CS 326 SOFTWARE ENGINEERING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand different views of software process, process models including difference between prescriptive and agile process.

CO2 Understand, analyse and design methods with an emphasis on object oriented technique, UML modeling, pattern based design and design for web application.

CO3 Understand and evaluate procedures, technique and methods to assess software quality (SQA), review software engineering work products, and apply an effective testing strategy.

CO4 Understand and apply relevant software management skills to plan, manage and control a software development project.

Unit -I

Software Engineering, Software process, Introduction to CMM. Software process models – Waterfall model, Incremental, prototyping, RAD, Spiral, concurrent development, Component based development. Introduction to Unified and Agile Process.

Requirement Engineering: requirement engineering tasks, requirement engineering process, eliciting requirements, requirement analysis and documentation, validating requirements. Analysis modeling – approaches, data modeling, use cases, activity diagram, swimlane diagrams, Data Flow Diagrams, class diagrams, CRC modeling, behavioral modeling.

Unit - II

Design Engineering: concepts, architecture, patterns, modularity, information hiding, functional independence, refinement. Pattern based software design, Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design, Mapping Data Flow into Software Architecture. Modeling component level design, class based components, design guidelines, cohesion, coupling.

Unit - III

Software Project Management concepts: The management spectrum, People, product, process, project, W^5HH principles. Software Process and Project Metrics: software measurements and metrics, metrics for software quality. Software project planning: Observations on estimating, Project planning objectives, Software scope, Resources, Software project estimation, Decomposition techniques, Empirical estimation models, COCOMO Model, Software equation, The Make buy decision, Automated estimation tools. Project Scheduling: concepts, task sets, defining task network, tracking the schedule, earned value analysis. Risk Management: Software risks, risk identification, projection, mitigation, monitoring, and management.

Unit - IV

Software Configuration Management: Baseline, Configuration items, SCM Process. Identification of objects in the software configuration. Version control, Change control, configuration Audit, Status Reporting, SCM Standards. Software Quality Assurance: Quality concepts, Quality

movement, Software quality assurance, software reviews, Formal technical reviews, Formal approaches to SQA, Statistical software quality Assurance, Software reliability, the ISO 9000 Quality Standards, The SQA plan.

Software Testing: Software Testing Fundamentals, Black box and white box testing, object oriented testing methods, testing documentation, testing patterns.

Practicals: Lab experiments based on theory.

Text Books/References

1. Roger S. Pressman. *Software Engineering, 6th ed,* Mcgraw Hill.
2. Jalote Pankaj. *An Integrated approach to software Engineering,* 3rd ed., Narosa Publishing House, New Delhi.

FOURTH YEAR B.TECH. (VII SEMESTER)

CS 411 MOBILE COMPUTING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**1**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1	Understand the design, challenges and issues in mobile computing along with recent trends in mobile computing.
CO2	Understand and analyze popular mobile communication technologies such as GSM, GPRS and CDMA technologies along with mobility management issues.
CO3	Design, analyze and apply Wireless Application Protocol.
CO4	Understand and analyze wireless LAN, Ad-Hoc networks, Sensor networks and the mobility issues and challenges.

Unit - I

Introduction: Wireless the beginning, mobile computing, dialogue control, Networks, Middleware and gateways, Applications & Services Security in mobile computing, Standards.

Mobile computing Architecture: Internet-the ubiquitous Network, Architecture of Mobile computing, Three-tier Architecture, Design Consideration for Mobile Computing, Mobile Computing thorough Internet.

Emerging Technologies: Bluetooth, Radio frequency Identification, Mobile IP, Internet Protocol version 6.

Unit - II

Global System for Mobile Communications: Introduction, GSM Architecture, GSM entities, Call Routing in GSM, GSM frequency allocation, Authentication & Security.

General Packet Radio Service: GPRS & Packet data Network, GPRS network Architecture, GPRS Network Authentication, Data services in GPRS, Application of GPRS, Limitations of GPRS.

Unit - III

Wireless Application Protocol: Introduction, WAP, MMS.

CDMA & 3G : Introduction, Spread Spectrum Technology, CDMA vs GSM, Wireless data, third Generation Networks, Application on 3G.

Unit - IV

Wireless LAN: Introduction, Wireless LAN advantages, IEEE 802.11 standards, Wireless LAN Architecture, Mobility in Wireless LAN, Mobile Ad-Hoc Networks & Sensor Networks, Wireless LAN security.

Practicals: Lab experiments based on theory.

Text Books/References

1. Asoke K Talukdar and Roopa R Yavagal. Mobile Computing, Tata Mc-Graw Hill.
2. William Stallings. Wireless Communications & Networks, Pearson Education.
3. John Schiller. Mobile Communications, Pearson Education.
4. T.S. Rappaport. Wireless Communications, Principles & Practices.

CS 412 ADVANCED DATABASE SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**1**	**0**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and evaluate query processing and query optimization techniques for RDBMS

CO2 Understand transaction processing concepts and apply serializability of schedules in RDBMS

CO3 Evaluate concurrency control techniques, database recovery and security techniques of RDBMS

CO4 Understand and analyse advance database system concepts such as object-relational databases, active temporal, deductive and XML databases

Unit - I

Query Processing and Optimization Physical Database Design in Relational Databases, concepts of Database Tuning in Relational Systems.

Unit - II

Transaction Processing Concepts, Transaction and System Concepts, Desirable Properties of Transaction, Schedules and Recoverability, Serializability of Schedules, Transaction support in SQL. Concurrency

control techniques: Two phase Locking, Timestamp ordering, Multiversion and optimistic concurrency control techniques. Granularity of Data items and Multiple Granularity Locking.

Unit -III

Database recovery Techniques: concepts, recovery techniques based on deferred and immediate Update, shadow paging, recovery in multidatabase systems. Database Security.

Unit IV

Concepts of Object Oriented databases and Object-Relational databases. Object Relational features of Oracle 8. Introduction to Active, temporal, deductive, and XML databases.

Text Books/References

1. Ramez Elmasri and Shamkant Navathe. Fundamentals of Database Systems 4th Ed, Pearson Education.
2. Silberschatz, Korth, Sudarshan. Database Systems Concepts, 4th ed, International Ed, Mcgraw Hill.

CS 413 DISTRIBUTED SYSTEMS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand the distributed system architecture, design challenges & issues.

CO2 Evaluate & implement RPC and RMI along with data marshalling.

CO3 Understand the role of DNS, directory & discovery services in distributed systems.

CO4 Demonstrate capability to design & develop the applications using socket programming in Java.

CO5 Understand the roles of logical, physical, vector clocks and demonstrate capability to synchronize distributed clocks in concurrent processes.

CO6 Evaluate locks, concurrency control measures, commit protocols with respect to various distributed transactions.

Unit - I

Characterization of Distributed Systems, Challenges & Examples of Distributed System, *Interprocess communication,* Internet Protocol APIs, External Data Representation and Marshalling, Client Server communications, group communications, IPC in unix.

Unit -II

Distributed Objects and Remote Method Invocation, Communication between distributed objects, distributed object model, design issues of RMI, Implementation of RMI, Distributed Garbage collection, Remote Procedure Call, Sun RPC and Java RMI

Unit - III

Name Services and Domain name system, Directory & discovery services, Time & Global States: clocks, events, process states, synchronizing physical clock, Logical time and logical clocks, Coordination and Agreement: Distributed Mutual exclusion, Elections.

Unit IV

Replication: System Model and Group communication, fault tolerance services, Highly available services, *Distributed Multimedia System:* Characteristics of multimedia data, quality of service management, resource management, Distributed Shared Memory: design and implementation issues, sequential consistency and Ivy, release consistency and munin.

Practicals: Lab experiments based on theory.

Text Books/References

1. George Coulouris, Jean Dollimore, Tim Kindberg. Distributed Systems, Concepts and Design, 3rd Ed, Addission Wesley.
2. A.S. Tanenbaum, M.S. Steen. Distributed System – Principles and Paradigms, Pearson Education.

ELECTIVE – I

CS 414 (a) DIGITAL SIGNAL PROCESSING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze discrete and linear time-invariant signals and systems, its properties, classification and frequency domain representation.

CO2 Understand and analyze various concepts of fourier analysis of periodic and aperiodic signals.

CO3 Understand and analyze properties and evaluation of z-transform, discrete and fast fourier transform particularly discrete-time, fast fourier etc.

CO4 Understand and analyze various types of digital filters particularly finite and infinite impulse response

Unit I

Classification of Signal and Systems: Sequences, Discrete-time systems, linear time-invariant systems, Properties of linear time-invariant systems, Frequency-domain representation of discrete-time signals and systems.

Unit II

Fourier Analysis of Periodic and Aperiodic Continuous: Time Signal and Systems: Introduction, Trigonometric Fourier Series, Complex or Exponential form of Fourier Series, Parseval's Identity for Fourier Series, Power Spectrum of a Periodic Function, Fourier Transform, Properties of Fourier Transform, Fourier Transform of Power and Energy Signals.

Unit III

z-Transforms: Introduction , Definition of the z-transform, Properties of z-transform, Evaluation of the Inverse z-transform. *Discrete and Fast Fourier Transforms*: Introduction, Discrete Convolution, Discrete-Time Fourier Transform (DTFT), Fast Fourier Transform (FFT), Computing an Inverse DFT by Doing a Direct DFT.

Unit IV

Digital Filters: Finite Impulse Response (FIR) Filters: Introduction, Magnitude Response and Phase Response of Digital Filters, Frequency

Response of Linear Phase FIR Filters. Introduction to Infinite Impulse Response (IIR) Filters.

Practicals: Lab experiments based on theory.

Text Books/References

1. J.G. Proakis, G. D. Manolakis. Digital Signal Processing, 3rd ed., Pearson Education Asia.
2. S Salivahanan, A Vallavaral, and C Gnanapriya. Digital Signal Processing,Tata MCGraw-Hill.
3. A.V. Oppenheim, W. Roland Schafer. Discrete- Time Signal Processing, Prentice Hall India.

CS 414 (b) EXPERT SYSTEMS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze the basic concepts of expert systems, its components and development process.

CO2 Understand various techniques of knowledge representation and domain knowledge exploration.

CO3 Understand and analyze various methods of knowledge acquisition, interviewing and sensor data capturing.

CO4 Understand and analyze various tools and mechanisms for learning, planning and explanation in expert systems.

Unit -I

Expert system, Definition types components, expert systems development process.

Unit II

Knowledge representation techniques, Logic Frames and Semantic Nets etc. Domain Exploration Knowledge elicitation, conceptualization, battering, formalization.

Unit - III

Methods of knowledge acquisition, Interviewing, sensor data capturing.

Unit -IV

Learning Planning and Explanation in Expert System. Implementation Tools: Prolog study of existing expert system, MYCIN.

Practicals: Lab experiments based on theory.

Text Books/References

1. Patterson. Introduction to AI Export Systems, PHI.
2. Jackson. Building Expert Systems, John Wiley.

CS 414 (c) NEURAL NETWORKS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze artificial neural system concepts, applications, models, neural processing and learning rules.

CO2 Understand, apply and implement back propagation training algorithm and perceptrons.

CO3 Understand and apply linearly nonseparable pattern classification and various delta learning rules of multilayer feedforward networks.

CO4 Understand and analyze concepts of dynamic systems and hopfield networks for single layer feedback networks and concepts of associative memory.

CO5 Understand and analyze matching and self-organizing networks such as hamming net, counter propagation network, cluster discovery network.

Unit - I

Artificial Neural System: Preliminaries: Basic Concepts of Neural networks, computation: Some examples and applications, History of Artificial Neural systems development. *Fundamental Concepts and Models of Artificial Neural Systems:* Biological Neurons and their artificial models, Models of Artificial Neural networks, Neural processing, Learning and adaptation, Neural network learning rules. Learning: Supervised and Unsupervised.

Unit - II

Back propagation -Introduction, back propagation training algorithm. Perceptron: Single and Multi-Layer Preceptrons. *Multilayer Feedforward Networks:* Linearly nonseparable pattern classification, Delta learning rule for multiperceptron layer, Generalized delta learning rule.

Unit - III

Single-Layer Feedback Networks: Basic concepts of dynamical systems, Hopfield networks. *Associative Memories*: Basic concepts, Linear associator, Basic concepts of recurrent auto associative memory, Bidirectional associative memory.

Unit - IV

Matching and Self-organizing Networks: Hamming net and MAXNET, Unsupervised learning of clusters, Counter propagation network. Cluster discovery network (ARTI).

Practicals: Lab experiments based on theory.

Text Books/References

1. Jacek M. Jurada. "Introduction to artificial neutral systems", Jaico Publishing house
2. Simon Haykin. "Neural Networks" Pearson Education; Indian Branch.
3. LiMin Fu. "Neural Network in Computer Intelligence" Tata McGraw-Hill Publishing Company Limited. New Delhi.

CS 414 (d) FAULT TOLERANT SYSTEM

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze fault tolerance, fault classification, attributes and system structure.

CO2 Understand and apply various fault tolerant design techniques and architectures for information, hardware, time redundancy.

CO3 Understand evaluation techniques for reliability, availability and performability models.

CO4 Understand and analyze various software faults and their manifestation.

CO5 Understand fault tolerant parallel/ distributed architectures such as shared bus, shared memory and security in fault tolerance system.

Unit - I

Fundamental Concepts: Definitions of fault tolerance, fault classification, fault tolerant attributes and system structure. *Fault-Tolerant Design Techniques*: Information redundancy, hardware redundancy, and time redundancy. Dependability.

Unit - II

Evaluation Techniques: Reliability and availability models: (Combinatorial techniques, Fault-Tree models, Markov models), Performability Models. Architecture of Fault-Tolerant Computers : General-purpose systems, high-availability systems, long-life systems, critical systems.

Unit - III

Software Fault Tolerance: Software faults and their manifestation, design techniques, reliability models.

Unit - IV

Fault Tolerant Parallel/Distributed Architectures: Shared bus and shared memory architectures, fault tolerant networks. *Recent topics in fault tolerant systems*: Security, fault tolerance in wireless/mobile networks and Internet.

Practicals: Lab experiments based on theory.

Text Books/References

1. B.W. Johnson. Design and Analysis of Fault-Tolerant Digital Systems, Addison-Wesley.
2. K.S.Trivedi. Probability and Statistics with Reliability, Queueing and Computer Science Application, Prentice Hall.

CS 414 (e) EMBEDDED SYSTEMS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Characterize the requirement, challenges and formalism of embedded system design.

CO2 Implement embedded program in ARM assembly Language.

CO3 Design standard single purpose processor peripherals.

CO4 Design Control Data Flow Diagram and Control Flow diagram of embedded systems.

CO5 Optimize execution time, energy, power consumption and program size of a program in embedded system.

Unit I

Embedded Computing Requirements: Characteristics and applications of embedded systems; Components of Embedded Systems; challenges in Embedded System Design and design process; Formalism for system design.

Unit II

Embedded Processors: RISC vs. CISC architectures; ARM processor – processor architecture and memory organization, instruction set, data operations and flow control; Input and output devices, supervisor mode, exception and traps; Memory system, pipelining and superscalar execution.

Unit III

Embedded Computing Platform: CPU Bus – Bus protocols, DMA, system bus configurations, ARM bus; Timers and counters, A/D and D/A converters, Keyboards, LEDs, displays and touch screens; Design examples.

Unit IV

Embedded Software Analysis and Design: Software design pattern for Embedded Systems; Model programs – data flow graphs and control/data flow graphs; Assembly and linking; Compilation techniques; Analysis and optimization of execution time, energy, power and program size. Embedded System Accelerators: Processor accelerators, accelerated system design.

Practicals: Lab experiments based on theory.

Text Books/References

1. Wayne Wolf. Computer as Components, Elsevier.
2. Andrew S. Loss. ARM System Developer's Guide, Elsevier.
3. Steve Heath. Embedded System Design, Elsevier.
4. Frank Vahid & Tony Givagi. Embedded System design: A unified. hardware/software Introduction, John Wiley & Sons.

ELECTIVE - II

CS 415 (a) THE DESIGN OF UNIX OPERATING SYSTEM

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze the fundamental concepts of Unix operating system, its architecture, user and system view.

CO2 Understand and analyze the buffer cache, header and structure of cache, reading and writing to and from cache, Unix file system including structure, directories, inode, superblock etc

CO3 Analyze and implement the process control namely creation, termination, awaiting of processes special process such as shell and INIT.

CO4 Understand and analyze process scheduling, memory management techniques like swapping, demand paging in unix operating system.

Unit - I

System structure: user perspective, operating system services, assumption about hardware, Architecture of the UNIX operating system, system concept, kernel data structure, system administration.

Unit - II

Buffer Cache: Buffer header, structure of the buffer pool, scenarios for retrieval of a buffer, reading & writing disk blocks, advantages & disadvantages of the buffer cache, *Internal representation of files* : Inodes, structure of a regular file, directories, conversion of a path name to an inode, super block, inode assignment to a new file, allocation of a disk blocks, other file types.

Unit - III

Process Control: process creation, signals, process termination, awaiting process termination invoking other programs, the user ID of a process, changing the size of a process, shell, system boot and the INIT process.

Unit - IV

Process scheduling & time: Process scheduling, system Calls for time clock, Memory management: swapping, Demand paging, A hybrid

system with swapping and demand paging, *I\O subsystem*: Driver Interface, disk drivers, terminal drivers.

Practicals: Lab experiments based on theory.

Text Books/References

1. Maurice J. Bach. The Design of the Unix Operating System, Pearson Education.

CS 415 (b) GRAPH THEORY

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze the basic concepts of graph theory and apply them to implement euler and hamiltonian graphs and solve travelling salesman problem.

CO2 Apply and analyze the use of tree data structure; basic properties of cut sets and cut vertices and its applications.

CO3 Understand and analyze the applications of various graphs like planar graph, dual graph with their attributes and representations.

CO4 Understand and analyze various coloring, covering and partitioning problems with their applications and representations.

Unit - I

Introduction: Graph, application of graph, finite & infinite graphs, incidence & degree, isolated vertex, pendant vertex & null graph, *Paths & Circuits*: isomorphism, subgraphs, walks, paths, Circuits, connected graphs, disconnected graphs, & components, Euler graphs, operation on graphs, Hamiltonian paths & circuits, traveling salesman problem.

Unit - II

Trees: Properties of trees, pendent vertices in a tree, distance & centers in a tree, rooted & binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph, spanning trees in a weighted graphs. *Cut sets & cut vertices*: Cut- sets, properties of cut-sets, cut sets in a graph, fundamental circuits and cut – sets, connectivity & Separability, networks flows, 1- isomorphism, 2- isomorphism.

Unit - III

Planar & Dual graphs: Planar graphs, kuratowski's two graphs, different representation of planar graphs, detection of planarity, geometric dual, Combinatorial Dual, *Matrix representation of graph*: Incidence Matrix, circuit matrix, cutset matrix, path matrix, adjacency, matrix.

Unit - IV

Coloring, covering & partitioning: Chromatic number, chromatic partitioning, chromatic polynomial, matching, covering, the four color problem, Directed graphs: types of digraphs, binary relations, Euler digraphs, trees with directed edges, fundamental circuits in digraphs, adjacency matrix of a digraph, Acyclic digraph and Decyclization.

Practicals: Lab experiments based on theory.

Text Books/References

1. Narsingh Deo. Graph Theory, Prentice- hall of India Pvt. Ltd.
2. Rogers. Procedural Elements of Computer Graphics, McGraw Hill
3. Asthana, Sinha. Computer Graphics, Addison Wesley

CS 415 (c) COMPUTER GRAPHICS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand the role of computer graphics, different graphics systems and their applications.

CO2 Understand and implement various algorithms for scan conversion and filling of basic objects.

CO3 Demonstrate and implement different basic geometric transformation including composite transformation techniques on graphical objects.

CO4 Understand and analyze various three dimensional geometric and modeling transformations.

CO5 Demonstrate and implement clipping and view-ports object representation for images.

Unit - I

Introduction to computer graphics, application areas, display devices, raster scan, random scan, color monitor, display file, frame buffer, 3-D display technique, input devices, hard copy devices.

Unit - II

Points, lines, plane and coordinate, character vector, circle generation algorithm, antialiasing techniques, representation of polygons, Interfacing and filling polygon, 2-D transformation, translation, rotation, scanning, shearing, reflection, composite transformation, raster transformations.

Unit - III

Windows, multiple windowing, view port, viewing transformation, clipping algorithm for points, line using Sutherland and Cohen, polygon, text clipping. Segment and segment operations. Interactive graphics, user dialogue, input modes, interactive picture construction techniques, curves and curved surface, interpolation and approximation curve, continuity of curve.

Unit - IV

Concept of 3-D, representation of 3-D object, 3-D transformation, translation, rotation, reflection, scaling. Parallel perspective, Isometric Projections. 3-D clipping Sutherland and Cohen algorithm. Hidden lines and surface removal techniques. Back face, Z-buffer, painter algorithm.

Practicals: Lab experiments based on theory.

Text Books/References

1. D. Hearn and M.P. Baker. Computer Graphics: C Version, 2nd Ed, Pearson Education.
2. James D. Foley; Andries Van Dam; Steven K. Feiner; John F. Hughes. Interactive Computer Graphics, Addison Wesley

CS 415 (d) NUMERICAL METHODS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and solve numerical in roots of nonlinear equations, simultaneous linear equations and eigen values and eigen vectors.

CO2 Understand and solve numericals in interpolation numerical integration.

CO3 Understand and solve numericals in numerical differentiation.

CO4 Understand and solve numerical pertaining to ordinary differential equations by euler's method, runga-kutta method etc.

Unit - I

Numerical Methods: Need for numerical methods, sources of errors, specification of error, significant digits.

Roots of Nonlinear (Algebraic and Transcendental) Equations: Bisection method, False position method, Newton Raphson method, Newton's second order method, secant method, roots of polynomials by Bairstow's method. *Solution of Simultaneous Linear Equations*: Gaussian elimination, pivoting, Gauss-Jordan method, Gauss-Seidal method, Cholesky's method, evaluation of determinant. Matrix inversion, matrix inversion in-place. *Eigenvalues and Eigenvectors*: Matrix iteration methods, power and inverse power method.

Unit - II

Interpolation: Lagrangian and Hermite interpolation, cubic spline interpolation. Curve fitting, polynomial method, methods of least squares. *Numerical Integration and Differentiation*: Numerical integration by trapezoid rule, Simpson's rule, Weddle's rule, Gauss quadrature.

Unit - III

Numerical differentiation: Differentiation based on equal interval interpolation, second order derivative, Derivatives using Newton's backward difference formula, Derivatives using central difference, Based on Stirling's, Differentiations based on Lagrange's interpolation.

Unit – IV

Solution of Ordinary Differential Equations: Euler's method, modified Euler's method, Runge-Kutta methods, predictor-corrector methods – Milne'es method. Introduction to finite difference methods. *Eigen values and Eigen vectors:* Determination of Eigen values and Eigen vectors of matrices, Inverse of a matrix – Recent trends and developments.

Practicals: Lab experiments based on theory.

Text Books/References

1. S.S. Sastry. Introductory Methods of Numerical Analysis, PHI.
2. M.K. Jain, S.R.K. Iyengar, and R.K. Jain. Numerical Methods for Scientific and Engineering Computation, New Age International (P) Limited.

CS 415 (e) COMPUTATIONAL INTELLIGENCE

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze the applications of artificial intelligence, strategies of state space search, depth first search and breadth first search.

CO2 Understand, analyze and implement various search and game heuristic such as A*, AO*, minmax search, alpha beta etc.

CO3 Understand and analyze various knowledge representation methodologies and its challenges and issues.

CO4 Understand and analyze various machine learning methodologies such as genetic algorithm, genetic programming etc.

CO5 Understand and analyze the basics of expert system technology.

Unit - I

Artificial Intelligence: History and Applications, Production Systems, Structure and Strategies for state space search, Data driven and goal driven search Depth first and Breadth First search, DFS with iterative Deepening.

Unit - II

Heuristic Search-Best first search, A* Algorithm, AO* Algorithm, Constraint Satisfaction, Using heuristic in games – Minimax Search, Alpha Beta Procedure. Propositional calculus, Predicate calculus.

Unit - III

Knowledge Representation – Theorem proving by Resolution, Answer extraction, AI representational schemes- Semantic Nets, Conceptual Dependency, Scripts, Frames, Introduction to Agent based problem solving.

Unit - IV

Machine Learning: Symbol based and Connectionist, Social and Emergent models of learning, The Genetic algorithm- Genetic Programming, Overview of Expert System Technology – Rule based Expert System, Introduction to Natural Language Processing.

Practicals: Lab experiments based on theory.

Text Books/References

1. George F. Luger. Artificial Intelligence- Structure and Strategies for Complex Problem Solving 4th Ed, Pearson Education.
2. E. Rich, K. Knight. Artificial Intelligence 2nd Ed, Tata McGraw-Hill.
3. Nils J. Nilsson. Artificial Intelligence – A New Synthesis, Morgan Kaufman Publication.

FOURTH YEAR B.TECH. (VIII SEMESTER)

CS 421 MULTIMEDIA SYSTEM

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand the concept and need of multimedia in today's digital world and its various technologies for input-output and storage retrieval.

CO2 Analyze and implement various data compression and encoding techniques along with their corresponding algorithms for lossy and lossless compressions.

CO3 Understand and apply compression and decompression techniques required for image, audio and video along with their associated popular formats.

CO4 Understand and apply multimedia communication across the computer network.

Unit - I

Introduction: Multimedia elements, applications, system architecture, evolving technologies and objects for multimedia systems, need for data compression.

Multimedia Input/Output Technologies: Limitation of traditional input devices, Resolution and bandwidth issues, *Video and Image Display Systems*: display system requirements and technologies, display performance issues, Video display technology standards, CRT and flat panel display system, Digital voice and audio, musical instrument digital interface (MIDI).

Storage and Retrieval Technologies: Magnetic media technology: SCSI and RAID Hard disk technologies, *Optical Storage Media*: Basic technology, Video disc, Compact Disc Digital Audio, Compact Disc Read only memory, CD-ROM extended architecture, Compact Disc recordable, Compact Disc Read/Write, Digital versatile disc.

Unit - II

Data Compression and Encoding: Encoding and Compression, Lossless Data Compression Algorithms: Run-length coding, Huffman coding, Shannon Fano algorithm, Adaptive Huffman algorithm, Extended Huffman algorithm, Arithmetic Coding, Dictionary based Compression techniques: LZ77, LZ78 and LZW Compression techniques.

Unit – III

Compression and Decompression Techniques: Concept of Audio and Video Compression: Introduction, Analog video formats, Digital audio and video formats, Video compression, audio compression. Types of compression, binary image compression schemes, colour characteristics and modes, B/W TV and Image composition, *JEPG*: introduction, overview of JPEG components, *discrete cosine transform (DCT)*: Quantization, zigzag sequence, entropy encoding.

Video image compression: multimedia standards for video, requirements for full-motion video compression, MPEG: Video encoding, audio coding, Data stream, MPEG compression, moving picture types, MPEG encoder, MPEG standards, MPEG standard recent development in Multimedia, *Audio compression*: ADPCM.

Unit IV

Multimedia Communication: Packet audio/video in the network environment: Packet voice, integrated packet networks, packet video. Video Transport across generic networks: Layered video coding, Error-resilient video coding techniques, scalable rate control, and Streaming video over the Internet, protocols for streaming video, and Multimedia across IP networks. Multicasting, caching, and perfecting issues in IP network.

Practicals: Lab experiments based on theory.

Texts/References

1. Prabhat K. Andleigh and Kiran Thakrar. Multimedia System Design, Prentice-Hall of India Private Limited, New Delhi-110001.
2. K.R. Rao, Zoran S. Bojkovic, and Dragorad A. Milovanovic. Multimedia Communication Systems, Prentice-Hall of India Private Limited, New Delhi-110001.

3. Ritendra Goal. Fundamental of Information Technology, Paragon International Publishers, New Delhi.
4. Buford. Multimedia Systems, Addison Wesley.
5. David Hillman. Multimedia technology and Applications, Galgotia Publications.
6. Rosch. Multimedia Bible, Sams Publishing.
7. Sleinreitz. Multimedia System, Addison Wesley.

CS 422 NETWORK PROGRAMMING

Cr. Hrs. 2 (0 + 2)

	L	T	P
Credit	0	0	2
Hours	0	1	4

Course outcome: At the end of the course, the student will be able to:

CO1	Design, analyze and implement socket programming in C and Java.
CO2	Design, analyze and implement Remote Method Invocation (RMI) in C and Java.
CO3	Design, analyze and implement Remote Procedure call (RPC) in C.
CO4	Design TCP and UDP based client server application using socket programming in C and Java.

Practical based on Interprocess communication using socket, RPC, RMI with C/C++ or Java.

Practicals: Lab experiments based on theory.

Text Books/References

1. R.W. Stevens. Unix Network Programming, Vol I and II, 2nd ed., Pearson Education Asia.
2. Herbert Schildt. Java 2, Tata McGraw Hill.

ELECTIVE - III

CS 423 (a) NETWORK SECURITY AND CRYPTOGRAPHY

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Identify common network security vulnerabilities/attacks.

CO2 Understand and design cryptographic algorithms in different types and modes.

CO3 Write code for relevant symmetric, asymmetric cryptographic and Digital Signature algorithms.

CO4 Understand and use different Authentication Mechanisms and Internet Security Protocols.

CO5 Characterize, configure and analyze firewall significance and use.

Unit - I

Need for security, security approaches, principle of security, Types of attacks, *Cryptography Techniques*: Plain Text and Cipher text, Substitution techniques, Transposition techniques, Encryption & decryption, symmetric & asymmetric cryptography, steganography, key range and key size, possible types of attacks.

Unit - II

Computer- based Symmetric key Cryptography Algorithms: Algorithms types and modes, overview of symmetric key cryptography, data encryption standards(DES), international data encryption algorithms(IDEA), blowfish, advance encryption standards(AES), *Computer- based Asymmetric key Cryptographic Algorithms*: RSA algorithms, Digital Signature, MD5.

Unit - III

Public Key Infrastructure (PKI): Digital Certificates, private key management, *Authentication* : password, authentication tokens, certificate based authentication, biometric authentication, Kerberos, single sign on(SSO) approaches.

Unit - IV

Internet Security Protocols: Secure socket layer (SSL), Secure hyper text transfer protocol (SHTTP), Time stamping protocol(TSP), Secure electronic transaction (SET), SSL verses SET, electronic money, E-Mail

Security, Wireless application protocol (WAP) security, Network Security: IP security, firewalls, Virtual Private networks (VPN).

Practicals: Lab experiments based on theory.

Text Books/References

1. Atul Kahate. Cryptography and Network Security, Tata McGraw-Hill Publishing Company Ltd.
2. William Stallings. Cryptography and Network Security, 2nd Ed, Pearson Asia.

CS 423 (b) COMPUTATIONAL GEOMETRY

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze various notions of complexity in classical geometry, models of computation and apply Geometric searching techniques.

CO2 Understand and analyze the properties and application of convex hulls.

CO3 Understand and analyze the various proximity approaches and issues.

CO4 Understand and analyze the geometry of rectangles particularly measuring the perimeter of union and intersection of rectangles.

Unit - I

Historical Perspective: complexity notions in classical geometry, geometric preliminaries, models of computation. Geometric Searching: point location problems, location of a point in a planner subdivision, the slab method, the chain method, range-searching problems.

Unit - II

Convex hulls: Problem statement and lower bounds. Graham's scan, Jarvis's march, quick hull technique, convex hulls in two and higher dimensions, extension and applications.

Unit - III

Proximity: Divide and conquer approach, locus approach, the Voronoi diagram, lower bounds, variants and generalizations. Intersections, hidden-line and hidden surface problem.

Unit - IV

The geometry of rectangles: Application of the geometry of rectangles, measure and perimeter of a union of rectangles, intersection of rectangles and related problems.

Practicals: Lab experiments based on theory.

Text Books/References

1. F.P. Preparata and M.I. Shamos. Computational geometry: An Introduction, Springer Verleg.
2. Berg, Van, Kreveld, Overmars, Schwarzkopf. Computational Geometry: Algorithms and Applications, Springer.
3. J.O. Rourke. Computational Geometry in C, Cambridge University Press.

CS 423 (c) DIGITAL IMAGE PROCESSING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand, analyze and apply image representation methods over 2D systems along with the properties of various transforms such as 2-D Fourier, discrete cosine and KL.

CO2 Understand and analyze the Sampling and reconstruction of Images along with Image quantization using uniform and non uniform max lloyd quantizer.

CO3 Understand and analyze the concepts of Image enhancement like contrast enhancement and histogram modification and digital image restoration.

CO4 Understand various image compression and coding problems along with data structures for image representation.

CO5 Analyze the picture and various models of picture classification.

Unit - 1

Perception and Image Representation: Perception of light, eye, subjective phenomena - monochrome vision model. Image representation. 2-D systems. Linearity and space invariance. Point spread function and convolution. 2-D Fourier transform and its properties. Discrete cosine transform and KL transform.

Unit - II

Sampling: 2-D sampling spectrum of a sampled image, Image reconstruction. Aliasing, Practical image sampling and reconstructing systems and their imperfections. Image Quantization - Uniform and Non uniform - Max - Lloyd Quantizer.

Unit - III

Image Enhancement and Restoration: *Enhancement* : Contrast enhancement. Histogram modification. Noise cleaning. Edge crispening. *Digital Image Restoration*: Sources of degradation. Characterization. Basic principles of inverse filtering.

Unit - IV

Image Compression and Coding: Image compression and coding problems. Data structures for picture representation. *Picture Analysis and Classification*: Region analysis, scene analysis, statistical and syntactic models for picture classification, Image understanding systems, Recent trends and developments.

Practicals: Lab experiments based on theory.

Text Books/References

1. R. Gonzalez, R.E. Wood. Digital Image Processing, Prentice Hall of India.

CS 423 (d) REAL TIME SYSTEMS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand concepts of real time systems and its application in digital control, high-level control and signal processing.

CO2 Describe and compare hard and soft real time systems in terms of release times, deadlines and timing constraint.

CO3 Understand and analyze various attributes of processes and resources in real time system.

CO4 Understand and analyze the implementation of various real time task scheduling approaches.

CO5 Analyze clock-driven and priority driven scheduling algorithms for periodic tasks.

CO6 Understand and analyze the implementation of algorithms for scheduling aperiodic and sporadic jobs in terms of bandwidth and resource utilization.

Unit - I

Real time application: Digital Control, High – Level control, Signal Processing. *Hard versus Soft Real time system:* Jobs & Processors, Release times, Deadlines, Timing constraints, hard & soft timing constraints, Hard Real Time Systems, Soft Real Time Systems.

Unit - II

Reference Model: Processors & Resources, Temporal Parameters, Periodic Task Model, Precedence Constraints and Data Dependency, Functional Parameters, Resources Parameters, Scheduling Hierarchy. *Real Time Scheduling:* Clock Driven Approach, Weighted Round Robin Approach, Priority Driven approach, Dynamic Versus Static System, Effective Release Time and Deadlines, Optimality of the EDF and the LST Algorithms, Off Line versus Online Scheduling.

Unit - III

Clock – Driven Scheduling: Static, Timer Driven Scheduler, Cyclic schedules, Cyclic Executive, Scheduling Sporadic Jobs, Generalization, Algorithm for Static Schedules, Pros & Cons of Clock – Driven Scheduling. *Priority - Driven Scheduling of Periodic Tasks:* Fixed Priority versus Dynamic Priority Algorithms, Maximum Schedulable Utilization,

Optimality of the RM and DM Algorithms, Sufficient Schedulability Conditions for the RM and DM algorithms, Practical Factors.

Unit - IV

Scheduling A periodic and Sporadic Jobs in Priority – Driven Systems: Deferrable Servers, Sporadic servers, Constant Utilization, Total Bandwidth, and Weighted Fair – Queuing Servers, Slack Stealing in Deadlines driven Systems, Slack Stealing in Fixed Priority Systems, Scheduling of Sporadic Jobs. *Resources and Resource Access Control:* Effects of Resources Contention and resource Access Control, Non-preemptive Critical Sections, Basic Priority – Inheritance Protocol, Basic priority – Ceiling Protocol, Stack – Based, Priority – Ceiling (Ceiling Priority) Protocol, preemption Ceiling Protocol, Accesses of Multiple – Unit Resources, Concurrent Accesses to Data Objects.

Practicals: Lab experiments based on theory.

Text Books/References

1. Jane W. S. Liu. Real Time Systems, Pearson Education.
2. Krishna C. M. Real Time Systems, McGraw Hill Publication.

CS 423 (e) ADVANCED COMPUTER ARCHITECTURE

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Compare and analyze the concepts of parallel processing and architectural classification for parallel computers.

CO2 Understand and analyze the principles of pipelining in advance computer architecture along with its design issues and challenges.

CO3 Understand the structure and data routing mechanism for array processors.

CO4 Analyze and understand loosely and tightly coupled multiprocessor systems along with the design issues in interconnection networks and cache coherence.

Unit - I

Introduction to parallel processing & trends: parallelism in uni-processor system, parallel computer structure, architectural classification schemes for parallel computers, multiplicity of instruction data streams, serial verses parallel computers, parallelism verses pipelining, *Memory hierarchy*: hierarchical memory structures, virtual memory system, memory allocation and management.

Unit - II

Principle of pipelining: pipelining principle and classification, general pipelines and reservation tables, interleaved memory organization, instruction pre-fetch and branch – handling, data buffering and business structures, internal forwarding and register tagging, hazard detection and resolution, job sequencing and collision prevention, dynamic pipelines and re configurability.

Unit - III

Structure for array processor: SIMD computer organization, masking and data routing mechanism inter PE communication, introduction to associative array processing.

Unit - IV

Multiprocessor architecture: loosely coupled & tightly coupled multiprocessor, processor characteristics for multiprocessing, interconnection networks, cache coherence protocols.

Practicals: Lab experiments based on theory.

Text Books/References

1. Hwang and Briggs. Computer Architecture and Parallel Processing, Mcgraw- Hill.
2. Kai Hwang. Advanced Computer Architecture, McGraw- Hill.
3. V. Rajaraman. Parallel Computers Architecture and Programming.

ELECTIVE – IV

CS 424 (a) PARALLEL COMPUTING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze the need of parallel processing along with the PRAM algorithms particularly parallel reduction, list ranking etc.

CO2 Analyze the processor organization of various networks such as mesh, pyramid, butterfly, hypercube etc. in the field of multiprocessors and multicomputers.

CO3 Understand and analyze different types of multiprocessors such as UMA & NUMA and multicomputers such as nCUBE2, Paragon XP/S along with their attributes.

CO4 Understand and analyze programming for parallel processors along with data mapping, load balancing and task scheduling in a multiprocessor environment.

Unit - I

Computational demands of modern science, advent of practical parallel processing, parallel processing terminology, *PRAM algorithms*: model of serial computation, PRAM model of parallel computation, PRAM algorithms: parallel reduction, prefix sums, list ranking, preorder tree traversal, merging two sorted lists, graph coloring, Reducing the number of processor, Processor array.

Unit -II

Multiprocessors & Multicomputers Processor Organization: Mesh networks, binary tree networks, hyper tree networks, pyramid network, butterfly network, hypercube network, Cube connected cycles networks, shuffle exchange networks, de bruijn networks, processor organization.

Unit - III

Processor Arrays: connection machine CM – 200, multiprocessor: uniform Memory access (UMA) multiprocessor, Non – uniform memory access (NUMA) multiprocessor, Multicomputers: nCUBE 2, Connection machine, Paragon XP/S, Flynns Taxonomy, speedup, scaled speedup and parallelizability.

Unit - IV

Programming Parallel Processes: Introduction to C* : sequent C, ncube C, OCCAM, C- Linda, a notation for expressing parallel algorithms, Mapping & Scheduling: mapping data to processors on processor array and multicomputers, dynamic load balancing on multicomputers, static scheduling on UMA multiprocessor, Deadlocks, classifying MIMD algorithms, reduction, broadcast, prefix sum, *matrix Multiplication*: sequential matrix multiplication, algorithms for processor arrays, algorithms for multiprocessors, algorithms for multicomputers.

Practicals: Lab experiments based on theory.

Text Books/References

1. Michel J quinn. Parallel Computing, Tata Mc graw hill Edition.
2. Kai Hwang. Advanced Computer Architecture, McGraw Hill.

CS 424 (b) WEB COMPUTING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and apply the concepts of internet, WWW to design HTML/XHTML web pages and forms

CO2 Identify and understand the concepts of CGI, secured socket layer and secured electronic transaction

CO3 Implement java servelets, java server pages and JSTL

CO4 Understand, apply and implement XML schema and databases

CO5 Understand various web services such as WSDL, UDDI, XML-RPC and SOAP

Unit - I

Internet and WWW, HTML/XHTML, HTML Forms. Dynamic Web pages, JavaScript

Unit -II

CGI, ASP. Secured Socket Layer, Secured Electronic Transaction.

Unit - III

Java Servelets, Java Server Pages, JSTL.

Unit - IV

XML, XML Schema, XML databases. Introduction to Web Services – WSDL, UDDI, XML-RPC, SOAP.

Practicals: Lab experiments based on theory.

Text Books/References

1. H.M. Deitel, P.J. Deitel and T.R. Neito. Internet and World Wide Web: How to Program, Pearson Education.
2. XML Profession. Wrox Publication.
3. Web Services Essential. O' Reilly.
4. S.A. Godbole, Atul Kahate. Web Technologies, TMH.

CS 424 (c) DISTRIBUTED DATABASE SYSTEMS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze various distributed database designs, transparencies, and architectural models of distributed database.

CO2 Understand and implement top-down and bottom up approaches of distributed database, fragmentation, allocation and semantic data control.

CO3 Understand, apply and implement query processing such as query decomposition, localization and optimization.

CO4 Understand and apply various distributed transaction management issues particularly concurrency control algorithms such as locking based, time stamp based, optimistic and deadlock management.

CO5 Apply, analyze and understand parallel database architecture, design techniques and interoperability.

Unit - I

Introduction, Advantages and disadvantages, *Distributed DBMS Architecture*: Transparencies in a Distributed DBMS, DBMS standardization, Architectural models, Global directory issues.

Unit - II

Distributed database design: A framework for distributed database design, Top-down and bottom up approaches, the design of database fragmentation, the allocation of fragments, general criteria for fragment allocation, measure of costs and benefits of fragment allocation, semantic data control.

Unit - III

Distributed query processing: Query decomposition, Data Localization. Optimization of Distributed Queries. *Transaction Management*: distributed concurrency control: classification of concurrent control algorithms, locking based algorithms, time stamp based algorithms, optimistic concurrency control algorithms, and deadlock management.

Unit - IV

Parallel Database Systems: Parallel Architecture, Parallel DBMS techniques, parallel execution problems. Database interoperability. Databases for word wide web. Mobile databases.

Practicals: Lab experiments based on theory.

Text Books/References

1 M. Tomer Ozsu, P. Valduriez. Principles of Distributed Database Systems 2nd Ed, Pearson Education.

2 S. Ceri, G. Pelagapati. Distributed Database, Principles and Systems, McGraw Hill Publication.

CS 424 (d) VLSI DESIGN

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course outcome: At the end of the course, the student will be able to:

CO1 Understand and analyze various VLSI design issues such as regularity, modularity and locality.

CO2 Understand and analyze various VLSI technologies such as MOS, CMOS, NMOS etc.

CO3 Understand and analyze the methodology for implementing sequential MOS circuits and dynamic logic circuits.

CO4 Understand and analyze the organization of semiconductor memories and BiCMOS logic circuits along with their structure and operation.

CO5 Understand and analyze chip I/O circuits for manufacturability and testability using techniques such as AdHoc testable design, scan based and BIST.

Unit - I

VLSI Design Methodologies: Introduction, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality, VLSI Design Styles, Design Quality, Packaging Technology, Introduction of Computer-Aided Design Technology. *Combinational MOS Logic Circuits*: Introduction, Classification of CMOS digital circuit types, Circuit design procedures. Metal-Oxide Semiconductor (MOS) Logic: Enhancement-Type MOSFET,The p-channel MOSFET, Depletion MOSFET. NMOS Inverter, NMOS NAND gate, NMOS NOR gate, Complementary metal oxide semiconductor (CMOS) Logic: CMOS Inverter, CMOS NAND Gates, CMOS NOR Gate, Pass-Transistor logic circuits, Complex logic circuits, CMOS characteristics.

Unit - II

Sequential MOS Logic Circuits: Introduction, CMOS Bistable Elements, The SR Latch Circuit based on NAND and NOR gates, Clocked Latch and Flip-Flop Circuits, CMOS D-Latch and Edge-Triggered Flip-Flop. *Dynamics Logic Circuits:* Dynamics logic circuit techniques, High-performance CMOS circuits: Domino CMOS Logic, NORA CMOS Logic, and TSPC Dynamic CMOS.

Unit - III

Semiconductor Memories: Memory-Chip Organization, Random-Access Memory (RAM) Cells, Read-Write Operation of Static Memory and

Dynamic Memory Cell. Sense Amplifiers and Address Decoders. Read Only Memory (ROM): A MOS ROM, EPROM Cell. BiCMOS *Logic Circuits* : Bipolar Junction Transistors (BIT): Structure and Operation. Basic BiCMOS Circuits, Switching Delay in BiCMOS Logic Circuits, BiCMOS NOR gate and NAND Gate.

Unit - IV

Chip Input and Output (I/O) Circuits: ESD Protection, Input Circuits, Output Circuits and L(di/dt) Noise, On-Chip Clock Generation and Distribution. *Design For Manufacturability and Testability: Manufacturability:* Introduction, Process Variations, Basic Concepts and Definitions, Design of Experiments and Performance Modeling. *Testability:* Fault Types and Models, Controllability and absorbability, Ad Hoc Testable Design Techniques, Scan-Based Techniques, and Built-In Self Test (BIST) Techniques.

Practicals: Lab experiments based on theory.

Text Books/References

1. CMOS Digital Integrated Circuits Analysis and Design, Sung -Mo Kang, Yusuf Leblebici, Tata McGrawHill Edition.

CS 424 (e) DATA WAREHOUSING AND DATA MINING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	3	0	1
Hours	3	0	2

Course outcome: At the end of the course, the student will be able to:

CO1 Understand the primitives of data warehousing and data mining along with issues, challenges and applications.

CO2 Understand and analyze the algorithms based on association rules

CO3 Understand and compare various classification technologies particularly bayesian, two class and generalized class classification.

CO4 Evaluate and analyze various clustering and decision tree algorithms for efficient extraction and classification.

CO5 Analyze and apply various techniques like genetic algorithms, text and content mining for data and web mining.

Unit - I

Data Warehousing: Introduction, Definition, Multidimensional data transformation, OLAP operations, Ware house schema, Ware house Server. Data Mining: Introduction, Definition, KDD vs. DM, DBMS vs. DM, DM Techniques, Issues and Challenges in DM, DM Applications. Association Rules: A Prior Algorithm, Partition, Pincer search, Incremental, Border, FP-tree growth algorithms, Generalized association rule.

Unit - II

Classification: Parametric and non-parametric technology: Bayesian classification, two class and generalized class classification, classification error, Decision boundary, Discriminant functions, Non-parametric methods for classification.

Unit - III

Clustering: Hierarchical and non-hierarchical techniques, K-MEDOID Algorithm, Partitioning, Clara, Clarans. Advanced Hierarchical algorithms. Decision Trees: Decision tree induction, Tree pruning, Extracting classification rules from decision trees, Decision tree construction algorithms, Decision tree construction with presorting.

Unit - IV

Data mining using neural networks, Genetic algorithms. *Web Mining:* Web mining, Text mining, Content mining, Web structure mining.

Practicals: Lab experiments based on theory.

Text Books/References

1. Jiawei Han, Micheline Kamber. Data Mining: Concepts and Techniques, Harcourt India Pvt.
2. Alex Berson, Stephen J. Smith. "Data Warehousing, Data Mining and OLAP", McGraw Hill.
3. D. Hand, H. Mannila, and P. Smyth. "Principles of Data Mining", MIT Press.

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