Scheme and Syllabus of

B.E. (Computer Science and Engineering)

1st TO 8th Semester (Batch 2021-2025)

University Institute of Engineering and Technology,

Panjab University, Chandigarh

DEPARTMENT: **COMPUTER SCIENCE AND ENGINEERING**

VISION:

To be recognized as an international leader in Computer Science and Engineering education and research to benefit society globally.

MISSION:

- To move forward as frontiers of human knowledge to enrich the citizen, the nation, and the world.
- To excel in research and innovation that discovers new knowledge and enables new technologies and systems.
- To develop technocrats, entrepreneurs, and business leaders of future who will strive to improve the quality of human life.
- To create world class computing infrastructure for the enhancement of technical knowledge in field of Computer Science and Engineering.

PROGRAMME:B.E. CSE (UG PROGRAMME)

PROGRAMME EDUCATIONAL OBJECTIVES:

I. Graduates will work as software professional in industry of repute.
II. Graduates will pursue higher studies and research in engineering and management disciplines.
III. Graduates will work as entrepreneurs by establishing startups to take up projects for societal and environmental cause.

PROGRAMME OUTCOMES:

A. Ability to effectively apply knowledge of computing, applied sciences and mathematics to computer science & engineering problems.

B. Identify, formulate, research literature, and analyze complex computer science & engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

C. Design solutions for computer science & engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

D. Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

E. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to different computer science & Engineering activities with an understanding of the limitations.

F. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

G. Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for the sustainable development.

H. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

I. Ability to function effectively as a member of a team assembled to undertake a common goal in multidisciplinary settings.

J. Ability to communicate effectively to both technical and non-technical audiences.

K. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

L. Recognition of the need for and the ability to engage in life-long learning. The ability to successfully pursue professional development.

EXAMINATION NOTE:

The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

2.0 Credit System :

2.1 All B.E / integrated B.E-M.B.A programmes are organised around semester-based credit system of study. The credit system is based on continuous evaluation of a student's performance/progress and includes flexibility to allow a student to progress at an optimum pace suited to his/her ability or convenience, subject to fulfilling minimum requirements for continuation.

2.2 Performance/progress of a student is measured by the number of credits that he/she has earned (completed satisfactorily). Based on the course credits and grades obtained by the student, grade point average is calculated, subject to his qualification of minimum grade in each subject.

2.3Course Credit Assignment:

Each course has a certain number of credits assigned to it depending on the associated number of lecture, tutorials and laboratory contact hours in a week. A few courses are without credit and are referred to as non-credit (NC) courses.

Lectures and Tutorials: One lecture hour or one tutorial hour per week per semester is assigned one credit.

Practical / Laboratory Work: One laboratory hour per week per semester is assigned half credit.

The credits are rounded off to the nearest whole number.

For each lecture or tutorial the self study component is 1 hour/week

2.4 Earning Credits :

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade (at least 'D' grade), the student accumulates the course credits as earned credits. Performance of a student is measured by the number of credits that he/she has earned and by the weighted grade point average. Grades obtained in audit courses are not counted towards the calculation of grade point average. However, a pass grade ('D' grade) is essential for earning credits from an audit course.

3.0 Grading System :

3.1 The grades and their respective description , along with grade points are listed in the table given below in Table-1

Table-1

Grade	Grade Point	Description
A+	**10**	**Outstanding**
A	**9**	**Excellent**
B+	**8**	**Very Good**
B	**7**	**Good**
C+	**6**	**Average**
C	**5**	**Below average**
D	**4**	**Marginal**
F	**0**	**Very Poor**
I	**-**	**Incomplete**
NP	**-**	**Audit Pass**
NF	**-**	**Audit Fail**
W	**-**	**Withdrawal**
X	**-**	**Unsatisfactory**
S	**-**	**Satisfactory**

		Completion

4.0 Evaluation System:

4.1 Continuous Assessment **:**

There shall be continuous evaluation of the student during the semester. For evaluation purpose, total marks assigned to each subject shall be distributed as :

Two Mid semester Examination (Minor-1 and Minor-2) with 30 % of total marks assigned to the subject. Best Marks of one of these two will be considered for award of sessional.

Assignments/Class projects/ short class tests/MCQ based quizzes/projects/presentations/group discussions/ Attendance with 20 % of total marks assigned to the subject.

One End Semester Examination (Major Examination) with 50 % of total marks assigned to the subject. It is compulsory to appear in End Semester Examination and secure at least 20% marks of total End semester exam marks.

If a candidate secures less than 20% marks of total End semester exam marks, he/she will be awarded F grade.

4.2 Method for the Award of Grades:

For the award of grades in a course, all component wise evaluation shall be done in terms of marks. The components include: Midterm-1 and Midterm-2 examinations, Assignments/projects/class presentations/Attendance, and End semester examination as per regulation 4.1. After converting the marks obtained in percentage , the grades will be assigned as per the guidelines given below :

Table-2

Sr. No.	Marks	Grade	Grade Point
1.	≥ 90	A+	10
2.	≥ 80 &< 90	A	9
3.	≥70 &< 80	B+	8
4.	≥60 &< 70	B	7
5.	≥50 &< 60	C+	6
6.	≥45 &< 50	C	5
7.	≥40 &< 45	D	4
8.	<40	F	0

5.0 Evaluation of Performance :

5.1 The performance of a student shall be evaluated in terms of two indices, viz. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA).

SGPA is the grade point average for the semester, and CGPA is the cumulative grade point average for all the completed semesters at any point in time.

The earned credits (E.C) are defined as the sum of course credits for course in which A+ to D grade has been obtained. For U.G students (B.E), credits from courses in which NP or S grade has been obtained are also added.

Points earned in a semester =

$$\sum(Course\ Credits\ x\ Grade\ Points)\ for\ courses\ in\ which\ A+ \text{ to } D\ grade\ has\ been\ obtained$$

The SGPA is calculated on the basis of grades obtained in all courses, except audit courses and courses in which S/Z grade is awarded,

registered for the particular semester.

$$SGPA = \frac{\sum_{\text{Semester}} (\text{Course Credits} \times \text{Grade Points}) \quad \text{for all courses except audit and S / Z grade Courses}}{\sum_{\text{Semester}} (\text{Course Credits}) \quad \text{except audit and S / Z grade Courses}}$$

$$SGPA = \frac{\text{Points Secured in the Semester}}{\text{Credits Registered the Semester, excluding audit and } {}^{S}/_{Z} \text{ grade courses}}$$

The CGPA is calculated as given below :

$$CGPA = \frac{\sum_{\text{All Semester}} (\text{Course Credits} \times \text{Grade Points}) \quad \text{for all courses with pass grade except audit and S / Z grade Courses}}{\sum_{\text{All Semester}} (\text{Course Credits earned}) \quad \text{except audit and S / Z grade Courses}}$$

Scheme of Examination of B.E. in Computer Science & Engineering

1st and 2nd Semesters for Academic Year 2021-2022

Year: First **Semester: First**

Course Code	Course Name	Option	Hours per week			Credits	Marks		
			L	T	P		Internal Assessment	University Exam	Total
-	Choice Based Physics Course	Theory	4	0	0	4	50	50	100
-	Choice Based Physics Course (P)	Practical	0	0	3	1.5	50	0	50
ASM 101	Calculus	Theory	4	1	0	5	50	50	100
ESC X01	Programming for Problem Solving	Theory	3	0	0	3	50	50	100
ESC X51	Programming for Problem Solving (P)	Practical	0	0	4	2	50	0	50
ESC X53	Workshop (P)	Practical	0	0	4	2	50	0	50
ESC X06	Digital Electronics	Theory	3	0	0	3	50	50	100
ESC X56	Digital Electronics (P)	Practical	0	0	2	1	50	0	50
Total			**14**	**1**	**13**	**21.5**	**400**	**200**	**600**

Scheme of Examination of B.E. in Computer Science & Engineering

Year: First **Semester: Second**

Course Code	Course Name	Option	Hours per week			Credits			
			L	T	P		Internal Assessment	University Exam	Total
ASC X01	Applied Chemistry	Theory	4	0	0	4	50	50	100
ASC X51	Applied Chemistry (P)	Practical	0	0	3	1.5	50	0	50
ASM 201	Differential Equations and Transforms	Theory	4	1	0	5	50	50	100
HSMC X01	Professional Communication	Theory	2	0	0	2	50	50	100
HSMC X51	Professional Communication (P)	Practical	0	0	2	1	50	0	50
CSC 201	Object Oriented Programming	Theory	3	0	0	3	50	50	100
CSC 251	Object Oriented Programming (P)	Practical	0	0	2	1	50	0	50
CSC 202	Introduction to Computer Science	Theory	3	0	0	3	50	50	100
Total			**16**	**1**	**7**	**20.5**	**400**	**250**	**650**

Summer Training (two weeks):

Subject Code	Subject Name	L-T-P	Contact hrs/week	Credits	Assessment
ST 251	**Product Re-engineering and Innovation**	0-0-20	20	Nil	Satisfactory / Unsatisfactory

Note: The students will undergo a mandatory "Summer Training" of two weeks in their respective departments after their second semester exams. It will be non-credited mandatory course, the result of which (satisfactory/unsatisfactory) will be reflected in their second semester mark sheet.

Scheme of Examination of B.E. in Computer Science & Engineering

Year: Second **Semester: Third**

S.No	Paper Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
1	CS 301	Data Structures	3-1-0	4	4	50	50	100	-
2	CS 351	Data Structures (Practical)	0-0-3	3	1	-	-	-	50
3	CS 302	Database Systems	3-1-0	4	4	50	50	100	-
4	CS 352	Database Systems (Practical)	0-0-3	3	1	-	-	-	50
5	CS 303	Discrete Structures	3-1-0	4	4	50	50	100	-
6	CS 304	Microprocessors	3-1-0	4	4	50	50	100	
7	CS 354	Microprocessors (Practical)	0-0-3	3	1	-	-	-	50
8	AS 201	Economics	3-0-0	3	3	50	50	100	
Total			**15-4-9**	**28**	**22**	**250**	**250**	**500**	**150**

*Practical marks are for continuous and end semester evaluation

Year: Second **Semester: Fourth**

S.No	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
1	CS 401	Analysis and Design of Algorithms	3-1-0	4	4	50	50	100	-
2	CS 451	Analysis and Design of Algorithms (Practical)	0-0-3	3	1		-	-	50
3	CS 402	Web Technologies	3-1-0	4	4	50	50	100	-
4	CS 452	Web Technologies (Practical)	0-0-3	3	1		-	-	50
5	CS 403	Operating Systems	3-1-0	4	4	50	50	100	-
6	CS 453	Operating Systems (Practical)	0-0-3	3	1		-		50
7	CS 404	Software Engineering	3-1-0	4	4	50	50	100	
8	CS 454	Software Engineering (Practical)	0-0-3	3	1		-	-	50
9	CS 405	Computer Architecture and Organization	3-1-0	4	4	50	50	100	-
Total			**15-5-12**	**32**	**24**	**250**	**250**	**500**	**200**

*Practical marks are for continuous and end semester evaluation

Scheme of Examination of B.E. in Computer Science & Engineering

Year: Second **Semester: Fifth**

S.No	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
1	CS 501	Data Communication and Networks	3-1-0	4	4	50	50	100	-
2	CS 551	Technical Communication and Soft Skills (Practical)	0-0-3	3	1		-	-	50
3	CS 502	Computer Graphics	3-1-0	4	4	50	50	100	-
4	CS 552	Computer Graphics (Practical)	0-0-3	3	1		-	-	50
5	CS 503	Artificial Intelligence	3-1-0	4	4	50	50	100	-
6	CS 553	Artificial Intelligence (Practical)	0-0-3	3	1		-		50
7	CS 504	Principle of Programming Languages	3-1-0	4	4	50	50	100	-
8	CS 505	Theory of Computation	3-1-0	4	4	50	50	100	
9	CS 556	Industrial Training (After 4thSem)	-------	-	2	50	-	50	-
10	CS 506	Principles of Designing (optional)	3-1-0	3	4	-	-	-	-
Total			**15-5-9**	**29**	**25**	**300**	**250**	**550**	**150**

*Practical marks are for continuous and end semester evaluation

Scheme of Examination of B.E. in Computer Science & Engineering

Year: Third **Semester: Sixth**

S.No	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
1.	CS 601	Computer Networks and Security	3-1-0	4	4	50	50	100	-
2.	CS 651	Computer Networks and Security (Practical)	0-0-3	3	1	-	-	-	50
3.	CS 602	Linear Algebra and Probability Theory	3-1-0	4	4	50	50	100	-
4.	CS 603	Modeling and Simulation	3-1-0	4	4	50	50	100	-
5.	CS 653	Modeling and Simulation (Practical)	0-0-3	3	1	-	-	-	50
6.	CS 604	Compiler Design	3-1-0	4	4	50	50	100	-
7.	CS 654	Compiler Design (Practical)	0-0-3	3	1	-	-	-	50
8.		Elective-I	3-1-0	4	4	50	50	100	-
9.		Elective-I (Practical)	0-0-3	3	1	-	-	-	50
Total			**15-5-12**	**32**	**24**	**250**	**250**	**500**	**200**

*Practical marks are for continuous and end semester evaluation

Scheme of Examination of B.E. in Computer Science & Engineering

Elective-I

S.No	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
1.	CS 605A	Software Testing and Quality Assurance	3-1-0	4	4	50	50	100	-
2.	CS 655A	Software Testing and Quality Assurance (Practical)	0-0-3	3	1	-	-	-	50
3.	CS 605B	Soft Computing	3-1-0	4	4	50	50	100	-
4.	CS 655B	Soft Computing (Practical)	0-0-3	3	1	-	-	-	50
5.	CS 605C	Data Mining and Analysis	3-1-0	4	4	50	50	100	-
6.	CS 655C	Data Mining and Analysis (Practical)	0-0-3	3	1	-	-	-	50
7.	CS 605D	Mobile Application Development	3-1-0	4	4	50	50	100	-
8.	CS 655D	Mobile Application Development (Practical)	0-0-3	3	1	-	-	-	50
9.	CS 605E	Data Acquisition and Interfacing	3-1-0	4	4	50	50	100	-
10.	CS 655E	Data Acquisition and Interfacing (Practical)	0-0-3	3	1	-	-	-	50
11.	CS 605F	Multimedia Computing	3-1-0	4	4	50	50	100	-
12.	CS 655F	Multimedia Computing (Practical)	0-0-3	3	1	-	-	-	50

*Practical marks are for continuous and end semester evaluation

Scheme of Examination of B.E. in Computer Science & Engineering

Year: Fourth **Semester: Seventh**

S.No	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
1.	CS 701	Digital Image Processing	3-1-0	4	4	50	50	100	-
2.	CS 751	Digital Image Processing (Practical)	0-0-3	3	1	-	-	-	50
3.	CS 702	Advance Database Systems	3-1-0	4	4	50	50	100	-
4.	CS 703	Cyber Laws and IPR	3-1-0	4	4	50	50	100	-
5.		Elective-II	3-1-0	4	4	50	50	100	-
6.		Elective-II (Practical)	0-0-3	3	1	-	-	-	50
7.		Elective-III	3-1-0	4	4	50	50	100	-
8.		Elective-III (Practical)	0-0-3	3	1	-	-	-	50
9.	CS 757	Project-I	0-0-6	6	3	100	-	100	-
10.	CS 756	Industrial Training (After 6th Semester)	---	-	2	100	-	100	-
Total			**15-5-15**	**35**	**28**	**450**	**250**	**700**	**150**

*Practical marks are for continuous and end semester evaluation

Minor Specializations

1. **Software Engineering**
2. **Artificial Intelligence**
3. **Data Sciences**
4. **Networks**
5. **Design Innovation Centre**

Scheme of Examination of B.E. in Computer Science & Engineering

Elective-II

S.No	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
1.	CS 704A	Software Project Management	3-1-0	4	4	50	50	100	-
2.	CS 754A	Software Project Management (Practical)	0-0-3	3	1	-	-	-	50
3.	CS 704B	Natural Language Processing	3-1-0	4	4	50	50	100	-
4.	CS 754B	Natural Language Processing (Practical)	0-0-3	3	1	-	-	-	50
5.	CS 704C	Business Intelligence	3-1-0	4	4	50	50	100	-
6.	CS 754C	Business Intelligence (Practical)	0-0-3	3	1	-	-	-	50
7.	CS 704D	Wireless Sensor Networks	3-1-0	4	4	50	50	100	-
8.	CS 754D	Wireless Sensor Networks (Practical)	0-0-3	3	1	-	-	-	50
9.	CS 704E	Sensor Systems and Application	3-1-0	4	4	50	50	100	
10.	CS 754E	Sensor Systems and Application (Practical)	0-0-3	3	1	-	-	-	50

*Practical marks are for continuous and end semester evaluation

Scheme of Examination of B.E. in Computer Science & Engineering

Elective-III

S.No	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
1.	CS 705A	Agile Software Development	3-1-0	4	4	50	50	100	-
2.	CS 755A	Agile Software Development (Practical)	0-0-3	3	1	-	-	-	50
3.	CS 705B	Neural Networks	3-1-0	4	4	50	50	100	-
4.	CS 755B	Neural Networks (Practical)	0-0-3	3	1	-	-	-	50
5.	CS 705C	Cloud Computing	3-1-0	4	4	50	50	100	-
6.	CS 755C	Cloud Computing (Practical)	0-0-3	3	1	-	-	-	50
7.	CS 705D	Mobile Computing	3-1-0	4	4	50	50	100	-
8.	CS 755D	Mobile Computing (Practical)	0-0-3	3	1	-	-	-	50
9.	CS 705E	Smart System Design	3-1-0	4	4	50	50	100	-
10.	CS 755E	Smart System Design (Practical)	0-0-3	3	1	-	-	-	50

*Practical marks are for continuous and end semester evaluation

Scheme of Examination of B.E. in Computer Science & Engineering

Year: Fourth **Semester: Eighth**

S.No	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
Option 1									
1.	HSMXXX	Management (Elective)	2-1-0	3	3	50	50	100	-
2.	CS 801	Network Science: Structural Analysis and Visualization	3-1-0	4	4	50	50	100	-
3.	CS 851	Network Science: Structural Analysis and Visualization (Practical)	0-0-3	3	1	-	-	-	50
4.		Elective –IV	3-1-0	4	4	50	50	100	-
5.		Elective –IV (Practical)	0-0-3	3	1	-	-	-	50
6.		Elective V	3-0-0	3	3	50	50	100	-
7.	CS 854	Project-II	0-0-6	6	3	-	-	100	-
Total			**11-3-12**	**26**	**19**	**200**	**200**	**500**	**100**
Option 2									
1.	CS 855	Industrial Training	---	-	19	400	200	600	-
Total			**---**	**-**	**19**	**400**	**200**	**600**	**-**

*Practical marks are for continuous and end semester evaluation

Scheme of Examination of B.E. in Computer Science & Engineering

S.No	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
1.	HSM 401	Principles of Management	2-1-0	3	3	50	50	100	-
2.	HSM 402	Business Environment and Business Laws	2-1-0	3	3	50	50	100	-
3.	HSM 403	Entrepreneurship and Project Management	2-1-0	3	3	50	50	100	-
4.	HSM 404	Financial Management	2-1-0	3	3	50	50	100	-
5.	HSM 405	Marketing Management	2-1-0	3	3	50	50	100	-
6.	HSM 406	Human Resource Management	2-1-0	3	3	50	50	100	-

Elective-IV

S.No	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical*
						Internal Assessment	University Assessment	Total	
1.	CS 802A	Building Enterprise Applications	3-1-0	4	4	50	50	100	-
2.	CS 852A	Building Enterprise Applications (Practical)	0-0-3	3	1	-	-	-	50
3.	CS 802B	Expert Systems	3-1-0	4	4	50	50	100	-
4.	CS 852B	Expert Systems (Practical)	0-0-3	3	1	-	-	-	50
5.	CS 802C	Machine Learning and Computational Intelligence	3-1-0	4	4	50	50	100	-
6.	CS 852C	Machine Learning and Computational Intelligence (Practical)	0-0-3	3	1	-	-	-	50

7.	CS 802D	Distributed Computing	3-1-0	4	4	50	50	100	-
8.	CS 852D	Distributed Computing (Practical)	0-0-3	3	1	-	-	-	50
9.	CS 802E	Pattern Recognition	3-1-0	4	4	50	50	100	-
10.	CS 852E	Pattern Recognition (Practical)	0-0-3	3	1	-	-	-	50

*Practical marks are for continuous and end semester evaluation

Elective-V

S.No	**Course Code**	**Course Name**	**Scheme of Teaching**			**Scheme of Examination**			
			L-T-P	**Contact hrs/week**	**Credits**	**Theory**			**Practical***
						Internal Assessment	**University Assessment**	**Total**	
1.	CS 803A	Software Agents	3-0-0	3	3	50	50	100	-
2.	CS 803B	Human Computer Interaction	3-0-0	3	3	50	50	100	-
3.	CS 803C	Information Retrieval and Management	3-0-0	3	3	50	50	100	-
4.	CS 803D	Cryptography and Network Security	3-0-0	3	3	50	50	100	-
5.	CS 803E	Advance Image Processing	3-0-0	3	3	50	50	100	-

*Practical marks are for continuous and end semester evaluation

First Year - First Semester

Branch: Computer Science and Engineering

Course Code	**ASP X01**
Course Title	**Applied Physics**
Course Assessment Methods	
End Semester Assessment(University Exam)	50
Continuous Assessment (Minors, Assignments, Quiz)	50

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION A

Oscillations

Complete mathematical treatment for mechanical as well as electrical free, damped and forced oscillators. Simple harmonic oscillator and solution of the differential equation, Physical characteristics of SHM. Superposition of two SHMs executing in same and perpendicular direction of same frequency and different frequencies, Lissajous figures. Superposition of n SHMs (4 hours)

Damped Oscillations: Concept and cause of damping, differential equation of a damped oscillator and different kinds of damping, Methods of describing damping of an oscillator - logarithmic decrement, relaxation time, quality factor, band width. Series LCR circuit as a damped oscillator. Use of damping in shock absorbers and seismic dampners. (4 hours)

Forced Oscillations: States of forced oscillations, differential equation of forced oscillator – its displacement, velocity and impedance, behaviour of displacement and velocity with driver's frequency, Power, bandwidth, Quality factor and amplification of forced oscillator, resonance in forced oscillators, vibration insulator (4 hours)

Electromagnetic waves:

Maxwell equations and their significance. Electromagnetic waves in vacuum conducting medium and

non-conducting medium. Energy and momentum carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure. Reflection and transmission of electromagnetic waves for oblique and normal incidence. (8 hours)

SECTION B

Modern Optics

Polarization: Methods of polarization, analysis of polarized light, quarter and half wave plates, double refraction, optical activity. Use of polarization in testing of materials, working of LCDs, projecting 3D movies (7 hours)

Lasers: Elementary idea of LASER production, spontaneous emission, stimulated emission, Einstein's coefficients, Helium-Neon, Ruby and semiconductor lasers, Applications of lasers in optical communication and storage, laser machining, defence, geophysical sciences. (6 hours)

Fibre Optics: Basics of optical fibre - its numerical aperture, coherent and incoherent bundle, step index and graded index fibre, material dispersion, fibre Optics sensors, applications of optical fibre in communication systems, medical sciences, defence, mechanical applications . (7 hours)

Reference Books:

1. Introduction to Solid State Physics, Charles Kittel
2. Solid State Physics, S.O. Pillai
3. Physics for Engineers (Prentice Hall India) - N.K. Verma
4. Physics of Vibrations and Waves (5th Edition, John Wiley & Sons) – H.J.Pain
5. Optics – Ajoy Ghatak
6. Introduction to Electrodynamics, David J. Griffiths

Course Code	**ASP X51**
Course Title	**Applied Physics (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

1. To study Lissajous figures obtained by superposition of oscillations with different frequencies and phases.
2. To find the wavelength of sodium light using Fresnel's biprism.
3. (i) To determine the wavelength of He-Ne laser using transmission grating.
   (ii) To determine the slit width using the diffraction pattern.
4. To determine the wave length of sodium light by Newton's rings method.
5. To determine the wave length of sodium light using a diffraction grating.
6. To find the specific rotation of sugar solution using a Laurant's Half shade/ Bi-quartz Polarimeter.
7. To design a hollow prism and used it find the refractive index of a given liquid.
8. To determine the wavelength of laser using Michelson interferometer.
9. To determine the velocity of ultrasonic waves in different liquids using ultrasonic interferometer.
10. To study the frequency response and to find resonant frequencies of LCR series and parallel circuits. Also to find the quality factor and band width in LCR.
11. To determine the value of acceleration due to gravity and radius of gyration using bar pendulum.
12. Study of transverse and longitudinal standing waves and the measurement of the frequency of the electrically maintained Tuning fork.
13. To study damping effects in spring mass system.

Course Code	**ASP X02**
Course Title	Quantum Physics
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

Section A

Special Theory of Relativity

Inertial and non-inertial frames of reference, Galilean transformation, Michelson Morley Experiment, Postulates of special theory of relativity, Lorentz transformation, Simultaneity, Length contraction, Time dilation, Doppler effect, Addition of velocities, variation of mass with velocity, mass-energy relation, Relativistic momentum, Minkowski space (8)

(Section 1.1 to 1.5, 1.7 to 1.9 of Book 1)

Origin and Postulates of Quantum Mechanics

Quantum theory of light, Blackbody Radiation, Photoelectric effect, Compton effect, X-rays production, spectrum & diffraction (Bragg's law), pair production, photons & gravity, Gravitational Red Shift, Black holes, de-Broglie hypothesis, particle diffraction, uncertainty principle and its applications (9)

Postulates of quantum mechanics, wave function, Born interpretation and normalization, Schrodinger theory, Time-dependent and Time-independent Schrodinger equation, Operators (Adjoint operator, Identity operator, Hermitian operator, unitary operator etc.), expectation values, Ehrenfest theorem (7)

(Sections 2.1-2.10, 3.1-3.5, 3.7-3.10, 5.1-5.7 of Book 1)

Section B

Applications of Quantum Mechanics

Particle in a box (infinite potential well), Potential step, Finite Potential Well and Barrier, Tunneling, Linear harmonic oscillator (one-dimensional), 3-D rigid box and degeneracy (9)

(Sections 5.8 – 5.11 of Book 1)

Application of Quantum Mechanics to Solids

Free Electron theory of Metals (Classical and Sommerfield), Bloch's theorem for particles in a periodic potential, Kronig-Penney Model and origin of energy bands, conductors, insulators and semiconductors, Fermi level, density of states, Effective mass, Specific heat of solids (12)

(Sections 6.35-6.38, 6.40, 6.41, 7.1-7.5 of book 4 and Section 1 of Chapter 10 of Book 2)

References:

1. Concepts of Modern Physics, by Arthur Beiser (McGraw-Hill)

2. Introduction to Solids by Leonid V. Azaroff

3. Elementary Solid state Physics by M.Ali Omar (Pearson Education)

4. Solid State Physics, by C. Kittel (Wiley Eastern)

5. Solid State Physics, by S.O. Pillai (New Age International)

Course Code	**ASP X52**
Course Title	Quantum Physics **(P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

1. To study the quantized energy level of the first excited state in the Argon using the Frank-Hertz setup.
2. To find the value of Planck's constant and evaluate the work function of cathode material by used of photoelectric cell.
3. To study various characteristics of photo-voltaic cell: (a) Voltage-current characteristics, (b) loading characteristics, (c) power-resistance characteristics and (d) inverse square law behavior of the photo-current with distance of source of light from photo-voltaic cell
4. To study the response of a photo-resistor to varying intensity of light falling on it and deduce spectral sensitivity of its semiconductor material.
5. To study the Balmer Series of Hydrogen spectrum using diffraction grating and calculate Rydberg constant.
6. To evaluate charge on an oil drop using Millikan's oil drop method.
7. To verify Rutherford's alpha scattering formula using a mechanical model.
8. To calculate charge to mass ratio of an electron using Thompsonś method.
9. To determine Hall coefficient of a given semiconductor material and evaluate charge carrier type, density and mobility of charge carriers.
10. To study temperature dependence of resistivity of a semiconductor using four probe method and determine the energy band gap of a given semiconductor.
11. To determine the velocity of ultrasonic waves in different liquids using ultrasonic interferometer.
12. To study probability theory using coins.
13. To study probability and statistics using two dice.

Course Code	**ASP X03**
Course Title	**Physics of Materials**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION - A

Crystal structure: Bonding forces and energies, Primary and Secondary bonds, Space Lattices, Symmetries in a cubic lattice, Crystal Structures (cubic and hexagonal cells), Assignment of coordinates, directions and planes in crystals, Linear, Planar and Space densities in crystals, close packed morphology (Hexagonal and cubic close packing), single and polycrystalline structures, interstitial spaces (trigonal, tetrahedral and octahedral voids)

Structure of ceramics (NaCl, Zinc blende, silica and silicates, diamond crystal, Graphite, Fullerenes and carbon nanotubes)

Structure of polymers, crystallinity of long chain polymers

Crystal Structure analysis, X-ray diffraction and Bragg's law, Experimental methods for study of X-ray diffraction pattern, Crystal Defects (Point, line, surface and volume imperfections)

(14 hours)

Diffusion: Diffusion mechanisms, steady state diffusion, non-steady state diffusion, factors affecting diffusion, applications based on diffusion (corrosion resistance of Duralumin, carburization of steel, decarburization of steel, doping of semiconductors)

(3 hours)

Elastic, Anelastic and Viscoelastic Behaviour Elastic behaviour and its atomic model, rubber like elasticity, anelastic behaviour, relaxation processes, viscoelastic behaviour

(3 hours)

SECTION - B

Plastic Deformations and strengthening mechanisms : Tensile properties (Yield strength, Tensile Strength, Ductility, Resilience, Toughness), Dislocations and plastic deformation, characteristics of dislocations, slip systems, slip in single crystals and polycrystalline materials, mechanisms of strengthening in metals (grain size reduction, solid-solution strengthening, strain hardening), recovery, recrystallization and grain growth (5hours)

Fracture, Fatigue and Creep : Fracture (Ductile and brittle fractures), principles of fracture mechanics, fracture toughness, ductile to brittle transitions Cyclic stresses, S-N curve, crack initiation and propagation, factors that affect fatigue life, environmental effects, generalized creep behavior, stress and temperature effect (5 hours)

Phase Diagrams : One-Component (or Unary) Phase Diagrams, Binary Isomorphous Systems, Interpretation of Phase Diagrams, Development of Microstructure in Isomorphous Alloys, Mechanical Properties of Isomorphous Alloys ,Binary Eutectic Systems, Development of Microstructure in Eutectic Alloy, Equilibrium Diagrams Having Intermediate Phases or Compounds, Eutectic and Peritectic Reactions, the Iron-Carbon system. (6 hours)

Phase Transformations: Kinetics of phase transformation, kinetics of solid state reactions, Isothermal transformation diagrams, continuous cooling transformation, temper embrittlement

(4 hours)

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Material science and engineering – An Introduction	William D Callister	6Th edition, John Willey and Sons.
2.	Material Science and Engineering – A First Course	V. Raghvan	4th edition, Eastern economy edition
3.	Solid State Physics	S. O. Pillai	New Age International
4.	Introduction to Solids	Leonid V Azaroff	Tata McGraw Hill, 3rd edition.

Course Code	**ASP X53**
Course Title	**Physics of Materials (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

1. To study the quantized energy of the first excited state in Argon using the Frank-Hertz Set-up.

2. To find the value of Planck's constant and evaluate the work function of cathode material by use of photoelectric cell.
3. To study various characteristics of photovoltaic cell: (a) Voltage-current characteristics (b) loading characteristics (c) power-resistance characteristics and (d) inverse squarelaw behavior of photocurrent with distance of source of light from photovoltaic cell.
4. To study the response of a photoresistor to varying intensity of light falling on it and deduce spectral sensitivity of its semiconductor material.
5. To determine Hall coefficient of a semiconductor material and then evaluate the type, density and mobility of charge carrier in a given semiconductor material.
6. To study the hysteresis loop of magnetic material (iron, nickel and steel) and determine its retentivity, coercivity and energy dissipated per unit volume per cycle of hysteresis.
7. To study temperature dependence of resistivity of a semiconductor material using four probe method and further deduce the band gap of this semiconductor.
8. To determine the Curie temperature of a ferroelectric material by measuring dielectric constant as a function of temperature.
9. To determine thermal conductivity of bad conductor by using guarded plate method (Lee's disc method).

Course Code	**ASM 101**
Course Title	**Calculus**
Course Assessment Methods	
End Semester Assessment(University Exam)	50
Continuous Assessment (Minors, Assignments, Quiz)	50
Course Prerequisites	
Course Objectives (CO)	1. To understand the behaviour of infinite series and its use. 2. To learn the concepts of functions of two and more than two variables and their applications. 3. To learn the methods to evaluate multiple integrals and their applications to various problems. 4. To understand the concepts of Vector calculus and their use in engineering problems.
Course Outcome	1. The students are able to test the behaviour of infinite series. 2. Ability to analyze functions of more than two variables and their applications. 3. Ability to evaluate multiple integrals and apply them to practical problems. 4. Ability to apply vector calculus to engineering problems

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION-A

FUNCTIONS OF ONE VARIABLE

Sequences and Series: Sequences, Limits of sequences, Infinite series, series of positive terms, Integral test, Comparison test, Ratio test, Root test. Alternating series, Absolute and Conditional Convergence, Leibnitz test. Power series: radius of convergence of power series, Taylor's and Maclaurin's Series. (Scope as in Chapter 10, Sections 10.1 – 10.9 of Reference 1).

Integral Calculus: Length of curves, Volume (disk and washer method) and surface areas of revolution (Scope as in Chapter 6, 6.1, 6.3, 6.4 of Reference 1).

DIFFERENTIAL CALCULUS OF FUNCTIONS OF TWO AND THREE VARIABLES

Concept of limit and continuity of a function of two and three variables, Partial derivatives, total derivative, composite function, differentiation of an implicit function, chain rule, change of variables, Jacobian, Taylor's theorem (statement only), Maxima and minima of a function of two and three variables, Lagrange's method of multipliers (Scope as in Chapter 14, Sections 14.1-14.4, 14.6-14.10 of Reference 1).

SECTION-B

INTEGRAL CALCULUS OF FUNCTIONS OF TWO AND THREE VARIABLES

Double and triple integrals, Change of order of integration, Change of Variables, Applications to area, volume and surface area. (Scope as in Chapter 15 of Reference 1).

VECTOR DIFFERENTIAL CALCULUS

Vector-valued functions and space curves and their tangents, integration, arc lengths, unit tangent vector, Curvature and torsion of a curve, Gradient of a Scalar field, Directional Derivative (Scope as in Chapter 13, Sections 13.1-13.5 Chapter 14, Section 14.5 of Reference 1).

VECTOR INTEGRAL CALCULUS

Line integrals, Vector fields, Work, Circulation and Flux, Path Independence, Potential functions and Conservative fields, Green's theorem in the plane, Surface Areas and Surface Integrals, Stoke's Theorem, Gauss Divergence Theorem (Statements only) (Scope as in Chapter 16 of Reference 1).

RECOMMENDED BOOKS

S. No.	NAME	AUTHORS	PUBLISHER
1.	Calculus	Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas	12th edition, Pearson Education.
2.	Advanced Engineering Mathematics	E. Kreyszig.	8th edition , John Wiley.
3.	Advanced Engineering Mathematics	Michael D. Greenberg	2nd edition, Pearson Education.

4.	Advanced Engineering Mathematics	Wylie and Barrett	Tata McGraw Hill
5.	Higher Engineering Mathematics	B.V.Ramana	Tata McGraw Hill.
6.	Advanced Engineering Mathematics	R. K. Jain, S. R. K. Iyenger	Narosa Publications

Course Code	**ESC X01**
Course Title **Course Assessment Methods** End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	Programming for Problem Solving 50 50
Course Outcome	1. To develop simple algorithms for solving arithmetic and logical problems. 2. To translate the algorithms to programs using C language and their execution. 3. To implement conditional branching, iteration and recursion. 4. To decompose a problem into functions and synthesize a complete program. 5. To use arrays, pointers and structures to develop algorithms and programs.

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

PART- A

Unit–1: Introduction to Programming [06]

Introduction to components of a computer system: Memory, processor, I/O devices, storage, operating system, concept of assembler, compiler, interpreter, loader and linker.

Concept of algorithm: Representation of an algorithm, flowchart, Pseudocode with examples, converting algorithms to programs.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language, standard I/O in C, data types, variables and constants, memory storage, storage classes.

Unit –2: Expressions and Statements [10]

Expressions and their evaluation: Operands and Operators, formation of expressions using arithmetic, relational, logical and bitwise operators, precedence and associativity rules , mixed operands, type conversion and evaluation of expressions.

Statements: Simple and compound statements, Conditional Branching: if and switch statements, nested if-else, dangling else problem, use of break and default with switch. Iteration and loops: use of while, do while and for loops, nested loops, use of break and continue statements.

Unit– 3: Arrays & Basic Algorithms **[07]**

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays, character arrays and strings.

Basic Algorithms: Searching and Sorting Algorithms (Bubble, Insertion and Selection), finding roots of equations, notion of order of complexity through example programs.

PART – B

Unit–4: Functions **[09]**

Introduction, advantages of modularizing a program into functions, types of functions, passing parameters to functions: call by value, call by reference, passing arrays to functions, recursion with example programs.

Unit – 5: Structures , Union, Enums and Bit-fields **[06]**

Defining, declaring and usage of structures, unions and their arrays, passing structures and unions to functions, introduction to enums and bit-fields.

Unit – 6: Pointers and File handling **[07]**

Pointers: Introduction, declaration, applications, dynamic memory allocation (malloc, calloc, realloc, free), use of pointers in self-referential structures.

File handling: File I/O functions, standard C pre-processors, defining and calling macros, command-line arguments.

Text books:

1. Schaum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. Programming in C: A practical approach by Ajay Mittal, Pearson Education, 2010
3. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
4. Computer Basics and C Programming by V.Rajaraman , PHI Learning, 2015.
5. Computer Concepts and Programming in C, E Balaguruswamy, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A.Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.

Course Code	**ESC X51**
Course Title	Programming for Problem Solving (P)
Course Assessment Methods Practical (Continuous and end semester evaluation)	 50
Course Outcome	• To formulate the algorithms for simple problems • To translate given algorithms to a working and correct program • To be able to correct syntax errors as reported by the compilers • To be able to identify and correct logical errors encountered at run time • To be able to write iterative as well as recursive programs • To be able to represent data in arrays, strings and structures and manipulate them through a program • To be able to declare pointers of different types and use them in defining self-referential structures. • To be able to create, read and write to and from simple text files.

Lab1: Familiarization with programming environment

Lab 2: Simple computational problems using arithmetic expressions

Lab 3: Problems involving if-then-else structures

Lab 4: Iterative problems e.g., sum of series

Lab 5: 1D Array manipulation, Arrays: searching, sorting

Lab 6: Matrix problems, String operations

Lab 7: Simple functions and parameter passing

Lab 8: Numerical methods (Root finding, numerical differentiation, numerical integration)

Lab 9: Recursive functions

Lab 10: Pointers and structures

Lab 11: File operations

Course Code	**ESC X53**
Course Title	**Workshop (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	 50
Course Prerequisites	Basic Workshop Practices
Course Objectives (CO)	1. Know different machines, tools and equipment, Identify different Engineering materials, metals and non-metals. 2. Understand different Mechanisms, Use of Machines, Tools and Equipment. 3. Knowledge of basic Manufacturing Processes in Electronics, Electrical, Machine, Welding, Fitting, Sheet Metal.Smithy, Foundry and Carpentry Workshops.
Course Outcome	1. Familiarity with common machines, Tools and Equipment in basic Workshop Practices. 2. On hand basic workshop practices in Electronics, Electrical, Machine, Welding, Fitting, Sheet Metal. Smithy, Foundry and Carpentry Workshops in Engineering professions. 3. Applications of Basic Workshop Practices..

SYLLABUS

Instruction for Students: Practice of basic exercises related with different shops. On hand basic workshop practices in Electronics, Electrical, Machine, Welding, Fitting, Sheet Metal. Smithy, Foundry and Carpentry Workshops in Engineering professions shall be carried out by the students.

Welding Workshop :
(Theory)Joining Processes, Welding and its Classification, Welding Processes, Fusion Welding, Pressure Welding, Electric Arc Welding, Gas Welding, Resistance Welding, Metal Inert gas Welding, Welding Joints, Welding Positions, Welding defects, Welding Applications, Basic welding design and Procedures, identification of materials,

Jobs: Butt Joint in Flat Position using SMAW, Lap Joint using Spot Welding, Edge Joint in Horizontal Position using SMAW, Tee Joint in Flat position using SMAW, Corner Joint in vertical position using SMAW.
Defect Identification and marking, Edge preparation and Fillet making, Tacking, Distortion identification.

Electronics Workshop

To know about Soldering mechanism and techniques, Familiarity with Electronic Components / symbols, Testing of electronic components, Application of Soldering : Circuit Assembly

List of Jobs :

Practice of Soldering and de-soldering, Identification and testing of a) passive electronic components b) Active electronic components, Assembly of Regulated Power supply circuit.

Electrical Workshop

Introduction of Various Electric wirings, Wiring Systems, Electrical wiring material and fitting, different type of cables, Conduit pipe and its fitting, inspection points, switches of all types, Distribution boards, M.C.B's etc., Electric Shock and its management.

Electric Tools: Conversance with various tools and to carry out the following:

1. Measurement of wire sizes using SWG and micrometer
2. Identification of Phase and neutral in single phase supply

Jobs:

To control a lamp with a single way switch

To control a lamp from two different places

To assemble a fluorescent lamp with its accessories

To control a lamp, fan and a three pin socket in parallel connection with single way switches

Fitting Shop

Introduction of Fitting, different type of operations, Tools, materials, precision instruments like Vernier caliper and Micrometer etc, Safety precautions and Practical demonstration of tools and equipments

Jobs:

To make a square from MS Flat, Punching, Cutting, Filling techniques and practice, Tapping, Counter Drilling.

Smithy Workshop

Introduction of Smithy and Forging process, Tools and Equipment's, Operations, Heat Treatment processes, Advantages, Dis-advantages, Defects and Safety precautions.

Jobs:

Drawing and Upsetting Practice using Open Hearth Furnace, Cold working process practice, Heat Treatment \: Annealing and hardening process

Machine Shop

Application, Function and different parts, Operations of Lathe, Type of Cutting Tools and their materials, Drill machine Types, applications and Functions. Hacksaw machines and functions, Work Holding devices and tools, chucks, Vices, machine Vices, V Block, Measuring Instruments uses, Shaper and Milling machine Applications.

Jobs:

To perform Marking, Facing, Turning,taper Turing, Grooving, Knurling, parting, Drilling, Reaming operations on lathe machine,Hacksawing practice on Power hacksaw,Shaping operation practice on Shaper.

Carpentry Shop

Classification of Tree, Timber. Advantages and uses of Timber, Seasoning of Wood, Tools Used, Defects and Prevention of Wood,

Jobs:

Tee Joint, Cross Joint,Tenon Joint, L Shape Joint, Practice of Wood Working Lathe, Practice on multi-purpose Planer.

Foundry Shop

Introduction to Foundry, Advantages and Disadvantages of castings process, Introduction to pattern and various hand tools, Ingredients of Green sands, Various Hand Molding processes, Introduction to Casting Defects.

Jobs:

Identification and uses of hand tools, Preparation of Green sand in Muller, Preparation of Sand Mould of Single piece solid pattern, Split pattern, Preparation of Green sand Core, casting of a Mould and study its defects.

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Introduction to Basic Manufacturing Processes and Workshop Technology	Rajender Singh	New Age International Publication
2	Manufacturing Processes	Chapman	Viva Books Private Limited

Course Code	**ESC X06**
Course Title	**Digital Electronics**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Objectives (CO)	1. To apply minimization techniques for reducing the functions up to six variables. 2. To design various combinational circuits 3. To write the truth table, excitation table, characteristic equations of various flip flops and to design the sequential circuits using Flip flops. 4. To familiarize the various A/D, D/A Converters, Logic families and their characteristics.

SYLLABUS

Note for Examiner: The semester question paper will be of 50 marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION – A

Introduction (5 hours)

Digital logic, Number Systems and Conversions for Binary, Octal, Decimal, Hexadecimal, Binary Arithmetic, Basic and Universal gates, Boolean Alegbra, Binary addition and subtraction.

Minimization Techniques (6 hours)

Sum of Products and Products of Sum forms, Minterms & Maxterms, Karnaugh Map for two, three, four five and six variables, Quine-McCluskey method.

Combinational Circuit Design (6 hours)

Half adder, full adder, subtractor, BCD adder, comparator, code converter, encoder decoder, multiplexer, demultiplexer, parity detector and generator, PLA, PAL and ROM

Flip Flops (5 hours)

1-bit memory cell, clocked and unclocked flip flops, S-R Flip flop, D flip flop, JK Flip flop, T flip flop, edge triggered flip flop, race around condition , Master slave flip flop, conversion of flip flops using excitation table.

SECTION - B

Counters (5 hours)

Ripple counter, design of Mod-N ripple counter, design of synchronous counter with and without lockout condition, decade counter, ring counter, Johnson counter

Shift Registers (5 hours)

Serial in serial out shift register, serial in parallel out shift register, parallel in serial out shift register and parallel in parallel out shift register, bidirectional shift register, universal shift register.

A/D and D/A Converters (6 hours)

Weighted resistor D/A converter, Binary ladder D/A converter. A/D Converters- flash type, successive approximation, counter ramp type, dual slope type, characteristics of ADC and DAC.

Logic Families (7 hours)

Characteristics of logic families: fan-out, noise margin, propagation delay, power dissipation. Circuit diagrams and working of DTL, DCTL, I^2L, HTL, TTL, Totem pole TTL, ECL, CMOS logic families.

RECOMMENDED BOOKS			
S. No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Digital Design	Morris Mano	PHI, 4th edition
2.	Digital principles and Applications	Malvino Leach	Tata-McGraw Hill
3.	Digital System Principles and Applications	R J Tocci	PHI
4.	Modern Digital Electronics	R P Jain	Tata-McGraw Hill
5.	Digital Integrated Electronics	Taub Schilling	Tata-McGraw Hill

Course Code	**ESC X56**
Course Title	**Digital Electronics (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	 50
Course Prerequisites	10+2

List of Experiments

1. To Study the data sheets of TTL and ECL gates
2. Implementation of Adder and Subtractor using Logic Gates.
3. Implementation of Binary Adder/Subtractor.
4. Implementation of BCD Adder.
5. Design & implementation of Combinational circuits using Multiplexers
6. Design and implement a Universal shift register having shift-right, shift-left, SISO, PIPO capabilities.
7. Implementation of Flip-flops using Logic Gates.
8. Implementations of Ripple counter.
9. Implementation of Modulo-N Synchronous Counter.
10. Implementation of Synchronous counters with unused states and/or avoiding Lock Out condition.
11. To convert 8 bit Digital data to Analog value using DAC
12. To convert Analog value into 8 bit Digital data using ADC.

Course Code	**ASC X01**
Course Title	**Applied Chemistry**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Prerequisites	
Course Objectives (CO)	To teach the fundamentals of basic chemical sciences essential for the development of new technologies to all branches of engineering.
Course Outcome	1. The geometry and bonding in homonuclear, heteronuclear molecules and coordination compounds. Splitting of d-orbital in octahedral, tetrahedral and square planar field along with different properties of the coordination compounds. 2. How the molecules are arranged in three dimensional structure and how it leads to the phenomena of various types of isomerism. 3. The basic principles of spectroscopy and its use to determine the chemical structure. 4. The different thermodynamic laws, heat changes and energy calculations. 5. The role and mechanism of various heterogeneous and homogeneous catalysts in increasing reactions rate of many synthetically important

	chemical reactions. 6. The sustainable technology in design and synthesis of polymers for its variety of applications.

Note for the examiner: The end semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SYLLABUS

SECTION - A

Chemical Bonding (6 hrs)

Molecular orbital theory and its applications to the formation of homonuclear (H_2, N_2) and heteronuclear diatomic molecules (NO, CO, CN), Valence bond theory as applicable to coordination compounds and its limitations. Crystal Field Theory, Splitting of octahedral, tetrahedral and square planner complexes, crystal field stabilization energies of octahedral and tetrahedral complexes and its application.

***S*tereochemistry of Organic Compounds (8 hrs)**

Concept of isomerism. Types of isomerism. Optical isomerism–enantiomers, optical activity, properties of enantiomers, diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization, R & S systems of nomenclature. Geometric isomerism– determination of configuration of geometric isomers, E & Z system of nomenclature Conformational isomerism – conformational analysis of ethane and n-butane; conformations of cyclohexane, Newman projection.

Spectroscopy (9 hrs)

Spectroscopy: UV- Introduction, Lambert-Beer's Law, selection rules, electronic transitions, Application to simple organic molecules (auxochrome, chromophore), effect of conjugation and solvent on transition of organic molecules, Woodward-Fieser Rules for calculating λmax for dienes. Infrared Spectroscop-Introduction, Principle of IR spectroscopy-Fundamental vibrations, Application to simple organic

molecules (effect of masses of atoms, bond strength, nature of substituent, hydrogen bonding on IR frequency), sample preparation for IR.

SECTION - B

Thermodynamics (10 hrs)

Review of objectives and limitations of chemical thermodynamics, State functions, Thermodynamic equilibrium, work, heat, internal energy, enthalpy, heat capacity. Zeroth law of thermodynamics, First law of thermodynamics Reversible, isothermal and adiabatic expansion & compression of an ideal gas. Irreversible isothermal and adiabatic expansion of an ideal gas. Carnot cycle and efficiency of reversible engines, Enthalpy change and its measurement. Flame temperature, Second and third law of thermodynamics. Concept of entropy. Gibb's and Helmholtz equations. Simple numericals for calculating w, q, ΔE, ΔH and entropy.

Catalysis (6 hrs)

Catalysis and general characteristics of a catalytic reactions, Homogeneous catalysis, Heterogenous catalysis, Acid base catalysis and Enzyme catalysis – Michealis Menten equations, Application of catalysis for industrially important processes – Hydrogenation (Wilkinson's catalyst), Hydroformylation, Acetic acid process, Wacker process.

Polymers (6 hrs)

General introduction, classification of polymers, Mechanism of addition and condensation polymerization, Idea of number average and weight average molecular masses of polymers, Properties and uses of polystyrene, polyester, polyamide, epoxy, phenol-formaldehyde and silicon resins.

Books suggested:

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Atkin's Physical Chemistry	Peter Atkins, Julio de Paula	7th Ed., Oxford University Press
2	Concise Inorganic Chemistry	J D Lee	5th Edition, Chapman & Hall, 2003
3	Organic Chemistry	Joseph M. Hornback	Brooke Cole Publishing Company U.S.A.

4	A Textbook of Engineering Chemistry	Shashi Chawla	Dhanpat Rai & Co. Pvt. Ltd., Delhi (2008)
5	Principles of Physical Chemistry	Puri, Sharma and Pathania	W.H. Freeman & Co. 2008.
6	Introductory Polymer Chemistry	G.S.Mishra	John Wiley & Sons, New York, 1993
7	Introduction to spectroscopy	D. S. Pavia, G.M. Lasmpman and G.S. Kriz	4th Edition, Thomson learning, Indian Edition 2012.
8	Basic Inorganic Chemistry.	F.A. Cotton, G. Wilkinson and P.L. Gaus	3rd Ed., John Wiley & Sons
9	Inorganic Chemistry- Principles of structure and reactivity	James E. Huheey, Ellen A. Keiter and Richard L. Keiter	4^{th} Ed. Pearson Edu. Asia
10	Organic Chemistry	S. M. Mukherji, S. P. Singh & R. P. Kapoor	1st Edition, Vol. 2, 1985, New Age International Pvt. Ltd

Course Code	**ASC X51**
Course Title	**Applied Chemistry (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	50

List of Experiments

Instruction for Students: The candidate will be attending a laboratory session of three hours weekly and has to perform any eight experiments.

1. Verify Lambert Beer's law using spectrophotometer and $CoCl_2$ or $K_2Cr_2O_7$ solution.
2. To determine the strength of an acid solution by using conductivity meter.
3. Determination of saponification number of oil.
4. Preparation of a phenol formaldehyde resin.
5. Experiments on TLC (determination of Rf values and identification of various compounds).
6. To determine the heat of a neutralization reaction.
7. To determine the heat of solution of given compound.
8. Determination of total hardness of a water sample.
9. Determination of copper.
10. Determination of chloride ion and dissolved O_2 in water.
11. Preparation of an inorganic complex/organic compound

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	A textbook of Quantitative Inorganic Analysis	A. I. Vogel	Longman Gp. Ltd, 4th editon
2	Essentials of Experimental Engineering Chemistry	Shashi Chawla	Dhanpat Rai and Co. Delhi (2001)
3	Vogel's text book of quantitative chemical analysis	J. Mendham, R. C. Denny, J. D. Barnes and M. J. K. Thomas	Pearson Education

Course Code	**ASM 201**
Course Title	Differential Equations and Transforms
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Objectives (CO)	1. To learn the methods to formulate and solve linear differential equations and their applications to engineering problems 2. To learn the concepts of Laplace transforms and to evaluate Laplace transforms and inverse Laplace transform 3. To apply Laplace transforms to solve ordinary differential equations 4. To learn the concept of Fourier series, integrals and transforms. 5. To learn how to solve heat, wave and Laplace equations.
Course Outcome	1. The student will learn to solve Ordinary Differential equations. 2. The students will be able to apply the tools of Laplace Transforms to model engineering problems and solve the resulting differential equations. 3. Students will understand the nature and behaviour of trigonometric (Fourier) series and apply it to solve boundary value problems.

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION – A

ORDINARY DIFFERENTIAL EQUATIONS

Review of geometrical meaning of the differential equation, directional fields, exact differential equations(scope as in chapter 8, sections 8.1 – 8.10 of reference 5), solution of differential equations with constant coefficients; methods of differential operators (scope as in chapter 9, sections 9.1 – 9.5 of reference 5). Non-homogeneous equations of second order with constant coefficients: Solution by method of variation of parameters, reduction by order (scope as in chapter 9, section 9.7, 9.10 of reference 5). Power series method of solution (scope as in chapter 10, section 10.2 of reference 5)

Laplace Transforms

Laplace transform, Inverse transforms, shifting, transform of derivatives and integrals. Unit step function, second shifting theorem, Dirac's Delta function. Differentiation and integration of transforms. Convolution Theorem on Laplace Transforms. Application of Laplace transforms to solve ordinary differential equations with initial conditions (Scope as in Chapter 6, Sections 6.1 – 6.6 of Reference 2).

SECTION – B

Fourier Series and Transforms: Periodic functions, Fourier series, Even and odd series, half range expansions, Complex Fourier Series, Approximation by trigonometric polynomials. Fourier integrals, Fourier Cosine and Sine transforms, Fourier Transforms (Scope as in Chapter 11, Sections 11.1 – 11.2, 11.4-11.5, 11.7 – 11.9 of Reference 2).

Partial Differential Equations: Partial differential equations of first order, origin, solution of linear partial differential equations of first order, Integral surfaces passing through a given curve (Scope as in Chapter 2, Sections 1, 2, 4, 5 of Reference 1).

Boundary Value Problems: D'Alembert's solution of wave equation, separation of variables: one dimension and two dimension heat and wave equation (Scope as in Chapter 12, Sections 12.1, 12.3 – 12.4, 12.6, 12.9 of Reference 2).

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Elements of Partial Differential Equations	Ian N. Sneedon	McGraw Hill,Singapore 1957.
2.	Advanced Engineering Mathematics	E. Kreyszig.	10th edition , John Wiley.
3.	Advanced Engineering Mathematics	Michael D. Greenberg	2nd edition, Pearson Education.
4.	Advanced Engineering Mathematics	Wylie and Barrett	Tata McGraw Hill
5.	Higher Engineering Mathematics	B.V.Ramana	Tata McGraw Hill.
6.	Advanced Engineering Mathematics	R. K. Jain, S. R. K. Iyenger	Narosa Publications
7.	Theory and problems of Differential Equations	Frank Ayers	Shuam outline series, McGraw-Hill, Singapore, 1957

Course Code	**HSMC X01**
Course Title	Professional Communication
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Outcome	The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

PART-A

English Grammar

Subject-verb agreement , Noun-pronoun agreement , Misplaced modifiers , Articles , Prepositions , Tenses, One word substitutes , Idioms and Phrases , Active-Passive , Synonyms -Antonyms (6)

Basic Writing Skills

Sentence Structures, Use of phrases and clauses in sentences , Importance of proper punctuation , Creating coherence , Organizing principles of paragraphs in documents, Techniques for writing precisely , Paragraph , Essay and Letter writing (5)

Communication details

Four Fundamental communication methods namely Writing, Speaking, Listening and Reading ,7 Cs of Communication , Barriers to Communication (3)

PART-B

Communication in Organizations

Formal- Informal Communication, Communication Networks, Intra and Inter Firm Communication (3)

Modes of Communication

Emerging channels of communication , Telephone and Email Etiquettes, Non-Verbal Communication, Cross-culture communication, Formal Presentations (3)

Communication methods

Reports and their types , Layout of a report , writing a report ,Office notice , Memo ,Business proposals, Minutes of meeting (5)

Suggested Readings:

(i) Practical English Usage. Michael Swan. OUP. 1995.

(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007

(iii)On Writing Well. William Zinsser. Harper Resource Book. 2001

(iv) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

(v) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

(vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Code	**HSMC X51**
Course Title	Professional Communication (P)
Course Assessment Methods Practical (Continuous and end semester evaluation)	50
Course Outcome	The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Practical

Oral Communication

(This unit involves interactive practice sessions in Language Lab)

1. Telling something about oneself

2. Story Telling and Event

3. Listening Comprehension

4. Pronunciation, Intonation, Stress and Rhythm

5. Common Everyday Situations: Conversations and Dialogues

6. Communication at Workplace

7. Facing an Interview

8. Formal Presentations

Course Code	**CSC 201**
Course Title	**Object Oriented Programming**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Prerequisites	Programming for Problem Solving
Course Objectives (CO)	To understand the basic concepts of object oriented programming languages and to learn the techniques of software development in C++.

SYLLABUS

Note for the Examiner: The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION - A

Principles of Objective Oriented Programming (2 hours)

Tokens, Expressions and control structures, various data types, and data structures, Variable declaration, Operators and scope of operators. (4 hours)

Pointers, Functions, Classes and Objects: Prototyping, referencing the variables in functions, memory allocation for classes and objects, Array of objects, pointers to member functions.

(8 hours)

Constructors and Destructors, Operator Overloading and type conversion. (4 hours)

Inheritance: Derived classes, types of inheritance, and various types of classes. (5 hours)

SECTION – B

Virtual functions and Polymorphism. (5 hours)

I/O operations on files: Classes for files, Operations on a file, file pointers. (8 hours)

Exception Handling and Generic programming with templates: Introduction to templates, overloading of template functions and Inheritance. Introduction to standard Template Library (9 hours)

TEXT BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Turbo C++	Robert and Lafore	Galgotia Publications
Reference Books			
1	C++ Primer Plus	Stephan & PRAT	Galgotia Publications
2	Object oriented programming with C++	Bala Guruswamy	Tata McGraw Hill
3	Object oriented Programming with ANSI and Turbo C++	Ashok N. Kamthane	Pearson Education

Course Code	**CSC 251**
Course Title	**Object Oriented Programming (P)**
Course Assessment Methods Practical (Continuous and end semester evaluation)	 50
Course Prerequisites	10+2

List of Experiments:

Note: Practical should be covered based on the following directions:

1. Functions, Classes and Objects
2. Constructors and Destructors
3. Operator Overloading and Type Conversion
4. Inheritance and Virtual Functions
5. Files
6. Exception Handling and Generic Programming

Course Code	**CSC 202**
Course Title	**Introduction to Computer Science**
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Minors, Assignments, Quiz)	 50 50
Course Objectives (CO)	1. To appraise students about various disciplines in Computer Science and Engineering. 2. To make students aware of emerging trends of Computer Science and Engineering.
Course Outcome	The student will have knowledge about various fields of Computer Science and Engineering.

SYLLABUS

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

SECTION – A

Introduction
What is computer science?, Differentiating computer science from engineering, Classification of computers, History, Types of Computers, Block Diagram of a Computer System, Introduction to various units, CPU, Memory, Input and Output devices, Auxiliary storage devices. Turing model, Von-Newmann model, social and ethical issues in computer science and engineering.
(8 hours)

Computer Hardware and Software
Introduction to computer hardware, components of mother boards & its types-ports, slots, connectors, add on cards, Basics of Number System. Application software, system software, interpreter, compliers, editor, computer viruses, worms, trozen. (6 hours)

Computer Organization
Central processing unit, computer storage: memory hierarchy, basics of RAM ,ROM , PROM, EPROM, Floppy, CD Rom, CDRW, DVD, Virtual memory, Cache memory, Physical memory
(5 hours)

SECTION - B

Logic Development and Algorithm
Various techniques to solve a problem, Ways to specify an algorithm, Flow charts. (6 hours)

Area of Computer Science and Engineering
Theory of computation, algorithms and data structures, Database, Artificial Intelligence, Computer Networks, Software Engineering, Computer Vision, Web and Internet. (16 hours)

Trends in Computing
Social and ethical issues related to computing technology, Professional development opportunities.
(4 hours)

TEXT BOOK			
S.No.	**NAME**	**AUTHOR**	**PUBLISHER**
1.	Computing Fundamentals	Peter Nortan	Tata McGraw Hill
REFERENCE BOOK			
1.	Compter Science Handbook	Allen B. Tucker	CRC Press

Second Year - Third Semester

Branch: Computer Science and Engineering

Course Code	CS 301
Course Title	**DATA STRUCTURES**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Programming Fundamentals (CS 101/201), Object Oriented Programming (CS 202)
Course Objectives (CO)	1. To develop proficiency in the specification, representation, and implementation of data types and data structures. 2. To understand the basic concepts of the fundamentals of different types of data structures. 3. To demonstrate the ways of implementation of different types of data structures. 4. To learn the techniques to solve problems like sorting, searching, insertion and deletion of data etc. related to data structures.
Course Outcome	1. Understand common data structures (such as arrays, linked lists, stacks, queues, priority queues, trees, heaps, hash tables, associative containers). 2. Understand the algorithms that build and manipulate different types of data structures including sorting, searching, and hashing algorithms. 3. Decide, apply and implement the appropriate data type and data structure for a given problem. 4. Make appropriate data structure and algorithm design decisions with respect to program size, execution speed, and storage efficiency.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Complexity Analysis: Time and Space complexity of algorithms, asymptotic analysis, big O and other notations, importance of efficient algorithms, program performance measurement, data structures and algorithms.

(4 hours)

Linear Lists: Abstract data type, sequential and linked representations, comparison of insertion, deletion and search operations for sequential and linked lists, list and chain classes, doubly linked lists, circular linked lists, applications of lists in bin sort, radix sort, sparse tables.

(8 hours)

Stacks and Queues: Abstract data types, sequential and linked implementations, representative applications such as parenthesis matching, towers of Hanoi.

(4 hours)

Sorting: Bubble sort, selection sort, insertion sort, Shell sort,Quick sort, Heap sort, Merge sort; Radix sort, Analysis of the sorting methods, Selecting the top k elements.

(7 hours)

SECTION-B

Trees: Binary trees and their properties, terminology, sequential and linked implementations, tree traversal methods and algorithms, Heap data structure and its applications as priority queues, heap implementation, insertion and deletion operations, Heapsort.

(7 hours)

Search & Multi-way Trees: Binary search trees, search efficiency, insertion and deletion operations, importance of balancing, AVL trees, B-trees, B+ trees

(7 hours)

Graphs: Definition, terminology, directed and undirected graphs, properties, connectivity in graphs, applications, implementation – adjacency matrix and linked adjacency chains, graph traversal – breadth first and depth first, spanning trees.

(5 hours)

Hashing: hashing as a search structure, hash table, collision avoidance, linear open addressing, chaining.

(3 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Data Structures using C and C++	Y. Langsam, M. J. Augenstein, A. M. Tanenbaum	2nd Edition, Pearson Education
2.	Data Structures & Program Design in C	R. Kruse, C. L. Tondo, B. Leung, S. Mogalla	2nd Edition, Pearson Education
RECOMMENDED BOOKS			
1	Fundamentals of Data Structures in C++	E. Horowitz, S. Sahni , D. Mehta	2ndEdition, Universities Press
2	Art of Computer Programming, Volume 1: Fundamental algorithms,	Donald E. Knuth	3rd Edition, Addison-Wesley
3	Art of Computer Programming, Volume 3: Sorting and Searching,	Donald E. Knuth	2nd Edition, Addison-Wesley

Branch: Computer Science and Engineering

Course Code	CS 351
Course Title	**DATA STRUCTURES (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Implementation of array operations: Traversal, Insertion & Deletion at and from a given location
2. Stacks: Implementation of Push, Pop; Conversion of Infix expression to Postfix, Evaluation of Postfix expressions.
3. Queues: Circular Queue: Adding & deleting elements.
4. Linked list: inserting, deleting, implementation of stacks & queues using linked lists; Polynomial addition.
5. Trees: Implementation of Binary & Binary Search Trees, Recursive and Non-recursive traversal of Trees.
6. Implementation of Graphs
7. Implementation of sorting and searching algorithms
8. Hash tables implementation: searching, inserting and deleting

Branch: Computer Science and Engineering

Course Code	CS 302
Course Title	**DATABASE SYSTEMS**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Introduction to Computer Science and Engineering(CS102), Programming Fundamentals(CS101/201)
Course Objectives (CO)	The main objective of this course is to provide students with the background to design, implement, and use database management systems. This course offers a good understanding of database systems concepts and prepares the student to be in a position to use and design databases for different applications. Behind the development and design of this course is to know. 1. How to design, manipulate and manage databases. 2. The course participants are exposed to the various forms, types and models of database systems to enable them make viable choices. 3. Supportive and complementary concepts of managing data and documents are thoroughly examined to give a wholesome view of data/information management. 4. The ultimate aim is to encourage the usage of database management systems for effective data management.
Course Outcome	1. Design ER and Relational models for real world problems with normalized data. 2. Construct simple and moderately advanced database queries using Structured Query Language (SQL) and Procedural SQL (PL/SQL). 3. Understand the concept of transactions along with achieving concurrency control through serializability and locking protocols.

	4. Design and implement various Security and integrity controls.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Database Systems:
File Systems Versus a DBMS, Advantages of a DBMS, Components of DBMS, Describing and Storing Data in a DBMS, Database System Architecture, Data abstraction, Data independence, Schemas.

(6 hours)

Physical Data Organization:
Fixed length and Variable Length Records, File Organizations and Indexing, Index Data Structures, Hashing, B-trees, Clustered Index, Sparse Index, Dense Index.

(3 hours)

Data Models:
Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Database Design with the ER Model, Comparison of Models.

(4 hours)

The Relational Model:
Introduction to the Relational Model, ER to Relational Model Conversion, Integrity Constraints over Relations, Enforcing Integrity Constraints, Relational Algebra, Relational Calculus, Querying Relational Data.

(4 hours)

Relational Query Languages:
SQL: Basic SQL Query, Creating Table and Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Nested Queries, Aggregate Operations, Cursors, Dynamic SQL, Integrity Constraints in SQL, Triggers and Active Database, Relational Completeness, Basic Query Optimization Strategies, Algebraic Manipulation and Equivalences.

(6 hours)

SECTION-B

Database Design:
Functional Dependencies, Reasoning about Functional Dependencies, Normal Forms, Schema Refinement, First, Second and Third Normal Forms, BCNF, Multi-valued Dependency, Join Dependency, Fourth and Fifth Normal Forms, Domain Key Normal Forms, Decompositions

(6 hours)

Transaction Management:
ACID Properties, Serializability, Concurrency Control, Concurrency problems: Dirty read, Lost update, Incorrect summary, Lock Management, Locking Protocols: Two phase, Time stamp, Validation based, Multiversion and Granularity based, Deadlocks Handling.

(6 hours)

Backup and Recovery:
Types of Database Failures, Types of Database Recovery, Recovery Techniques: Deferred Update, Immediate Update, Shadow Paging, Checkpoints, Buffer Management.

(6 hours)

Database Protection:
Threats, Access Control Mechanisms, Discretionary Access Control, Grant and Revoke, Mandatory Access Control, Bell LaPadula Model, Role Based Security, Firewalls, Encryption and Digital

Signatures. (4 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Fundamentals of Database Systems	RamezElmasri, ShamkantNavathe	Pearson Education Fifth Edition
RECOMMENDED BOOKS			
1	An Introduction to Database Systems	C.J. Date	Pearson Education Eighth Edition
2	Database Management Systems	Alexis Leon, Mathews Leon	
3	Database Systems Concepts, Design and Applications	S. K. Singh	Pearson Education
4	Database Management Systems	Raghu Ramakrishnan, Johannes Gehrke	Tata McGraw-Hill
5	System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	Tata McGraw-Hill

Branch: Computer Science and Engineering

Course Code	CS 352
Course Title	**DATABASE SYSTEM (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Introduction to SQL and installation of SQL Server / Oracle.
2. Data Types, Creating Tables, Retrieval of Rows using Select Statement, Conditional Retrieval of Rows, Alter and Drop Statements.
3. Working with Null Values, Matching a Pattern from a Table, Ordering the Result of a Query, Aggregate Functions, Grouping the Result of a Query, Update and Delete Statements.
4. Set Operators, Nested Queries, Joins, Sequences.
5. Views, Indexes, Database Security and Privileges: Grant and Revoke Commands, Commit and Rollback Commands.
6. PL/SQL Architecture, Assignments and Expressions, Writing PL/SQL Code, Referencing Non-SQL parameters.
7. Stored Procedures and Exception Handling.
8. Triggers and Cursor Management in PL/SQL

Branch: Computer Science and Engineering

Course Code	CS 303
Course Title	**DISCRETE STRUCTURES**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To get familiar and understand the fundamental notions in discrete mathematics. 2. To introduce the knowledge of core mathematical foundation of computer science. 3. Be exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups. 4. Be aware of the counting principles. 5. To introduce the basic properties of graphs and trees and model simple applications.
Course Outcome	1. Get familiar and understand the fundamental notions in discrete mathematics. 2. Acquire the knowledge of core mathematical foundation of computer science. 3. Aware of the counting principles, basic properties of graph, trees and model simple applications. 4. Exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Set theory:
Definition of sets and proof by induction; Peano postulates; Relations; representation of relations by graphs; properties of relations; equivalence relations and partitions; Partial orderings; Posets; Linear and well-ordered sets.

(9 hours)

Functions:
Mappings; injection and surjections; composition of functions; inverse functions; special functions;

pigeonhole principle.

(5 hours)

Mathematical reasoning:

Propositions; negation disjunction and conjunction; implication and equivalence; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs used in program proving .

(9 hours)

SECTION-B

Combinatorics:

Elementary combinatorics; counting techniques; recurrence relation; generating functions.

(6 hours)

Graph Theory:

Introduction, Graphs Multigraph, Isomorphic Graph, Homeomorphic Graphs, Paths and Circuits, Shortest Paths In weighted Graphs, Eulerian and Hamiltonian Paths and Circuits, Konigsberg Bridge, Complete , Regular, Bipartite Graphs, Planar Graphs, Graph Coloring, Graph Traversal Techniques. Trees, Binary Search Trees, Complete & Extended Binary Trees.

(10 hours)

Groups:

Definition and elementary properties of groups, semigroups, monoids, rings, fields and lattices.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Elements of Discrete Mathematics	C.L.Liu, D P Mohapatra	Tata McGraw Hill Third Edition
2	Discrete Mathematics and applications	K.H.Rosen,	Tata McGraw Hill Seventh Edition
3	Discrete Mathematics, McGraw Hill,	Lipschutz	McGraw Hill, Latest Edition
4	Discrete Mathematical Structures ,	B. Kolman, R. C. Busby and S. C. Ross	PHI, Latest Edition

Branch: Computer Science and Engineering

Course Code	CS 304
Course Title	**MICROPROCESSORS**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Introduction to Computer Science and Engineering(CS102), Programming Fundamentals(CS101/201)
Course Objectives (CO)	Provide students with the opportunity to gain experience in microprocessor-based system design, assembly language programming, and I/O interfacing to microprocessors. This course is intended as a first level course for microcomputer and embedded system design. Designer of an embedded system must have a thorough understanding of hardware, software and system integration. In view of this, various aspects of hardware design, such as interfacing of memory and different types of I/O devices, will be covered in details. As it is customary to write software in machine or assembly language for embedded system applications, laboratory assignments will be on assembly language programming of 8085. 1. This course contains fundamental principles of 8085 microprocessor, its hardware interfacing and programming. 2. After completion of this course the student must be able to use 8085 microprocessor and its peripherals in small applications.
Course Outcome	1. Identify the basic element and functions of microprocessor, describing the architecture of microprocessor and its peripheral devices, memory interfacing. 2. Demonstrate the fundamental understanding on the operation between the microprocessor and its interfacing devices, testing and troubleshooting, circuit diagrams along with description. 3. Apply the programming techniques in developing the assembly language

	program for microprocessor application, types of instructions and its uses, 8-bit as well as 16-bit programming, looping, counter delay executions, issues related to debugging. 4. Understand the concepts of stack and subroutines, its need in microprocessors, various types of interrupts, interrupt handling, instructions related to interrupts and related programming, interfacing data convertors and brief introduction to various general purpose programmable peripheral devices and its interfacing with 8085 microprocessor.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Microprocessor Architecture and Microcomputer Systems:
Microprocessor Architecture Memory, Input and Output Devices, the 8085 MPU, Example of an 808S-Based Microcomputer, Memory Interfacing, The SDK-85 Memory System.

(4 hours)

Interfacing I/O Devices:
Basic Interfacing Concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O, Testing and Troubleshooting, I/O Interfacing Circuits.

(4 hours)

Programming the 8085:
Introduction to 8085 Assembly Language Programming, The 8085 Programming Model, Instruction Classification, Instruction format.
Data Transfer (Copy) Operations, Arithmetic Operations, Logic Operations Branch Operations, Writing Assembly Language Programs.

(7 hours)

Programming Techniques with Additional Instructions:
Programming Techniques Looping, Counting and Indexing, Additional Data Transfer -'arid 16-Bit Arithmetic Instructions, Arithmetic Operations Related to Memory, Logic Operations.

(8 hours)

SECTION-B

Counters and Time Delays:
Counters and Time Delays, Hexadecimal Counter, Modulo: Ten Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs.

(4 hours)

Stack and Subroutines:
Stack, Subroutine, Conditional Call and Return Instructions.

(4 hours)

Interrupts:
The 8085 Interrupt 8085 Vectored interrupts.

(4 hours)

Interfacing Data Converters:
Digital- to- Analog *(01* A) Converters, Analog- to- Digital (A/D) Converters.

(4 hours)

General -Purpose Programmable Peripheral Devices:
The 82S5A Programmable Peripheral Interface, Illustration: Interfacing Keyboard and Seven- Segment Display, Illustration: Bi- directional-Data Transfer between Two Microcomputers, The 8254 Programmable Interval Timer, The 8259 A Programmable Interrupt Controllers, and Direct Memory. Access (DMA) and the 8257 DMA Controller, serial communication, Programmable communications interface 8251.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Microprocessor Programming and Architecture, Applications with the 8085	Ramesh S. Gaonkar	Pearson third edition
RECOMMENDED BOOKS			
1	Microprocessor Principles and Applications,	Charles M.Gilmore	Tata McGraw Hill.
2	Microprocessors and Interfacing programming and Hardware	Douglas V. Hall	Tata McGraw Hill second edition.

Branch: Computer Science and Engineering

Course Code	CS 354
Course Title	**MICROPROCESSORS (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Familiarization of 8085 kit.
2. Applications of data movement instructions to develop relevant programs.
3. Verification of arithmetic and logic operations using above kits.(At least 5 programs)
4. Application of assembly language using 8085 instructions set to develop various programs.
5. Development of interfacing circuits of various control applications based on 8085.

Branch: Computer Science and Engineering

Course Code	AS 201
Course Title	**ECONOMICS**
Type of Course	Core
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To make students understand how society manages its scarce resources for achieving maximum satisfaction. 2. To make students learn about economic aspects related to a consumer, firm, market and economy.
Course Outcome	1. Apply engineering knowledge to maximize profit, satisfaction and welfare. 2. Identify the forces that affect the economy. 3. Apply concepts of economy to software development.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Economics

Nature of Economics, Economic Thoughts, Economic Activities, Relationship of Economics with other Social Sciences and Engineering

(5 hours)

Theory of Consumer Behaviour

Demand: Types, Law of Demand, Determinants of Demand and Change in Demand

Elasticity of Demand: Nature, Degrees, Types, Measurement and Factors Affecting Elasticity of Demand and its Application

Laws of Consumption: Concept and Applicability of Law of Diminishing Marginal Utility and Law of Equi-Marginal Utility

(10 hours)

Theory of Production and Cost

Cost: Types of Costs, Production: Law of Variable Proportion, Returns to Factor and Returns to Scale, Economies and Diseconomies of Scale

(9 hours)

SECTION-B

Theory of Market
Nature and Relevance of Perfect Competition, Monopoly and Monopolistic Competition

(8 hours)

Basic Concepts of Macroeconomics
National Income: Concept and Measurement, Determination of Equilibrium of Income
Inflation: Concept, Causes and Effect of Inflation, Measures to Control Inflation

(8 hours)

Economics of Software:-Why should software be valued? Principles of valuation. Cost versus value. Market value of software companies. Examples of estimation of the value of software.
Sales expectations and discounting. Alternate business models. Risks when outsourcing and offshoring development.

(5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Modern Economics	Ahuja H. L	S. Chand & Co. Ltd
2	Economics For Engineers	Gupta M. L. & Gupta S. P	ESS PEE Publications
3.	Valuing Intellectual Capital, Multinationals and Taxhavens;	GioWiederhold	Springer Verlag, August 2013
4.	Business Economics	Ahuja H. L	S. Chand & Co. Ltd
5.	Macroeconomic Theory	Jhingan M.L	Konark Publisher Pvt. Ltd.
6.	Principles of Microeconomics	Stiglitz J. & Walsh Carl E	W.W. Norton & Company
7.	Principles of Macroeconomics	Stiglitz J. & Walsh Carl E	W.W. Norton & Company
8.	Principles of Economics	Mankiw N Gregory	Cengage Learning
9.	Course in Microeconomics Theory	Kreps A	Prentice Hall
10.	Economics	Samuelson Paul A. & Nordhaus William D	Tata McGraw Hill
11.	Microeconomics	Gravelle H. & Reiss R	Pearson Education
12.	Macro Economics: Theory and Practice	Ahuja H. L.,	S. Chand & Co. Ltd.

Second Year -Fourth Semester

Branch: Computer Science and Engineering

Course Code	**CS 401**
Course Title	**ANALYSIS AND DESIGN OF ALGORITHMS**
Type of Course	Core
L T P	3-1-0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Introduction to Computer Science and Engineering(CS102), Data Structures (CS301)
Course Objectives (CO)	To understand the different algorithms design techniques and to understand the algorithm analysis approach.
Course Outcome	1. Understand different measures for time and space complexities. 2. Understand the different algorithm design approaches including Divide and Conquer, Greedy, Dynamic Programming, Backtracking and Branch and Bound. 3. Understand P and NP class of problems.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction:-Revisiting space/time complexity and asymptotic notations; Recurrences: writing recurrences, solving recurrences: iterative substitution, recursion-tree method, Master's theorem, substitution method.

(8 hours)

Divide and Conquer:- General method,Analysis of divide and conquer based solutions to: Binary Search, Merge sort, Quick sort, Selection sort; finding maximum and minimum using divide and conquer, Strassen's matrix multiplication.

(7 hours)

Greedy Algorithms:-Elements of Greedy strategy, Activity Selection Problem, Knapsack problem, Single source Shortest paths problem, Minimum Spanning tree problem and analysis of these problems.

(8 hours)

SECTION-B

Dynamic Programming:- Elements of dynamic programming, Assembly-line scheduling problem, Matrix-chain multiplication, Multistage Graph, All Pairs Shortest paths, Longest common

subsequence, 0/1 Knapsack.

(12 hours)

Backtracking: - General method, N-Queen's problem, Graph coloring problem, Sum of subsets Problem.

(6 hours)

NP-Completeness:-Polynomial Time, polynomial-time verification, NP-completeness and reducibility, NP-complete problems.

(4 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest	Prentice Hall of India
RECOMMENDED BOOKS			
1	Fundamentals of Computer Algorithms	Ellis Horowitz, SartajSahni	Galgotia
2	The Design and Analysis of Computer Algorithms	Aho A.V., Hopcroft J.E., Ullman J.D.	Pearson Education
3	Introduction to the Design and Analysis of Algorithms	Goodman S.E. &Hedetniemi	McGraw-Hill

Branch: Computer Science and Engineering

Course Code	CS 451
Course Title	**ANALYSIS AND DESIGN OF ALGORITHMS (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Divide & Conquer
2. Greedy Method
3. Dynamic Programming
4. Backtracking

Branch: Computer Science and Engineering

Course Code	**CS 402**
Course Title	**WEB TECHNOLOGIES**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Introduction to Computer Science and Engineering(CS102), Programming Fundamentals(CS101/201)
Course Objectives (CO)	Aim of this course is to familiarize the students with current technologies used in Web development and maintenance 1. To introduce the concepts of Internet ,WWW and underlying technologies 2. To enable the student to use of HTML, DHTML, CSS for Static Webpage creation. 3. To introduce the concept of JavaScript for Client Side programming. 4. To introduce the concept of byte code and Java Programming to develop architecture (Platform) neutral application. 5. To study the concept of XML for data interchange across different platforms 6. To introduce the concept of PHP for various web servers 7. To demonstrate the concept of integrating AJAX and PHP with MySQL.
Course Outcome	1. Understand the core principle on which Internet and WWW operates and ability to create static web pages using HTML, CSS and DHTML. 2. Create dynamic and interactive web contents using the concept of JavaScript, Session and Cookies in Software development. 3. Understand the basic principle of Object Oriented Technology and ability to create powerful but robust standalone application using Java. 4. Understand the concept of add on technologies like AJAX, XML and ability to develop Web Pages using PHP and AJAX and MySQL for server side scripting

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

INTERNET AND WORLD WIDE WEB:
Introduction, Internet addressing, ISP, types of Internet connections, introduction to WWW, web browsers, web servers, URL, HTTP, DNS, web applications, tools for web site creation.

(4 hours)

HTML: Introduction to HTML, lists, adding graphics to HTML page, creating tables, linking documents, frames, DHTML and cascading style sheets.

(7 hours)

Java Script: Introduction, programming constructs: variables, operators and expressions, conditional checking, functions and dialog boxes, JavaScript DOM, creating forms, objects like Window, Navigator, History, Location, introduction to cookies,

(11 hours)

SECTION-B

XML: Why XML, XML syntax rules, XML elements, XML attributes, XML DTD displaying XML with CSS.

(6 hours)

PHP: Introduction, syntax, variables, statements, operators, decision making, loops, arrays, strings, forms, get and post methods, functions, cookies, sessions.

(11 hours)

PHP and MySQL: Introduction to MySQL, connecting to MySQL database, creation, insertion, deletion and retrieval of MySQL data using PHP, PHP and XML, XML parsers, XML DOM.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	XML How to Program,	Deitel,Deitel,Nieto, and Sandhu	Pearson Education
2.	Java 2: The Complete Reference	Herbert Schieldt	TMH, Fifth Edition
3.	Web Enabled Development Application	Ivan Bayross : Commercial	BPB
4.	HTML,CSS, JavaScript,Perl, Python and PHP	Schafer Textbooks.	Wiley India

Branch: Computer Science and Engineering

Course Code	CS 452
Course Title	**WEB TECHNOLOGIES (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Creation of Web pages using: HTML, DHTML
2. Creation of Web pages using JavaScript
3. Implementing basic concepts of Java
4. Creation of Web pages using AJAX
5. Database and AJAX
6. XML
7. PHP

Branch: Computer Science and Engineering

Course Code	**CS 403**
Course Title	**OPERATING SYSTEM**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Introduction to Computer Science and Engineering (CS102), Programming Fundamentals (CS101/201), Data Structures (CS301).
Course Objectives (CO)	1. To introduce design and implementation issues of various Operating Systems: batch, multiprogrammed, time sharing, real time, distributed, parallel Operating System structural Components, layered structure, functions 2. To understand concept of processes, CPU Scheduling Algorithms: FCFS, SJF, RR and Priority, Inter Process Communication, Process Synchronization, Critical Sections, Semaphores and Monitors. 3. To introduce Deadlocks Detection , Recovery, Avoidance and Prevention 4. To familiarize with Memory Management using contiguous memory allocation, paging, segmentation, segmentation with paging. 5. To introduce Virtual Memory, demand paging and page replacement algorithms (FIFO, Optimal, LRU), Thrashing. 6. To understand File Systems, directory structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping) and Protection mechanisms. 7. To discuss Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, and LOOK), Disk Management (Disk Formatting, Boot Blocks, and Bad Blocks), Swap Space Management (Swap Space use, Swap Space Location, Swap Space Management). 8. To explore case Studies: Brief

	introduction of MS-DOS, Windows, UNIX and LINUX.
Course Outcome	1. Design and implement solutions for CPU scheduling, process synchronization and deadlock related problems. 2. Understand the concepts of memory management, Secondary storage management and File system management along with providing solutions for real world problems. 3. Explore features and functionality of MS-DOS, Windows, Unix and Linux.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction: What is an O.S., O.S. Functions; Different types of O.S.: batch, multiprogrammed, time sharing, real time, distributed, parallel; General structure of operating system, O/S services, system calls.

(5 hours)

Process Management: Introduction to processes - Concept of processes, process scheduling, operations on processes; Interprocess Communication, Critical Sections, Mutual Exclusion with Busy Waiting, Sleep and Wakeup, Semaphores, Message passing; CPU scheduling**-** scheduling criteria, pre-emptive & non-pre-emptive scheduling, Scheduling Algorithms: FCFS, SJF, RR and priority, Threads.

(10 hours)

Deadlocks: Introduction to deadlocks, Conditions for deadlock, Resource allocation graphs, Deadlock Detection and Recovery, Deadlock Avoidance, Deadlock Prevention

(6 hours)

SECTION-B

Memory Management: background, logical vs. physical address space, memory management without swapping; swapping; contiguous memory allocation, paging, segmentation, segmentation with paging; Virtual Memory, demand paging, performance, page replacement, page replacement algorithms (FIFO, Optimal ,LRU); Thrashing.

(6 hours)

File Systems: Files - file concept, file structure, file types, access methods, File attributes, file operations; directory structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), Protection mechanisms.

(6 hours)

Secondary Storage : Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, LOOK), Disk Management (Disk Formatting, Boot Blocks, Bad Blocks), Swap Space Management (Swap Space use, Swap Space Location, Swap Space Management)

(6 hours)

Case Studies: Brief introduction of MS-DOS, Windows, UNIX and LINUX.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Operating System Concepts	Silberschatz and Galvin	Addison Wesley Inc.
2	Operating System Design & Implementation	Tanenbaum A.S	Pearson Education.
3	An introduction to Operating Systems Concepts and Practice,	Bhatt and Chandra	Prentice Hall of India Publication

Branch: Computer Science and Engineering

Course Code	CS 453
Course Title	**OPERATING SYSTEM (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Learning Basic Features and Operating Environment of UNIX and LINUX.
2. Introduction to Shell and Shell Commands.
3. Shell programming: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).
4. Process: starting new process, replacing a process image, duplicating a process image, waiting for a process.
5. Programming with semaphores.

Branch: Computer Science and Engineering

Course Code	CS 404
Course Title	**SOFTWARE ENGINEERING**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Introduction to Computer Science and Engineering (CS102), Programming Fundamentals (CS101/201)
Course Objectives (CO)	This course aims to give students a theoretical foundation in software engineering. Students will learn about the principles and methods of software engineering, including current and emerging software engineering practices and support tools. 1. To understand the concept and need of Software Engineering principles, SDLC, process models and tools. 2. To understand project management as an umbrella activity for software development including schedule and cost estimations. 3. To study the concept of software requirements and their changing nature 4. To understand various software architectures and design principle in software Engineering. 5. Understanding good coding practices, including documentation, contracts, regression tests and daily builds. 6. To understand various quality assurance and testing techniques, including unit testing, functional testing and automated testing. 7. To study various CASE tools and understand the methodologies working behind these tools. 8. To understand model based software development using UML.
Course Outcome	1. Demonstrate an understanding of various process models and be able to select appropriate process model for a particular project. 2. Use software cost estimation and scheduling techniques for small programs.

	3. Understand SRS and create architecture design for software systems using CASE tools. 4. Devise test plan, test case and test suit using Black Box and White Box Testing.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction:
Introduction to Software Engineering, System Engineering Vs Software Engineering, Software Evolution, Software Characteristics, Cost of Software Production, Software Components, Crisis – Problem and Causes, Challenges in Software Engineering.

(4 hours)

Software Process Models:
SDLC, Waterfall Model, Incremental Model, Prototyping Model, Evolutionary Model, Spiral Model, Rapid Application Development Model, Rational Unified process Model, Agile Methods, Xtreme programming, SEI Capability Maturity Model.

(8 hours)

Software Requirements Analysis and Specification Concepts:
Requirement Engineering, Requirement Elicitation Techniques, Requirements Documentation, Characteristics and Organization of SRS,

(4 hours)

Software Analysis and Design:
Design Principles, Design issues and Approaches, Abstraction, modularity, Coupling, Cohesion, Structured Analysis and Design, DFD, Object oriented Design, Data Design, Architectural design, Interface Design, Component Level Design, Object Oriented Design Concepts, Structured vs. Object Oriented Analysis.

(8 hours)

SECTION-B

Project Management Concepts:
Management Activities, Project Planning, Project Scheduling, Size Estimation – LOC, FP; Cost Estimation Models –COCOMO, COCOMO-II.

(6 hours)

Coding & Testing:
Coding, Coding Standards, Coding Conventions, Programming Style, Verification and Validation, Testing Process, Design of Test Cases, Software Testing Strategies, Unit Testing, Integration Testing, Top Down and Bottom Up Integration Testing, Alpha & Beta Testing, System Testing and Debugging.

(5 hours)

Technical Metrics for Software:
Software Measurements: What and Why, A Framework for Technical Software Metrics, Metrics for the Analysis Model, Metrics for Design Model, Metrics for Source Code, Metrics for Testing, Metrics for Software Quality, Metrics for Maintenance.

(4 hours)

CASE (Computer Aided Software Engineering) and Introduction to UML:
CASE and its Scope, Building blocks of CASE, CASE Tools, CASE Environment, UML Concepts, Use Case Diagrams, Sequence Diagrams, Collaboration Diagrams, Class Diagrams, State Transition

Diagrams, Component and Deployment Diagrams.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Software Engineering	Ian Sommerville	Pearson Education Seventh Edition
RECOMMENDED BOOKS			
1	Software Engineering: A Practitioner's Approach	R.S. Pressman	McGraw Hill. Sixth Edition
2	Software Engineering: Theory and Practice, ,	Pfleeger, J.M. Atlee	Pearson Education Second Edition
3	Software Engineering for Students.	Douglas Bell	PearsonEducation Fourth Edition
4	An Integrated Approach to Software Engineering,	Pankaj Jalote	Narosa Second Edition
5	Software Engineering	K.K.Aggarwal, Yogesh Singh	New Age International. Second Edition

Branch: Computer Science and Engineering

Course Code	CS 454
Course Title	**SOFTWARE ENGINEERING (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Study the features of MS-Project.
2. Use MS-Project/OpenProj/similar tool to draft project plan for a particular project case study.
3. Use MS-Project/OpenProj/similar tool to generate various reports like Gantt chart, Network diagram, Resource usage sheet.
4. Use MS-Project/OpenProj/similar tool to track the progress of a project.
5. Study the concepts of UML modeling.
6. Use Rational Rose/StarUML/similar tool to generate use case diagrams.
7. Use Rational Rose/StarUML/similar too to generate sequence diagrams.
8. Use Rational Rose/StarUML/similar too to generate class diagrams.
9. Use Rational Rose/StarUML/similar too to generate collaboration diagrams.
10. Study the features of a particular CASE tool for requirements specification, analysis, design and cost estimation.
11. Apply each of the above tools to a particular case study.

Branch: Computer Science and Engineering

Course Code	CS 405
Course Title	**COMPUTER ARCHITECTURE & ORGANIZATION**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Introduction to Computer Science and Engineering (CS102) Microprocessors (CS 304)
Course Objectives (CO)	This course offers a good understanding of the various functional units of a computer system and prepares the student to be in a position to design a basic computer system.
Course Outcome	1. Understand basic organization and functional units of Computer and principles and implementation of computer arithmetic. 2. Understand and Design the different functional units and control unit of CPU 3. Understand the concepts of memory and I/O organization 4. Understand pipelining and parallel processing concepts. 5. Evaluate and design of a basic computer system

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Basic organization of computers, Block level description of the functional units as related to the execution of a program; Fetch, decode and execute cycle.

(6 hours)

Machine instructions, Instruction set architectures, Assembly language programming, addressing modes, instruction cycles, registers and storage, addressing modes; discussions about RISC versus CISC architectures; Inside a CPU

(6 hours)

Information representation, Floating point representation (IEEE 754), computer arithmetic and

their implementation; Fixed-Point Arithmetic: Addition, Subtraction, Multiplication and Division, Arithmetic Logic Units control and data path, data path components, design of ALU and data path, controller design; Hardwired and Micro programmed Control .

(10 hours)

SECTION-B

Memory Technology, static and dynamic memory, Random Access and Serial Access Memories, Cache memory and Memory Hierarchy, Address Mapping, Cache updation schemes, Virtual memory and memory management unit.

(8 hours)

I/O subsystems: Input-Output devices such as Disk, CD-ROM, Printer etc.; Interfacing with IO devices, keyboard and display interfaces; Basic concepts Bus Control, Read Write operations, Programmed IO, Concept of handshaking, Polled and Interrupt-driven I/O, DMA data transfer.

(8 hours)

Pipeline Processing, Instruction and Arithmetic Pipeline, Pipeline hazards and their resolution, Parallel Processing.

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Computer Organization	V. Carl Hamacher, Safwat G. Zaky and Zvonko G. Vranesic	Tata McGraw-Hill series (2002)
2	Computer Organization and Design	David Patterson and John Hennessey	Elsevier (2008)
3.	Computer System Architecture	M. Morris Mano	Pearson Third Edition
4.	Computer Architecture and Organization	J.P. Hayes	Tata McGraw-Hill Third Edition
5.	Computer Organization and Architecture	William Stallings	Pearson Seventh Edition

Third Year - Fifth Semester

Branch: Computer Science and Engineering

Course Code	**CS 501**
Course Title	**DATA COMMUNICATION AND NETWORKS**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Structures (CS 301)
Course Objectives (CO)	1. To introduce the concepts and terminology of Data Transmission. 2. To understand concept of Data Encoding and Data Communication Interface. 3. To familiarize with Multiplexing, Switching Techniques, LAN Technologies. 4. To study and explore different Protocol Architectures, Error detection and correction techniques, MAC layer protocols, Channel access methods, Address resolution protocol and Ethernet technologies.
Course Outcome	

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Data Transmission/The Physical Layer: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Guided Transmission Media, Wireless Transmission, Communication Satellites, The Public Switched Telephone Network, The Mobile Telephone System, Cable Television.

(5 hours)

Data Encoding: Digital Data: Digital and Analog Signals, Analog Data: Digital and Analog Signals, Spread Spectrum.

(3 hours)

Data Communication Interface: Asynchronous and Synchronous Transmission, Line

Configurations, Interfacing.

(3 hours)

Multiplexing: Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing.

(2 hours)

Circuit Packet and Switching: Switched Networks, Circuit-Switching Networks, Switching Concepts, Routing in Circuit-Switched Networks, Control Signaling, Packet-Switching Principles, Routing, Congestion Control, X.25.

(4 hours)

Frame Relay: Frame Relay Protocol Architecture, Frame Relay Call Control, User Data Transfer, Network Function, Congestion Control.

(3 hours)

LAN Technology and Systems: LAN Architecture, BusITree LANs, Ring LANs, Star LANs, Wireless LANs, Ethernet and Fast Ethernet (CSMA/CD), Token Ring and FDDI, 100VG-AnyLAN, ATM LANs, Fibre Channel, Wireless LANs, Bridge Operation, Routing with Bridges.

(6 hours)

SECTION-B

Protocols and Architecture: Protocols, OSI, TCP/IP Protocol Suite.

(3 hours)

Examples of networks: Arpanet, and Internet. Examples of Data Communication Services: X.25 Networks, Frame relay, Broad band ISDN and ATM. Physical Layer: Transmission media-Narrow band ISDN: Services-Architecture- Interface, Broad band ISDN and ATM- Virtual Circuits versus Circuit Switching –Transmission in ATM networks. FDDI.

(6 hours)

Link Layer and Local Area Networks Data link layer: Service provided by data link layer-Error detection and correction Techniques-Elementary data link layer protocols -Sliding Window protocols - Data link layer in HDLC, Internet and ATM . Multiple Access protocols: Channel partitioning protocols: TDM-FDM-Code Division Multiple Access(CDMA) .Random Access protocols : ALOHA, CSMA and CSMA/CD . Local area Network: LAN addresses- Address Resolution Protocol-Reverse Address Resolution Protocol. Ethernet: Ethernet Technologies-IEEE standards- Hubs-Bridges and Switches.

(10 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Computer Networks	Andrew S. Tanenbaum	5th edition, Pearson Education,2011
2	Data Communications and Networking	Behrouz A. Forouzan	5th edition, 2015
3	Computer Networking	James F. Kurose and Keith W. Ross	International edition, Pearson Education 2012
4	Data and Computer Communication	William Stalling	10th edition, Pearson Education, 2013
5	Computer Networks and Internets	Douglas E Comer	6th edition, Pearson Education, 2014

Branch: Computer Science and Engineering

Course Code	CS 551
Course Title	**TECHNICAL WRITING AND COMMUNICATION SKILLS (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. **Remedial Grammar:** Errors of accidence and syntax with reference to parts of speech; Agreement of subject and verb; Tense and Concord; Conditional clauses; Use of connectives in complex and compound sentences; Question tags and short responses.
2. **Vocabulary and Usage:** Word Formations (by adding suffixes and prefixes); Technical Word Formation; Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words; Phrasal Verb Idioms
3. **Technical Writing:**

A. Scientific Attitude and Impersonal Style; Plain Statements, Definitions; Description and Explanations (of objects, instruments, Processes, Scientific Principles, etc.) Summarizing and abstracting; Expressing ideas within a restricted word limit; Paragraph Writing (Paragraph division, introduction and the conclusion, Variety in sentences and paragraphs) Interpretation and use of charts, graphs and tables in technical writing. Punctuation

B. Reading at various speeds (slow, fast, very fast); reading different kinds of texts for different purpose (e.g. for relaxation, for information, for discussion at a later stage, etc.); reading between the lines. Comprehension of Unseen Passages

Branch: Computer Science and Engineering

Course Code	CS 502
Course Title	**COMPUTER GRAPHICS**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	The course provides a comprehensive introduction to computer graphics leading to the ability to understand the terminology, progress, issues and trends in the area. The detailed coverage of graphics based algorithms enables the students to draw various geometric objects as well as to perform 2-D & 3-D transformations on them. This course further discusses the techniques for designing animation sequences and to achieve realism in rendering such as hidden surface elimination, shading.
Course Outcome	1.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Graphics Hardware:
Application areas of Computer Graphics, Overview of graphics systems, Video-display devices, Raster scan systems, Random scan systems, Graphics Input and Output devices.

(4 hours)

Output Primitives:
Points and Lines, Line Drawing Algorithms: DDA Algorithm, Bresenham's Line Algorithm, Circle Generating Algorithm: Mid point circle algorithm, Ellipse Generating Algorithms: mid point ellipse algorithm, Pixel Addressing and Object Geometry, Boundary Fill Algorithms, Flood Fill Algorithms, Character Generation, Line, Area-Fill and Character Attributes.

(9 hours)

Two Dimensional Geometric Transformations and Viewing:
Basic Transformations: Translation, Rotation and Scaling, Matrix Representations, Composite Transformations, Viewing Pipeline, Window to Viewport Coordinate Transformation, Clipping Operations: Line, Polygon, Curve and Text Clipping.

(9 hours)

SECTION-B

Three Dimensional Concepts, Transformations and Viewing:
Three Dimensional Display Methods, Three Dimensional Transformations; Three Dimensional Viewing Pipeline; Viewing Coordinates; Specifying the View Plane, Projections: Parallel Projections, Perspective Projections.

(6 hours)

Splines and Curves:
Curved Lines and Surfaces, Spline Representations, Cubic Splines, Bezier Curves and their properties, B-Spline Curves.

(5 hours)

Visible Surface Detection Methods:
Classification of Visible Surface Detection Methods, Back Face Detection, Depth Buffer, A-Buffer, Scan Line and Depth-Sorting Methods, Wireframe Methods, Concepts of Computer Animation, Design of Animation Sequences.

(7 hours)

Illumination Models and Shading:
Light sources, Basic Illumination models, Shading models: Flat and Smooth Shading.

(5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Computer Graphics C Version	. Donald Hearn, M.P. Baker	Second Edition, Pearson Education.
RECOMMENDED BOOKS			
1	Computer Graphics: principles and practice,	J. D. Foley, A. van Dam, S.K. Feiner, J.F. Hughes	Second Edition, Pearson Education
2	Computer Graphics	Z. Xiang, R.A. Plastock:,	Second Edition, Schaum's Outlines, Tata McGraw-Hill.
3	. N. Krishnamurthy	: Introduction to Computer Graphics	Tata McGraw-Hill.
4	Mathematical Elements for Computer Graphics,	David F. Rogers, James Alan Adams	Tata McGraw-Hill.
5	Computer Graphics: A Programming Approach	S. Harrington	Tata McGraw-Hill.

Branch: Computer Science and Engineering

Course Code	CS 552
Course Title	**COMPUTER GRAPHICS (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Introduction to Borland Graphics Interface (BGI) and graphics libraries such as OPENGL, Cairo.
2. Implement DDA, Bresenham and midpoint line drawing algorithms.
3. Implement midpoint circle drawing algorithm.
4. Implement ellipse drawing algorithm.
5. Performing transformations in 2D space.
6. Performing 3D transformations.

Branch: Computer Science and Engineering

Course Code	CS 503
Course Title	**ARTIFICIAL INTELLIGENCE**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Discrete Structures (CS 303), Analysis and Design of Algorithms (CS 401)
Course Objectives (CO)	1. To introduce the AI techniques to solve problems and search strategies to find optimal solution paths from start to goal state. 2. To introduces different knowledge representation methods in AI Programs. 3. To introduce different design techniques for Game Playing Programs. 4. To introduce the AI Agents their design, planning and learning techniques. 5. To introduce the natural language processing and expert systems.
Course Outcome	1. Understand fundamental AI concepts and and identify a range of symbolic and non-symbolic AI techniques. 2. Demonstrate an understanding of various searching algorithms such as adversarial search and game-playing commonly used in artificial intelligence software. 3. Use different knowledge representation techniques used in AI Applications. 4. Demonstrate an understanding of agent-based AI architectures and an understanding of Planning and logic-based agents.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction:
Artificial Intelligence and its applications, Artificial Intelligence Techniques, criteria of

success.

(4 hours)

Problem solving techniques:

State space search, control strategies, heuristic search, problem characteristics, production system characteristics., Generate and test, Hill climbing, best first search, A* search, AO* search, Constraint satisfaction problem, Agenda Driven Search, Mean-end analysis, Min-Max Search, Alpha-Beta Pruning, Iterative Deepening.

(9 hours)

Knowledge representation:

Mapping between facts and representations, Approaches to knowledge representation, procedural vs declarative knowledge, Forward vs. Backward reasoning, Matching, conflict resolution, Weak and Strong filler structures, semantic nets, frame, conceptual dependency, scripts.

(8 hours)

SECTION-B

Non Monotonic and Statistical Reasoning

Non monotonic Logic, Default Logic, Circumscription, Bayes Theorem, Bayesian Network, Dempster Shafer Theory, Fuzzy sets, Fuzzy Logic, Defuzzification.

(8 hours)

Planning and Learning Agents:

Intelligent Agents, Nature and structure of Agents, Learning Agents, Introduction to different Forms of Learning,

The Planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, Analysis of planning approaches, Hierarchical planning, conditional planning, Continuous and Multi Agent planning.

(9 hours)

Introduction to Learning and Expert system:

Expert systems, Expert system examples, Expert System Architectures, Rule base Expert systems, Non Monotonic Expert Systems, Decision tree base Expert Systems.

(7 hours)

TEXT BOOKS

S. No.	NAME	AUTHOR(S)	PUBLISHER
1.	AI: A Modern Approach	Stuart J. Russel, Peter Norvig	Pearson Education Latest Edition, 2012
2	Artificial Intelligence	Elaine Rich, Knight	McGraw Hill Third Edition2010
3	Artificial Intelligence,	Saroj Kaushik	Cengage Learning, First Edition2011
4	Artificial Intelligence,	Partick Henry Winston	Addison Wesley Latest Edition2012
5	Artificial Intelligence	George Luger	Pearson Education Latest Edition2010
6	Introduction to AI and Expert Systems, ,	DAN, W. Patterson	PHI Latest Edition2011
7	Principles of AI,	A.J. Nillson	Narosa publications Latest Edition, 2010

Branch: Computer Science and Engineering

Course Code	CS 553
Course Title	**ARTIFICIAL INTELLIGENCE (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Program Related to Problem Solving techniques of AI
   - Breadth First Search
   - Depth First Search
   - Heuristic Search
   - Best Search
   - Min-Max Search with alpha-beta pruning
   - Tic-Tac-Toe problem
   - N-Queens and N-Knight problem
   - Unification Algorithm
2. Introduction To AI Languages such as LISP, PROLOG
3. Representing Knowledge using RuleML
4. Using semantic Web
5. Knowledge of using Neural Networks, Fuzzy logic, genetic algorithms
6. Other new AI Techniques

Branch: Computer Science and Engineering

Course Code	CS 504
Course Title	**PRINCIPLES OF PROGRAMMING LANGUAGES**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Programming Fundamentals(CS101/201)
Course Objectives (CO)	This course should provide the students with a fairly good concept of fundamental concepts and design issues of programming languages and become familiar with major programming paradigms. Understand similarities and differences between models and know when to use them and also learn programming techniques appropriate for each model.
Course Outcome	

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction:
Study of principles and major concepts in various programming paradigms like imperative, functional, object-oriented and logic programming. Introduction to various phases of compilers, Formal translation models: BNF Grammars.

(5 hours)

Imperative Programming:
Location, reference and expressions, assignment and control, data types, blocks, procedures and modules.

Object Oriented Programming:
Classes and objects, abstraction and encapsulation, inheritance, Polymorphism, virtual functions and classes, abstract classes. (7 hours)

Logic Programming:
Unification, SLD-resolution, Backtracking, Cuts.
Concepts Of Concurrent Programming: Processes, synchronization primitives.

(8 hours)

SECTION-B

Functional Programming:
Functions as first class objects, higher order functions, polymorphic data types, type checking and type inference.

(10 hours)

Storage Management:
Static storage management, Heap storage management.

(10 hours)

Illustration of the above concepts using representative languages: C++, Java, and Prolog etc.

(5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Programming Languages: Design & Implementation	Prattt&Zelkowrtz,	Pearson Education 5th Edition
2	Essentials of Programming Languages,	Friedman, Wand, and Haynes	MIT Press 2001, ISBN 0262062178, 9780262062176 Latest Edition
3	Principles of Programming Languages: Design, Evaluation, and Implementation	Bruce J. MacLennan	Oxford University Press US, 1999, ISBN 0195113063, 9780195113068 Latest Edition

Branch: Computer Science and Engineering

Course Code	CS 505
Course Title	**THEORY OF COMPUTATION**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	This course will provide the in-depth knowledge of various computing models like Finite State Machine, Pushdown Automata and Turing machine..
Course Outcome	1.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Finite Automata:
Introduction: Basic mathematical notation and techniques, Finite Automata (FA), Deterministic Finite Automata (DFA), Non-deterministic Finite Automata (NFA), Finite Automata with Epsilon transitions.

(7 hours)

Regular Expression and Languages:
Regular Expression, Finite Automata and Regular Expressions, Regular and Non-regular languages, Closure properties of regular languages, Equivalence of Finite Automaton and regular expressions, Minimization of Automata, Pumping lemma for regular sets.

(7 hours)

Grammars and Languages:
Introduction, types of grammar, Context-free grammar, derivation and languages, ambiguity, Simplification of context-free grammars: Elimination of useless symbols, unit productions and Null productions, Normal Forms: Greibach normal form (GNF) and Chomsky normal form (CNF) .

(7 hours)

SECTION-B

Pushdown Automaton:
Pushdown Automaton: definition, moves, instantaneous descriptions, Deterministic Pushdown automaton, Equivalence of Pushdown automaton and Context free languages

(CFL), Pumping lemma for CFL.

(8 hours)

Turing Machines:

Definitions of Turing Machines, models, computable languages and functions, Techniques for Turing machine construction, Multi-head and Multi-tape Turing machines, The halting problem.

(8 hours)

Undecidability:

Unsolvable problems and computational functions, Recursive and recursively enumerable languages, Tractable and Intractable problems, P and NP completeness, Polynomial time reductions.

(8 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Introduction to Automata Theory, languages and computations	J. E. Hopcroft, R. Motwani, J. D. Ullman	Pearson Education 2nd Edition,2008
2	Introduction to languages and theory of computation	J. C. Martin	Tata McGraw Hill Publishing Company 2007
3.	Theory of Computer Science-Automata, Languages and Computation	K L P Mishra, N Chandrasekaran	Prentice Hall of India 3rd Edtion2004

Branch: Computer Science and Engineering

Course Code	CS 506
Course Title	**Principle of Designing**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. Conceptualisation and development of innovative, commercially important and socially sound decisions related to engineering products, processes and systems. 2. To train students to translate academic developments in electronics, computational, materials and energy engineering to real life applications of interest to industry for accelerated start of career.
Course Outcome	1. Develop and design engineering products that are commercially and socially viable. 2. Develop real-time applications using engineering design.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to designing

Fundamentals of engineering designs and applications; social, economic, sustainability, environmental and aesthetic rationales in design engineering, design decisions related to competitiveness of products, processes, services and systems. Impact of product design on business and market, product portfolio development through continuity in designing.

(7 hours)

Managing technologies and innovations

Technology road mapping, market and trend analyses for design decisions, managing technology and innovations, protecting designs by intellectual property rights, IPR gap analysis, creative thinking, technology sharing and transfer, founding start up companies, raising seed funding, challenges of conceiving, creating and growing a new venture.

(7 hours)

Design process

Principles, tools and strategies for conceptualising the need and presenting designs - product specifications, digital tools, analog drawings, design modeling: mathematical modeling, simulation using computers, and creation of 2D and 3D scale models. Engineering fundamentals related to mechanical, electrical, electronic and computational concepts in designing; environmental, sustainability, life cycle analysis, upstream manufacturing economics and downstream assembly, distribution, recyclability, robustness, maintenance and safety aspects in design development; functional prototypes, iterations, validation of product concept, product development .

(7 hours)

SECTION-B

Materials in Engineering Designs

Mechanical and structural properties of materials, application related needs, stress analysis and fracture, heat transfer, conductivity, transparency, surface properties etc. Nanomaterials, transparent ceramics, polymers, biocompatible materials, composites for biomechanical applications. Case studies through examples and minor projects on designing materials for dental restorative applications, energy harvesting technologies and transparent ceramics.

(8 hours)

Computational Designs

Theory and applications of computational design and manufacturing methods, use of tools like, computer aided design, computer aided engineering, computer aided manufacturing, Digital image capture and reconstruction, additive and subtractive manufacturing using CAD CAM, milling and 3D approaches. Examples by case studies and minor projects for designing prosthetics and orthosis.

(6 hours)

Challenges of Energy in Engineering Designs

Energy source, quality, costing, storage, utilisation, conservation and sustainability in engineering designs. Examples by case studies and minor projects on small energy capture, storage and management technologies.

(4 hours)

Smart Systems in Engineering Designs

Smart system technologies, real time sensing and communication, embedded intelligence, designing for internet of things, data acquisition and hardware interfacing and robotics. Case studies and minor projects related to devices for visually and hearing challenged individuals, traffic sensing and information analysis.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Design Thinking. 405 pages	Michael Luchs, Scott Swan, Abbie Griffin, 2015	1. John Wiley & Sons, Inc (ISBN 978-1-118-97180-2)
2	AProduct Design for Manufacture and Assembly..	Geoffrey Boothroyd, Peter Dewhurst	CRC Press
3.	Engineering Design Methods:	Nigel Cross, 2008	Strand Winston A Knight, 2011
4.	Strategies for Product Design		2. Wiley & Sons (ISBN 978-0-470-51926-4)
5.	Mechanical Engineering Design	Richard G Budynas and J Keith Nisbett, 2010	3. Mc Graw Hill (ISBN 978-0-07-352928-8).

Branch: Computer Science and Engineering

Course Code	**CS 601**
Course Title	**COMPUTER NETWORKS AND SECURITY**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks (CS 501)
Course Objectives (CO)	1. To introduce the data communication components, data flow and network categories and reference models. 2. To introduce the concepts of analog and digital signals, multiplexing, transmission media and switching techniques 3. To introduce different techniques for error detection and correction, media access and flow control protocols. 4. To introduce concepts of logical addressing, routing algorithms and congestion control algorithms. 5. To introduce the techniques for buffering, crash recovery, network security and application protocols.
Course Outcome	1. Understand the fundamental concepts of computer networking and enumerate the functions of Physical layer and Data Link layer. 2. Understand Network layer and Transport Layer functions and protocols. 3. Familiarize with different Application layer functions and protocols. 4. Demonstrate the knowledge of different protocols and security techniques.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction:

Data Communication: Components, Data Flow; Network Categories: LAN, MAN, WAN (Wireless / Wired); Network Software: Concept of layers, protocols, interfaces and services; Reference Model: OSI, TCP/IP and their comparison. Review of functionality of Physical and Data Link layer.

(7 hours)

Network Layer:

Logical Addressing: IPv4 and IPv6; Packet Formats & their comparison: IPv4 and IPv6;

Routing algorithms: Distance vector, Link State Routing, Hierarchical Routing, Broadcast & Multicast Routing.

Congestion Control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket & Token bucket algorithms.

(10 hours)

Transport Layer:

Addressing, flow control & buffering, multiplexing & de-multiplexing, crash recovery;

Example transport protocols: TCP, SCTP and UDP.

(6 hours)

SECTION-B

Application Layer:

WWW and HTTP; File transfer Protocol: FTP Commands and Replies; Domain Name System; SMTP, SNMP; Electronic Mail

(8 hours)

Web Security:

Security in Computer Networks: Principles of Cryptography-Symmetric key-Public key-authentication protocols; Digital Signatures, Firewalls; Security in different Layers

(7 hours)

Email and IP Security:

Secure E-mail- SSL, IP security, PGP, S/MIME, IP Security Overview and Architecture, Key Management, SSl, TLS, SET

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Computer Networks	Andrew S. Tanenbaum	5th edition, Pearson Education, 2012.
2	Data Communications and Networking	Behrouz A Forouzan	5th edition, Tata Mcgraw Hill, 2013
RECOMMENDED BOOKS			
1	Data and Computer Communications	William Stallings	8th edition, Pearson Education, 2007.
2	Computer Networks and Internets with Internet Applications	Douglas e. Comer	4th edition, Pearson Education, 2008
3	Computer Networking: A top down approach	James F. Kurose and Keith W. Ross	6th edition, Pearson Education, 2012
4	Network Security Essentials	William Stallings	Pearson Education, 2000

Branch: Computer Science and Engineering

Course Code	**CS 651**
Course Title	**COMPUTER NETWORKS AND SECURITY (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. To familiarize with the various basic tools (crimping, krone etc.) used in establishing a LAN.
2. To study various topologies for establishing computer networks.
3. To familiarize with switch , hub, connecters, cables (cabling standards) used in networks
4. To familiarize with routers & bridges
5. To use some basic commands like ping, trace-root, ipconfig for trouble shooting network related problems.
6. To use various utilities for logging in to remote computer and to transfer files from / to remote computer.
7. To develop a program to compute the Hamming Distance between any two code words.
8. To develop a program to compute checksum for an 'm' bit frame using a generator polynomial.
9. To develop a program for implementing/simulating the sliding window protocol.
10. To develop a program for implementing/simulating a routing algorithm.
11. To study various IEEE standards (802.3, 802.11, 802.16)
12. Implementation of Firewall in a Network.

Branch: Computer Science and Engineering

Course Code	**CS 602**
Course Title	**LINEAR ALGEBRA AND PROBABILITY THEORY**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To introduce the concept of Linear equations and vector spaces. 2. To introduces the use of Eigen vectors and Linear transformations. 3. To introduce random variables and probability theory. 4. To introduce the use of 2-d random variables.
Course Outcome	1. Understand the use of linear algebra and linear transformations. 2. Design solutions using matrices and eigen vectors 3. Apply probability theory in different engineering problems. 4. Understand the use of random variables in different applications.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Systems of Linear equations:
Introduction, Linear equations, solutions, Linear equations in two unknowns, Systems of linear equations, equivalent systems, Elementary operations, Systems in Triangular and echelon form, Reduction Algorithm, Matrices, Row equivalence and elementary row operations, Systems of Linear equations and matrices, Homogeneous systems of Linear equations. (Scope as in Chapter 1, Sections 1.1-1.10 of Reference 1).
(5 hours)

Vector Spaces:
Introduction, Vector spaces, examples of vector spaces, subspaces, Linear combinations, Linear spans, Linear dependence and Independence, Basis and Dimension, Linear equations and vector spaces. (Scope as in Chapter 5, Sections 5.1-5.8 of Reference 1).

(5 hours)

Eigenvalues and Eigenvectors, Diagonalization:
Introduction, Polynomials in matrices, Characteristic polynomial, Cayley-Hamilton theorem, Eigen-values and Eigen-vectors, computing Eigen-values and Eigen-vectors, Diagonalizing matrices.(Scope as in Chapter 8, Sections 8.1-8.5 of Reference 1).

(4 hours)

Linear Transformations:
Introduction, Mappings, Linear mappings, Kernel and image of a linear mapping, Rank- Nullity theorem (without proof), singular and non-singular linear mappings, isomorphisms.(Scope as in Chapter 9, Sections 9.1-9.5 of Reference 1).

(5 hours)

Matrices and Linear transformations:
Introduction, Matrix representation of a linear operator, Change of basis and Linear operators.(Scope as in Chapter 10, Sections 10.1-10.3 of Reference 1).

(5 hours)

SECTION-B

Probability
Sample Space and Events, the Axioms of probability, some elementary theorems, Conditional probability, Baye's Theorem, Random Variables-Discrete and Continuous, Independent random variables, Expectation, Variance and Covariance, Means and variances of linear combinations of random variables, Chebyshev's inequality

(7 hours)

Probability Distributions
Joint Probability distributions, Marginal and Conditional distributions, Binomial, Poisson, Uniform and Normal distributions, Normal and Poisson approximations to Binomial, Moments, Moment generating function.

(7 hours)

Two Dimensional Random Variables
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Regression – function of a random variable-Transformation of random variables - Central limit theorem.

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Shaum's Outline of Theory and Problems of Linear Algebra	Seymour Lipschutz	2nd edition, McGraw-Hill, 1991.
2	Linear Algebra	VivekSahai, VikasBist	Narosa Publishing House, 2002
3	Introduction to Probability and Statistics	J. S. Milton and J.C. Arnold	4th edition, McGraw Hill, 2007
4	Probability and Statistics for Engineers	R.A. Johnson and C.B. Gupta	7th edition, Pearson Education, 2007
5	Fundamentals of Mathematical Statistics	S. C. Gupta and V.K. Kapoor	Sultan Chand and Sons

Branch: Computer Science and Engineering

Course Code	**CS 603**
Course Title	**MODELING AND SIMULATION**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To introduce the simulation techniques to solve real time problems where experimentation on the actual system is very risky. 2. To introduce different discrete event and continuous simulation methods. 3. To introduce different techniques for generating random numbers and random variates following various distributions. 4. To introduce different queuing techniques for single server and multi server systems. 5. To introduce the different simulation languages like MATLAB and GPSS.
Course Outcome	1. Understand the continuous and discrete event simulation techniques and apply them suitably to real time problems where experimentation on actual system is risky. 2. Analysing different procedures to generate random numbers and apply them for implementation of different simulation systems. 3. Understand different simulation languages like MATLAB and GPSS and apply them to simulate different systems.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction:
What is modeling and simulation, application areas, definition and types of system, model and simulation, introduction to discrete-event and continuous simulation.
(5 hours)

Simulation Methods:
Discrete-event Simulation, Time advance Mechanisms, Components and organization of Discrete-event simulation, Flowchart of next-event time advance approach, Continuous Simulation, Monte Carlo Simulation.

(10 hours)

Queuing Models:
Single server queuing system, introduction to arrival and departure time, flowcharts for arrival and departure routine. Event graphs of queuing model. Determining the events and variables, Event graphs for inventory model.

(10 hours)

SECTION-B

Random Numbers:
Introduction to Random Numbers, Importance of Random Numbers in Simulation, Mid-Square random number generator, Residue method, Arithmetic Congruential generator, Testing Numbers for Randomness, Chi-Square Test.

(5 hours)

Distribution Functions:
Stochastic activities, Discrete probability functions, Cumulative distribution function, Continuous probability functions. Generation of random numbers following binomial distribution, Poisson distribution, continuous distribution, normal distribution, exponential distribution, uniform distribution.

(10 hours)

Simulation Languages:
Basic Introduction to Special Simulation Languages:-GPSS/ MATLAB/ Network Simulators. (5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Simulation Modeling and Analysis	Averill M. Law	4th edition, Tata Mcgraw Hill, 2007.
2	System Simulation	Geoffery Gordon	2nd edition, Prentice-Hall of India, 2001
3	System Simulation	D.S. Hira	1st edition, S. Chand Publication, 2001
4	MATLAB Programming for Engineers	Stephen J. Chapman	3rd edition, Thomson Learning, 2005
5	Discrete-Event System Simulation	Jerry Banks, John S. Carson, Barry L. Nelson and David M. Nicol	5th edition, Prentice-Hall of India, 2009
6	Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers	RudraPratap	8th edition, Oxford University Press, 2009

Branch: Computer Science and Engineering

Course Code	**CS 653**
Course Title	**MODELING AND SIMULATION (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Programming in MATLAB: Introduction, Branching statements, loops, functions, additional data types, plots, arrays, inputs/outputs etc.
2. Introduction regarding usage of any Network Simulator.
3. Practical Implementation of Queuing Models using C/C++.

Branch: Computer Science and Engineering

Course Code	**CS 604**
Course Title	**COMPILER DESIGN**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Theory of Computation (CS 505)
Course Objectives (CO)	1. This course will provide the in-depth knowledge of different concepts involved while designing a compiler.
Course Outcome	1. Understand the functioning of different phases of a compiler. 2. Understand the implementation details and concepts behind each phase of the compiler by stressing more on the syntax analysis and further on different parsing techniques. 3. Understand need of intermediate code generation, code optimization and actual machine code generation techniques.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction:
Compilers and Translators; The phases of the compiler – Lexical Analysis, Syntax Analysis, Intermediate Code Generation, Optimization, Code generation, Bookkeeping, Error handling.
(5 hours)

Lexical Analysis:
The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of a tokens, design of a lexical analyzer generator.
(5 hours)

Syntax Analysis:
The role of a parser, Context free grammars, Writing a grammar, Top down Parsing: Recursive decent parser, Predictive parser, Bottom up Parsing: Handles, Viable prefixes, Operator precedence parsing, LR parsers: SLR, LALR, CLR. Parser generator (YACC).Error Recovery techniques for different parsers
(12 hours)

SECTION-B

Syntax directed translation:
Syntax directed definitions, Synthesized and inherited attributes, Construction of syntax trees.

(4 hours)

Run time environments:

Source language issues (Activation trees, Control stack, scope of declaration, Binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Symbol tables: storage, data structures used

(6 hours)

Intermediate code generation:

Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples)

(3 hours)

Code optimization and code generation:

Introduction, Basic blocks & flow graphs, DAG, principle sources of optimization: loop optimization, eliminating induction variable, eliminating common sub-expression, loop unrolling, loop jamming etc. Peephole optimization, Issues in the design of code generator, a simple code generator, Register allocation & assignment.

(10 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Compilers: Principles, techniques and tools	A. V. Aho, J D. Ullman, M. S. Lam, R. Sethi	2nd edition, Pearson Education, 2014.
2	Compiler Construction: Principle and Practice	K C Louden	1st edition, Cengage Learning
3	Compiler Design in C	Holub	Latest edition, PHI

Branch: Computer Science and Engineering

Course Code	**CS 654**
Course Title	**COMPILER DESIGN (PRACTICAL)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Implementation of lexical analyzer for a hypothetical language.
2. Implementation of LL parser.
3. Implementation of SLR parser.
4. Implementation of CLR parser.
5. Implementation of LALR parser.

Branch: Computer Science and Engineering

Course Code	**CS 605A**
Course Title	**SOFTWARE TESTING AND QUALITY ASSURANCE**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Software Engineering (CS 404)
Course Objectives (CO)	1. To study the concept of quality control and quality assurance. 2. To study risk management and technique to manage changing requirement of software. 3. To study change control management process to tackle changing requirement of system 4. To study various software testing strategies for testing different type of system under test. 5. To enable the student to extend their testing concept to real scenarios and specialized systems**.** 6. To study the concepts of quality metrics and reporting formats**.**
Course Outcome	1. Understand the concept of Software Testing and Quality Assurance to develop cost effective software system. 2. Understand the essence of risk management and control management and ability to develop RMMM plan to mitigate risk and manage the artifacts of software system.. 3. Ability to tests the system at various levels and dimensions to control error generation and propagation which ultimately makes debugging successful and cost effective. 4. Ability to extend the testing concept to real scenarios and specialized systems like multiplatform, Real Time system, Client-Server system**.**

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is*

compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A

Introduction:
Overview of Software Engineering, Software Process, Characteristics of a Software Process, Process Models, Project Management Process and its Phases, Software Measurements, Metrics, Scheduling, Estimation.
(7 hours)

Software Quality Assurance Concepts and Standards :
Quality Concepts, Quality Control, Quality Assurance, SQA Activities, Software Reviews, Formal Technical Reviews, Review Guidelines, Software Reliability, Software Safety, Quality Assurance Standards, ISO 9000, ISO 9001:2000, ISO 9126 Quality Factors, CMM, TQM, Six Sigma, SPICE, Software Quality Assurance Metrics.
(8 hours)

Risk Management and Change Management:
Software Risks, Risk Identification, Risk Projection, Risk Refinement, The RMMM Plan, Software Configuration Management, Baselines, Software Configuration Items, SCM Process: Version Control, Change Control, Configuration Audit, Configuration Management for Web Engineering.
(7 hours)

SECTION-B

Software Testing:
Testing, Verification and Validation, Test Strategies for Conventional and Object Oriented Software, Unit Testing, Integration Testing, Validation Testing, Alpha and Beta Testing, System Testing, Recovery Testing, Security Testing, Stress Testing, Performance Testing, Metrics for Source Code, Metrics for Testing, Debugging Process, Debugging Strategies.
(7 hours)

Testing Techniques: Software Testing Fundamentals, Black Box and White Box Testing, Basis Path Testing, Flow Graph Notation, Independent Program Paths, Graph Matrices, Control Structure Testing, Condition Testing, Data Flow Testing, Loop Testing, Graph Based Testing Methods, Equivalence Partitioning, Boundary Value Analysis, Object Oriented Testing Methods: Applicability of Conventional Test Case Design Methods, Fault-Based Testing, Scenario-Based Testing, Random Testing and Partition Testing for Classes, Interclass Test Case Design.
(8 hours)

Testing Process and Specialized Systems Testing:
Test Plan Development, Requirement Phase, Design Phase and Program Phase Testing, Testing Client/Server Systems, Testing Web based Systems, Testing Off-the-Shelf Software, Testing in Multiplatform Environment, Testing for Real Time Systems, Testing Security
(8 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Software Engineering	Ian Somerville	7th edition, Pearson Education.
2	Software Engineering: A Practitioner's Approach	Pressman	6th edition, TataMcGraw- Hill.
3	Effective Methods for Software Testing	William E. Perry	2nd edition, John Wiley
RECOMMENDED BOOKS			
1	Software Engineering: Theory and Practice	Pfleeger	2nd edition, Pearson Education

2	Software Engineering	K..Aggarwal, Yogesh Singh.	2nd edition, New.Age International
3	An Integrated Approach to Software Engineering	Pankaj Jalote	2nd edition, Narosa
4	Software Quality Assurance – Principles and Practice,	.Nina S Godbole :Narosa.	2nd edition, Narosa
5	Software Testing Techniques	Boris Beizer	2nd edition

Branch: Computer Science and Engineering

Course Code	**CS 655A**
Course Title	**SOFTWARE TESTING AND QUALITY ASSURANCE (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Study of different quality assurance and software testing tools.
2. Use of black box testing techniques to test programs.
3. Use of white box testing techniques to test programs.
4. Use of Object Oriented Testing Techniques to test programs.
5. Use of a software testing tool.
6. Use of a quality assurance tool.
7. Testing a web based system.
8. Design and Implementation of a quality assurance / software testing tool.

Branch: Computer Science and Engineering

Course Code	**CS 605B**
Course Title	**SOFT COMPUTING**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Artificial Intelligence (CS 503)
Course Objectives (CO)	1. To understand the basic soft computing techniques available and to apply these concepts as applicable to different problems in real life. 2. Describe, argue for and critique Soft Computing discipline. Students will be able to use at least two of the Soft Computing techniques
Course Outcome	1. Illustrate different soft computing techniques and their relation to artificial intelligence 2. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems 3. Apply genetic algorithms to combinatorial optimization problems 4. Apply neural networks to pattern classification and regression problems 5. Analyze and study the problem in question conceptually and mathematically and solve the problem using any of soft computing techniques

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Intelligent Agents:

Agents Behavior and Environments, Structure of Agents, Planning Problem, Planning with state Space Search, Partial order Planning, GRAPHPLAN, Planning in logic, Planning in non-deterministic domains, hierarchical task planning, Multi agent planning, execution.

(9 hours)

Probabilistic Reasoning Fuzzy Logic:

Knowledge representation under uncertainty, Bayesian theorem, Bayesian Networks, Dempster Shafer theory, Representing vagueness, Fuzzy sets, operation on fuzzy sets, reasoning with fuzzy logic, Fuzzy

Automata, Fuzzy Control methods, Fuzzy decision making, inference in temporal models, Hidden Markov Models, Kalman Filters

(12 hours)

SECTION-B

Neural Networks:

Basic concepts, Single layer perception, Multilayer Perception, Supervised and Unsupervised learning - Backpropagation networks - Kohnen'sself organizing networks - Hopfield network.

Introduction to Artificial Neural Systems - Perceptron - Representation - Linear separability - Learning – Training algorithm -Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing

(16 hours)

Genetic Algorithms:

Evolutionary computation.Survival of the Fittest - Fitness Computations - Cross over – Mutation, Reproduction - Rank method - Rank space method.

(8 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	AI: A Modern Approach	Stuart J.Russel, Norvig	Latest edition, Pearson Publication
2	Artificial Intelligence: A Guide to Intelligent Systems	Michael Negnevitsky	2nd edition, Addison Wesley, 2005
3	Neural Networks - Algorithms, Applications & Programming Techniques	James Freeman A. and David Skapura M	Addison Wesley, 1992
4	Artificial Neural Networks	Yegnanarayana B	Prentice Hall of India Private Ltd, 1999
5	Genetic algorithms in search, optimization and machine learning	Goldberg, David E	Latest edition, Addison Wesley

Branch: Computer Science and Engineering

Course Code	**CS 655B**
Course Title	**SOFT COMPUTING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Write a Matlab program to calculate union, intersection, complement of two fuzzy sets.
2. Write a Matlab program to implement the Demorgan's Law.
3. Write a Matlab program to plot Triangular, Trapezoidal and Bell-shaped membership functions.
4. Use Matlab's Fuzzy Logic Toolbox to model the tip given after a dinner for two, where the food can be not good, satisfying, good and delightful, and the service can be poor, average, or good.
5. Consider the water tank with following rules
   1. IF (level is okay) THEN (valve is no_change)
   2. IF (level is low) THEN (valve is open_fast)
   3. IF (level is high) THEN (valve is close_fast)

   Using Mamdani method and max–min method for fuzzification and method of centroid for defuzzification method construct a FIS. Before editing that rules, membership functions must be defined with membership function editor.
6. Write a Matlab Program to generate logical AND, NOT, XOR functions using McCulloch-Pitts neural net.
7. Write a Matlab program for Perceptron net for an AND function with bipolar inputs and targets.
8. Write a Matlab program to store vector[-1 -1 -1 -1] and [-1 -1 1 1] in an auto-associative net.Find weight matrix.Test the net with [1 1 1 1] as input.
9. Write a program in Matlab to implement Roulette wheel and ranking selection method.
10. Write a program in Matlab to maximize a function f(x,y)=xsin(4□x) + ysin(20□x) subject to $-3.0 \leq x \leq 12.1$ and $4.1 \leq y \leq 5.8$

Branch: Computer Science and Engineering

Course Code	**CS 605C**
Course Title	**DATA MINING AND ANALYSIS**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Database Systems (CS 302)
Course Objectives (CO)	1. To learn various data mining techniques and different ways to analyze different data sets.
Course Outcome	1. Understand different ways to manage the large data set using data warehousing techniques. 2. Analyze various multi dimensional techniques to represent data for effective retrieval. 3. Identify different data analysis techniques like frequent pattern analysis, classification and clustering 4. Demonstrate the use of various data mining techniques on different datasets.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction: Introduction to RDBMS, Data Warehouse, Transactional Databases, Data Mining Functionalities, Interestingness of pattern, classification of data mining system, major issues
(6 hours)

Data Warehouse and OLAP: Difference from traditional databases, Multidimensional data model, Schema for Multi dimensional model, measures, concept hierarchies, OLAP operations, starnet query model, Data Warehouse architecture, ROLAP, MOLAP, HOLAP, Data Warehouse Implementation, Data Cube, Metadata Repositories, OLAM

(6 hours)

Data Processing: Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and concept hierarchy generation

(2 hours)

Data Mining Architecture: Data Mining primitives, Task relevant data, interestingness measures, presentation and visualization of patterns, Data Mining Architecture, Concept Description, Data Generalization and Summarization, Attributed oriented induction, Analytical characterization, Mining class comparisons

(6 hours)

SECTION-B

Association Rules: Association rules mining, Mining Association rules from single level, multilevel transaction databases, multi dimensional relational databases and data warehouses, Correlational analysis, Constraint based association mining

(6 hours)

Classification and Clustering: Classification and prediction, Decision tree induction, Bayesian classification, k-nearest neighbor classification, Cluster analysis, Types of data in clustering, categorization of clustering methods

(6 hours)

Introduction of Mining Complex Data: Complex data objects, Mining spatial databases, Multimedia databases, Time Series and sequence databases, Text databases and World Wide Web

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Data Mining: Concepts and Techniques	J.Han and M. Kamber	Latest edition, Morgan Kaufman publishers, Harcourt India pvt. Ltd
2	Data Mining Introductory and Advance Topics	Dunham	Latest edition, Pearson Education

Branch: Computer Science and Engineering

Course Code	**CS 655C**
Course Title	**DATA MINING AND ANALYSIS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

Students are required to perform practicals in Oracle/MS SQL Server and STATISTICA Data Miner.

1. Building a Database Design using ER Modeling and Normalization Techniques
2. Implementation of functions, Procedures, Triggers and Cursors
3. Load Data from heterogeneous sources including text files into a predefined warehouse schema.
4. Design a data mart for a bank to store the credit history of customers in a bank .Use this credit profiling to process future loan applications.
5. Feature Selection and Variable Filtering (for very large data sets)
6. Association Mining in large data sets
7. Interactive Drill-Down, Roll up, Slice and Dice operations
8. Generalized EM & k-Means Cluster Analysis
9. Generalized Additive Models (GAM)
10. General Classification and Regression Trees (G Trees)
11. General CHAID (Chi-square Automatic Interaction Detection) Models
12. Interactive Classification and Regression Trees
13. Goodness of Fit Computations

Branch: Computer Science and Engineering

Course Code	**CS 605D**
Course Title	**MOBILE APPLICATION DEVELOPMENT**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Programming Fundamentals (CS 101), Object-Oriented Programming (CS 202)
Course Objectives (CO)	1. To learn the basics of mobile application development using Android and their testing and deployment in different user environments.
Course Outcome	1. Understand basic requirements to develop mobile applications. 2. Design and develop different mobile applications using Android platform 3. Test their application in different conditions. 4. Deploy the mobile applications in different environments.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Java and Android

Basic programming introduction to Java, Java Foundation Classes, Developing applications in Java, Overview of Android platform

(9 hours)

Getting started with Mobility

Mobility landscape, Mobile platforms, Mobile apps development, , setting up the mobile app development environment along with an emulator, a case study on Mobile app development

(6 hours)

Building blocks of mobile apps

App user interface designing – mobile UI resources (Layout, UI elements, Drawable, Menu), Activity-states and life cycle, interaction amongst activities.

(6 hours)

SECTION-B

Sprucing up mobile apps

App functionality beyond user interface - Threads, Async task, Services – states and life cycle, Notifications, Broadcast receivers, Telephony and SMS APIs

Native data handling – on-device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet)
Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness, and native hardware access (sensors such as accelerometer and gyroscope)

(16 hours)

Testing mobile apps

Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps, JUnit for Android, Robotium, MonkeyTalk

(5 hours)

Deployment of apps

Versioning, signing and packaging mobile apps, distributing apps on mobile market place

(3 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Android Application Development All in one for Dummies	Barry Burd	1st edition
2	Android Application Development	Rick Rogers, John Lombardo , Meike Blake	1st edition, O'Reilly, 2010
3	Professional Android 2 Application Development	Reto Meier	1st edition,Wrox, 2010
4	Teach Yourself Android Application Development In 24 Hours		1st edition, SAMS

Branch: Computer Science and Engineering

Course Code	**CS 655D**
Course Title	**MOBILE APPLICATION DEVELOPMENT (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

Students should implement (and learn to use the tools to accomplish this task) the following during Practical hours: (illustrative only)

1. Understand the app idea and design user interface/wireframes of mobile app
2. Set up the mobile app development environment
3. Develop and debug mobile app components – User interface, services, notifications, broadcast receivers, data components
4. Using emulator to deploy and run mobile apps
5. Testing mobile app - unit testing, black box testing and test automation

Branch: Computer Science and Engineering

Course Code	**CS 605E**
Course Title	**DATA ACQUISITION AND INTERFACING**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. This course will introduce various data acquisition systems and techniques and their application using different hardware interfacing mechanisms.
Course Outcome	1. Understand the principles of operation and limitations of the data acquisition system (single and Multiple channels). 2. Use Labview for analysing and generating reports of various acquired signals. 3. Use different interface mechanism of devices for communication

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Signal conditioning and data acquisition: Analog-to-digital and digital-to-analog converters; sampling rate, multiplexing, resolution, range, and code width; grounding, isolation and noise; single-ended and differential measurements; attenuation, amplification, and filtering; excitation and linearization; impedance mismatch and loading; digital signal conditioning; signal transmission (voltage vs. current loop); and hardware architecture of a modern multi-function data acquisition card. Various DAS Configurations, Single Channel DAS, Multi-Channel DAS, IC Based DAS, Data Acquisition, Data Acquisition in PLC

(9 hours)

Fundamentals of programming logic: Labview: Virtual instruments; indicators and controls; front panel and block diagram; data types and data flow programming; case and sequence structures; arrays, loops, and clusters; graphs and charts; sub VIs; and file I/O.

(12 hours)

SECTION-B

Instrument control: Components of an instrument control system (GPIB and RS-232); detecting and configuring instruments; and instrument drivers.

(6 hours)

Instrumentation system design: Design specifications; functional block representation; design, debugging, and testing; interpretation and presentation of data; user interface; temperature control system

design; motor speed control system design; and instrumentation project incorporating multiple sensors, signal interfacing electronics, data-acquisition hardware, instrument control

(6 hours)

Buses – Industry standard architecture (ISA), peripheral component Interconnect (PCI) – Instrumentation Buses: Serial (RS232C, USB) and Parallel (GPIB) Accelerated Graphics port (AGP) – plug-and-play devices – SCSI concepts – USB architecture.

(4 hours)

Project Work: Using Labview: Generation of signal (different function generators) on PC and acquiring the signal from sensor at PC again with different sampling rate and quantization level. Representations of different characteristics of acquired signals and their analysis and reporting.

(8 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Instrumentation Devices And Systems	Rangan C. S., Sarma G. R. and Mani V. S. V.	Tata McGraw-Hill
2	Modern Electronic Instrumentation and Measurement Techniques	Helfrick Albert D. and Cooper W. D.	Prentice Hall India
RECOMMENDED BOOKS			
1	Digital Instrumentation	A. J. Bouvens	McGraw-Hill
2	Process Control Instrumentation Technology	Johnson Curtis D.	Prentice Hall
3	A Course In Electrical And Electronics Measurements And Instrumentation	Shawhney A. K.	Dhanpat Rai & Sons
4	Data acquisition technique using personal computers	Howard Austurlitz	

Branch: Computer Science and Engineering

Course Code	**CS 655E**
Course Title	**DATA ACQUISITION AND INTERFACING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Embedded Programming.
2. RF Experiments.
3. Experiments in interfacing with UbiSense.
4. Experiments in interfacing with Ubi-DAQ.
5. WSN Applications.

Branch: Computer Science and Engineering

Course Code	**CS 605F**
Course Title	**MULTIMEDIA COMPUTING**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To provide an in-depth understanding of Multimedia system design Enabling technologies and standards.
Course Outcome	1. Demonstrate Knowledge of Multimedia Tools and Standards 2. Understand Compression standards 3. Understand current technologies in multimedia 4. Familiarize with issues in multimedia communication systems

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction:
Multimedia and its types, Introduction to Hypermedia, Hyper Text, Multimedia Systems and their Characteristics, Challenges, Desirable Features, Components and Applications, Trends in Multimedia
(4 hours)

Multimedia Technology:
Multimedia Systems Technology , Multimedia Hardware devices, Multimedia software development tools, Multimedia Authoring Tools, Multimedia Standards for Document Architecture, SGML, ODA, Multimedia Standards for Document interchange, MHEG, Multimedia Software for different media.

(6 hours)

Storage Media :
Magnetic and Optical Media, RAID and its levels, Compact Disc and its standards, DVD and its standards, Multimedia Servers

(4 hours)

Audio:
Basics of Digital Audio, Application of Digital Audio, Digitization of Sound, Sample Rates and Bit Size, Nyquist's Sampling Theorem Typical Audio Formats Delivering Audio over a Network , Introduction to MIDI (Musical Instrument Digital Interface), Components of a MIDI System Hardware Aspects of MIDI ,MIDI Messages. Audio Compression, Simple Audio Compression Methods, Psychoacoustics ,MPEG Audio Compression

(8 hours)

SECTION-B

Basics of Compression:

Classifying Compression Algorithms, Lossless Compression Algorithms, Entropy Encoding, Run-length Encoding, Pattern Substitution, Basics of Information theory, Huffman Coding, Adaptive Huffman Coding, Arithmetic Coding, Lempel-Ziv-Welch (LZW) Algorithm, Source Coding Techniques: Transform Coding, Frequency Domain Methods, Differential Encoding.

(6 hours)

Image and Graphics Compression:

Color in Images, Types of Color Models, Graphic/Image File Formats: TIFF, RIFF, BMP, PNG, PDF, Graphic/Image Data, and JPEG Compression, GIF Compression.

(6 hours)

Video Compression:

Basics of Video, Video Signals, Analog Video, Digital Video, TV standards, H. 261 Compression, Intra Frame Coding, Inter-frame (P-frame) Coding, MPEG Compression, MPEG Video, The MPEG Video Bit stream, Decoding MPEG Video in Software.

(6 hours)

Multimedia Communication:

Building Communication network, Application Subsystem, Transport Subsystem, QOS, Resource Management, and Distributed Multimedia Systems.

(5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Multimedia Computing Communications and Applications	Ralf Steinmetz and Klara Nahrstedt	Pearson Educations
2	Multimedia Systems	Parag Havaldar, Gerard Medioni	Cengage Learning publication
3	Multimedia System Design	Prabhat K. Andleigh, Kran Thakkar	Latest edition, PHI
4	Multimedia Communications	Fred Halsall	Pearson Education

Branch: Computer Science and Engineering

Course Code	**CS 655F**
Course Title	**MULTIMEDIA COMPUTING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Introduction to Windows Movie Maker.
2. Create a movie file using windows movie maker.
3. Introduction to Adobe Photoshop.
4. Study of Image Editing using Adobe Photoshop.
5. Introduction to Macromedia Flash.
6. Creating animated e-card using macromedia Flash.
7. Study of Corel Draw.
8. Working and designing in Corel Draw.
9. Study of Audio-Video mixing software like Audacity.

Fourth Year - Seventh Semester

Branch: Computer Science and Engineering

Course Code	**CS 701**
Course Title	**DIGITAL IMAGE PROCESSING**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Computer Graphics (CS 502)
Course Objectives (CO)	1. To introduce the various image processing techniques and their applications in different domains. To get students acquainted with computer vision.
Course Outcome	1. Understand the basic terms related to imaging, types of images, image conversions, matrix calculations, steps involved in image processing, its need in real time applications, state of art, color models and color image processing, various domains. 2. Understand and develop various image enhancement filters both in spatial and frequency domain, restoration process after discussing degradation functions, role of image enhancement and restoration in any image processing application. The implementation of same is also required to be done practically. 3. Discuss the role and need of image compression and its techniques, morphological operations, role and need of segmentation, types of segmentation, edge segmentation, various segmentation algorithms like region growing, region splitting and merging, watershed etc., calculations and practice of numerical related to segmentation. 4. Discuss various boundary and regional descriptor methods, equation related to boundary detection, various types of image features and methods defined for object recognition.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Image Processing:

Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation

(6 hours)

Image Transformation & Filtering:

Intensity transform functions, histogram processing, Spatial filtering, fourier transforms and its properties, frequency domain filters, , color models, Pseudo coloring, color transforms, Basics of Wavelet Transforms.

(12 hours)

Image Restoration:

Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering

(7 hours)

SECTION-B

Image Compression:

Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.

(8 hours)

Image Segmentation & Representation:

Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, region Based Segmentation, Boundary representation,Boundary Descriptors, Regional Descriptors.

(12 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Digital Image Processing	Gonzalez and Woods	Addison Wesley, 1992
2	Computer Vision	Boyle and Thomas	2nd edition, Blackwell Science, 1995
3	Digital Image Processing and Pattern Recogination	Pakhira Malay K	PHI

Branch: Computer Science and Engineering

Course Code	**CS 751**
Course Title	**DIGITAL IMAGE PROCESSING (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Reading and displaying images in different formats using different color models.
2. Converting color images into monochrome images, Image color enhancements using pseudo coloring techniques.
3. Images enhancements using grey level transformations and spatial and frequency domain filters
4. Image Noise removal and inverse filtering of images
5. Point, Line, Edge and Boundary Detections in images
6. Histogram Matching and specification on images
7. Boundary Linking, Representation and Description techniques on images
8. Thresholding & Magnification of Images
9. Image Morphological Operations
10. Object Recognition Techniques

Branch: Computer Science and Engineering

Course Code	**CS 702**
Course Title	**ADVANCE DATABASE SYSTEMS**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Database Systems (CS 302)
Course Objectives (CO)	1. To review various Database concepts, Data models and their architectures. 2. To introduce Advanced Strategies for implementation of Transaction processing, concurrency control and Recovery management. 3. To learn how to optimize query processing. 4. To familiarize with concepts of Distributed databases and their implementation concepts. 5. To elaborate Significance of Data warehouses and their setup strategies. 6. To understand role of Data mining, OLAP, OLTP in databases and their implementation strategies. 7. To familiarize with Object oriented databases and their significance. 8. To expose to various databases like oracle, Sql server, DB2, MySqletc through case studies.
Course Outcome	1. Recall various Database concepts with discovery of advanced strategies for Transaction processing, Concurrency control, Recovery management and Query Processing. 2. Understand Object Oriented and Distributed databases. 3. Learn significance of Data warehousing, Data mining, OLAP and OLTP. 4. Examine various Case studies: Oracle, Sql server, DB2, MySql etc.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Database Systems:
Database System Concepts and Architecture, Data Models, Data Independence, SQL: DDL, DML, DCL, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.
(6 hours)

Query Processing and Optimization:
Query Processing, Syntax Analyzer, Query Decomposition, Query Optimization, Heuristic Query Optimization, Cost Estimation, Cost Functions for Select, Join, Query Evaluation Plans.
(6 hours)

Transaction Processing and Concurrency Control:
Transaction Processing Concepts, Concurrency Control Techniques: Two-phase Locking, Timestamp Ordering, Multiversion, Validation, Multiple Granularity Locking.
(5 hours)

Object Oriented and Object Relational Databases:
Object Oriented Concepts, Object Oriented Data Model, Object Definition Language, Object Query Language, Object Relational Systems, SQL3, ORDBMS Design.
(5 hours)

SECTION-B

Distributed Databases:
Distributed Database Concepts, Advantages and Disadvantages, Types of Distributed Database Systems, Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design, Five Level Schema Architecture, Query Processing, Concurrency Control and Recovery in Distributed Databases.
(6 hours)

Backup and Recovery:
Types of Database Failures, Types of Database Recovery, Recovery Techniques: Deferred Update, Immediate Update, Shadow Paging, Checkpoints, Buffer Management.
(5 hours)

Introduction to Data Warehousing and Data Mining:
Introduction to OLAP, OLTP, Data Warehouse, Data Marts, Data Mining, Data Mining Process.
(5 hours)

Commercial Databases:
Commercial Database Products, Familiarity with IBM DB2 Universal Database, Oracle, Microsoft SQL Server, MySql, their features.
(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Fundamentals of Database Systems	RamezElmasri, ShamkantNavathe	5th edition, Pearson Education, 2007
2	Database Management Systems,	Raghu Ramakrishnan, Johannes Gehrke	Tata McGraw-Hill
3	An Introduction to Database Systems	C.J. Date	8th edition, Pearson Education
4	Database Management Systems	Alexis Leon, Mathews Leon	Leon Press
5	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	Tata McGraw-Hill
6	Database Systems Concepts, Design and Applications	S. K. Singh	Pearson Education

Branch: Computer Science and Engineering

Course Code	**CS 703**
Course Title	**CYBER LAWS AND IPR**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To introduce the Cyber laws and Intellectual property rights.
Course Outcome	1. To understand the various cyber laws those govern the cyber space. 2. To understand the legal aspects of e-commerce. 3. To understand the Intellectual Property Rights and the different components of the IT Act.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Basics of Computer & Internet Technology

Internet, ISP & domain name; Network Security; Encryption Techniques and Algorithms; Digital Signatures.

(8 hours)

Introduction to Cyber World

Introduction to Cyberspace and Cyber Law; Different Components of cyber Laws; Cyber Law and Netizens.

(2 hours)

E-Commerce

Introduction to E-Commerce; Different E-Commerce Models; E-Commerce Trends and Prospects; E-Commerce and Taxation; Legal Aspects of E-Commerce.

(7 hours)

SECTION-B

Intellectual Property Rights

IPR Regime in the Digital Society; Copyright and Patents; International Treaties and Conventions; Business Software Patents; Domain Name Disputes and Resolution.

(12 hours)

IT Act, 2000

Aims and Objectives; Overview of the Act; Jurisdiction; Role of Certifying Authority; Regulators under IT Act; Cyber Crimes-Offences and Contraventions; Grey Areas of IT Act.

(12 hours)

Project Work

Candidates will be required to work on a project. At the end of the course students will make a presentation and submit the project report.

(4 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	A Guide to Cyber Laws & IT Act 2000 with Rules & Notification	NandanKamath	Galgotia Publications
2	Cyber Cops, Cyber Criminals& Internet	Keith Merill& Deepti Chopra	(IK Inter.)
3	Information Technology Laws	Diane Row Land	TATA McGraw Hill
4	Handbook of Cyber Law	Vakul Sharma	(McMillian)

Branch: Computer Science and Engineering

Course Code	**CS 704A**
Course Title	**SOFTWARE PROJECT MANAGEMENT**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Software Engineering (CS 404), Software Testing and Quality Assurance (CS 605A)
Course Objectives (CO)	1. To introduce the concepts of software project management. 2. To make them understand the role and importance of project planning, estimation and scheduling activities and the relevant techniques. 3. To make them understand the role and usage of project and process metrics. 4. To make them aware about risk management, maintenance and reengineering issues.
Course Outcome	1. Understand project management activities like planning, estimation and scheduling. 2. Use techniques and tools relevant to planning, estimation and scheduling. 3. Identify quality requirements, security risks and the approaches to address them. 4. Apply risk management, configuration management, quality management, maintenance and reengineering concepts.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Project Management Concepts

The management spectrum, the people, the product, the process, the project, stakeholders, W^5HH Principle, critical practices, the SPM plan, project planning steps.

(4 hours)

Process and Project Metrics

Metrics in the Process and Project Domains, Software Measurement, Size-Oriented Metrics, Function-Oriented Metrics, Reconciling LOC and FP Metrics, Object-Oriented Metrics, Use Case-Oriented Metrics, WebApp Project Metrics, Metrics for Software Quality, Integrating Metrics within the Software Process, Establishing a Software Metrics Program.

(6 hours)

Estimation for Software Projects

The Project Planning Process, Selection of an appropriate project approach, Software Project Estimation, Decomposition Techniques, Software Sizing, Problem-Based Estimation, An Example of LOC-Based Estimation, An Example of FP-Based Estimation, Process-Based Estimation, Estimation with Use Cases, Reconciling Estimates, Empirical Estimation Models, Estimation for Object-Oriented Projects, Specialized Estimation Techniques, The Make/Buy Decision.

(7 hours)

Project Scheduling

Basic Concepts of Project Scheduling, The Relationship between People and Effort, Effort Distribution, Defining a Task Set for the Software Project, Refinement of Major Tasks, Time-Line Charts, Tracking the Schedule, Tracking Progress for an OO Project, Scheduling for WebApp and Mobile Projects, Earned Value Analysis, Project Monitoring and Control.

(6 hours)

SECTION-B

Quality Planning

Quality Concepts, Quality control, Quality assurance, Formal Technical Reviews, Team Management, The SQA Plan, ISO and CMM standards.

(7 hours)

Risk Management

Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Assessing Overall Project Risk, Risk Projection, Assessing Risk Impact, Risk Refinement, Risk Mitigation, Monitoring, and Management, The RMMM Plan.

(4 hours)

Configuration Management

Elements of a Configuration Management System, Baselines, Software Configuration Items, Management of Dependencies and Changes, The SCM Repository, The SCM Process, Version Control, Change Control, Configuration Audit, Status Reporting, Configuration Management for Web and MobileApps.

(4 hours)

Maintenance and Reengineering

Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering Process Model, Reverse Engineering, Restructuring, Forward Engineering, The Economics of Reengineering.

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Software Project Management	Bob Hughes and Mike Cotterell	Latest edition, McGraw Hill
2	Software Engineering	Roger S. Pressman, Bruce R. Maxim	8th edition, McGraw Hill
3	Software Project Management in Practice	Pankaj Jalote	Latest edition, Addison Wesley
4	Software Project Management	Walker Royce	Latest edition, Addison Wesley
5	Software Project Management: A Concise Study	S A Kelkar	Latest edition, PHI
6	Software Project Management: A Real-World Guide To Success	Joel Henry	Latest edition, Pearson

Branch: Computer Science and Engineering

Course Code	**CS 754A**
Course Title	**SOFTWARE PROJECT MANAGEMENT (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Software Project Management syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 704B**
Course Title	**NATURAL LANGUAGE PROCESSING**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Principle of Programming Languages (CS 504), Theory of Computation (CS 505)
Course Objectives (CO)	1. This course is designed to introduce students to the fundamental concepts and ideas in natural language processing (NLP), and to get them up to speed with current research in the area.
Course Outcome	1. Gain understanding of linguistic phenomena and will explore the linguistic features relevant to each NLP task. 2. Develop understanding in syntactic and semantic processing of text. 3. Be familiar with different NLP Concepts and Resources for doing research in NLP.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to NLP:
Introduction and Survey of applications, Levels of linguistic processing: morphology, syntax, semantics, Tokenization, Stemming, N-grams Modeling
(4 hours)

Language processors and Understanding: recognizers, transducers, parsers, generators, Language as a rule-based system, Language understanding as an inferential activity.

(10 hours)

Resources for NLP:
Introduction to lexicons and knowledge bases.

(2 hours)

Computational morphology
lemmatization, Part-of-Speech Tagging, Finite-State Analysis, noun phrase chunking.

(5 hours)

SECTION-B

Syntactic Processing:

Basic parsing: Top Down and Bottom Up parsing, Chart parsing, Deterministic parsing, Statistical parsing, Grammars with features, Unification Grammars, The Lexicon

(6 hours)

Semantic Interpretation:

Lexical semantics, Semantics and logical form, Resolving ambiguities: Word Sense Disambiguation, Linking syntax and semantics, Linking syntax and semantics in restricted domains

(6 hours)

Context and World Knowledge:

Discourse: linguistic context, Ellipsis; World knowledge, Discourse structure Conversation and co-operation, Implementing "co-operative responses", Information Retrieval and Information Extraction.

(6 hours)

NLP concepts: named entity recognition, coreference resolution, question answering, text classification, document clustering, text summarization, machine translation, Basics of Machine Learning.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Natural language understanding	Allen, J	2nd Edition, Redwood City, CA: 1994. Benjamin/Cummings
2	Natural Language Processing for Prolog. Programmers	Covington, M.A	Prentice Hall, 1994
3	Speech and Language Processing	Jurafsky, D. and Martin	Prentice Hall, 2000
4	Natural Language Processing in Prolog: An Introduction to Computational Linguistics	Gazdar, G. &Mellish, C.	Addison Wesley, 1989

Branch: Computer Science and Engineering

Course Code	**CS 754B**
Course Title	**NATURAL LANGUAGE PROCESSING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Natural Language Processing syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 704C**
Course Title	**BUSINESS INTELLIGENCE**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Database Systems (CS 302)
Course Objectives (CO)	1. To introduce the concepts of Business process their requirements, key performance indicators and their evaluation in a typical Business houses. 2. To introduces the concept of data warehouses and use of multi dimensional databases and Online Analytical processing. 3. To introduce the basic data mining concepts like Association Rule Analysis, classification, clustering and their use in different application domains.
Course Outcome	1. Understand fundamental Business processes, their requirements, evaluation using key performance indicators, 2. Demonstrate an understanding of BI framework and its implementation using open source tools. 3. Demonstrate an understanding of various concepts related to data warehousing and OLAP. 4. Use different data mining representation techniques used in different domains.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Business Intelligence:
Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities
(8 hours)

Basics of Data Integration (Extraction Transformation Loading)
Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL, Introduction to data quality, data profiling concepts and applications.

(8 hours)

Introduction to Multi-Dimensional Data Modeling,
Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS

(8 hours)

SECTION-B

Basics of Enterprise Reporting
Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, and overall architecture

(6 hours)

Data Mining Functionalities:
Association rules mining, Mining Association rules from single level, multilevel transaction databases, Classification and prediction, Decision tree induction, Bayesian classification, k-nearest neighbor classification, Cluster analysis, Types of data in clustering, categorization of clustering methods

(15 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Fundamentals of Business Analytics	R N Prasad, Seema Acharya	1st edition, Wiley India, 2011
2	Data Mining: Concepts and Techniques	Han and M. Kamber	Latest edition, Morgan Kaufman publishers, Harcourt India pvt. Ltd, 2010
3	Business Intelligence: The Savvy Manager's Guide.	David Loshin	Latest edition, Knowledge Enterprise, 2011
4	Business Intelligence roadmap	Larissa Terpeluk Moss, ShakuAtre	Latest edition, Addison Wesley, 2012
5	Successful Business Intelligence: Secrets to making Killer BI Applications	CindiHowson	Latest edition, Tata McGraw Hill, 2012
6	Business intelligence for the enterprise	Mike Biere	Latest edition, Addison Wesley, 2010

Branch: Computer Science and Engineering

Course Code	**CS 754C**
Course Title	**BUSINESS INTELLIGENCE (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Business Intelligence syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 704D**
Course Title	**WIRELESS SENSOR NETWORKS**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks (CS 501)
Course Objectives (CO)	1. Understand the design issues in Adhoc and Wireless Sensor networks (WSN) 2. Learn architecture and deployment features of WSN 3. Be familiar with different types of routing protocols 4. Knowledge of different sensors and Software platform
Course Outcome	1. Understand the concepts, network architectures and applications of Adhoc and Wireless Sensor Networks 2. Analyze the protocol design issues of Adhoc and Sensor networks 3. Implement routing protocols for Adhoc and Wireless Sensor Networks with respect to some protocol design issues 4. Evaluate the QoS related performance measurements of Adhoc and Sensor networks and understanding of different kinds and types of sensor for deployment

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum, Radio propagation Mechanisms, Characteristics of the Wireless Channel, Mobile Adhoc Networks (MANETs) and Wireless Sensor Networks (WSNs):concepts and architectures. Applications of AdHoc and Sensor networks. Design Challenges in Adhoc and Sensor Networks.
(8 hours)

Overview of Wireless Sensor Networks and its Architecture

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks. Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture -

Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts

(9 hours)

Networking Sensors

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses

(9 hours)

SECTION-B

WSN Routing, Localization and QOS

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation, Topology Control , Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control, QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

(10 hours)

Sensor Network Platforms and Tools

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

(9 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	AdHoc Wireless Networks: architectures and Protocols	C. Siva Ram Murthy, and B. S. Manoj	6th edition, Prentice Hall Professional Technical Reference, 2008
2	Protocols and Architectures for Wireless Sensor Networks	Holger Karl and Andreas Willig	Wiley, 2005
RECOMMENDED BOOKS			
1	Ad Hoc & Sensor Networks: Theory and Applications	Carlos De MoraisCordeiro, Dharma Prakash Agrawal	World Scientific Publishing Company, 2006
2	Wireless Sensor Networks: - An Information Processing Approach	Feng Zhao and LeonidesGuibas	Elsevier Publication, 2007
3	Wireless Sensor Networks-Technology, Protocols, and Applications	KazemSohraby, Daniel Minoli, &TaiebZnati	John Wiley, 2007
4	Wireless Sensor Network Designs	.Anna Hac	John Wiley, 2003

Branch: Computer Science and Engineering

Course Code	**CS 754D**
Course Title	**WIRELESS SENSOR NETWORKS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Wireless Sensor Networks syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 704E**
Course Title	**SENSOR SYSTEMS AND APPLICATIONS**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. Develop judgment of what sensors and modalities are appropriate for different applications 2. Know how to electronically condition the sensor, hook it up to a microcomputer, and process the signal (at least basically) 3. Have some idea of how/where these sensors were used before 4. Have a reasonable idea of how different sensors work
Course Outcome	1. Understand fundamental of different types of sensors, 2. Demonstrate the use of different types of sensors available. 3. Able to capture data from multiple sensors and analyze it. 4. Design a simple application based on single sensor

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Basics Sensors: Examples and Definitions, Introduction to Sensor Electronics and terminology (Fraden Ch. 2) Sensors classifications from output point of view and quasi-digital sensors classification; Sensors architectures for integrated and smart sensors; Informative parameters (unified and frequency-time domain parameters of signal); Advantages of frequency as informative parameter including high noise immunity, high power of signal, wide dynamic range, high reference accuracy, simple interfacing, simple Integration and coding.
(12 hours)

Mobile Phone Sensors

Capacitive sensors: Fundamentals, Applications and Examples (Fraden Ch. 3.2, 6.3, 7.3, 10.6), Accelerometers (Fraden Ch. 8)
Piezoelectric Sensors (Fraden Ch. 3.6, 5.2.4, 8.4)

Pressure sensors: Principles and Examples (Fraden Ch. 10)
Inductive and Magnetic Sensors (Fraden Ch. 3.3, 3.4, 7.4)

(9 hours)

SECTION-B

Application Sensors

Strain Gauges: Basics and Examples (FradenCh 3.5, 5.1, 5.2, 5.7, 9) ,Thermometers: Measurement Techniques and Examples, Flow Sensors (Fraden Ch. 16),Radiation Sensors: Overview of Types, Examples of Applications (Fraden Ch. 14)IR Sensors and Demo: IR Motion Active sounding: Methods for measurement, Examples
Chemical Sensors,Biosensors, RF sensors

(12 hours)

Data Acquisition Methods for Sensor Systems: Data acquisition (DAQ) systems, data-loggers, DAQ boards. Frequency-to-digital converter (FDC) - to - microcontroller interface.Different DAQ architectures and main errors of DAQ.

(12 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Handbook of Modern Sensors: Physics, Designs, and Applications.	Fraden, J.	4th edition, Springer, India, 2010
2	Understanding the Smart Sensors	Frank. R,	2nd edition, ArtechHouse, 2010
3	Smart Sensor Systems by 2008	Meijer.M. C.G	Latest edition, John Willey & Sons Ltd, 2008

Branch: Computer Science and Engineering

Course Code	**CS 754E**
Course Title	**SENSOR SYSTEMS AND APPLICATIONS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Sensor Systems And Applications syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 705A**
Course Title	**AGILE SOFTWARE DEVELOPMENT**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Software Engineering (CS 404), Software Testing and Quality Assurance (CS 605A)
Course Objectives (CO)	1. To introduce the concepts of agile software development. 2. To make them understand agile process models and design practices. 3. To make them understand and apply agile testing concepts and principles. 4. To make them aware about agile project management and quality assurance related issues.
Course Outcome	1. Understand the principles and practices of agile software development. 2. Understand and apply agile design principles. 3. Understand and apply agile testing techniques. 4. Understand and conduct agile project management tasks like scheduling, estimation, monitoring and quality assurance activities.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Basics of Agile Software Development

The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Differences between Agile and traditional plans, Stakeholders, Challenges.

(6 hours)

Agile Approaches

Extreme Programming, Agile Process Models: Scrum, Project Phases, Dynamic Systems Development Method, Agile Modeling, Agile Unified Process. A Tool Set for the Agile Process, Feature Driven development, Lean Software Development, Agile Project management, Test Driven Development, Continuous Integration, Refactoring, Pair Programming.

(8 hours)

Agile Design

Agile Design practices, The Single-Responsibility Principle, The Open-Closed Principle, The Liskov-Substitution Principle, The Dependency-Inversion Principle, The Interface-Segregation Principle

(9 hours)

SECTION-B

Agile Testing

Planning and Managing Testing Cycle, Agile Lifecycle and its impact on testing, Principles of Agile Testing, Agile Testing Techniques, xUnit Framework, Test-Driven Development, User Acceptance Tests, Test Automation

(8 hours)

Agile Project Management

Scheduling in an agile project, scheduling challenges, estimating costs, monitoring project progress, burning down the product backlog, reporting, controlling the project

(7 hours)

Incorporating ISO 9001 into the Agile Transition

Quality Assurance in Agile World, Managing Scrum Teams, Agile Metrics, Incorporating ISO 9001 into the Agile Transition, Creating Policy and Process Documentation, Development processes, Focusing on customers, Resource management, Formal reviews.

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Agile Software Development, Principles, Patterns, and Practices	Robert C. Martin	Latest edition, Pearson
2	Enterprise-Scale Agile Software Development	James Schiel	Latest edition, CRC Press
3	Software Engineering	Roger S. Pressman, Bruce R. Maxim	8th edition, McGraw Hill
4	Agile software development Methods - Review and analysis	PekkaAbrahamsson, OutiSalo, JussiRonkainen&JuhaniWarsta	VTT Publications
5	Agile Testing	Lisa Crispin, Janet Gregory	Latest edition, Addison-Wesley
6	Succeeding with Agile: Software Development Using Scrum	Mike Cohn	Latest edition, Addison-Wesley

Branch: Computer Science and Engineering

Course Code	**CS 755A**
Course Title	**AGILE SOFTWARE DEVELOPMENT (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Agile Software Development syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 705B**
Course Title	**NEURAL NETWORKS**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks (CS 501), Web Technologies (CS 402), Database Systems (CS 302)
Course Objectives (CO)	1. To introduce concepts of artificial neural networks and principles of leaning and regression. 2. To learn various types of neural networks and their working principles 3. To understand role of neural network in various applications and apply it to multi-class classification etc.
Course Outcome	1. Understand basic concepts of neural networks. 2. Use neural networks to perform classification for single class and multiclass problems. 3. Learn and apply the concept of self organizing maps.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Neural Network Basics

Classical AI and Neural Networks, characteristics of neural networks, Historical perspective, The biological inspiration, models of artificial neuron & activation functions, Artificial Neuron Model and Linear Regression, Nonlinear Activation Units and Training of artificial neural networks.
(6 hours)

Learning Mechanisms: Gradient Descent Algorithm, Learning Mechanisms-Hebbian, Competitive, Boltzmann , Universal function approximation.

(6 hours)

Single Layer and Multi layerPerceptrons:

Representation of perceptron, Linear separability, Perceptron Learning, Single-Layer Perceptions , Unconstrained Optimization: Gauss-Newton's Method, Linear Least Squares Filters, Least Mean Squares Algorithm , Perceptron Convergence Theorem , Back Propagation Algorithm, Practical Consideration in

Back Propagation Algorithm Training of single layer and multi-layer, back propagation training algorithm, Applications of back propagation,

Solution of Non-Linearly Separable Problems Using MLP, Heuristics For Back-Propagation, Multi-Class Classification Using Multi-layered Perceptrons

(12 hours)

SECTION-B

Associative Memory Networks:- Associative Memory Model, Conditions for perfect Recall in Associative memory.

Radial Basis Function Networks: Introduction ,Separability and Interpolation, Learning Mechanisms in RBF, Comparison Between MLP and RBF

(5 hours)

Introduction to Principal Components and Analysis, Dimensionality reduction Using PCA, Hebbian-Based Principal Component Analysis

(5 hours)

Self OrganizingMaps : Introduction to Self Organizing Maps, Cooperative and Adaptive Processes in SOM, Vector-Quantization Using SOM, Competitive learning, Maxican Hat networks

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Neural Networks, fuzzy Logic, and Genetic Algorithms	Rajasekaran&Vijayalakhmi Pai	Pearson, 2011
2	Principles of Soft Computing	Sivanandam, Deepa	Wiley, 2014
3	Neural Networks – A Classroom Approach	Satish Kumar	Tata Mcgraw, 2010

Branch: Computer Science and Engineering

Course Code	**CS 755B**
Course Title	**NEURAL NETWORKS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Neural Networks syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 705C**
Course Title	**CLOUD COMPUTING**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks(CS 501), Web Technologies(CS 402), Database Systems (CS 302)
Course Objectives (CO)	1. To introduce cloud computing, types of cloud services and enabling technologies. 2. To make them understand the role and usage of virtualization technologies. 3. To introduce cloud security issues and their resolution mechanisms. 4. To make them understand the features and usage of cloud platforms by studying the existing systems.
Course Outcome	1. Understand cloud based systems and enabling technologies. 2. Use virtualization technologies for enabling cloud services. 3. Identify security risks and their handling mechanisms in cloud environment. 4. Use cloud platforms to configure and host cloud services.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Cloud Computing Basics

Cloud Computing Overview; Characteristics; Applications; Internet and Cloud; Benefits; Limitations; Challenges; Cloud Computing Reference Architecture; Architectural Components; Cloud Computing Services and Deployment Models.

(7 hours)

Abstraction and Virtualization

Virtualization, Types of virtualization; Hardware Virtualization - full, partial, paravirtualization; Software Virtualization ; Memory Virtualization; Storage Virtualization; Data Virtualization; Network Virtualization; Nested Virtualization; Hypervisor- Type-1, Type-2; Hyperjacking.

(7 hours)

Cloud Storage

Cloud Storage – managed, unmanaged; Storage as a Service; Cloud Storage issues and challenges; Creating cloud storage system; Virtual storage containers; SAN, NAS, SAN vs. NAS

(7 hours)

SECTION-B

SMAC

SMAC-Social Media, Mobility, Analytics and Cloud; Big Data, Introduction to Hadoop, MapReduce; MapReduce steps

(7 hours)

Cloud Security

Cloud security issues and challenges; cloud security controls, dimensions of cloud security, Security and privacy, identity management, physical security, confidentiality, access controllability, integrity, Migration to cloud-issues, approaches

(5 hours)

Mobile Cloud Computing

Overview of Mobile Cloud Computing, Advantages, Challenges, Using Smartphones with the Cloud, Offloading techniques - their pros and cons, Mobile Cloud Security

(5 hours)

Cloud Computing Platforms

Introduction to cloud platforms: Google Cloud Platform – Google Compute Engine, Google App Engine, BigTable, BigQuery, Amazon Web Services, Microsoft Azure, IBM Bluemix, features of important cloud platforms.

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Cloud Computing: A Practical Approach	Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter	McGraw Hill, 2010
2	Cloud Computing: Principles and Paradigms	RajkumarBuyys, James Broberg, Andrzej Goscinski (Editors)	Wiley, 2011
3	Cloud Computing Bible,	Barrie Sosinsky	Wiley, 2011
4	Cloud Computing for Dummies	Judith Hurwitz, Robin Bloor, Marcia Kaufman,Fern Halper	Wiley, 2010
5	Handbook of Cloud Computing	BorkoFurht, Armando Escalante (Editors)	Springer, 2010

Branch: Computer Science and Engineering

Course Code	**CS 755C**
Course Title	**CLOUD COMPUTING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Cloud Computing syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 705D**
Course Title	**MOBILE COMPUTING**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks (CS 501)
Course Objectives (CO)	1. To understand advanced element of learning in the field of wireless communication, wireless devices and mobile computing. 2. Knowledge of communication and networking principles that support connectivity to cellular and telecommunication networks, Wireless Internet and Sensor devices. 3. To understand the use of transaction and e-commerce principles over such devices to support mobile business concepts 4. Designing and Implementation of various applications related to mobile computing
Course Outcome	1. Knowledge of wireless communication and current telecommunication technologies 2. Understanding of the characteristics and limitations of mobile hardware devices including their user-interface modalities 3. Understanding of MANETs routing algorithms and its implementation 4. Ability to develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Mobile Devices and Systems

Cellular Networks and Frequency Resuse, Mobile Smartphones, Smart Mobiles and Systems, Handheld Devices, Smart Systems, Limitations of Mobile Devices and Automative Systems

(6 hours)

GSM and Other Architectures

Modulation, Multiplexing, Controlling the Medium Access, GSM, Radio Interfaces, Protocols, Localization, Call Handling, Handover, Security, GPRS, Spread Spectrum, FHSS, CDMA, WCDMA, CDMA 2000, OFDM, HSPA, WiMAX, Broadband Wirless access, 4G Networks

(7 hours)

Mobile IP Network Layer

Mobile Network Layer Mobile IP Goals, Assumptions and Requirements, Entities, IP packet Delivery Agent Advertisement and Discovery, Registration.Tunneling and Encapsulation, Optimization Reverse Tunneling, IPv6, DHCP.

(7 hours)

SECTION-B

Mobile Transport Layer

Mobile Transport Layer & Wireless Application Protocol Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Transmission / Timeout Freezing Selective Retransmission, Transaction oriented TCP. Architecture, Datagram Protocol, Transport Layer Security, Transaction Protocol, Session Protocol, Application Environment , Wireless Telephony.

(8 hours)

Databases and Mobile Computing

Data Organization, Database Transaction Models, Query processing, Recovery process, Data Caching, Context Aware Mobile Computing

(5 hours)

Mobile Ad-Hoc and Wireless Sensor Networks

MANET-architecture, properties, Spectrum, Applications, Routing Algorithms- DSR, AODV, TORA, OLSR

(5 hours)

Mobile Application Languages and Mobile Application Development Platforms

Mobile Application Development, XML, JAVA, Java 2 Micro Edition, OS, Windows Phone, Android.

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Mobile Computing	Raj Kamal	2nd edition, Oxford, 2012
2	Mobile Communication	J Schiller	2nd edition, Addison Wesley, 2006
RECOMMENDED BOOKS			
1	Mobile Communication Design Fundamentals	William C . Y Lee	2nd edition, John Wiley, 1993
2	Wireless Communication and Networks,	William Stallings	2nd edition, Pearson Education, 2009
3	WAP-Wireless Application Protocol	Sandeep Singhla, Thomas Bridgman, LalithaSuryanarayana	2nd edition, Pearson Education, 2006

Branch: Computer Science and Engineering

Course Code	**CS 755D**
Course Title	**MOBILE COMPUTING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Mobile Computing syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 705E**
Course Title	**SMART SYSTEM DESIGN**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. This course shall introduce various MEMS, NEMS based smart system technologies. This would help them to process the acquired data from real world so as to make the system smart
Course Outcome	1. Understand basics of sensor based applications, 2. Analyze the data acquired using sensor. 3. Understand different ways to communicate with sensors . 4. Design a simple application sensors and IoT

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction: Main definitions for smart sensors and its properties, quasi-digital sensors, MTS, MEMS and system-on-chip (SoC); Sensors classifications from output point of view and quasi-digital sensors classification; Sensors architectures for integrated and smart sensors; Informative parameters (unified and frequency-time domain parameters of signal); Advantages of frequency as informative parameter including high noise immunity, high power of signal, wide dynamic range, high reference accuracy, simple interfacing, simple Integration and coding.

(12 hours)

Digital Sensors and Smart Sensors System Design: Practical realizations of different smart sensors systems and digital sensors: optical sensors systems with color-to-digital and light-to-digital converters; a DAQ system for temperature sensors; accelerometers based systems; rotation speed digital sensors and systems; digital humidity sensors and data loggers; temperature and humidity multisensors system; pressure sensors systems and digital gauges; digital magnetic sensors and systems; multiparameters sensors systems.

(12 hours)

SECTION-B

IEEE 1451 Standard and Frequency Sensors: Brief introduction to IEEE 1451 standard and its extension for any sensors and transducers from frequency-time signal domain. Direct Sensor-to-Microcontroller Interface for resistive, capacitance, inductance, resistive bridges sensing elements. Future

Trends - The future development of main systems' components as the Universal Frequency-to-Digital Converter (UFDC-2) and Universal Sensors and Transducers Interface (USTI).Integration of all components of sensor system into a single system-on-chip (SoC) with advanced processing and conversion methods.

(13 hours)

Internet of Things: Basic Introduction and communication mechanism, various applications in different fields, Case Study

(8 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Handbook of Modern Sensors: Physics, Designs, and Applications.	Fraden, J.	4th edition, Springer, India, 2010
2	Understanding the Smart Sensors	Frank. R,	2nd edition, Artech House, 2010
3	Smart Sensor Systems by 2008	Meijer.M. C.G ,	Latest edition, John Willey & Sons Ltd, 2008
4	Introduction to Instrumentation, Sensors and Process Control	Dunn. C. W	Latest edition, Artech House
RECOMMENDED BOOKS			
1			

Branch: Computer Science and Engineering

Course Code	**CS 755E**
Course Title	**SMART SYSTEM DESIGN (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Smart System Design syllabus.

Fourth Year - Eighth Semester

Branch: Computer Science and Engineering

Course Code	**HSM 401**
Course Title	**PRINCIPLES OF MANAGEMENT**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to make students understand the management process and principles along with its application in practical life and to help them manage different jobs and situations with the help of management functions.
Course Outcome	1. The students will be able to apply management concepts and principles in daily life and thus, will be able to manage things efficiently and effectively. 2. The students will learn how to get work done easily by using management knowledge and functions.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Management

Nature of Management: Art or Science, Principles and Functions of Management

(3 hours)

Evolution of Management Thought

Classical Theories: Bureaucratic, Scientific and Administrative Approach
Neo-Classical Theories: Human Relations and Human Behaviour Approach
Modern Theories of Management
Relevance of Management Thought in present scenario – Management Cases

(6 hours)

Planning

Nature of Planning, Planning Process, Application of Planning Process in a Hypothetical Situation, Types of Planning, Types of Plans, Management by Objective (MBO)

(4 hours)

Organizing

Concept of Organization, Departmentation, Forms of Organization Structure

Analysis of Organization Structure – Case Studies
Hypothetical Formation of an Organization
New Methods of Managing Organizations

(4 hours)

SECTION-B

Staffing

Human Resource Planning: HRP Process, Job Analysis: Job Description, Job Specifications and Used of Job Analysis
Recruitment: Sources and Methods
Selection: Selection Process, Role Playing and Case Study on Selection Tests and Interviews
Training and Development: Techniques, Performance Appraisal: Methods
Case Study on Staffing Practices

(6 hours)

Directing

Concept, Leadership: Importance and Styles, Motivation: Theories and their relevance in present scenario, Communication: Process, Types and Barriers of Communication
Management Game on Leadership, Motivation and Communication

(3 hours)

Controlling

Nature and Process of Controlling, Requirements for Effective Controlling

(2 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Principles and Practices of Management	Rao V.S.P. and Narayana P.S.	Konark Publishers, 1987
2	Principles & Practice of Management	Prasad L.M.	8th Edition, Sultan Chand & Sons, 2012
3	Essentials of Management: International and Leadership Perspective	Weihrich H.and Koontz H.	Edition, McGraw Hill, 2012
4	The New Era of Management	Daft R.L	11th Edition, Cengage Learning, 2014
5	Management: Text and Cases	Rao V.S.P. and Krishna V.H	Excel Books, 2008
6	Fundamentals of Management: Essential Concepts and Applications	Robbins S.P, DeCenzo D.A., Bhattacharya S. and Agarwal M.N	6th Edition, Pearson India, 2009

Branch: Computer Science and Engineering

Course Code	**HSM 402**
Course Title	**BUSINESS ENVIRONMENT AND BUSINESS LAWS**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to make students understand different types of environment influencing business decisions and to provide knowledge about different laws that needs to be followed for initiating and managing business.
Course Outcome	1. The students will be able to analyze the impact of environment on business and formulate appropriate business strategies to compete in the competitive world. 2. The students will learn how companies follow corporate governance and social responsibility practices along with fulfilling economic objectives. 3. The students will gain knowledge about application and implementation of various business laws in practice.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Business

Scope and Characteristics of Business, Classification of Business Activities

Forms of Ownership of Business: Sole Proprietorship, Partnership and Company

(5 hours)

Business Environment

Internal Environment: Concept and Elements (Value System, Vision Mission Objectives, Management Structure, Human Resources, Company Image etc.)

SWOT Analysis: Concept and Case Study

External Environment: Micro Environment (Suppliers, Customers, Competitors, Market Intermediaries etc.) and Macro Environment – PESTEL Analysis (Political, Economic, Social, Technological, Ecological and Legal), Case Study on Impact of Environment on Business

(7 hours)

Globalization

Concept, Pros and Cons of Globalization, Impact of Global Environment on Business
Globalization of Company – Case Study

(4 hours)

SECTION-B

Corporate Social Responsibility

Concept, Social Responsibility towards different stakeholders, Rationale for CSR
CSR – Case Studies

(2 hours)

Corporate Governance

Concept, Elements and Essentials of Good Governance

(3 hours)

Contract Law

Concept, Types and Essentials Elements of Contract

(3 hours)

Partnership Law

Nature of Partnership, Provisions of Partnership Act, Issues Related to Partnership Firm, Hypothetical Formation of a Partnership Firm

(2 hours)

Company Law

Nature of Company, Provisions of Company Act, Issues Related to Incorporation of Company, Hypothetical Formation of a Company

(2 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Business Environment: Text and Cases	Cherunilam F	22nd Edition, Himalaya Publications, 2013
2	Legal Aspects of Business	Pathak A	5th Edition, McGraw Hill Education, 2013
3	Essential of Business Environment: Text, Cases and Exercises	Aswathappa K.	11th Edition, Himalaya Publication, 2011
4	Business Law Including Company Law	Gulshan S.S. and Kapoor G.K	15th Edition, New Age International (p) Ltd, 2011
5	Business Law and Corporate Laws	Tulsian P.C	1st Edition, Sultan Chand Publishing, 2011
6	Fundamentals of Business Organization & Management	Bhushan Y.K	19th Edition, Sultan Chand & Sons, 2013
7	Corporate Governance: Principles, Policies and Practices	Fernando A.C	2nd Edition, Pearson India, 2011
RECOMMENDED BOOKS			
1			

Branch: Computer Science and Engineering

Course Code	**HSM 403**
Course Title	**ENTREPRENEURSHIP AND PROJECT MANAGEMENT**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to make prospective engineers familiar with the concept of entrepreneurship and MSMEs and to provide knowledge about different aspects to be considered while formulating the business plan for a new entrepreneurial venture. This course also intends to create awareness among students about financial and marketing functions that is required for a new venture.
Course Outcome	1. The students will be able to apply engineering knowledge effectively in the field of entrepreneurship development. 2. The students can make effective use of entrepreneurial knowledge to start and manage their venture. 3. The students will learn to check the feasibility of a new project to maintain its long run sustainability.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Entrepreneurship

Concept of Entrepreneurship, Characteristics and Functions of Entrepreneur
Forms of Ownership of Business, Factors Affecting Entrepreneurship
Case Studies of Entrepreneurs

(6 hours)

Women Entrepreneurship

Nature of Women Entrepreneurship, Problems of Women Entrepreneurs, Institutional Initiatives for Promotion of Women Entrepreneurs

(2 hours)

Micro, Small and Medium Enterprises (MSMEs)
Concept of MSMEs, Schemes of MSMEs
Functions of Entrepreneurial Development Programmes (EDPs)

(2 hours)

Project Identification
Idea Generation, Project Life Cycle, Concept of SWOT Analysis
SWOT Analysis of Selected Project

(2 hours)

SECTION-B

Project Planning and Formulation
Elements of Project Formulation: Product, Technical (Location, Scale, Technology, Production Process, Layout, Manpower, Resources), Market, Finance and Economic Aspects
Feasibility Analysis: Financial Viability and Profitability, and Socio-Economic Desirability

(7 hours)

Project Report
Formulation of Business Plan and Project Report, Hypothetical Example of a Real-Life Project

(2 hours)

Finance and Marketing Function
Concept of Finance, Finance Related Terminologies, Sources of Finance, Cost Estimations
Marketing Mix: Product, Place, Price, Promotion, People, Process and Physical Evidence
Marketing Segmentation Targeting and Positioning

(5 hours)

Discussions on Additional Reading (any one of the following in the semester)
- The New Age Entrepreneurs
- The $100 Startup: Fire your Boss, Do what you Love and Work Better to Live More
- A Guide to Entrepreneurship
- Dhandha: How Gujaratis Do Business
- Rokda: How Baniyas Do Business
- Take Me Home
- Business Families of Ludhiana

(2 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Dynamics of Entrepreneurial Development & Management	Desai V.	5th Edition, Himalaya Publishing House.
2	Projects: Planning, Analysis, Selection, Financing, Implementation and Review	Chandra P	8th Edition, McGraw-Hill Education (India), 2014
3	Entrepreneur's Toolkit	Harvard Business School	Harvard University Press, 2004
4	Entrepreneurship	Hisrich R.D., Peters M.P. and Shepherd D.A	McGraw Hill Education, 2006
5	Essentials of Project Management	Ramakrishna K	PHI Learning
6	Entrepreneurship	Roy R	2nd Edition, Oxford University Press, 2011
7	Entrepreneurship Development in India	Gupta C.B. and Srinivasan N.P.	Sultan Chand and Sons, 2013

Branch: Computer Science and Engineering

Course Code	**HSM 404**
Course Title	**FINANCIAL MANAGEMENT**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to make students learn different financial decisions i.e. investing, financing and dividend, required to be taken by a company and provide knowledge about the functioning of the financial system (financial markets, financial institutions, financial services and financial instruments) of the country.
Course Outcome	1. The students will learn to make best combination of financial decisions by considering risk and return trade-off. 2. The students will identify how business can gain maximum through the financial system. 3. The students will understand how to manage funds effectively so as to maximize returns.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Financial Management

Concept of Finance, Terminology Related to Finance, Financial Decisions, Factors Affecting Financial Decisions, Risk-Return Trade-Off

(3 hours)

Financial System

Concept and Role of Financial System in Indian Economy

(2 hours)

Financial Markets and Instruments

Concept and Relevance of Money Market and Capital Market
Money Market Instruments: Call Money, Treasury Bills, Commercial Papers, Certificate of Deposits
Capital Market Instruments: Equity Shares, Preference Shares and Debentures
Hypothetical Trading in Financial Markets

(5 hours)

Financial Services

Nature and Functions of Financial Services: Merchant Banking, Mutual Funds, Factoring, Forfaiting, Credit Rating

Case Study on Financial Services

(6 hours)

SECTION-B

Financial Institutions

Nature and Functions of Financial Institutions: Reserve Bank of India (RBI), Securities and Exchange Board of India (SEBI), Discount and Finance House of India (DFHI)

(2 hours)

Long Term Investment Decisions

Capital Budgeting: Concept, Importance, Factors

Techniques/Methods with Numerical Applications (Pay Back Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return and Profitability Index), Case Study

(3 hours)

Short Term Investment Decisions

Working Capital: Nature, Type and Factors Affecting the Requirement of Working Capital, Case Study

(2 hours)

Financing Decisions

Capital Structure: Essentials and Approaches of Capital Structure

Sources of Finance (long-term and short-term), Financial Leverage: Concept and Numerical Application, Case Study

(3 hours)

Dividend Decisions

Types of Dividend, Dividend Policy: Nature and Factors Affecting Dividend Policy,

Case Study

(2 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Financial Management	Shah P.	2nd Edition, Dreamtech Press, 2009
2	Financial Markets and Services	Gordon E. and Natarajan K.	3rd Edition, Himalaya Publishing House, 2006
3	Financial Management: Theory and Practice	Chandra P.	8th Edition, McGraw Hill Education (India), 2012
4	Financial Management	Pandey I.M.	10th Edition, Vikas Publishing House Pvt. Ltd., Noida, 2010
5	Cases in Financial Management	Pandey I.M. and Bhat R.	3rd Edition, McGraw Hill Education (India), 2012
6	Financial Institutions and Markets: Structure, Growth and Innovations	Bhole L.M. and Mahakud J.	5th Edition, McGraw Hill Education (India), 2009
7	The Indian Financial System: Markets, Institutions and Services	Pathak B.V.	3rd Edition, Pearson India, 2010

8	Financial Management and Policy	Horne J.C.V. and Dhamija S.	12th Edition, Pearson India, 2011

Branch: Computer Science and Engineering

Course Code	**HSM 405**
Course Title	**MARKETING MANAGEMENT**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to make students understand about the marketing concepts to be applied in real life and the marketing process for delivering value to customers.
Course Outcome	1. The students will learn how to market goods and services effectively to different segments so as to deliver value to customers. 2. The students will be able to formulate marketing mix and marketing strategies for different products and different sets of customers.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Marketing
Concepts, Role, Scope and Types of Marketing, Case Study on Marketing Management

(3 hours)

Marketing Research
Scope and Process of Marketing Research, Hypothetical Marketing Research Analysis

(3 hours)

Consumer and Business Markets
Types of Markets, Building Customer Value
Consumer and Business Buying Behaviour: Factors Influencing Behaviour and Buying Decision Process

(4 hours)

Selection of Markets
Segmentation: Factors and Bases, Targeting and Positioning
Preparation of STP of Selected Product

(3 hours)

Marketing Mix

7 P's of Marketing Mix: Product, Price, Physical Distribution, Promotion, People, Process and Physical Evidence
Formulation of Marketing Mix of Selected Product

(3 hours)

SECTION-B

Product Decisions
Product (Good or Service) Characteristics, Product Life-Cycle, Packaging and Branding, Product Development and Management

(3 hours)

Pricing Decisions
Pricing Policies and Strategies, Factors Influencing Pricing

(3 hours)

Physical Distribution Decisions
Marketing Channels, Channel Players, Physical Distribution, Managing Distribution,
Analysis of Supply Chain Management – Case Studies

(3 hours)

Promotion Decisions
Nature of Promotion Decisions, Managing Mass Communication and Personal Communication
Analysis of Promotional Strategies – Case Studies

(3 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Marketing Management: Concepts, Cases, Challenges and Trends	Govindarajan M	2nd Edition, PHI Learning, 2009
2	Marketing Management	Kotler P., Keller K.L., Koshy A. and Jha M.	14th Edition, Pearson India, 2012
3	Marketing Concepts and Strategies	Dibb S., Simkin L., Pride W.M. and Ferrell O.C.	Cengage Learning, 2012
4	Marketing Management	Kumar A. and Meenakshi N	2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, 2011
5	Marketing Management	Saxena R.	4th Edition, McGraw Hill Education (India), 2013
6	Marketing: Managerial Introduction	Gandhi J.C.	1st Edition, McGraw Hill Education, 1987
7	Marketing	Etzel M.J., Walker B.J., Stanton W.J. and Pandit A.	14th Edition, McGraw Hill Education (India), 2010
8	Super Marketwala: Secrets to Winning Consumer India	Mall D.	1st Edition, Random House India, 2014

Branch: Computer Science and Engineering

Course Code	**HSM 406**
Course Title	**HUMAN RESOURCE MANAGEMENT**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to provide an overview of HRM, keeping the Indian business scenario in the background and to acquaint the students with the strategic role of HRM in managing an organization.
Course Outcome	1. The students will develop the ability to solve problems in area of HRM in organizations. 2. The students will become aware of latest developments in HRM practices which are essential for effective management in organization.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Human Resource Management

HRM: Nature, Scope, Functions, HRM Practices and Problems in India with Case Studies

(4 hours)

Human Resource Planning (HRP)

Concept and Process of HRP, Factors Affecting HRP

(3 hours)

Job Analysis and Designing

Uses and Process of Job Analysis, Job Description and Job Specification: Features and Hypothetical Formulation, Job Designing: Job Enrichment, Job Enlargement

(3 hours)

Recruitment and Selection

Recruitment: Sources and Methods

Selection: Selection Process, Selection Tests, Types and Nature of Interviews

Role Playing and Case Study on Selection Process, Tests and Interview

(4 hours)

SECTION-B

Induction and Internal Mobility

Induction Programme, Need and Scope of Internal Mobility: Transfer, Promotion, Demotion

(3 hours)

Training and Development

Training: Need and Methods, Management Development: Need, Methods and Management Development Programme

HRM Games for Development of Employees

(4 hours)

Performance Appraisal and Compensation

Nature and Methods of Performance Appraisal, Hypothetical Performance Appraisal

Compensation: Financial and Non-Financial Benefits

(4 hours)

Employee Health and Safety

Concept, Issues related to Health and Safety, Workplace Health Hazards

(3 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Human Resource Management: Text and Cases	Rao V.S.P.	Excel Books, 2002
2	Human Resource Management	Dessler G. and Varkkey B.	12th Edition, Pearson India, 2011
3	Human Resource Management: Text and Cases	Aswathappa K.	7th Edition, McGraw Hill Education (India), 2013
4	Human Resource Management: Text and Cases	Gupta C.B.	14th Edition, Sultan Chand and Sons, 2012
5	Human Resource Management: Text and Cases	Bedi S.P.S. and Ghai R.K	Bharti Publications, 2012
6	Human Resource Management Applications: Cases, Exercises, Incidents and Skill Builders	Fottler M.D., McAfee R.B. and Nkomo S.M.	7th Edition, Cengage Learning, 2013

Branch: Computer Science and Engineering

Course Code	**CS 801**
Course Title	**NETWORK SCIENCE: STRUCTURAL ANALYSIS AND VISUALIZATION**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Structures (CS 301), Analysis and Design of Algorithms (CS 401)
Course Objectives (CO)	1. Introduces the Network Science Fundamentals 2. Learn various Network related measures and analysis 3. Introduce Epidemic models and their relation to large networks 4. Learn Contagion spread over the social networks
Course Outcome	1. Understand Fundamentals necessary for Network Science 2. Applications of Network Science in Link Analysis and Prediction 3. Applications of Network Science in understanding and modeling social phenomena 4. Applications of Network Science in understanding and modeling diffusion on networks under various epidemiological models.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to graph theory and network science: Review of Graph theory and Notations, Introduction to the complex network theory, Network properties and metrics; Power laws:Power law distribution, Scale-free networks, Pareto distribution, normalization, moments. Zipf law, Rank-frequency plot.

(5 hours)

Random graphs: Erdos-Reni random graph model. Poisson and Bernoulli distributions, Distribution of node degrees, Phase transition, gigantic connected component. Diameter and cluster coefficient.Configuration model.

(5 hours)

Centrality measures: Node centrality metrics, degree centrality, closeness centrality, betweenness centrality, eigenvector centrality. Katz status index and Bonacich centrality, alpha centrality Spearman rho and Kendall-Tau ranking distance.

(5 hours)

Link analysis and Prediction: Directed graphs. PageRank, Perron-Frobenius theorem and algorithm convergence.Power iterations.Hubs and Authorities.HITS algorithm. Link prediction problem, Proximity measures, Scoring algorithms, Prediction by supervised learning, Performance evaluation

(10 hours)

SECTION-B

Diffusion on networks: Random walks on graph, Stationary distribution, Physical diffusion, Diffusion equation, Diffusion on networks, Discrete Laplace operator, Laplace matrix, Solution of the diffusion equation, Normalized Laplacian.

(5 hours)

Epidemics: Epidemic models: SI, SIS, SIR, Limiting cases, Basic reproduction number, Branching Galton-Watson process, Probability of epidemics**.** Spread of epidemics on network, SI, SIS, SIR models, Epidemic threshold, Simulations of infection propagation.

(10 hours)

Social contagion and spread of information: Information diffusion. Rumor spreading models.Homogenous and mean field models.Examples.Cascades and information propagation trees.

(3 hours)

Diffusion of innovation and influence maximization: Diffusion of innovation, Independent cascade model, Linear threshold model, Influence maximization, Sub-modular functions. Finding most influential nodes in networks.

(2 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Networks: An Introduction	Mark Newman	Oxford University Press, 2010
2	Social and Economic Networks	Matthew O. Jackson	Princeton University Press, 2010
RECOMMENDED BOOKS			
1	Networks, Crowds, and Markets: Reasoning About a Highly Connected World.	David Easley and John Kleinberg	Cambridge University Press, 2010
2	Social Network Analysis. Methods and Applications.	Stanley Wasserman and Katherine Faust	Cambridge University Press, 2010
3	The Structure and Dynamics of Networks	Eds.M. Newman, A.-L. Barabasi, D. Watts	Princeton University Press, 2006
4	Network Analysis	Eds. UlrikBrandes, Thomas Erlebach	Lecture Notes in Computer Science, Springer, 2005
5	Social Network Data Analysis	Ed. Charu C. Aggarwal	Springer, 2011

Branch: Computer Science and Engineering

Course Code	**CS 851**
Course Title	**NETWORK SCIENCE: STRUCTURAL ANALYSIS AND VISUALIZATION (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Network Science: Structural Analysis and Visualization syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 802A**
Course Title	**BUILDING ENTERPRISE APPLICATIONS**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Database Systems (CS 302)
Course Objectives (CO)	1. To introduce the concepts of Enterprise applications and different issues related to their implementation 2. To introduces the architecture of different Enterprise applications and different design modeling techniques for construction. 3. To introduce the different testing techniques for Enterprise application and methodologies used to roll out these applications.
Course Outcome	1. Understand fundamental of Enterprise applications and key determinants to measure the success. 2. Demonstrate an understanding of different modelling techniques used to design Enterprise applications. 3. Construct applications by understanding the design. 4. Test and roll out the enterprise applications in real environment.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Enterprise application

Introduction to enterprise applications and their types, software engineering methodologies, life cycle of raising an enterprise application, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise applications.

(8 hours)

Incepting enterprise application and business process modelling

Inception of enterprise applications, enterprise analysis, business modelling, requirements elicitation, use case modelling, prototyping, non functional requirements, requirements validation, planning and estimation.

(7 hours)

Enterprise Architecture and designing enterprise application

Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design.

(8 hours)

SECTION-B

Constructing enterprise application

Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage.

(12 hours)

Testing and rolling out enterprise application

Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application.

(10 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Raising Enterprise Applications	Anubhav Pradhan, Satheesha B. Nanjappa, Senthil K. Nallasamy, VeerakumarEsakimuthu	1st edition, Wiley India, 2012
2	Building Java Enterprise Applications,	Brett McLaughlin	Latest edition, O' Reily Media, 2010
3	Software Requirements: Styles & Techniques.	Soren Lauesen	Latest edition, Addison Wesley, 2012
4	Software Systems Requirements Engineering: In Practice	Brian Berenbach, Daniel J. Paulish, Juergen Kazmeier, Arnold Rudorfer	Latest edition, McGraw-Hill/Osborne Media, 2009
5	Managing Software Requirements: A Use Case Approach,	Dean Leffingwell, Don Widrig	1st edition, Pearson, 2003
6	Software Architecture: A Case Based Approach	VasudevVerma	1st edition, Pearson, 2009
7	SOFTWARE TESTING Principles and Practices,	Srinivasan Desikan, Gopalaswamy Ramesh	1st edition, Pearson, 2006

Branch: Computer Science and Engineering

Course Code	**CS 852A**
Course Title	**BUILDING ENTERPRISE APPLICATIONS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Building Enterprise Applications syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 802B**
Course Title	**EXPERT SYSTEMS**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Artificial Intelligence (CS 503); Soft Computing (CS 605B)
Course Objectives (CO)	1. To provide a thorough foundation in the discipline of Artificial Intelligence, focusing on Expert Systems, and related methodologies; to bring current trends and advances in the discipline to the forefront so that they may be considered for possible use as solutions to appropriate problems.
Course Outcome	1. To to bring current trends and advances in the discipline to the forefront so that they may be considered for possible use as solutions to appropriate problems.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Concepts and challenges; Various paradigms in expert systems; Rule-based systems; Bayesian networks

(6 hours)

Knowledge representation and methods of inference

(8 hours)

Probability in AI; Probability and conditional probability; Independence; Bayesian rules; Bayesian views (in comparison with frequentism and propensity interpretation); Utility theories and decision making

(13 hours)

SECTION-B

Bayesian Networks

Inference in Bayesian Networks; Junction Tree Algorithms; Learning in Bayesian Networks

(8 hours)

Decision Networks

Knowledge Engineering with Bayesian Network; Applications of Bayesian Networks; Other formalisms of uncertainty reasoning: Default logic; Certainty factor; Dempster-Shafer theory; Fuzzy set

(10 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Bayesian Artificial Intelligence	Kevin B. Korb and Ann E. Nicholson, Chapman and Hall	CRC Press, 2004
RECOMMENDED BOOKS			
1	Expert Systems: Principles and Programming	Joseph C. Giarratano, Gary D. Riley	4th edition, Thomson Course Technology
2	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	3rd edition, Prentice Hall
3	Bayesian Networks and Decision Graphs	Finn B. Jensen, Thomas Graven-Nielsen	2nd edition, Springer

Branch: Computer Science and Engineering

Course Code	**CS 852B**
Course Title	**EXPERT SYSTEMS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Expert Systems syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 802C**
Course Title	**MACHINE LEARNING AND COMPUTATIONAL INTELLIGENCE**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. This course is designed to introduce students to the fundamental concepts and ideas in Machine Learning and Computational Intelligence, and to get them up to speed with the current research in the area.
Course Outcome	1. Understand the problems that can be solved with machine learning 2. Understand the fundamental concepts of different machine learning techniques 3. Apply machine learning to solve real-world problems

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

INTRODUCTION TO MACHINE LEARNING

Examples of Machine Learning Problems, Structure of Learning, Learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection.

(8 hours)

CLASSIFICATION AND REGRESSION

Classification: Binary Classification- Assessing Classification performance, Class probability Estimation- Assessing class probability Estimates, Multiclass Classification.

Regression: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression.

Theory of Generalization: Effective number of hypothesis, Bounding the Growth function, VC Dimensions, Regularization theory

(8 hours)

LINEAR MODELS

Least Squares method, Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification. Perceptron, Support Vector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linearity.

(7 hours)

SECTION-B

LOGIC BASED AND ALGEBRAIC MODELS

Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering,

Rule Based Models: Rule learning for subgroup discovery, Association rule mining.

Tree Based Models: Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees.

(7 hours)

PROBABILISTIC MODELS

Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables: Estimation-Maximization Methods, Gaussian Mixtures, and Compression based Models.

(7 hours)

TRENDS IN MACHINE LEARNING

Model and Symbols- Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, Reinforcement Learning.

(8 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Introduction to Machine Learning	EthemAlpaydin	PHI, 2013
2	Machine Learning: The Art and Science of Algorithms that Make Sense of Data	Peter Flach	Cambridge University Press, 2012
RECOMMENDED BOOKS			
1	Introduction to Statistical Machine Learning with Applications in R	Hastie, Tibshirani, Friedman	Springer, 2012
2	Reinforcement and Systematic Machine Learning for Decision Making	Parag Kulkarni	Wiley-IEEE Press, 2012

Branch: Computer Science and Engineering

Course Code	**CS 852C**
Course Title	**MACHINE LEARNING AND COMPUTATIONAL INTELLIGENCE (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Machine Learning and Computational Intelligence syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 802D**
Course Title	**DISTRIBUTED COMPUTING**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Operating Systems (CS 403), Data Communication and Networks (CS 501)
Course Objectives (CO)	1. To introduce distributed systems, their architecture, types and enabling technologies. 2. To make them understand how communication takes place in a distributed environment. 3. To introduce issues related to process execution, naming and security in distributed systems. 4. To make them understand distributed systems by studying existing systems. 5. To make them familiar with the design and implementation issues of distributed systems.
Course Outcome	1. Differentiate between a distributed and a network system and understand how communication takes place in a distributed environment. 2. Understand how process execution in distributed systems is different from process execution in non-distributed systems and the design and implement issues of a name space. 3. Identify security risks and their handling mechanisms in distributed environment. 4. Understand and design distributed object based systems, distributed file based systems and web based systems.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Distributed Systems

Definition of distributed systems, their objectives, types, architecture, self management in distributed systems, introduction to XML, SOAP, service oriented architecture.

(6 hours)

Communication

Interprocess communication, Remote Procedure Call (RPC), Remote Method Invocation (RMI), Remote Object Invocation, Message Oriented Communication.

(6 hours)

Processes

Introduction to threads, threads in distributed and non distributed systems, virtualization, networked user interfaces, client side software, design issues for servers, code migration.

(6 hours)

Naming

General issues with respect to naming, flat naming, distributed hash tables, hierarchical approaches, structured naming, name spaces, name resolution, implementation of a name space, domain name system, X.500 name space, attribute based naming.

(5 hours)

SECTION-B

Security

Security threats, policies, and mechanisms, design issues, cryptography, secure channels, authentication using public key cryptography, message integrity and confidentiality, digital signatures, session keys, Kerberos, general issues in access control, firewalls.

(6 hours)

Distributed Object-based Systems

Distributed objects, general architecture of an EJB server, global distributed shared objects, processes, object servers, communication, static vs. dynamic RMI, Java RMI, naming, CORBA object references.

(6 hours)

Distributed File Systems

Architecture: client-server, cluster-based distributed file systems, symmetric architectures, communication, RPC in NFS, naming, Naming in NFS, synchronization, consistency and replication.

(5 hours)

Distributed Web-based Systems

Architecture, traditional web-based systems, web services, processes, general organization of the Apache web server, web server clusters, communication, hypertext transfer protocol, simple object access protocol, naming, replication for web hosting systems.

(5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Distributed Systems- Principles and Paradigms	Andrew S. Tanenbaum	2nd edition, Pearson Education
2	Distributed Systems – Concepts and Design	George Coulouris, Jean Dollimore, Tim Kindberg	4th edition, Pearson Education
3	Distributed Systems and Networks	William Buchanan	McGraw-Hill

Branch: Computer Science and Engineering

Course Code	**CS 852D**
Course Title	**DISTRIBUTED COMPUTING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Distributed Computing syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 802E**
Course Title	**PATTERN RECOGNITION**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. This course is designed to introduce students to the fundamental concepts and ideas in Pattern Recognition, and to get them up to speed with the current research in the area.
Course Outcome	1. Understand the problems that can be solved with the application of principles of Pattern Recognition 2. Understand the fundamental theory of different pattern recognition techniques 3. Apply pattern recognition techniques to solve problems

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

INTRODUCTION - Basic concepts, Applications, Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Examples of Automatic Pattern recognition systems, Simple pattern recognition model

(4 hours)

DECISION AND DISTANCE FUNCTIONS - Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

(5 hours)

STATISTICAL DECISION MAKING - Introduction, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

(7 hours)

NON PARAMETRIC DECISION MAKING - Introduction, histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminate functions, Minimum squared error discriminate functions, choosing a decision making techniques.

(6 hours)

SECTION-B

CLUSTERING AND PARTITIONING - Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

(6 hours)

PATTERN PREPROCESSING AND FEATURE SELECTION- Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

(7 hours)

SYNTACTIC PATTERN RECOGNITION - Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers

(7 hours)

APPLICATION OF PATTERN RECOGNITION - Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scan, Finger prints recognition, etc.

(3 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Pattern Recognition and Image Analysis	Earl Gose, Richard johnsonbaugh, Steve Jost	Prentice Hall of India,.Pvt Ltd, New Delhi, 1996
2	Pattern Classification	Duda R.O., P.E.Hart& D.G Stork	2nd edition, J.WileyInc, 2001
RECOMMENDED BOOKS			
1	Pattern Recognition: Statistical Structural and Neural Approaches	Robert Schalkoff	John wiley& sons , Inc, 1992
2	Neural Networks for Pattern Recognition	Bishop C.M	Oxford University Press, 1995

Branch: Computer Science and Engineering

Course Code	**CS 852E**
Course Title	**PATTERN RECOGNITION (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Pattern Recognition syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 803A**
Course Title	**SOFTWARE AGENTS**
Type of Course	Elective
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Artificial Intelligence (CS 503); Soft Computing (CS 605B)
Course Objectives (CO)	1. To introduce the concept of agents, their design and manipulation. 2. To study the various aspects related to agent architecture and communication.
Course Outcome	1. To understand the concept of agents, their architecture. 2. To understand agent communication and their role in information sharing. 3. To be able to apply the knowledge gained to implement a software agent.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

AGENT AND USER EXPERIENCE

Interacting with Agents - Agent From Direct Manipulation to Delegation - Interface Agent Metaphor with Character - Designing Agents - Direct Manipulation versus Agent Path to Predictable.

(9 hours)

AGENTS FOR LEARNING IN INTELLIGENT ASSISTANCE

Agents for Information Sharing and Coordination - Agents that Reduce Work Information Overhead - Agents without Programming Language - Life like Computer character - S/W Agents for cooperative Learning - Architecture of Intelligent Agents

(9 hours)

SECTION-B

AGENT COMMUNICATION AND COLLABORATION

Overview of Agent Oriented Programming - Agent Communication Language - Agent Based Framework of Interoperability

(9 hours)

AGENT ARCHITECTURE

Agents for Information Gathering - Open Agent Architecture - Communicative Action for Artificial Agent

(9 hours)

MOBILE AGENTS

Mobile Agent Paradigm - Mobile Agent Concepts -Mobile Agent Technology - Case Study: Tele Script, Agent Tel

(9 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Software Agents	Jeffrey M.Bradshaw	MIT Press, 2000.
2	Mobile Agents	William R. Cockayne, Michael Zyda	Prentice Hall, 1998.
RECOMMENDED BOOKS			
1	Artificial Intelligence: A Modern Approach	Russel &Norvig	2nd edition, Prentice Hall, 2002.
2	Constructing Intelligent agents with Java: A Programmer's Guide to Smarter Applications	Joseph P.Bigus& Jennifer Bigus	Wiley, 1997.

Branch: Computer Science and Engineering

Course Code	**CS 803B**
Course Title	**HUMAN COMPUTER INTERACTION**
Type of Course	Elective
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To recognize and recall terminology, facts and principles. 2. To determine the relationships between specific instances and broader generalizations. 3. To use concepts and principles to explain, analyze and solve specific situations, often with the applicable concepts implicit in the setting. 4. To apply course content in coping with real life situations. These differ from directed applications by having less structured questions and issues, no direction as to which concepts will be applicable and a range of potentially acceptable answers.
Course Outcome	1. To understand the basics of human and computational abilities and limitations. 2. To understand basic theories, tools and techniques in HCI. 3. To understand the fundamental aspects of designing and evaluating interfaces. 4. To practice a variety of simple methods for evaluating the quality of a user interface. 5. To apply appropriate HCI techniques to design systems that are usable by people.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Human-Computer Interaction.Psychology of everyday things: psychopathology ofeveryday things, examples, concepts for designing everyday things

(3 hours)

User-centred design and prototyping: assumptions, participatory design, methods for involving the user, prototyping, low fidelity prototypes, medium fidelityprototypes, wizard of Oz examples

(5 hours)

Task-centred system design: task-centered process, development of task examples, evaluation of designs through a task-centered walk-through

(5 hours)

Methods for evaluation of interfaces with users: goals of evaluation, approaches, ethics, introspection, extracting the conceptual model, direct observation, constructive interaction, interviews and questionnaires, continuous evaluation via user feedback and field studies, choosing an evaluation method.

(10 hours)

SECTION-B

Beyond screen design: characteristics of good representations, information visualization, Tufte's guidelines, visual variables, metaphors, direct manipulation. Graphical screen design: graphical design concepts, components of visible language, graphical design by grids

(10 hours)

Design principles and usability heuristics: design principles, principles to support usability, golden rules and heuristics, HCI patterns. HCI design standards: process-oriented standards, product-oriented standards, strengths and limitations of HCI Standards

(10 hours)

Past and future of HCI: the past, present and future, perceptual interfaces, context-awareness and perception

(2 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Human-Computer Interaction	Dix A. et al.	Harlow, England: Prentice Hall, 2004.
RECOMMENDED BOOKS			
1	Interaction Design: Beyond Human Computer Interaction	Yvonne Rogers, Helen Sharp, Jenny Preece	3rd Edition, Wiley, 2011

Branch: Computer Science and Engineering

Course Code	**CS 803C**
Course Title	**INFORMATION RETRIEVAL AND MANAGEMENT**
Type of Course	Elective
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Artificial Intelligence (CS 503), Soft Computing (CS 605B), Data Mining and Analysis (CS 605C)
Course Objectives (CO)	1. This subject will provide the knowledge of various concepts involved in efficient information retrieval that leads to the development of efficient Web crawling techniques.
Course Outcome	1. Understand fundamental of Information Retrieval systems 2. Understand the indexing mechanism and their application in text based retrieval systems. 3. Understand the web search engine basics and different methods to design this. 4. Compare and contrast various web search engines using different types of queries.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction

Introduction to Information Retrieval. Inverted indices and boolean queries. Query optimization. The nature of unstructured and semi-structured text.

(5 hours)

The term vocabulary and postings lists

Text encoding: tokenization, stemming, lemmatization, stop words, phrases. Optimizing indices with skip lists. Proximity and phrase queries.Positional indices.

(5 hours)

Dictionaries and tolerant retrieval

Dictionary data structures. Wild-card queries, permuterm indices, n-gram indices. Spelling correction and synonyms: edit distance, soundex, language detection.

(6 hours)

Index construction

Postings size estimation, sort-based indexing, dynamic indexing, positional indexes, n-gram indexes, distributed indexing, real-world issues.

(5 hours)

SECTION-B

Scoring

Term weighting and the vector space model.Parametric or fielded search.Document zones.The vector space retrieval model.weighting. The cosine measure.Scoring documents.

(6 hours)

Computing scores in a complete search system

Components of an IR system.Efficient vector space scoring.Nearest neighbor techniques, reduced dimensionality approximations, random projection.

(6 hours)

Classification

Naive Bayes models. Spam filtering, K Nearest Neighbors, Decision Trees, Support vector machine classifiers.

(6 hours)

Web Crawling

What makes the web different? Web search overview, web structure, the user, paid placement, search engine optimization. Web size measurement, Crawling and web indexes. Near-duplicate detection, Link analysis, Learning to rank, focused web crawler and its different architectures.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Introduction to Information Retrieval	C. Manning, P. Raghavan, and H. Schütze	Cambridge University Press, 2008
2	Modern Information Retrieval	R. Baeza-Yates, B. Ribeiro-Neto	Addison-Wesley, 1999

Branch: Computer Science and Engineering

Course Code	**CS 803D**
Course Title	**CRYPTOGRAPHY AND NETWORK SECURITY**
Type of Course	Elective
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks (CS 501)
Course Objectives (CO)	The subject Information Security aims at providing essential concepts and methods for providing and evaluating security in information processing systems (operating systems and applications, networks, protocols, and so on). In addition to its technical content, the course touches on the importance of following: 1. Develop a "security mindset:" learn how to critically analyze situations of computer and network usage from a security perspective, identifying the salient issues, viewpoints, and trade-offs. 2. To understand basic Encryption and Decryption Algorithms, security threats, challenges in Information Security 3. Have understanding of security management which describes access control, secure group management and authorization management. 4. Familiarization with working of various Key management protocols 5. To learn how to provide security in Networks and Web 6. To understand various working and installation of Firewalls
Course Outcome	1. Understand data encryption and decryption techniques (such as caesar Cipher, Monoalphabetic ciphers, Polyalphabetic Ciphers such as Vigenere, Vernam Cipher etc.) 2. Apply these techniques on given data by using various softwares like:- RSA Cryptosystem, Proxy Crypt, Packet Tracer, WireShark etc. 3. Understand methods which authenticates and secure the messages. 4. Contribute towards network security and

	web security.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Basic Encryption and Decryption:
Attackers and Types of threats, challenges for information security, Encryption Techniques, Classical Cryptographic
Algorithms: Monoalphabetic Substitutions such as the Caesar Cipher, Cryptanalysis of Monoalphabetic ciphers, Polyalphabetic Ciphers such as Vigenere, Vernam Cipher.

(6 hours)

Stream, Block, Symmetric Key and Asymmetric Key Ciphers:
Rotor based system and shift register based systems. Block cipher: principles, modes of operations. The Data encryption Standard (DES), Analyzing and Strengthening of DES, Introduction to Advance Encryption Standard (AES), Concept and Characteristics of Public Key Encryption system, Rivets – Shamir-Adlman (RSA) Encryption, Digital Signature Algorithms and authentication protocols, The Digital Signature Standard (DSA).

(7 hours)

Number theory and basic Algebra: Modular Arithmetic, Euclidean algorithm, Random number generation

(5 hours)

Key Management Protocols: Solving Key Distribution Problem, Diffie-Hellman Algorithm, Key Exchange with Public Key Cryptography.

(6 hours)

SECTION-B

Message Authentication and Hash Functions
Authentication Requirements, Authentication Functions, Message Authentication codes, Hash Functions, Hash Algorithms (MD-5 and SHA-1), Key Management Algorithms.

(5 hours)

Network Security: Kerberos, IP security: Architecture, Authentication Header, Encapsulating Security Payload, Digital Signatures and Digital Signature Standards.

(5 hours)

Web Security: Web security consideration, secure socket Layer protocol, Transport Layer Security Secure Electronic Transaction Protocol.

(6 hours)

Firewalls: Firewall Design principles, Characteristics, Types of Firewall, trusted systems, Virtual Private Networks.

(5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Network Security Essentials, Applications and Standards	William Stallings	Pearson Education.38
RECOMMENDED BOOKS			
1	Cryptography and Network Security Principles and practice	William Stallings	Pearson Education.

2	Introduction to Computer Security. Addison-Wesley	Bishop, Matt	Pearson Education, Inc./ ISBN: 0-321-24744-2, 2005
3	Principles of Information Security	Michael. E. Whitman and Herbert J. Mattord	
4	Cryptography & Network Security, TMH,	AtulKahate	2nd Edition

Branch: Computer Science and Engineering

Course Code	**CS 803E**
Course Title	**ADVANCE IMAGE PROCESSING**
Type of Course	Elective
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Digital Image Processing (CS 701)
Course Objectives (CO)	1. This course include ideas and theory behind the state-of-the art techniques used in the area of image processing, and is designed for the students who have already undergone a basic course on digital image processing.
Course Outcome	1. Understand the image fundamentals and mathematical transforms necessary for image processing 2. Understand how images are analyzed to extract features of interest 3. Understand concept of image registration and image fusion 4. Analyze and solve domain specific research problems using image processing

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

Elements of visual perception, brightness, contrast, hue, saturation, 2D image transforms-DFT, DCT. Image enhancement in spatial and frequency domain, Review of morphological image processing

(6 hours)

SEGMENTATION

Region growing, Fuzzy clustering, Watershed algorithm, Active contour methods, Active Shape Models, Active Appearance Models, Texture feature based segmentation, Atlas based segmentation, Wavelet based Segmentation methods

(10 hours)

FEATURE EXTRACTION

Phase congruency, Localized feature extraction- detecting image curvature, shape features Hough transform, shape skeletonization, Boundary descriptors, Moments, Texture descriptors- Autocorrelation, Co-occurrence features, Run-length features, Fractal model based features, Gabor filter, wavelet features, Scale Invariant Feature Transform (SIFT), Speeded Up Robust Features (SURF)

(10 hours)

SECTION-B

REGISTRATION AND IMAGE FUSION

Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature correspondence-Point pattern matching, Line matching, region matching Template matching. Transformation functions-Similarity transformation and Affine Transformation. Resampling- Nearest Neighbour and Cubic Splines Image Fusion-Overview of image fusion, pixel fusion, Multi-resolution based fusion discrete wavelet transform, Curvelet transform. Region based fusion.

(10 hours)

3D IMAGE VISUALIZATION

Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, Multiply connected surfaces, Image processing in 3D, Measurements on 3D images

(9 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	The Image Processing Handbook	John C.Russ	CRC Press, 2007
2	Feature Extraction and Image Processing	Mark Nixon, Alberto Aguado	Academic Press, 2008
RECOMMENDED BOOKS			
1	Computer Vision: A Modern Approach	David A. Forsyth and Jean Ponce	Pearson Education, 2003
2	Computer Vision: Algorithms and Applications	Richard Szelisk	Springer, 2010