Narula Institute of Technology

College Logo

Department of Computer Science and Engineering

Curriculum and Syllabus

Autonomy Regulation 2015

DEPARTMENT OF COMPUTERSCINECE AND ENGINEERING

Departmental Vision

To develop responsible citizens who would 'think global and act local' and become the change agents of society to meet the challenges of future.

Departmental Mission

The mission of the Computer Science and Engineering Department is to build and sustain a high quality and broad area-based teaching and research program in computer science, to prepare students for successful professional careers both in industry, academics and as entrepreneur, and to provide service to the nation as a good human being.

Program Educational Objectives (PEOs)

PEO1: Graduates are prepared to be employed in IT industries and be engaged in learning, understanding, and applying new ideas.

PEO2: Graduates are prepared to take up Masters / Research programs.

PEO3: Graduates are prepared to beresponsible computing professionals in their own area of interest.

PEO4: Graduates are prepared to be good entrepreneur and responsible social representatives.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex 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.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: 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.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: 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.

PO12:Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES(PSOs)

PEO1: Graduates are prepared to be employed in IT industries and be engaged in learning, understanding, and applying new ideas.

PEO2: Graduates are prepared to take up Masters / Research programs.

PEO3: Graduates are prepared to be responsible computing professionals in their own area of interest.

PEO4: Graduates are prepared to be good entrepreneur and responsible social representatives.

Curriculum

First Year First Semester

A. THEORY							
Sl. No.	**Field**	**Theory**	**Contact Hours/Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	**HU101**	ENGLISH LANGUAGE &TECHNICALCOMMUNICATION	2	0	0	**2**	2
2	**PH101 / CH101**	Chemistry -1 (Gr-B) / Physics – 1 (Gr-A)	3	1	0	4	4
3	**M101**	Mathematics-1	3	1	0	4	4
4	**ES101**	Basic Electrical & Electronic Engineering – 1 (GrA+GrB)	3	1	0	4	4
5	**ME101**	Engg. Mechanics	3	1	0	4	4
Total of Theory						**18**	**18**
B. PRACTICAL							
6	**PH191/ CH191**	Chemistry -1 (Gr-B)/ Physics – 1 (Gr-A)	0	0	3	3	**2**
7	**ES191**	Basic Electrical & Electronic Engineering -1	0	0	3	3	**2**
8	**ME191 /192**	Engg Drawing & Computer Graphics(Gr-B) / Workshop Practice (Gr-A)	1	0	3	4	**3**
Total of Practical						**10**	**7**
C. SESSIONAL							
9	**HU181**	Language Laboratory	0	0	2	2	**1**
10	**XC181**	Extra CurricularActivities(NSS/NCC/NSO etc)	0	0	2	2	**1**
Total of Sessional						**4**	**2**
Total of Semester						**32**	**27**

Physics based branches divided in to Gr-A & Gr-B, Gr-A= Phys in sem-I , Gr-B = Phys in sem-II; Chemistry based branches Physics in sem-1.

Group division:

Group-A: Chemistry based subjects: [Bio-Technology, Food Technology, Leather Technology, Textile Technology, Ceramic Technology, Chemical Engineering and any other Engineering that chooses to be Chemistry based] + Physics based subjects: [Mechanical Engineering, Production Engineering, Civil Engineering, Automobile Engineering, Marine Engineering, Apparel Production Engineering, Computer Science & Engineering, Information Technology.]

Group-B: All Physics based subjects which are also Electrical & Electronics based [Electrical Engineering, Electronics & Communication Engineering, Applied Electronics & Instrumentation Engineering, Power Engineering, Electrical & Electronics Engineering, Bio-Medical Engineering, Instrumentation &ControlEngineering]

First Year Second Semester

A. THEORY							
Sl. No.	Field	Theory	Contact Hours/Week				Credit Points
			L	T	P	Total	
1	**CS201**	Basic Computation & Principles of Computer Programming	3	1	0	4	**4**
2	**PH201/ CH201**	Physics - 1(Gr-B)/ Chemistry-1(Gr-A)	3	1	0	4	**4**
3	**M201**	Mathematics-2	3	1	0	4	**4**
4	**ES201**	Basic Electrical & Electronic Engineering-II	3	1	0	4	**4**
5	**ME201**	Engineering Thermodynamics & Fluid Mechanics	3	1	0	4	4
Total of Theory						**20**	**20**
B. PRACTICAL							
7	**CS291**	Basic Computation & Principles of Computer Programming	0	0	3	3	**2**
8	**PH291/ CH291**	Physics – 1 (Gr-B) /Chemistry-1 (Gr-A)	0	0	3	3	**2**
9	**ES291**	Basic Electrical & Electronic Engineering- II	0	0	3	3	**2**
10	**ME291/ 292**	Workshop Practice (Gr-B) / Basic Engg Drawing & Computer Graphics (Gr-A)	1	0	3	4	**3**
Total of Practical						**13**	**9**
Total of Semester						**32**	**29**

	Group A	Group B
1st Sem	Physics-I Workshop Practice	Chemistry –1; Engg Drawing & Computer Graphics
2nd Sem	Chemistry –1; Engg Drawing & Computer Graphics	Physics-I Workshop Practice

Second Year - Third Semester

A. Theory							
SL No.	**Field**	**Theory**	**Contact Hour / Week**				**Credit Point**
			L	**T**	**P**	**Total**	
1	HU301	Values & Ethics in Profession	3	0	0	3	3
2	PH301	Physics-2	3	1	0	4	4
3	CH301	Basic Environmental Engineering & Elementary Biology;	3	0	0	3	3
4	CS301	Analog & Digital Electronics	3	0	0	3	3
5	CS302	Data Structure & Algorithm	3	1	0	4	4
6	CS303	Computer Organisation	3	1	0	4	4

B. Practical

7	PH391	Physics-2	0	0	3	3	2
8	CS391	Analog & Digital Electronics	0	0	3	3	2
9	CS392	Data Structure & Algorithm	3	3	2	3	2
10	CS393	Computer Organisation	0	0	3	3	2
Total ofPractical						**12**	**8**
Total ofSemester						**33**	**29**

Second Year - Fourth Semester

A. THEORY							
Sl.No.	**Field**	**Theory**	**Contact Hours/Week**				**Cr. Points**
			L	**T**	**P**	**Total**	
1	**(CS401**	Numerical Methods	2	1	0	3	2
2	**M401**	Mathematics-3	3	1	0	4	4
3	**CS401**	Communication Engg&CodingTheory	21	0	0	3	3
4	**CS402**	Formal Language & Automata Theory	3	1	0	4	4
5	**CS403**	Computer Architecture	3	1	0	4	4
Total of Theory						**18**	**17**
B. PRACTICAL							

6 7	**HU481** **M(CS)491**	Technical Report Writing & Language Lab Practice	0 0	0 0	3 2	3 2	2 1
8	**CS491.**	Communication Engg& Coding Theory	0	0	3	3	2
9 10	**CS492** **CS493**	Software Tools Computer Architectur	0 0	0 0	3 3	3 3	2 2
		Total of Practical				**14**	**9**
		Total of Semester				**32**	**26**

Third Year - Fifth Semester

A. THEORY							
Sl. No	**Field**	**Theory**	**Contact Hours/Week**				**Cr. Pts**
			L	**T**	**P**	**Total**	
1	**HU501**	Economics for Engineers	3	0	0	3	3
2	CS501	Design & Analysis of Algorithm	3	**1**	0	4	4
3	CS502	Microprocessors & Microcontrollers	3	**1**	0	4	4
4	CS503	Discrete Mathematics	3	0	0	3	3
5	**Free Elective CS504A** **CS504B CS504C CS504D**	Circuit Theory & Network (ECE) Data Communication (ECE) Digital Signal Processing (ECE Object Oriented Programming (IT)	3	**0/1**	0	3/4	3/4
Total of Theory						**17/18**	**17-18**
B. PRACTICAL							
6 7	**CS591** **CS592**	Design & Analysis of Algorithm Microprocessors &Microcontrollers	0 0	0 0	3 3	3 3	2 2
8 9	**CS593 F.E.** **CS594ACS594B CS594C CS594D**	Programming Practices using C++ Circuit Theory & Network (ECE) Data Communication (ECE) Digital Signal Processing (ECE)	1 0	0 0	2 3	3 3	2 2

		Object Oriented Programming (IT)					
Total of Practical						**12**	**8**
Total of Semester						**29/30**	**25-26**

Third Year - SixthSemester

A. THEORY							
Sl. No.	**Field**	**Theory**	**Contact Hours/Week**				**Cr. Pts**
			L	**T**	**P**	**Total**	
1	**HU601**	Principles of Management	2	0	0	2	2
2	**CS601**	Data Base Management System	3	0	0	3	3
3	**CS602**	Computer Networks	3	0	0	3	3
4	**CS603**	Operating System	3	0	0	3	3
5	**P.E** **CS604A** **CS604B** **CS604C**	Information Theory & Coding Computer Graphics ERP	3	0	0	3	3
6	**F. E.** **CS605A** **CS605B** **CS605C**	Operation Research (M) Human Resource Management (HSS) Multimedia Technology (IT)	3/3	0/1	0/0	3/4	3/4
Total of Theory						**17/18**	**17-18**
B. PRACTICAL							
7	**CS691**	Data Base Management SystemLab	0	0	3	3	2
8	**CS692**	Network Lab	0	0	3	3	2
9..	**CS693**	Operating SystemLab	0	0	3	3	2
10	**CS681**	**Seminar**	**0**	**0**	**3**	**3**	**2**
Total of Practical						**12**	**8**
Total of Semester						**29-30**	**25-26**

Fourth Year - Seventh Semester

A. THEORY							
Sl. No.	**Field**	**Theory**	**Contact Hours/Week**				**Cr. Pts**
			L	**T**	**P**	**Total**	
1	**CS701**	Software Engg.	3	0	0	3	3
2	**CS702**	Compiler Design	3	0	0	3	3
3	**CS703**	A. PatternRecognition B. SoftComputing C. ArtificialIntelligence D. ImageProcessing	3	**0**	0	3	3
4	**CS704**	A. Distributed OperatingSystem B. CloudComputing C. Data Warehousing and DataMining D. SensorNetworks E. MobileComputing	3	0	0	3	3
5	**CS705**	A. Internet Technology(IT) B. Microelectronics & VLSI Design(ECE) C. Control System(EE) D. Modelling & Simulation(M)	3	0	0	3	3
Total of Theory						**15**	**15**
B. PRACTICAL							
6	**HU781**	Group Discussion	0	0	3	3	2
7	**CS791**	Software Engg. Lab	0	0	3	3	2
8	**CS793**	A. PatternRecognition B. SoftComputing C. ArtificialIntelligence D. ImageProcessing	0	0	3	3	2
9	**CS795**	A. Internet Technology(IT) B. Microelectronics & VLSI Design(ECE) C. Control System(EE) D. Modelling & Simulation(M)	0	0	3	3	2
10	**CS792**	Industrial training	4 wks during 6th - 7 th Sem-break				2
11	**CS794**	Project-1				3	2
Total of Practical						**15**	**12**
Total of Semester						**30**	**27**

Fourth Year - Eighth Semester

A. THEORY							
Sl. No.	**Field**	**Theory**	**Contact Hours/Week**				**Cr. Pts**
			L	**T**	**P**	**Total**	
1	**HU801A** **HU801B**	A. OrganisationalBehaviour B. ProjectManagement	2	0	0	2	2
2	**CS801**	A. Advanced ComputerArchitecture B. ParallelComputing C. Natural Language Processing D. Cryptography &NetworkSecurity E. BusinessAnalytics	3	0	0	3	3
3	**CS802**	A. Technology Management(HSS) B. Cyber Law & Security Policy(HSS) C. Optical Networking(ECE) D. Low Power Circuits & Systems(ECE) E. E-Commerce(IT) F. Robotics(EE &ME)	3	0	0	3	3
Total of Theory						8	8
B. PRACTICAL							
4	**CS891**	Design Lab / Industrial problem related practical training (Workshop needed)	0	0	6	6	4
5	**CS892**	Project-2	0	0	12	12	6
6	**CS893**	Grand Viva					3
Total of Practical						**18**	**13**
Total of Semester						**26**	**21**

Syllabus

First Semester

Theory

HU

ENGLISH LANGUAGE & TECHNICAL COMMUNICATION
PAPER CODE : HU 101
CONTACT: 2L
CREDIT: 2

Course Objectives

Designed to meet the basic survival needs of communication in the globalized workplace, including knowledge of and competency in the use of macro-skills in reading and writing proficiency, functional grammar and usage.

Pre-requisite-

Basic knowledge of high school English.

Detailed Syllabus

Guidelines for Course Execution:
Objectives of the Course: This Course has been designed

1. To impart advanced skills of Technical Communication in English through Language Lab. Practice Sessions to 1st Semester UG students of Engineering &Technology.
2. To enable them to communicate confidently and competently in English Language in allspheres.

Desired Entry Behaviour:
The students must have basic command of English toTalk about day-to-day events and experiences of life.
Comprehend Lectures delivered in English .Read and understand relevant materials written in English. Write grammatically correct English.

Strategies for Course Execution:

1. It is a Course that aims to develop Technical Communication Skills. It is, therefore, *Lab*- based and practical in orientation. Students should be involved in Practice Sessions.
2. The content topics should be conveyed through real-life situations. Lecture classes should be

conducted as Lecture cum Tutorial classes.

3. Keeping in view the requirements of students, the teachers may have to prepare some learning aids task materials.
4. Some time should be spent in teaching stress and intonation.
5. In teaching 'Speaking skill,' emphasis should be on *clarity, intelligibility, fluency,(as well as accepted pronunciation).*
6. Micro Presentation and Group Discussion Sessions should be used for developing Communicative Competence
7. The Language Lab, device should be used for giving audio-visual inputs to elicit students' responses by way of Micro-Presentation, Pair Conversation, Group Talk and Class Discussion.
8. The teacher must function as *a creative monitor in the Language Lab for the following:*

A. Developing Listening Comprehension Skill;

1. Developing Listening Comprehension through Language Lab Device
2. Developing sub skills of the Listening Skill by Conversational Practice Sessions
3. Focusing on intelligent and advanced Listening Sessions e.g. Seminars, Paper Presentation, Mock Interviews etc.
4. Conducting Conversational Practice: Face to Face & Via Media (Telephone, Audio, Video + Clips)

B. Developing Speaking Competence:

a) Helping students in achieving *clarity and fluency* ; manipulating paralinguistic features of speaking (*voice modulation ,pitch , tone stress , effective pauses)*
Conducting *Task oriented interpersonal ,informal and semiformal Speaking / Classroom Presentation*

b) Teaching strategies for Group Discussion Teaching Cohesion and Coherence
Teaching effective communication & strategies for handling criticism and adverse remarks
Teaching strategies of Turn- taking, effective intervention, kinesics (use of body language) and courtesies and all components of soft skills.

C. Developing Reading Comprehension Skill:

a) Developing Reading Skill through Non Technical (Literary) Texts (See Recommended Book5)

1. The Thief by Ruskin Bond
2. The Open Window by Saki
3. Marriage is a private Affair by Chinua Achebe
4. The Moon in the Earthen Pot by Gopini Karuna kar

b) Developing Reading Skill through Radio Commentary, Technical Texts and Case Studies (Referto Recommended Book1.)
* Freedom by G. B. Shaw (Radio Commentary)
a) Guiding students for Intensive & Extensive Reading(See Recommended Book 1)

D. Developing Writing Competence:

a) Teaching all varieties of Technical Report, Business Letters and Job Application (Expressing Ideas within restricted word limit through paragraph division, Listing Reference Materials through Charts , Graphs ,Tables and Diagrams);

b) Teaching correct Punctuation & Spelling, Semantics of Connectives, Modifiers and Modals, variety of sentences and paragraphs

c) Teaching Organizational Communication: Memo, Notice, Circular, Agenda / Minutes etc.

SYLLABUS--DETAILED OUTLINES

A. ENGLISH LANGUAGEGRAMMAR:
5L
Correction of Errors in Sentences Building Vocabulary
Word formation
Single Word for a group of Words Fill in the blanks using correct Words
Sentence Structures and Transformation Active & Passive Voice
Direct & Indirect Narration
(MCQ Practice during classes)

B. READINGCOMPREHENSION:
Strategies for Reading Comprehension 1L
Practicing Technical &Non Technical Textsfor Global/Local/Inferential/Referential comprehension;3L Précis Writing

C. TECHNICALCOMMUNICATION
The Theory of Communication –Definition & Scope Barriers of Communication
Different Communication Models
Effective Communication (Verbal / Non verbal)
Presentation / Public Speaking Skills 5L
(MCQ Practice during classes)

D. MASTERING TECHNICAL COMMUNICATION

Technical Report(formal drafting)
3
L
Business Letter(formal drafting)
4
L
Job Application(formal drafting) 3L
Organizational Communication (seepage3)
3
L
Group Discussion –Principle & Practice
3
L

TotalLectures 30

MARKS SCHEME(Written Examination) Total Marks70

1. 10 Multiple Choice Questions(Communication & Eng. Language-Vocabulary &Syntax) Marks 10
2. Short Questions & Précis writing on unseen passages Marks 15 (10+5)
3. 3 Essay type Questions on Technical Communication (Technical Report / Business Letter / Job Application/ Organizational Communication etc,) Marks45-15*3

MARKS SCHEME(Internal Examination) TotalMarks30

1. Attendance Marks 5
2. Testing Speaking Ability Marks 5
3. Testing Listening Ability Marks 5
4. 2 Unit Tests Marks15

Text Book :

BOOKS -- RECOMMENDED:

1. Sharma(Oxford Higher Education)
2. Effective Technical Communication by Barun K. Mitra(Oxford Higher Education)
3. V. Sashi kumar (ed.): Fantasy- A Collection of Short Stories
4. Orient Black swan (Reprint 2006)

Ref. Book:

1. Board of Editors: Contemporary Communicative English for Technical Communication Pearson Longman,2010
2. Dr. D. Sudharani: Manual for English Language Laboratory

Pearson Education (W.B. edition), 2010

Technical Communication Principles and Practice by Meenakshi Raman, Sangeeta

Course Outcomes:

CO-PO(PSO) Mapping

Basic Science

Chemistry-1(Gr-A/Gr-B)
Code: CH101
Contacts: 3L + 1T = 4 Credits:4

Pre requisites: 10+2 science with chemistry

Objective

Understanding of the fundamental theories and applications of thermodynamics, electrochemical principles in modern electrochemical cells and to get an insight into electronic structure of crystals and nano materials. Learning about the Synthesis, properties and applications of polymers , fuels and alternative energy sources & their significance in petrochemical industries. Analyzing water quality for its various parameters & its significance in industries.

Detailed Syllabus:

Module 1

Chemical Thermodynamics -I

Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.

Introduction to first law of thermodynamics: different statements, mathematical form.

Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas.

Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy foridealgas. 3L

Heat Capacity: Definition, Classification of Heat Capacity (C_p and C_V): Definition and General expression of Cp - C_V. Expression of Cp - C_V for ideal gas.

Reversible and Irreversible processes: Definition, Work done in Isothermal Reversible and Isothermal Irreversible process for Ideal gas,

Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V and

T), slope of P-V curve in adiabatic and isothermal process.

Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier and Laplace, Hess's law of constant heat summation, Kirchoff's law. 3L

2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature.

Evaluation of entropy: characteristics and expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases.

2L

Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for ideal gas, Maxwell's Expression (only the derivation of 4 different forms), Gibbs Helmholtz equation.

Condition of spontaneity and equilibrium reaction. 2L

Module 2

Reaction Dynamics

Reaction laws: rate and order; molecularity; zero, first and second order kinetics. Pseudo uni-molecular reaction, Arrhenius equation. Mechanism and theories of reaction rates (Transition state theory, Collision theory:).

Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics). 3L

Solid state Chemistry

Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency).

Role of silicon and germanium in the field of semiconductor. 2L

Module 3Electrochemistry *Conductance*

Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte).

Kohlrausch's law of independent migration of ions, transport numbers and hydration of ions. Conductometric

titrations: SA vs SB & SA vs WB; precipitation titration KClvs $AgNO_3$. 2L

Electrochemical cell

Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, quin hydrone half cell and calomel half cell (construction, representation, cell reaction, expression of potential, Discussion, Application)

Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, Discussion, Application).

Application of EMF measurement on a) Ascertain the change in thermodynamic function (ΔG, ΔH, ΔS) b) ascertain the equilibrium constant of a reversible chemical reaction c) ascertain the valency of an ion.

3L

Module 4

Structure and reactivity of Organic molecule

Electro negativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals.

Brief study of some addition, eliminations and substitution reactions. 3L

Polymerization

Concepts, classifications and industrial applications.

Polymer molecular weight (number avg. weight avg. viscosity avg.: Theory and mathematical expression only), Poly disparity index (PDI).

Polymerization processes (addition and condensation polymerization), degree of polymerization, Co-polymerization, stereo-regularity of polymer, crystallinity (concept of T_m) and amorphicity (Concept of T_g) of polymer.

Preparation, structure and use of some common polymers: plastic (**PE**: HDPE, LDPE, LLDPE, UHMWPE)), rubber (natural rubber, SBR), fiber(nylon 6.6). Vulcanization.

Conducting and semi-conducting polymers. 5L

Module 5

Industrial Chemistry

Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC), Coal

analysis: Proximate and ultimate analysis. Liquid fuel: Petroleum, classification of petroleum, Refining, Petroleum distillation, Thermal cracking, Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Bio-diesel.

Gaseous fuels: Natural gas, water gas, Coal gas, biogas. 5L

Text books:

1. P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition).
2. S. Glasston, Text Book of Physical Chemistry, Macmillan IndiaLimited.
3. S. Pahari, Physical Chemistry, New Central Book Agency.
4. S. Sarkar, Fuels and Combustion, Taylor & Francis (3rd Edition), 2009

Reference books:

1. Physical Chemistry, Atkins, 6th Edition, Oxford Publishers.
2. Organic Chemistry, Mark Loudon, 4th Edition, Oxford Publishers.

Course Outcomes:

CO-PO(PSO) Mapping

Physics-1(Gr-B/Gr-A) Code:PH-101

Contacts:3+

1Credit:4L

Prerequisites: Knowledge of Physics upto 12th standard.

Objective: The aim of courses in Physics is to provide an adequate exposure and develop insight about the basic physics principles along with the possible applications. The acquaintance of basic principles of physics would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches. It can also create awareness of the vital role played by science and engineering in the development of new technologies. It also gives necessary exposure to the practical aspects, which is an essential component for learning sciences.

Detailed Syllabus:

Module 1:

Oscillation:

Simple harmonic motion : Preliminary concepts, Superposition of S.H.M sin two mutually perpendicular directions: Lissajous figure
2L

Damped vibration: Diferential equation and its solution, Logarithmic decrement, Quality factor .3L

Forced vibration :Differential equation and its solution, Amplitude and Velocity resonance, Sharpness of resonance .Application in L-C-R Circuit 3L

Module2:

Optics1:

Interference of electromagnetic waves: Conditions for sustained interference, doubles litas an example. Qualitative idea of Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Newton's ring 3L

Di fraction of light: Fresnel and Fraunhofer class. Fraunhofer diffraction for singles lit and double slits. Intensity distribution of N-slits and plane transmission grating(No deduction of the intensity distributions for N-slits is necessary),Missing orders. Rayleigh criterion, Resolving power of

grating and microscope. (Definition and formulae) 5L

Module3:

Optics2

Polarization: General concept of Polarization, Plane of vibration and plane of polarization, Qualitative discussion on Plane, Circularly and Elliptically polarized light, Polarization through reflection and Brewster's law, Double refraction (birefringence) -Ordinary and Extra-ordinary rays . Nicol's Prism, Polaroid. Half wave plate and Quarter wave plate 4L

Laser : Spontaneous and Stimulated emission of radiation, Population inversion, Einstein's A & B co-efficient (derivation of the mutual relation), Optical resonator and Condition necessary for active Laser action, Ruby Laser, He-Ne Laser- applications of laser. 4L

Holography: Theory of holography, viewing the hologram, Applications **3L**

Module 4:

Quantum Physics:

Concept of dependence of mass with velocity, mass energy equivalence, energy- momentum relation (no deduction required). Blackbody radiation: Rayleigh Jeans' law (derivation without the calculation of number of states), Ultraviolet catastrophe, Wien's law, Planck's radiation law (Calculation of the average energy of the oscillator), Derivation of Wien's displacement law and Stephan's law from Planck's radiation
law. Rayleigh Jean's law and Wien's law as limiting cases of Planck's law. Compton Effect (calculation of

Compton wavelength is required

Laser: Spontaneous and Stimulatedemissionofradiation,Populationinversion,Einstein'sA&Bco-eficient(derivationofthemutualrelation),OpticalresonatorandConditionnecessaryforactiveLaser action,RubyLaser,He-NeLaser-applicationsoflaser.4L

Holography: Theory of holography, viewing the hologram, Applications 3L

Wave-particle duality and deBroglie's hypothesis, Concept of matter waves, Davisson-Germer

experiment,Concept of wave packets and Heisenberg'suncertaintyprinciple.4L

Module5:

Crystallography:

Elementary ideas of crystal structure: lattice, basis, unitcell, Fundamental types of lattices – Bravais lattice ,Simplecubic, f.c.c. and b.c.c. lattices, (use of models in the class during teaching is desirable] Millerindices and millerplanes, Co-ordination number and Atomic packing factor. 4L

X-rays: Origin of Characteristic and Continuous X-ray, Brag's law (No derivation) ,Determination of lattice constant. 2L

Recommended TextBooks and Reference Books:

For Both Physics I and II

1. Dutta Roy (Basic Physics)
2. .K .Kar (Engineering Physics)
3. Maniand Meheta (Modern Physics)
4. Arthur Baiser(Perspective & Concept of Modern Physics) PhysicsI (PH101 /201)

5. Vibration and Waves
6. Kingsler and Frey
7. D. P. Roy Chaudhury
8. N.K. Bajaj (Waves and Oscillations)
9. K. Bhattacharya
10. R. P. Singh (Physics of Oscillations and Waves)

h) A. B. Gupta (College Physics Vol. II)

11. Chattopadhyay and Rakshit (Vibration, Waves and Acoustics)

Optics

1. Möler (Physical Optics)
2. A.K. Ghatak
3. Hecht (Optics)
4. Hecht (Schaum Series)
5. F.A. Jenkinsand H.E. White
6. ChitaRanjan Dasgupta (DegreePhysicsVol3)

QuantumPhysics

1. Eisberg & Resnick is published by Wiley India
2. A.K .Ghatak and S. Lokenathan
3. S.N. Ghoshal (IntroductoryQuantumMechanics)
4. E.E. Anderson(ModernPhysics)
5. Haliday, Resnick & Krane : Physics Volume 2 is Published by Wiley India
6. Binayak Dutta Roy [Elements of Quantum Mechanics]

Crystallography

1. S.O. Pillai (a.Solid state physics b.Problem in Solid state physics)
2. A.J. Dekker
3. Aschroft and Mermin
4. Ali Omar
5. R. L. Singhal
6. Jak Tareenand Trn Kutty(Basiccoursein Crystallography

Laser and Holography

1. A.K.Ghatak and Thyagarajan(Laser)
2. Tarasov (Laser)
3. P. K. Chakraborty(Optics)
4. C Ghosh and K. G. Majumder (Optics)
5. B. B. Laud (Laser and Non-linear Optics)
6. Bhattacharya[Engineering Physics]Oxford

Course Outcomes:

CO-PO(PSO) Mapping

Mathematics Code: M101

Contacts: 3L + 1T = 4 Credits:

Prerequisites: Any introductory course on matrix algebra, calculus, geometry.

Objective: The purpose of this course is to provide fundamental concepts matrix algebra, Calculus of Single and Several Variables and Vector Analysis.

Detailed Syllabus:

Note 1: The whole syllabus has been divided into five modules. Note 2: UStructure of the question paperU

There will be three groups in the question paper. In Group A, there will be one set of multiple choice type questions spreading the entire syllabus from which 10 questions (each carrying one mark) are to be answered. From Group B, three questions (each carrying 5 marks) are to be answered out of a set of questions covering all the three modules. Three questions (each carrying 15 marks) are to be answered from Group C. Each question of Group C will have three parts covering not more than two topics (marked in bold italics face). Sufficient questions should to be set covering all modules.

Module I

Matrix: Determinant of a square matrix, Minors and Cofactors, Laplace's method of expansion of a determinant, Product of two determinants, Adjoined of a determinant, Jacobi's theorem on adjoint determinant. Singular and non-singular matrices, Adjoined of a matrix, Inverse of a non-singular matrix and its properties, orthogonal matrix and its properties, Trace of a matrix.

Rank of a matrix and its determination using elementary row and column operations, Solution of simultaneous linear equations by matrix inversion method, Consistency and inconsistency of a system of homogeneous and inhomogeneous linear simultaneous equations, Eigen values and eigen vectors of a square matrix (of order 2 or 3), Eigen values of APTP, kA, AP-1P, Caley-Hamilton theorem and its applications.

Module II

Successive differentiation: $_0$Higher order derivatives of a function of single variable, Leibnitz's theorem (statement only and its application, problems of the type of recurrence relations in derivatives of different orders and also to find $(y_n))$.

Mean Value Theorems & Expansion of Functions: Rolle's theorem and its application, Mean Value theorems – Lagrange & Cauchy and their application, Taylor's theorem with Lagrange's and Cauchy's formofremaindersanditsapplication,ExpansionsoffunctionsbyTaylor'sand Maclaurin'stheorem,

Mean Value Theorems & Expansion of Functions: Rolle's theorem and its application, Mean Value theorems – Lagrange & Cauchy and their application, Taylor's theorem with Lagrange's and Cauchy's form of remainders and its application, Expansions of functions by Taylor's and Maclaurin's theorem, Maclaurin's infinite series expansion of the functions: $\sin x$, $\cos x$, e^x, $\log(1+x)$, $(a+x)^n$, n being an integer or a fraction (assuming that the remainder $R_n \to 0$ as $n \to \infty$ in each case). **5L**

Reduction formula: Reduction formulae both for indefinite and definite integrals of types

$\int \sin^n x$, $\int \cos^n x$, $\int \sin^m x \cos^n x$, $\int \cos^m x \sin nx$, $\int \frac{dx}{\left(x^2+a^2\right)^n}$. m, n are positive integers.

Module III

Calculus of Functions of Several Variables: Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives and related problems, Homogeneous functions and Euler's theorem and related problems up to three variables, Chain rules, Differentiation of implicit functions, Total differentials and their related problems, Jacobians up to three variables and related problems, Maxima, minima and saddle points of functions and related problems, Concept of line integrals, Double and triple integrals. **9L**

Module IV

Infinite Series: Preliminary ideas of sequence, Infinite series and their convergence/divergence, Infinite series of positive terms, Tests for convergence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test and Raabe's test (statements and related problems on these tests), Alternating series, Leibnitz's Test (statement, definition) illustrated by simple example, Absolute convergence and Conditional convergence. **5L**

Module-V

Vector Algebra and Vector Calculus*:* Scalar and vector fields – definition and terminologies, dot and cross products, scalar and vector triple products and related problems, Equation of straight line, plane and sphere, Vector function of a scalar variable, Differentiation of a vector function, Scalar and vector point functions, Gradient of a scalar point function, divergence and curl of a vector point function, Directional derivative. Related problems on these topics. Green's theorem, Gauss Divergence Theorem and Stoke's theorem (Statements and applications). **8L**

Total 40
Lectures Suggested Reference Books

1. Advanced Engineering Mathematics 8e by Erwin Kreyszig is published by WileyIndia
2. **Engineering Mathematics**: B.S. Grewal (S. Chand &Co.)
3. **Higher Engineering Mathematics**: John Bird (4th Edition, 1st Indian Reprint 2006,Elsevier)
4. **Mathematics Handbook**: for Science and Engineering, L. Rade and B. Westergren (5P^{thP} edition, 1P^{stP} Indian Edition 2009,Springer)
5. **Calculus**: M. J. Strauss, G. L. Bradley and K. L. Smith (3P^{rdP} Edition, 1P^{stP} Indian Edition 2007, Pearson Education)
6. **Engineering Mathematics**: S. S. Sastry (PHI, 4P^{thP} Edition, 2008)
7. **Advanced Engineering Mathematics, 3E**: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), IndianEdition.

Engineering Science
Basic Electrical and Electronics Engineering-I
Code: ES101
Contacts: 3L + 1T = 4
Credits: 4

Basic Electrical Engineering-I

Prerequisites: Basic 12st standard Physics and Mathematics.

Objectives: Basic electrical engineering is an introductory course in electrical engineering. Students are introduced to
simple applied electrical circuits, theories and practice to impart skill set to have visualization of

electrical engineering applications. It is a course suitable for students pursuing electrical engineering as well as other related engineering disciplines.

Ditailed Syllabus:

DC Network Theorem: Definition of electric circuit, network, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, Kirchhoff's law, Principle of superposition. Source equivalence and conversion, Thevenin's theorem, Norton Theorem, nodal analysis, mesh analysis, stardelta conversion. Maximum power transfer theorem with proof. 7L

Electromagnetism: Biot-savart law, Ampere's circuital law, field calculation using Biot-savart & ampere's circuital law. Magnetic circuits, Analogous quantities in magnetic and electric circuits, Faraday's law, Self and mutual inductance. Energy stored in a magnetic field, B-H curve, Hysteretic and Eddy current losses, Lifting power of Electromagnet. 5L

AC fundamental: Production of alternating voltage, waveforms, average and RMS values, peak factor, form factor, phase and phase difference, phasor representation of alternating quantities, phasor diagram, behavior of AC series , parallel and series parallel circuits, Power factor, Power in AC circuit, Effect of frequency variation in RLC series and parallel circuits, Resonance in RLC series and parallel circuit, Q factor, band width of resonant circuit. 9L

Text books

1. V. Mittle& Arvind Mittal, Basic Electrical Engineering,TMH.
2. Ashfaq Hussain, Basic Electrical Engineering, S. ChandPublication
3. Chakrabarti,Nath& Chanda, Basic Electrical Engineering,TMH
4. C.L. Wadhwa, Basic Electrical Engineering, PearsonEducation

Reference books

1. H. Cotton, WilleyPress
2. J.B. Gupta, Basic Electrical Engineering, Kataria&Sons.
3. Kothari &Nagrath, Basic Electrical Engineering, TMH

Course Outcomes:

CO-PO(PSO) Mapping

Basic Electronics Engineering-I

Instruction: 1 credit means 1 hour; 1 lecture means a lecture of 1 hour duration.

Basic Electronics Engineering - I: 18L + 2L = 20L

Pre-requisites: Knowledge of Class XII level electronics, Physics & Mathematics.

Objectives: Students will be able to Analyze the behavior of semiconductor diodes in Forward and Reverse bias . To design a half wave and full wave rectifiers , Explore V-I characteristics of Bipolar Junction Transistor n CB, CE & CC configurations. To acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amps. Students will be able to explain feedback concept and different oscillators . They will also be familiar with the analysis of digital logic basics and measuring Electronic devices. Students will have knowledge about characteristics ofFET.

Detailed Syllabus:

Recapitulation and Orientation lectures: 2L

Module –1:Semiconductors: 4L

Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusioncarriers.

Module – 2: Diodes andDiodeCircuits:3L+3L = 6L

Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varact or diode.
Simple diode circuits, load line, linear piecewise model;
Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

Module – 3: Bipolar Junction Transistors: 6L+2L = 8L

Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes.
Biasing and Bias stability: calculation of stability factor;

Outcome:

Students will be able to identify semiconductor materials, draw band-diagrams, distinguish between intrinsic and extrinsic semiconductors, n- and p- type semiconductors, calculate drift

and diffusion current components.

Students must be able to explain the junction properties and the phenomenon of rectification, draw the I-V characteristics and identify operating points; Calculate ripple factors, efficiency of power supplies.

Students will be able to draw and explain the I-V characteristics of BJTs – both input and output; learn to bias transistors, both as amplifiers and switches; identify operating points.

CO-PO(PSO) Mapping

Recommended Books:
Text:

1. Sedra& Smith: Microelectronics Engineering.
2. Millman &Halkias:

IntegratedElectronics.
References:

a) Malvino: Electronic Principle.
b) Schilling & Belove: Electronics Circuits.
c) Millman &Grabal: Microelectronics.
d) Salivahanan: Electronics Devices &Circuits.
e) Boylestad & Nashelsky: Electronic Devices & Circuit Theory

Engineering Mechanics Code: ME101
Contacts: 3L + 1T = 4
Credits: 4

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics.

Objective:

1. Understand the vector and scalar representation of forces and moments.
2. Describe static equilibrium of particles and rigid bodies in two dimensions and three dimensions including the effect of Friction
3. Analyze the properties of surfaces & solids in relation to moment of inertia.
4. Illustrate the laws of motion, kinematics of motion and their interrelationship.
5. Study the concepts of engineering mechanics on deformable materials under applied loads.

Detailed Syllabus:

Sl. No.	Syllabus	Contact Hrs.	Reference Books & Chapters and Problems for practice
Mod-1	Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector).	2L	Meriam & Kraig: Vol-I Chapt: 1/1, 2/2,1/3
	Introduction to Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i,j,k; Cross product and Dot product and their applications.	4L+1T	1. Meriam &Kraig:Vol-IChapt: 1/3, 2/4,2/7 2. I.H. Shames Chapt: 2.1 to 2.8 Probs: 2.1, 2.2, 2.3,2.6, 2.10, 2.48, 2.52, 2.54, 2.64, 2.68
	Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces.	4L+2T	1. Meriam & Kraig: Vol-I Chapt: 2/3, 2/4, 2/5, 2/6, 2/9 Probs: 2/1 to 2/8; 2/13, 2/16, 2/20; 2/27, 2/31 to 2/33, 2/35, 2/37,2/39; 2/53, 2/55, 2/57, 2/61, 2/66;2/75, 2/77, 2/79, 2/78 to 2/82; 2/135 to 2/137, 2/139, 2/141, 2/146, 2/147,2/151, 2/157
Mod-II	Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium.	3L+1T	Meriam & Kraig: Vol-I Chapt: 3/2, 3/3 Probs: 3/1, 3/3, 3/4 to 3/7, 3/11, 3/13, 3/15, 3/21, 3/25, 3/27, 3/31,3/39
	Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction.	3L+1T	Meriam & Kraig: Vol-I Chapt: 6/1, 6/2, 6/3 Probs: 6/1 to 6/6, 6/13, 6/15, 6/17; 2. I.H. Shames; Chapt: 7.1,7.2
Mod-III.	Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadrilateral, composite areas consisting of above figures.	4L+1T	1. Meriam & Kraig: Vol-I Chapt: 5/1, 5/2, 5/3 Sample probs: 5/1 to 5/5 Probs: 5/2, 5/5, 5/7, 5/9, 5/12, 5/20, 5/25, 5/30, 5/43,5/47
	Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone.	3L+1T	1. Meriam & Kraig: Vol-I Chapt: Appendix A/1, A/2 Sample Probs: A/1 to A/5; Probs: A/1, A/5, A/9, A/15, A/20

Sl. No.	Syllabus	Contact Hrs.	Reference Books & Chapters and Problems for practice

	Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety.	2L+1T	1. Elements of strength of Materials by Timoshenko &Young Chapt: 1.1,1.2,1.3,2.2 Prob set 1.2 : Prob: 3,4,5,8,9,10 Prob set 1.3: Prob: 1,3,5,7 Nag & Chanda -3rdPart Chapt: 1.1, 1.2.1 to 1.2.3, 1.2.6, 1.2.7
Mo d-IV	Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs.	3L+1T	Meriam &Kriag: Vol-II Chapt: 1/3, 1/5,1/7, 2/1,2/2 Probs: 1/1 to 1/10; 2/1 to 2/14; 2/15, 2/17, 2/19, 2/25, 2/27;
	Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion).	3L+1T	Meriam & Kraig: Vol-II Chapt: 2/3, 2/4, 2/5, Probs: 2/59 to 2/65, 2/67, 2/71, 2/81, 2/84, 2/89; 2/97, 2/99 to 2/103;
Mo d-V.	Kinetics of particles: Newton's second law; Equation of motion; D.Alembert's principle and free body diagram; Principle of work and energy ; Principle of conservation of energy; Power and efficiency.	5L+2T	Meriam & Kraig: Vol-II Chapt: 3/2, 3/3, 3/4,3/6, 3/7; Probs: 3/1, 3/3, 3/4,3/7, 3/11, 3/12; 3/17, 3/19, 3/23; 3/103 to 3/107, 3/113, 3/115, 3/116; Sample probs: 3/16, 3/17; Probs: 3/143,3/145, 3/158

Books Recommended

1. Engineering Mechanics [Vol-I & II]by Meriam &Kraige, 5th ed. – WileyIndia
2. Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. –PHI
3. Engineering Mechanics by Timoshenko , Young and Rao, Revised 4th ed. –TMH
4. Elements of Strength of Materials by Timoshenko & Young, 5th ed. –E.W.P
5. Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda– ChhayaPrakashani
6. Engineering Mechanics by Basudeb Bhattacharyya– Oxford UniversityPress.
7. Engineering Mechanics: Statics & Dynamics by Hibbeler& Gupta, 11th ed. – Pearson

Course Outcomes:

CO-PO(PSO) Mapping

Sessional

HU

HU 181 (Practical) LANGUAGE LABORATORY CONTACTS: 2P
CREDIT: 1
LANGUAGELABORATORYPRACTICE

a. Honing 'Listening Skill' and its sub skills through Language Lab Audio device; 3P

b. Honing 'Speaking Skill' and its sub skills; 2P
c. Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/ Stress/ Intonation/ Pitch &Accent) of connected speech; 2P

d. Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone , Mobile phone &Role Play Mode);2P
e. Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success; 2P

f. G D Practice Sessions for helping the minternalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills)ofGD; 4P

g. Honing 'Reading Skills' and its sub skills using Visual / Graphics/Diagrams/Chart Display/Technical/Non Technical Passages;
   a. Learning Global / Contextual /Inferential Comprehension; 2P

h. Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions 2P

Total Practical Classes 17

Books Recommended:

Dr. D. Sudharani: Manual for English Language Laboratory
Pearson
Education (WB edition),2010 Board of
Editors: Contemporary Communicative
Englishfor Technical Communication
Pearson Longman, 2010

Course Outcomes:

CO-PO(PSO) Mapping

Extra CurricularActivities(NSS/NCC/NSOetc)
Code: XC181
Code Credits: 1

Prerequisites:

Course Objectives: The objectives of the course are as follows:

- To increase student awareness about the weaker and unprivileged sections ofsociety
- To expose students to environmental issues and ecological concerns
- To make students self aware about their participatory role in sustaining society and the environment

a) Creating awareness in social issues
b) Participating in mass education programmes
c) Proposal for local slum are a development
d) Waste disposal
e) Environmental awareness
f) Production Oriented Programmes
g) Relief & Rehabilitation work during Natural calamities

Creating awareness in social issues:

1. Women's development – includes health, income-generation, rights awareness.
2. Hospital activities – Eg. writing letters for patients, guiding visitors
3. Old age home – visiting the aging in-mates, arranging for their entertainment.
4. Children's Homes - visiting the young in-mates, arranging for their entertainment
5. Linking with NGOs to work on other social issues. (Eg. Children ofsex-workers)
6. Gender issues- Developing an awareness, to link it with Women's Cell of college

Participating in mass education programmes1.Adult education
2. Children's education

Proposal for local slum area development
One or two slums to be identified and according to the needs, activities to be developed and proposals and reports are to be submitted.

Environmental awareness

- Resource conservation – Awareness to be developed on water,energy,soil.
- Preservation of heritage monuments- Marches, poster campaigns
- Alternative energy consciousness amongst younger school-children.
- Plantation and beautification- Plantation of trees, their preservation and upkeep, developing NSS parks.
- Waste disposal- Proper methods of domestic waste disposal.

Production Oriented Programmes

1. Working with people and explaining and teaching improved agricultural practices
2. Rodent control land pest control practices;
3. Soil-testing, soil health care and soilcon servation;
4. Assistance in repair of agriculture machinery;
5. Work for the promotion and strengthening of cooperative societies in villages;
6. Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;

7. Popularization of small savings and
8. Assistance in procuring bank loans

Relief & Rehabilitation work during Natural calamities

g) Assisting the authorities in distribution of rations, medicine, clothes etc.;
h) Assisting the health authorities in inoculation and immunization, supply of medicine etc.;
i) Working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
j) Assisting and working with local authorities in relief and rescue operation; Collection of clothes and other materials, and sending the same to the affected areas;

Course Outcomes:

CO-PO(PSO) Mapping

Practical

Basic Science

Chemistry-1(Gr-A/Gr-B)
Code: CH191
Contacts: Credits: 2

Pre requisites: 10+2 science with chemistry

Course Objectives:

Acquiring knowledge on Standard solutions and the various reactions in homogeneous and heterogeneous medium. Understanding the basic principles of pH meter and conductivity meter for different applications and analyzing water for its various parameters. Synthesis of Polymeric materials and Nano materials.

Detailed Syllabus:

1. To Determine the alkalinity in a given water sample.
2. Red-ox titration (estimation of iron using permanganometry)
3. To determine calcium and magnesium hardness of a given water sample separately.
4. To determine the value of the rate constant for the hydrolysis of ethyl acetate catalyzed by hydrochloric acid.
5. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water)

6. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)
7. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
9. Determination of dissolved oxygen present in a given water sample.
10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)

*At least **Six** experiments must perform in a semester out of above **Ten** experiments.*

Course Outcomes:

CO-PO(PSO) Mapping

Or

Physics-1(Gr-B/Gr-A)
Code: PH191
Contacts: 3P
Credits: 2

Pre requisites: Knowledge of Physics upto 12^{th} standard.

Objectives:

Detailed Syllabus:

Group 1: Experiment from Higher Secondary knowledge of Physics

1. Determination of thermal conductivity of a good conductor by Searle's mothod.
2. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
3. Determination of dispersive power of the material of given prism.

4. Use of Carry Foster's bridge to determine unknown resistance.

Group 2: Experiments on General Properties of matter

5. Determination of Young's modulus by Flexure method and calculation of bending moment and shear force at a point on the beam.
6. Determination of modulus of rigidity by static/ dynamic method.
7. Determination of co-e ficient of viscosity by Poiseulle's capillary flow method.

Note:

I. Failure to perform each experiment mentioned in b] and c] should be compensated by *two* experiments from two different groups mentioned in the abovelist.

II. At the end of the semester report should sent to the board of studies regarding experiments, actually performed by the college, mentioned in b] andc]

III. Experiment in b] and c] can be coupled and can be parts of a single experiment.

Course Outcomes:

CO-PO(PSO) Mapping

Basic Electrical and Electronics Engineering-I

Code: ES191

Contacts: Credits: 2

Basic Electrical Engineering Laboratory-I

Pre requisites:

1. Basic Physics and applied physics.
2. Basic Mathematics.
3. Basic concept of Electric Circuit

Objective:

1. Provide knowledge for the analysis of basic electrical circuit.
2. To introduce electrical appliances, machines with their respective characteristics.

Detailed Syllabus

List of Experiments:

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
   a) Verification of Thevenin's theorem.
   b) Verification of Norton's theorems.
3. Verification of Maximum power theorem.
4. Verification of Super position theorem
5. Study of R-L-C Series circuit

6. Study of R-L-C parallel circuit

Course Outcomes:

CO-PO(PSO) Mapping

Basic Electronics Engineering Laboratory-I

Prerequisites

A basic course in electronics and Communication engineering Progresses from the fundamentals of electricity, active and passive components, basic electronics laws like Ohm's law, Ampere's law

Course objectives:

Students will become familiar with the circuit design using semiconductor diodes in Forward and Reverse bias, They will also be able to design rectifiers like half-wave, full-wave rectifiers etc. using diodes. The ability of circuit design with Bipolar Junction Transistor in CB, CE & CC configurations will be improved. The students will acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amp. Basic concepts and Circuit design with logic gates will be developed in the students. The students will be able design circuit using FET .

Detailed Syllabus:

There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled Eg: CRO, Multimeters etc will be given. Lectures on measurement techniques and error calculation will also have to beorganized.
3 hours per week must be kept, initially for practical lectures, and later for tutorials.

List of Experiments:

1. Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.
2. Familiarisation with measuring and testing equipment like CRO, Signal generators etc. Study of I-V characteristics of Junction diodes.
3. Study of I-V characteristics of Zener diodes.
4. Study of Half and Full wave rectifiers with Regulation and Ripple factors. Study of I-V characteristics of BJTs.

Course Outcomes:

CO-PO(PSO) Mapping

Engineering Drawing & Computer Graphics(Gr-A/GrB) Code: ME191
Contacts: 1L+3P
Credits: 3

A. THEORETICALPART

1. Introduction to Lines, Lettering, Dimensioning, Scales. - 1L
2. Geometrical Construction and Curves - 1L
3. Projection of Points, Lines and Surfaces - 2L
4. Projection of Solids - 2L
5. Isometric Views - 1L
6. Sectional Views - 1L
7. Development of Surfaces - 1L
8. Introduction to Computer Aided Drafting - 3L

B. PRACTICALPART

1. LINES, LETTERING, DIMENSIONING, SCALES; Plain scale, Diagonalscale.
3. 6hrs
2. GEOMETRICAL CONSTRUCTION AND CURVES; Construction of polygons, Parabola, Hyperbola,
4. Ellipse. - 6hrs
5. PROJECTION OF POINTS, LINES, SURFACES; Orthographic projection- 1st and 3rd angle projection, Projection of lines and surfaces– Hexagon. - 3hrs
6. PROJECTION OF SOLIDS; Cube, Pyramid, Prism, Cylinder, Cone. - 6hrs
7. DRAWING ISOMETRIC VIEW FROM ORTHOGONAL/ SECTIONAL VIEWS OF SIMPLE SOLID OBJECTS. - 3hrs
8. FULL AND HALF SECTIONAL VIEWS OF SOLIDS. - 3hrs
9. DEVELOPMENT OF SURFACES; Prism, Cylinder, Cone. - 3hrs
10. COMPUTER AIDED DRAFTING (Using AutoCAD and/or similar softwares); Introduction: Cartesian and Polar coordinate system, Absolute and Relative coordinates; Basic editing commands: Line, Point, Trace, Rectangle, Polygon, Circle, Arc, Ellipse, Polyline; Editing methods; Basic object selection methods,

Window and crossing window, Erase, Move, Copy, Offset, Fillet, Chamfer, Trim, Extend, Mirror; Display commands: Zoom, Pan, Redraw, Regenerate; Simple dimensioning and text,Simpleexercises.

References / Books:

- Narayana, K.L. and Kannaiah, P. Text Book of Engineering Drawing"Engineering Graphics", Scitech Publication
- Bhatt, N.D. "Elementary Engineering Drawing", Charotar Book Stall, Anand,1998
- Lakshminarayanan, V. and VaishWanar, R.S., "Engineering Graphics", Jain Brothers, New Delhi, 1998
- Chandra, A.M. and Chandra Satish, "Engineering Graphics", Narosa,1998
- Jolhe, "Engineering Graphics", Tata McGraw-Hill- WBUTSeries
- Gill, P.S., "A Text Book of Engineering Drawing", Katson Publishing House (KatariaandSons)
- Venugopal, K., "Engineering Drawing & Graphics + AutoCAD", New AgeInternational
- Ventaka Reddy K., "Text Book of Engineering Drawing (2nd Edition)", BSPublication.

Course Outcomes:

CO-PO(PSO) Mapping

Or

Workshop Practice(Gr-B/GrA)
Code: ME192
Contacts:
Contact Hours Per week: 1L+3P=4
Credits:3

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:

1. To understand the basic knowledge of Workshop Practice and Safety.
2. To identify and use of different hand tools and other instruments like Hand Saw, Jack Plane, Chisels etc and operations like such as Marking, Cutting etc used in

manufacturing processes.

3. To get hands on practice in various machining metal joining processes such as Welding, Brazing, Soldering, etc.

Detailed Syllabus:

A. THEORETICALPART

1. INTRODUCTION TO MANUFACTURING; Socio-economic role, Definition, Major grouping and Examples. -1L
2. ENGINEERING MATERIALS; Classification / Major grouping, Physical, Chemical and Mechanical properties, Applications -1L
3. DIFFERENT CONVENTIONAL MANUFACTURING PROCESSES MAINLY COVERING BASIC PRINCIPLES, DIFFERENT METHODS AND GENERAL APPLICATIONS; Manufacturing by forming

/shaping from solid (input) to solid (product); Forging, Rolling, Drawing, Extrusion; Press tool work- Bending, Shearing, Drawing and Coining. -3L

4. FORMING / SHAPING FROM LIQUID TO SOLID- CASTING; General principles, General classification or Types of casting; Sand mould casting- procedural steps and requirements; Pattern, Mould, Melting, Pouring, Solidification, Extracting and Fettling. Other casting processes (for larger volume and quality); Centrifugal casting, Investment casting,Diecasting. -3L
5. JOINING PROCESSES; Welding (Permanent Joining)- General classification and basis; Gas welding, Arc welding, Friction welding and Resistance welding, w.r.t. Principle, Requirements, Relative Advantages and Applications; Brazing and soldering.- 2L
6. REMOVAL (MACHINING) PROCESS; Principle and purpose of machining, Machining requirements, Machine tools- Definition, General classification w.r.t, functional principles and applications; Major machining parameters (and responses)- Speed, Feed and Depth of cut; Tool geometry (Rake, Clearance and Cutting angles), Cutting fluid application; Elementary machining operations- Facing, Centering, Turning, Threading, Drilling, Boring, Shaping and Milling. 2L

B. SCHEDULE OF PRACTICALCLASSES

Suggested apportionment / weigtage:

- Machining (and fitting)- 50% (6 days) 18hrs
- Casting (including pattern making molding and preparation) - 25% (3 days9hrs)
- Welding (gas, arc and resistance) (2 days 6hrs) and Sheet Metal

Working (1 day 3hr)- 25% (3 days 9hrs)

FEASIBLE TYPES / MODELS OF ASSIGNMENTS

i) FITTING (in 2 days or 6 hours); Making a gauge from MS plate as shown inFig.1.

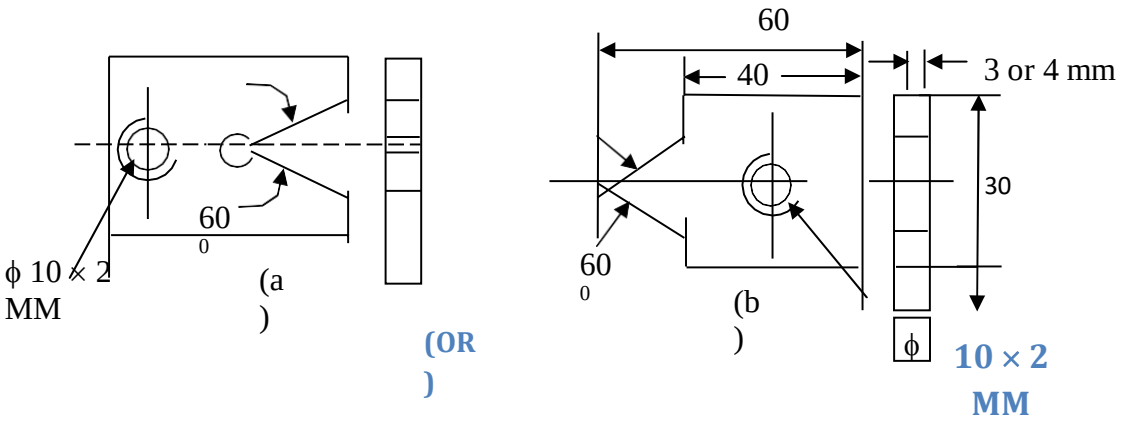

Fig.1: Job for fitting practice

Operations required:

11. Squaring and finishing of the blank byfiling
12. Making the Vee-portion by sawing andfiling
13. Drilling (in machine) and tapping (hand)

14.MACHINING (in 3 days or 9 hours); To make a pin as shown in Fig.2 from a ⍰20mm mild steel rod in alathe.

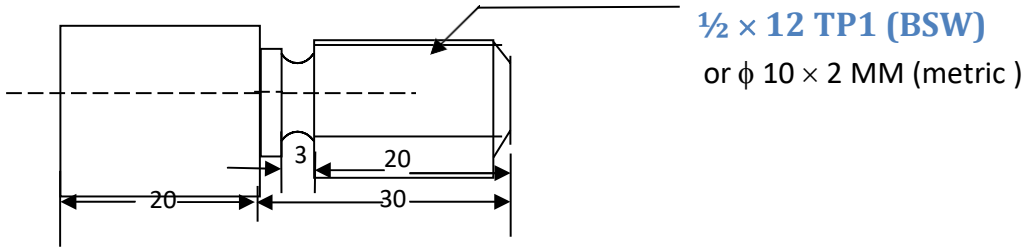

Fig.2: Job for practice on a lathe

15. MACHINING (in 1 day or 3 hours); To make a MS prism as shown in Fig.3 from a ⍰20mm mild steel rod in a shaping and / or millingmachine.

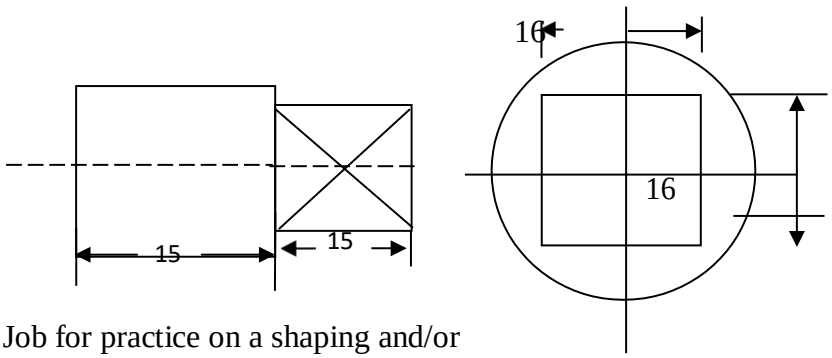

Fig.3: Job for practice on a shaping and/or milling machine

16. PATTERN MAKING, SAND MOULDING AND CASTING (in 3 classes or 9 hours); To make a wooden pattern and a sand mould with that pattern for casting a cast iron block as shown inFig.4.

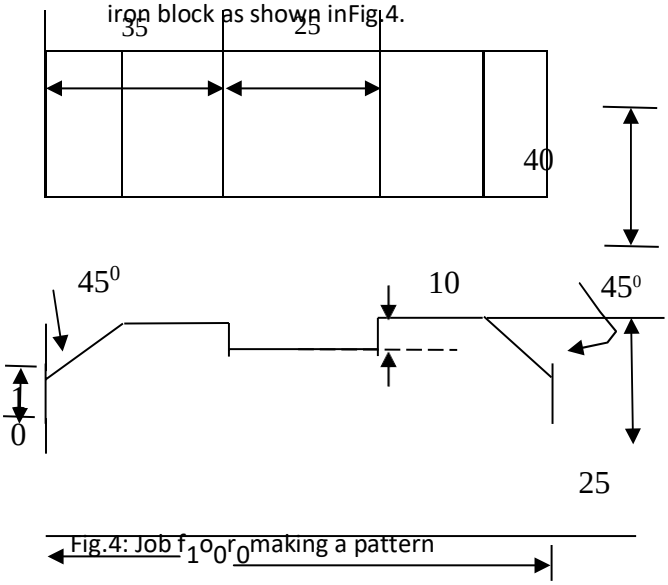

Fig.4: Job for making a pattern

17. WELDING (GAS WELDING) (in 1 class or 3 hours); To join two thin mild steel plates or sheets (1 to 3 mm thick) as shown in Fig. 5 by gas welding.

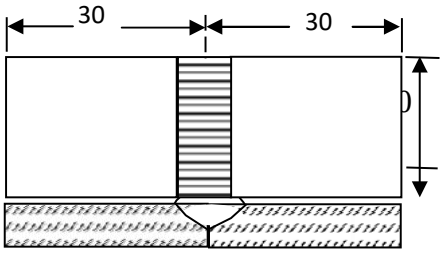

Fig.5: Welding specimen for practice

18. WELDING (ARC WELDING) (in 1 day or 3 hours); To join two thick (6mm) MS

plate as shown in Fig. 5 by arcwelding.

19. SHEET METAL WORK (in 1 day or 3 hours); Forming a cone, forexample.

Course Outcomes:

CO-PO(PSO) Mapping

End of First Semester **********************************

Second Semester

Theory

Basic Science

Basic Computation & Principles of Computer Programming
Code: CS 201
Contacts: 3L + 1T = 4 Credits: 4

Prerequisites: Numbersystem,Booleanalgebra

Objective(s)

1. To develop the programming skills of students
2. To know the principles of designing structured programs
3. To write basic C programs using
   - i) Selection statements
   - ii) Repetitive statements
   - iii) Functions
   - iv) Pointers
   - v) Arrays
   - vi) Strings

Detailed Syllabus

Fundamentals of Computer:

History of Computer, Generation of Computer, Classification of Computers 2L

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices 3L

Binary & Allied number systems representation of signed and unsigned numbers. BCD, ASII. Binary Arithmetic &logic gates 6L

Assembly language, high level language, compiler and assembler (basic concepts) 2L

Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX, Algorithm & flow chart 2L

C Fundamentals:
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements 3L

Operators & Expressions:
Arithmetic operators, relational and logical operators, type, conversion, increment and decrement operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Input and Output: Standard input and output, formatted output -- printf, formatted input scanf. 5L

Flow of Control:
Statement and blocks, if - else, switch, loops - while, for do while, break and continue, go to and labels 2L

Fundamentals and Program Structures:
Basic of functions, function types, functions returning values, functions not returning values, auto, external, static and register variables, scope rules, recursion, function prototypes, C preprocessor,
Command line arguments. 6L

Arrays and Pointers:
One dimensional arrays, pointers and functions, multidimensional arrays. 6L

Structures Union and Files:
Basic of structures, structures and functions, arrays of structures, bit fields, formatted and unformatted
files. 5L

Recommended reference Books:

Introduction To Computing (TMH WBUT Series), E. Balagurusamy,TMH
Kerninghan,B.W. The Elements of ProgrammingStyle
Yourdon,E. Techniques of Program Structures andDesign
SchiedF.S. Theory and Problems of Computers andProgramming
Gottfried Programming with C Schaum
Kerninghan B.W. &RitchieD.M. The C Programming Language
RajaramanV. Fundamental of Computers
Balaguruswamy Programming in C
KanetkarY. Let usC
M.M.Oka Computer Fundamentals,EPH
Leon Introduction toComputers,Vikas
Leon- Fundamental of Information Technology,Vikas
RamB. Computer Fundamentals, New Age International
RavichandranD.Programming in C, New Age International
XavierC. C Language & Numerical Methods, New Age Inter.
XavierC. I introduction to Computers, New Age International
RaoS.B. Numerical Methods with Programs in Basic Fortran Pascal & C++, UniversitiesPress
DuttaN. Computer Programming & Numerical Analysis, Universities Press
BhanuPratap Computer Fundamentals
Rajaram Computer Concepts & C Program, Scitech

Course Outcomes:

CO1	**Formulate** simple algorithms for arithmetic and logical problems and **design** suitable programs (in C language) for the same.

CO2	**Test** and **execute** the programs and correct syntax and logical errors.
CO3	**Use** conditional branching, iteration, recursion, arrays, pointers, structures, file and **formulate** algorithms and programs for mathematical and scientific problem.
CO4	**Understand** the concept of dynamic memory allocation and **use** it for problem solving.
CO5	**Understand** how to decompose a problem into functions and **assemble** into a complete program usingdifferent algorithm design techniques like divide and conquer.

CO-PO(PSO) Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	2	1	1	-	2	2	1	1	3	3	3
CO2	2	2	2	1	2	2	1	-	1	1	1	1	3	3	3
CO3	2	3	3	2	2	1	1	-	2	2	1	1	3	3	3
CO4	2	3	3	2	2	1	1	-	2	2	1	1	3	3	3
CO5	2	3	3	2	2	1	1	-	2	2	1	1	3	3	3

Chemistry-1(Gr-B/Gr-A) Code: CH201

Contacts: 3L + 1T = 4 Credits: 4

Or

Physics-1(Gr-A/Gr-B)
Code: PH201
Contacts: 3L + 1T = 4
Credits: 4

Mathematics Code: M201
Contacts: 3L + 1T = 4 Credits: 4

Prerequisite: Any introductory course on matrix algebra, calculus, geometry.

Objective: The purpose of this course is to provide fundamental concepts matrix algebra, Calculus of Single and Several Variables and Vector Analysis.

Detailed Syllabus

Note 1: The whole syllabus has been divided into five modules.

Note 2: UStructure of the question paperThere will be three groups in the question paper. In Group A, there will be one set of multiple choice type questions spreading the entire syllabus from which 10 questions (each carrying one mark) are to be answered. From Group B, three questions (each carrying 5 marks) are to be answered out of a set of questions covering all the three modules. Three questions (each carrying 15 marks) are to be answered from Group C. Each question of Group C will have three parts covering not more than two topics (marked in bold italics faces). Sufficient questions should to be set covering all modules.

Module I

***Ordinary differential equations (ODE)- First order and first degree*:** Exact equations, Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation. General solution of ODE of first order and higher degree (different forms with special reference toClairaut'sequation). **5L**

Module II

***ODE- Higher order and first degree*:** General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Euler equations, Solution of simultaneous linear differential equations. **6L**

Module III

Basics of Graph Theory: Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph,; Walks, Paths, Circuits, Euler Graph, Cut sets and cut vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph. **10L**

Module IV

Tree: Definition and properties, Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees, Algorithms: Dijkstra's Algorithm for shortest path

problem, Determination of minimal spanning tree using DFS, BFS, Kruskal's and Prim's algorithms. **6L**

Module V

***Improper Integral*:** Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations. **3L**

Laplace Transform (LT): Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of $\frac{f(t)}{t}$, LT of $t^n f(t)$, LT of derivatives of $f(t)$, L.T. of $\int f(u)du$. Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT**:** Definition and its properties; Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT. **10L**

Total 40 Lectures

Suggested Reference Books:

1. **Advanced Engineering Mathematics**, Erwin Kreyszig, (Wiley Eastern)
2. **Graph Theory**: V. K. Balakrishnan, (Schaum's Outline, TMH)
3. **A first course at Graph Theory**: J. Clark and D. A. Holton (Allied Publishers LTD)
4. **Introduction to Graph Theory**: D. B. West (Prentice-Hall o fIndia)
5. **Graph Theory**: N. Deo (Prentice-Hall of India)
6. **Engineering Mathematics:** B.S. Grewal (S. Chand &Co.)
7. **Higher Engineering Mathematics**: John Bird (4th Edition, 1st Indian Reprint 2006,Elsevier)
8. **Calculus**: Strauss, Bradley and Smith (3P^{rdP} edition, Pearson Education)
9. **Engineering Mathematics (Volume 2):** S. S. Sastry (Prentice-Hall of India)
10. **Advanced Engineering Mathematics, 3E**: M.C. Potter, J.L. Goldberg and E.F. Abonfadel(OUP), Indian Edition
11. **An Introduction to Differential Equations**, R.K. Ghosh and K.C.Maity (New Central Book Agency)

Course Outcomes:

CO-PO(PSO) Mapping

Engineering Science

Basic Electrical and Electronics Engineering-II
Code: ES201
Contacts: 3L + 1T = 4
Credits: 4

Basic Electrical Engineering-II

Detailed Syllabus

Electrostatics: Coulomb's law, Electric Field Intensity, Electric field due to a group of charges, continuous charge distribution, Electric flux, Flux density, Electric potential, potential difference, Gauss's law, proof of gauss's law, its applications to electric field and potential calculation, Capacitor, capacitance of parallel plate capacitor, spherical capacitor, isolated spheres, concentric conductors, parallel conductors. Energy stored inacapacitor. 5L

DC Machines: Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Speed- torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage andfieldcontrol) 6L

Single phase transformer: Core and shell type construction, EMF equation, no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation andefficiencycalculation. 4L

3 phase induction motor: Types, Construction, production of rotating field, principle of operation, equivalent circuit and phasor diagram, rating, torque-speed characteristics (qualitative only). Starter for squirrel cage and wound rotor induction motor. Brief introduction of speed control of 3 phase induction motor (voltage control, frequency control,resistancecontrol) 5L

Three phase system: Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two wattmetersmethod. 3L

General structure of electrical power system: Power generation to distribution through overhead lines and under ground cables with singlelonediagram. 1L

Text books:

1. Basic Electrical engineering, D.P Kothari &I.JNagrath, TMH, Second Edition
2. Fundamental of electrical Engineering, Rajendra Prasad, PHI, Edition2005.
3. Basic Electrical Engineering, V.N Mittle& Arvind Mittal, TMH, Second Edition
4. Basic Electrical Engineering, J.P. Tewari, New age international publication

Reference books:

1. Basic Electrical Engineering(TMH WBUT Series), Abhijit Chakrabarti &SudiptaNath,TMH
2. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education, Second Edition.
2. Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Basic Electrical Engineering, T.K. Nagsarkar& M.S. Sukhija, Oxford
4. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiah, TMH
5. Basic Electrical Engineering, J.J. Cathey &S.A Nasar, TMH, Second Edition.

Course Outcomes:

CO-PO(PSO) Mapping

Basic Electronics Engineering-II

Basic Electronics Engineering-II: 20L

Pre-requisites: Knowledge of Basic Electronics Engineering – I.

Objectives:

Detailed Syllabus

Module – 1: FieldEffectTransistors: 5L

Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles.

Module – 2: Feed Back Amplifier, Oscillators andOperationalAmplifiers:

5L+

5L = 10L Concept (Block diagram), properties, positive and negative feed back, loop gain, open loop gain, feed back factors; topologies of feed back amplifier; effect of feed back on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability; effect of positive feed back: instability and oscillation, condition of oscillation, Barkhausen criteria.

Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator.

Module – 3:DigitalElectronics: 5L

Introduction to binary number; Basic Boolean algebra; Logic gates and function realization with OPAMPs.

Recommended Books:

Text:

- Sedra& Smith: Micro electronics Engineering.
- Millman &Halkias: Integrated Electronics. References:
- Malvino: Electronic Principle.
- Schilling & Belove: Electronics Circuits.
- Millman & Grabal: Microelectronics.
- Saliva hanan: Electronics Devices &Circuits.
- Boyelstad & Nashelsky: Electronic Devices & Circuit Theory.

Course Outcomes:

1. Students will be able to distinguish the different Gate isolation techniques; draw and explain the I-V characteristics of FETs; Appreciate the utility of CMOS.

2. Student will analyze the different OPAMP circuits and apply the knowledge of network theory to OPAMP circuits.

3. Student must acquire the proficiency to express binary numbers, convert binary to decimal and vice versa, draw truth tables for different logic operations, design Gates and simple digital circuits using the Gates.

CO-PO(PSO) Mapping

Engineering Thermodynamics & Fluid Mechanics Code: ME201
Contacts: 3L + 1T = 4
Credits: 4

Detailed Syllabus

Module1 :8L+3T

Basic Concepts of Thermodynamics
Introduction: Microscopic and Macroscopic viewpoints Definition of Thermodynamic systems: closed, open and isolated systems Concept of Thermodynamics state; state postulate.

Definition of properties: intensive, extensive & specific properties. Thermodynamic equilibrium Thermodynamic processes; quasi-static, reversible & irreversible processes; Thermodynamic cycles. Zeroth law of thermodynamics. Concept of empirical temperature.

Heat and Work
Definition & units of thermodynamic work.
Examples of different forms of thermodynamic works; example of electricity flow as work. Work done during expansion of a compressible simple system
Definition of Heat; unit of Heat
Similarities & Dissimilarities between Heat & Work

Ideal Equation of State, processes; Real Gas
Definition of Ideal Gas; Ideal Gas Equations of State.
Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytropic processes.
Equations of State of Real Gases: Van der Waal's equation; Virial equation of state.

Properties of Pure Substances
p-v & P-T diagrams of pure substance like H_2O
Introduction to steam table with respect to steam generation process; definition of saturation, wet & superheated status.
Definition of dryness fraction of steam, degree of superheat of steam.

Module2 : 4L+3T

1st Law of Thermodynamics
Definition of Stored Energy & Internal Energy 1st Law of Thermodynamics for cyclic processes Non Flow Energy Equation
Flow Energy & Definition of Enthalpy
Conditions for Steady State Steady flow: Steady State Steady Flow Energy Equation

Module3 : 6L+3T

2nd Law of Thermodynamics
Definition of Sink, Source Reservoir of Heat. Heat Engine, heat Pump & Refrigerator; Thermal efficiency of Heat Engines & co-efficient of performance of Refrigerators
Kelvin – Planck & Clausius statements of 2nd Law of Thermodynamics Absolute or Thermodynamic scale of temperature
Clausius Integral Entropy

Entropy change calculation for ideal gas processes. Carnot Cycle & Carnot efficiency
PMM-2; definition & its impossibility

Module4: 6L+3T

Air standard Cycles for IC engines
Otto cycle; plot on P-V, T-S planes; Thermal efficiency Diesel cycle; plot on P-V, T-S planes; Thermal efficiency

Rankine cycle of steam
h-s chart of steam (Mollier's Chart)
Simple Rankine cycle plot on P-V, T-S, h-s planes Rankine cycle efficiency with & without pump work
(Problems are to solved for each module)

Module5: 9L+3T

Properties & Classification of Fluids
Ideal & Real fluids

Newton's law of viscosity; Newtonian and Non-Newtonian fluids
Compressible and Incompressible fluids

Fluid Statics
Pressure at a point

Measurement of Fluid Pressure
Manometers : simple & differential U-tube

Inclined tube

Fluid Kinematics
Stream line
laminar & turbulent flow
external & internal flow
Continuity equation

Dynamics of ideal fluids
Bernoulli's equation
Total head; Velocity head; Pressure head Application of Bernoulli's equation

Measurement of Flow rate : Basic principles
Venturimeter
Pilot tube
Orifice meter

33L+15T =48P

(Problems are to be solved for each module)

Engineering Thermodynamics

Text:
1 Engineering Thermodynamics - P K Nag, 4th edn,TMH.

References:
1 "Fundamentals of Thermodynamics" 6e by Sonntag & Van Wylin published by WileyIndia.

2 Engineering Thermodynamics – Russel &Adeliyi (Indian edition), OUP
3 Engineering Thermodynamics – Onkar Singhh, New Age International PublishersLtd.
4 Basic Engineering Thermodynamics – R Joel, 5th Ed.,Pearson

Fluid Mechanics

Text:

1 Fluid Mechanics and Hydraulic Machines - R K BansalReferences:

1 Introduction to Fluid Mechanics and Fluid Machines - S.K.Som and G.Biswas. 2nd edn,TMH

2 Fluid Mechanics byA.K.Jain.

Course Outcomes:

CO-PO(PSO) Mapping

Practical

Basic Science

Basic Computation & Principles of Computer Programming Lab Code: CS 291
Contacts: Credits: 2

Prerequisites: Basic Computer Knowledge

Objective(s):

1. To develop an understanding of the design, implementation, and compilation of a C program
2. To gain the knowledge about pointers, a fundamental for understanding data structure issues
3. To understand the usage of user defined data type for applicationdevelopment

Detailed Syllabus

Exercises should include but not limited to:

1. DOS System commands and Editors (Preliminaries)
2. UNIX system commands and vi (Preliminaries)
3. Simple Programs: simple and compound interest. To check whether a given number is a palindrome or not, evaluate summation series, factorial of a number , generate Pascal's triangle, find roots of a quadratic equation
4. Programs to demonstrate control structure : text processing, use of break and continue, etc.
5. Programs involving functions and recursion
6. Programs involving the use of arrays with subscripts and pointers
7. Programs using structures and files.

Course Outcomes:

CO1	**Formulate** the algorithms for simple problems and **translate** the algorithms to a working and correct program.
CO2	**Identify** and **solve** the syntax errors as reported by the compilers and also the logical errors encountered at run time.

CO3	**Design** and **develop** iterative as well as recursive programs.
CO4	**Interpret** and **organize** data in arrays, strings and structures and manipulate them through a program.
CO5	**Define** pointers of different types and **use** them in defining self-referential structures and also to **construct** and **use** files for reading and writing to and from.

CO-PO(PSO) Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	3	2	2	1	1	-	2	2	1	1	3	3	3
CO2	2	2	2	1	2	2	1	-	1	1	1	1	3	3	3
CO3	2	3	3	2	2	1	1	-	2	2	1	1	3	3	3
CO4	2	3	3	2	2	1	1	-	2	2	1	1	3	3	3
CO5	2	3	3	2	2	1	1	-	2	2	1	1	3	3	3

Chemistry-1(Gr-B/Gr-A)
Code: CH291
Contacts:
Credits:2

Or

Physics-1(Gr-A/Gr-B)
Code: PH291 Contacts:
Credits: 2

Engineering Science

Basic Electrical and Electronics Engineering-II
Code: ES291
Contacts:
Credits: 2

Basic Electrical Engineering Laboratory-II

Pre requisites:

1. Basic Physics and applied physics.
2. Basic Mathematics.
3. Basic concept of Electric Circuit

Course Objective:

1. Provide knowledge for the analysis of basic electrical circuit.
2. To introduce electrical appliances, machines with their respective characteristics.

Detailed Syllabus

List of Experiments:
1. Calibration of ammeter and voltmeter.
2. Open circuit and Short circuit test of a single phase Transformer.
3. No load characteristics of D.C shunt Generators
4. Starting and reversing of speed of a D.C. shunt
5. Speed control of DC shunt motor.
6. Measurement of power in a three phase circuit by two wattmeter method.

Basic Electronics Engineering Laboratory-II

Prerequisites: A basic course in electronics and Communication engineering Progresses from the fundamentals of electricity, active and passive components, basic electronics laws like Ohm's law, Ampere's law

Objectives: Students will become familiar with the circuit design using semiconductor diodes in Forward and Reverse bias, They will also be able to design rectifiers like half-wave, full-wave rectifiers etc. using diodes. The ability of circuit design with Bipolar Junction Transistor in CB, CE & CC configurations will be improved. The students will acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amp. Basic concepts and Circuit design with logic gates will be developed in the students. The students will be able design circuit using FET .

Detailed Syllabus

There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled will be given. 3 hours per week must be kept, initially for practical lectures, and later fortutorials.

List of Experiments:

1. Study of I-V characteristics of Field EffectTransistors.
2. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
3. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null ofOPAMPs.
4. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.
5. Study of Logic Gates and realization of Boolean functions using LogicGates.
6. Study of Characteristic curves for CB, CE and CC modetransistors.

Engineering Drawing & Computer Graphics(Gr-B/Gr-A)
Code: ME291
Contacts:
Credits: 3

Or

Workshop Practice(Gr-A/Gr-B) Code: ME292

Contacts: Credits: 3

Course Outcomes:

CO-PO(PSO) Mapping

3rd Semester

Theory

VALUES & ETHICS IN PROFESSION

HU-301
Contracts:3L
Credits- 3

Pre requisites: Basic knowledge of management, basics of communication, Knowledge about environment science

Course Objective: To create awareness on professional ethics and Human Values

Detailed Syllabus:

Science, Technology and Engineering as knowledge and as Social and Professional Activities

Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development

Energy Crisis: Renewable Energy Resources

Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics

Appropriate Technology Movement of Schumacher; later developments

Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis. Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Profession and Human Values:

Values Crisis in contemporary society

Nature of values: Value Spectrum of a good life Psychological values: Integrated personality; mental health

Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.

Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity

Moral and ethical values: Nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta1996.

Course Outcomes:

CO-PO(PSO) Mapping

Physics 2
Code: PH-301
Contacts: 4L Credit: 3+1

Prerequisites:

Knowledge of Physics up B.Tech 1st year Physics-I course

Objective(s)

The Physics-II course will provide

- exposure to the physics of materials that are applied in digital circuitry, storage devices.
- exposure to the physics of quantum logic gate operation and quantum computation
- an insight into the science & technology of next generation.
- foundations of electromagnetic theory and communication systems
- concept of fundamental particles and associated applications in semiconductors

Detailed Syllabus:

Module 1:

Vector Calculus:

1.1 Physical significances of grad, div, curl. Line integral, surface integral, volume integral- physical examples in the context of electricity and magnetism and statements of Stokes theorem and Gauss theorem [No Proof]. Expression of grad, div, curl and Laplacian in Spherical and Cylindrical co-ordinates. 2L

Module 2 :

Electricity

Coulumbs law in vector form. Electrostatic field and its curl. Gauss's law in integral form and conversion to differential form . Electrostatic potential and field, Poisson's Eqn. Laplace's eqn (Application to Cartesian, Spherically and Cylindrically symmetric systems – effective 1D problems) Electric current, drift velocity, current density, continuity equation, steadycurrent. 5L

Dielectrics-concept of polarization, the relation $D=\varepsilon_0 E+P$, Polarizability. Electronic polarization and

polarization in monoatomic and polyatomic gases. 3L

Module 3:

Magnetostatics & Time Varying Field:

3. Lorentz force, force on a small current element placed in a magnetic field. Biot-Savart law and its applications, divergence of magnetic field, vector potential, Ampere's law in integral form and conversion to differential form. Faraday's law of electro-magnetic induction in integral form and conversion to differential form. 3L

Module 4:

Electromagnetic Theory:

4.1 Concept of displacement current Maxwell's field equations, Maxwell's wave equation and its solution for free space. E.M. wave in a charge free conducting media, Skin depth, physical significance of Skin Depth, E.M. energy flow, & Poynting Vector.

6L

Module 5:

Quantum Mechanics: Generalized coordinates, Lagrange's Equation of motion and Lagrangian, generalized force potential, momenta and energy.Hamilton's Equation of motion and Hamiltonian. Properties of Hamilton and Hamilton's equation of motion.

4L

Course should be discussed along with physical problems of 1-D motion

Concept of probability and probability density, operators, commutator. Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Physical interpretation of wave function ψ (normalization and probability interpretation), Expectation values, Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well), Discussion on degenerate levels.

9L

Module 6:

Statistical Mechanics:

Concept of energy levels and energy states. Microstates, macro states and thermodynamic probability, equilibrium macro state. MB, FD, BE statistics (No deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics Fermi distribution at zero & non-zero temperature, Calculation of Fermi level in metals, also total energy at absolute zero of temperature and total number of particles, Bose-Einstein statistics – Planck's law of black body radiation.. 7L

Course Outcomes:

CO-PO(PSO) Mapping

Basic Environmental Engineering & Elementary Biology
Code: CH301
Contacts: 3L = 3
Credits: 3

Pre requisites: 10+2 science with chemistry

Objective(s)

- Be able to understand the natural environment and its relationships with human activities.
- Be able to apply the fundamental knowledge of science and engineering to assess environmental and health risk.
- Be able to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues.
- Be able to solve scientific problem-solving related to air, water, noise & land pollution.

Detailed Syllabus

General Basic ideas of environment, basic concepts, man, society & environment, their interrelationship.

1L

Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development.

2L

Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. 1L

Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering. 2L

Ecology

Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. 1L

Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundarban); Food chain [definition and one example of each food chain],Food web. 2L

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. 1L

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity. 2L

Air pollution and control

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. 1L

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as a lbedo],Problems. 1L

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget. 1L

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). 2L

Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. 2L

Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. 2L

Smog, Photochemical smog and London smog.

Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification. 1L

Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference). 1L

Water Pollution and Control

Hydrosphere, Hydrological cycle and Natural water.

Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. 2L

River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[de oxygenation, re aeration], COD, Oil, Greases, pH. 2L

Lake: Eutrophication [Definition, source and effect]. 1L Ground water: Aquifers, hydraulic gradient, ground water flow(Definition only) 1L Standard and control: Waste water standard [BOD, COD, Oil, Grease],

Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening]

Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition.

2L

Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic

1L

Land Pollution

Lithosphere; Internal structure of earth, rock and soil 1L

Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling.

Solid waste management and control (hazardous and biomedical waste). 2L

Noise Pollution

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbor hood noise] 1L

Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level,
L_{10} (18 hr Index) , Ld_n .

Noise pollution control. 1L

Environmental Management:

Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/agreement/protocol. 2L

References/Books

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., "Environmental Chemistry", New Age International.

Course Outcomes:

CO-PO(PSO) Mapping

Analog & Digital Electronics
Code: CS301
Contact: 3L
Cr: 3

Objectives:

Pre-requisite of Analog Electronics: Basic Electronics Parts I & II learned in the First year, semesters 1 & 2. Basic concept of the working of P-N diodes, Schottky diodes, Basic BJTs, Basic FETs and OPAMP as a basic circuit component. Concept of Feedback.

Detailed Syllabus:

Module -1: [9L]

Different Classes of Amplifiers - (Class-A, B, AB and C - basic concepts, power, efficiency [2L]; Recapitulation of basic concepts of Feedback and Oscillation [1L], Phase Shift, Wein Bridge oscillators[2L].
(5L)

Astable & Monostable Multi vibrators [1L]; Schimtt Trigger circuits [1L], 555 Timer[2L].
(4L)

[***Learning Outcome***: The learner will be trained to compare the merits and demerits of the different amplifiers and must be able to bias the transistors accordingly; the student must be able to design multi vibrator circuits using 555 timers]

Pre-requisite of Digital Electronics: Binary numbers & Basic Boolean algebra – already covered in First year; Logic gates, Truth Tables and function realization – already covered in First year up to minimisation of Logic expressions by algebraic method, K-map,

Module – 2: [11 L]

a) Binary Number System & Boolean Algebra (recapitulation) [1L]; BCD, ASCII, EBDIC, Gray codes and their conversions [1L]; Signed binary number representation with 1's and 2's complement methods [1L], Binary arithmetic, Venn diagram, Boolean algebra (recapitulation) [1L]; Representation in SOP and POS forms [1L]; Minimization of logic expressions by algebraic method.[2L] (7L)
b) Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor) [2L]; Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator[2L]. (4L)

Module-3: [10L]

1. Sequential Circuits - Basic Flip-flop & Latch [1L], Flip-flops -SR, JK, D, T and JK Master-

slave Flip Flops [3L], (4L)

2. Registers (SISO,SIPO,PIPO,PISO) [2L], Ring counter, Johnson counter [1L], Basic concept of Synchronous and Asynchronous counters (detail design of circuits excluded), [2L], Design of Mod N Counter[2L]
(6L)

Module– 4: [6L]

1. A/D and D/A conversion techniques – Basic concepts (D/A :R-2-R only [2L] A/D: successive approximation[2L]) (4L)
2. Logic families- TTL, ECL, MOS and CMOS –basic concepts. (2L)

[***Learning Outcome***: The student must be able to convert from one number system to another, work out problems related to Boolean algebra, minimization problems etc. The student must also learn to differentiate between the combinational and sequential circuits and design simple circuits)

Total: 36 hours

Textbooks:

Microelectronics Engineering - Sedra& Smith-Oxford.

Principles of Electronic Devices & circuits—B L Thereja & Sedha—S Chand Digital Electronics – Kharate – Oxford

Digital Electronics – Logic & Systems by J.Bigmell & R.Donovan;
Cambridge Learning. Digital Logic and State Machine Design (3rd Edition)
– D.J.Comer, OUP

Reference:

Electronic Devices & Circuit Theory – Boyelstad & Nashelsky - PHI Bell-Linear IC & OP AMP—Oxford

P. Raja- Digital Electronics- Scitech Publications Morries Mano- Digital Logic Design- PHI

R. P. Jain—Modern Digital Electronics, 2/e , Mc Graw Hill

H.Taub & D.Shilling, Digital Integrated Electronics- Mc Graw Hill. D. Ray Chaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers Tocci, Widmer, Moss- Digital Systems,9/e- Pearson

ignell & R.Donovan-Digital Electronics-5/e- Cenage Learning. Leach & Malvino—Digital Principles & Application, 5/e, Mc GrawHill Floyed& Jain- Digital Fundamentals-Pearson.

Course Outcomes:

CO-PO(PSO) Mapping

Data Structure & Algorithm
Code: CS302
Contacts: 3L +1T
Credits: 4

Pre-requisites: CS 201 (Basic Computation and Principles of C), M101 & M201 (Mathematics), basics of set theory

Objective(s)

- To learn the basics of abstract datatypes.
- To learn the principles of linear and nonlinear data structures.
- To build an application using sorting and searching.

Detailed Syllabus:

Module -I. [8L] Linear Data Structure
Introduction (2L):

Why we need data structure?

Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code.

Algorithm efficiency and analysis, time and space analysis of algorithms – order notations.

Array (2L):

Different representations – row major, column major.

Sparse matrix - its implementation and usage. Array representation of polynomials.

Linked List (4L):

Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.

Module -II: [7L] Linear Data Structure [Stack and Queue (5L):

Stack and its implementations (using array, using linked list), applications.

Queue, circular queue, dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications.

Recursion (2L):

Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.

Module -III. [15L] Nonlinear Data structures Trees (9L):

Basic terminologies, forest, tree representation (using array, using linked list).

Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree.

Binary search tree- operations (creation, insertion, deletion, searching).

Height balanced binary tree – AVL tree (insertion, deletion with examples only). B- Trees – operations (insertion, deletion with examples only).

Graphs (6L):

Graph definitions and concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cut- vertex/articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path,isomorphism).

Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list.

Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge),applications.

Minimal spanning tree – Prim's algorithm (basic idea of greedy methods).

Module - IV. Searching, Sorting (10L):

Sorting Algorithms (5L): Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort.

Searching (2L): Sequential search, binary search, interpolation search.

Hashing (3L): Hashing functions, collision resolution techniques.

Recommended books:

1. "Data Structures And Program Design In C", 2/E by Robert L. Kruse, Bruce P.Leung.
2. "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed.
3. "Data Structures in C" by Aaron M.Tenenbaum.
4. **"**Data Structures" by S.Lipschutz.
5. "Data Structures Using C" by Reema Thareja.
6. "Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.
7. **"**Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, CliffordStein.

Learning outcome:

Ideally this course should act as a primer/pre-requisite for CS 503 (Design and Analysis of Algorithms). On completion of this course, students are expected to be capable of understanding the data structures, their advantages and drawbacks, how to implement them in C, how their drawbacks can be overcome and what the applications are and where they can be used. Students should be able to learn about the data structures/ methods/algorithms mentioned in the course with a comparative perspective so as to make use of the most appropriate data structure/ method/algorithm in a programto enhance the efficiency (i.e. reduce the run-time) or for better memory utilization, based on the priority of the implementation. Detailed time analysis of the graph algorithms and sorting methods are expected to be covered in CS 503 but it is expected that the students will be able to understand at least the efficiency aspects of the graph and sorting algorithms covered in this course. The students should be able to convert an inefficient program into an efficient one using the knowledge gathered from this course.

Course Outcomes:

CO1	**Differentiate** how the choices of data structure & algorithmic method simpact the performance of program.
CO2	**Solve** problems based upon different data structure & also write programs.
CO3	**Identify** appropriate data structure & algorithmic methods in solving problem.
CO4	**Discuss** the computational efficiency of the principal algorithms for sorting, searching, and hashing.
CO5	**Compare** and **contrast** the benefits of dynamic and static data structure simplementations.

CO-PO(PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	2	−	1	1	1	1	3	3	3
CO2	3	3	3	2	3	3	2	−	1	1	1	1	3	3	3
CO3	3	3	3	2	3	3	2	−	1	1	1	1	3	3	3
CO4	3	3	3	2	3	3	2	−	1	1	1	1	3	3	3
CO5	3	3	3	2	3	3	2	−	1	1	1	1	3	3	3

Computer organization
Code: CS303
Contacts: 3L +1T
Credits: 4

Prerequisites:

1. Computer Fundamentals and principal of computerprogramming
2. Basic Electronics Engineering

Course Objective(s)

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.
- To know how Computer Systems work & its basic principles,
- To know how I/O devices are being accessed and its principles etc

Module – 1: [8L]

Basic organization of the stored program computer and operation sequence for execution of a program. Role of operating systems and compiler/assembler. Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes. [7L]

Commonly used number systems. Fixed and floating point representation of numbers. [1L]

Module – 2: [8L]

Overflow and underflow. Design of adders - ripple carry and carry look ahead principles. [3L]

Design of ALU. [1L]

Fixed point multiplication -Booth's algorithm. [1L]

Fixed point division - Restoring and non-restoring algorithms. [2L] Floating point - IEEE754standard. [1L]

Module – 3: [10L]

Memory unit design with special emphasis on implementation of CPU-memory interfacing. [2L]
Memory organization, static and dynamic memory, memory hierarchy, associative memory. [3L]Cache memory, Virtual memory. Data path design for read/write access. [5L]

Module – 4: [10L]

Design of control unit - hardwired and microprogrammed control. [3L] Introduction to instruction pipelining. [2L]

Introduction to RISC architectures. RISC vs CISC architectures. [2L]

I/O operations - Concept of handshaking, Polled I/O, interrupt and DMA. [3L]

Learning Outcome:

Additional Tutorial Hours will be planned to meet the following learning outcome.

Through this course, the students will be exposed to extensive development and use of computer organization based concepts for the future knowledge outcome of Advanced Computer Architecture offered in subsequent semester. The students will be able to understand different instruction formats, instruction sets, I/O mechanism. Hardware details, memory technology, interfacing between the CPU and peripherals will be transparent to the students. Students will be able to design hypothetical arithmetic logic unit.

Course Outcomes:

CS303.1	Demonstratethe working principles of the logic gates, combinational and sequential circuits as well as different components of a digital computer.
CS303.2	Solve the problem related to number system conversion, minimization techniques and their application in digital design.
CS303.3	Analyze, design and implement combinational and sequential circuits for solving real world problems.
CS303.4	Evaluate the performance of different algorithms for floating point representation, Booth's multiplication algorithm and division algorithm as well as stored program concept, addressing mode, instruction format.
CS303.5	Compare and contrast different methods for computer I/O.

Text Book:

1. Mano, M.M., "Computer System Architecture",PHI.
2. BehroozParhami " Computer Architecture", Oxford UniversityPress

Reference Book:

1. Hayes J. P., "Computer Architecture &Organisation", McGrawHill,
2. Hamacher, "Computer Organisation", McGrawHill,
3. N. senthil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers" OUP
4. Chaudhuri P. Pal, "Computer Organisation& Design",PHI,
5. P N Basu- "Computer Organization & Architecture" , VikasPub

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS301.1	2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CS301.2	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS301.3	3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CS301.4	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS301.5	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CS301	2.8	2.8	2.6	2.4	-	-	-	-	-	-	-	-	-	-	-

Practical

Physics Lab-2
Code: PH-391
Contacts: (3P)
Credit: (2)

Prerequisites: Knowledge of Physics up B. Tech 1st year Physics-I course

Course Objective(s)

The Physics-II course will provide

- exposure to the physics of materials that are applied in digital circuitry, storage devices.
- exposure to the physics of quantum logic gate operation and quantum computation
- an insight into the science & technology of next generation.
- foundations of electromagnetic theory and communication systems
- concept of fundamental particles and associated applications in semiconductors

Detailed Syllabus:

Group 1: Experiments on Electricity and Mangentism

1. Determination of dielectric constant of a given dielectric material.
2. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
3. Determination of the thermo-electric power at a certain temperature of the given the rmo couple.
4. Determination of specific charge (e/m) of electron by J.J. Thomson's method. Group 2: Quantum Physics
5. Determination of Planck's constant using photocell.
6. Determination of Lande'g factor using Electron spin resonancespetrometer.
7. Determination of Stefan's radiation constant
8. Verification of Bohr's atomic orbital theory through Frank-Hertzexperiment.
9. Determination of Rydberg constant by studying Hydrogen/ Heliumspectrum Group 3: Modern Physics
10. Determination of Hall co-efficient of semiconductors.
11. Determination of band gap of semiconductors.
12. To study current-voltage characteristics, load response, areal characteristics and

spectral response of photo voltaic solar cells.

a) A candidate is required to perform 3 experiments taking one from each group. Initiative should be taken so that most of the Experiments are covered in a college in the distribution mentioned above. Emphasis should be given on the estimation of error in the datataken.

b) In addition a student should perform one more experiments where he/she will have to transduce the output of any of the above experiments or the experiment mentioned in c] into electrical voltage and collect the data in a computer using phoenix or similar interface.

c) Innovative experiment: One more experiment designed by the student or the concerned teacher orboth.

Note:

Failure to perform each experiment mentioned in b] and c] should be compensated by two experiments mentioned in the above list.

At the end of the semester report should sent to the board of studies regarding experiments, actually performed by the college, mentioned in b] and c]

Experiment in b] and c] can be coupled and parts of a single experiment.

Recommended Text Books and Reference Books:

For Both Physics I and II

1. Dutta Roy (Basic Physics)
2. R.K. Kar (Engineering Physics)
3. Mani and Meheta (Modern Physics)
4. Arthur Baiser (Perspective & Concept of Modern Physics)
5. Physics I (PH101/201) Vibration and Waves Kingsler and Frey
6. D.P. Roy chaudhury
7. N.K. Bajaj (Waves and Oscillations)
8. K. Bhattacharya
9. R.P. Singh (Physics of Oscillations and Waves)
10. A.B. Gupta (College Physics Vol.II)
11. Chattopadhya and Rakshit (Vibration, Waves and Acoustics)

Optics

1. Möler (Physical Optics)
2. A.K. Ghatak
3. Hecht (Optics)
4. Hecht (Schaum Series)
5. F.A. Jenkins and H.E. White

6. Chita Ranjan Dasgupta (Degree Physics Vol 3)
7. Quantum Physics Eisberg and Resnick
8. A.K. Ghatak and S. Lokenathan
9. S.N. Ghoshal (Introductory Quantum Mechanics)
10. E.E. Anderson (Modern Physics)
11. Haliday, Resnick and Crane (Physics vol.III)
12. Binayak Dutta Roy [Elements of Quantum Mechanics]

Crystallography

1. S.O. Pillai (a. Solid state physics b. Problem in Solid statephysics)
2. A.J. Dekker
3. Aschroft and Mermin
4. AliOmar
5. R.L. Singhal
6. Jak Tareen and TrnKutty (Basic course inCrystallography

Laser and Holography

A.K. Ghatak and
Thyagarajan (Laser)
Tarasov (Laser)

P.K. Chakraborty (Optics)

B. Ghosh and K.G. Majumder (Optics)

B.B. Laud (Laser and Non-linear Optics) Bhattacharyya [Engineering Physics] Oxford

Physics II(PH 301)

Classical Mechanics (For Module 5.1 in PH 301)

H. Goldstein

A.K. Roychaudhuri

R.G. Takwal and P.S. Puranik Rana and Joag

M. Speigel (Schaum Series)

J.C. Upadhya (Mechanics)

Electricity and Magnetism Reitz, Milford and Christy David J. Griffith

D. Chattopadhyay and P.C. RakshitShadowitz (The Electromagnetic Field)

Quantum Mechanics Eisberg and Resnick

A.K. Ghatak and S. Lokenathan

S.N. Ghoshal (Introductory Quantum Mechanics)

E.E. Anderson (Modern Physics)

Haliday, Resnick and Crane (Physics vol.III)

Binayak Dutta Roy [Elements of Quantum Mechanics]

Statistical Mechanics

Sears and Sallinger (Kinetic Theory,Thermodynamicsand StatisticalThermodynamics) Mondal (StatisticalPhysics)

S.N. Ghoshal (Atomic and Nuclear Physics) Singh and Singh

B.B. Laud (Statistical Mechanics)

F. Reif (Statistical Mechanics)

Dilectrics

Bhattacharyya [Engineering Physics] Oxford

Course Outcomes:

CO-PO(PSO) Mapping

Analog & Digital Electronics
Code: S391
Contact: 3
Cr: 2

Prerequisites:

Objectives:

Detailed Syllabus:

ANALOG: At least any two of the following

1. Design a Class Aamplifier
2. Design a Phase-Shift Oscillator
3. Design of a Schmitt Trigger using 555timer.

DIGITAL : At least any five of the following

1. Design a Full Adder using basic gates and verify its output / Design a Full Subtractor circuit using basic gates and verify its output.
2. Construction of simple Decoder & Multiplexer circuits using logic gates.
3. Realization of RS / JK / D flip flops using logic gates.
4. Design of Shift Register using J-K / D FlipFlop.
5. Realization of Synchronous Up/Down counter.
6. Design of MOD- NCounter
7. Study of DAC.

Any one experiment specially designed by the college.

(Detailed instructions for Laboratory Manual to follow for further guidance. The details will be uploaded in the website from time to time)

Course Outcomes:

CO-PO(PSO) Mapping

Data Structure & Algorithm
Code: CS392
Contacts:3
Credits: 2

Perquisites: Computer Fundamentals and principal ofcomputer programming Lab

Objectives:

- To write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.
- To write and execute write programs in C to implement various sorting and searching methods.

Detailed Syllabus:

Experiments should include but not limited to :Implementation of array operations:

Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem : Evaluation of expressions operations on Multiple stacks & queues : Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists:
Polynomial addition, Polynomial multiplication Sparse Matrices : Multiplication, addition. Recursive and Nonrecursive traversal of Trees

Threaded binary tree traversal. AVL tree implementation

Application of Trees. Application of sorting and searching algorithms

Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

(Detailed instructions for Laboratory Manual to follow for further guidance. The details will be uploaded in the website from time to time)

CourseOutcomes:

On completion of the course students will be able to

CO1	**Choose** appropriate data structure and **apply** itto solve specific problem in hand.
CO2	**Solve** problems based upon different data structure & also write programs.
CO3	**Differentiate** how the choices of data structure & algorithmic methods impact the performance of program.
CO4	**Discuss** the computational efficiency of the principal algorithms for sorting, searching, and hashing.
CO5	**Compare** and **contrast** the benefits of dynamic and static data structures and **use** it in problem solving.

CO-PO(PSO) Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	2	–	1	1	1	1	3	3	3
CO2	3	3	3	2	3	3	2	–	1	1	1	1	3	3	3
CO3	3	3	3	2	3	3	2	–	1	1	1	1	3	3	3
CO4	3	3	3	2	3	3	2	–	1	1	1	1	3	3	3
CO5	3	3	3	2	3	3	2	–	1	1	1	1	3	3	3

Computer organization
Code: CS393
Contacts:3
Credits: 2

Prerequisite: Basic concepts of Logic gates, Truth Tables, function realization –minimization of Logic expressions by K-map, Concept of basic components of a digital computer, Binary Arithmetic

Course objectives:

This subject will act as prerequisite for computer architecture. The aims of this lab are to make students familiar with the principles of combinational and sequential digital logic design and optimization at a gate level and designing various circuits with ICs.

Detailed Syllabus:

a) Familiarity with IC-chips, e.g.Multiplexer , b) Decoder, c) Encoder b) Comparator Truth Table verification and clarification fromData-book.

1. Design an Adder/Subtractor composite unit.
2. Design a BCDadder.
3. Design of a 'Carry-Look-Ahead' Addercircuit.
4. Use a multiplexer unit to design a composite ALU.
5. Use ALU chip for multibit arithmetic operation.
6. Implement read write operation using RAMIC.
7. (a) & (b) Cascade two RAM ICs for vertical and horizontal expansion.

(Detailed instructions for Laboratory Manual to follow for further guidance. The details will be uploaded in the website from time to time)

Course Outcomes:

CS393.1	Comprehend the working principles of the logic gates, combinational and sequential circuits as well as different components of a digital computer.
CS393.2	Demonstrate and realize the basic logic gate operations.
CS393.3	Design and compare different combinational circuits- adder, subtractor, multiplexer, De-multiplexer, decoder, encoder, Comparator.
CS393.4	Analyze and implement sequential circuits - flip flops, register, counter.
CS393.5	Construct ALU and RAM circuits and evaluate their performance for solving real world problems.

CO-PO(PSO) Mapping:

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS391.1	2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CS391.2	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS391.3	3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CS391.4	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS391.5	3	2	2	2		-	-	-	-	-	-	-	-	-	-
CS391	2.8	2.8	2.6	2.4	-	-	-	-	-	-	-	-	-	-	-

SEMESTER - IV

NUMERICAL METHODS
Code: M (CS) 401
Contacts: 2L+1T
Credits: 2

Prerequisite: Concept of Calculusand Algebra.

Course Objective

The purpose of this course is to provide basic understanding of the derivation and the use of the numerical methods along with the knowledge of finite precision arithmetic and fundamental concepts of Statistics.

Detailed Syllabus

Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.(3L)
Numerical solution of a system of linear equations:
Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.(6L)
Numerical solution of Algebraic equation:
Bisection method, Regula-Falsi method, Newton-Raphson method. (4L)
Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector
methods and Finite Difference method. (6L)

Text Books:

1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B. Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution). References:
5. Balagurusamy: Numerical Methods, Scitech.
6. Baburam: Numerical Methods, Pearson Education.
7. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
8. Soumen Guha & Rajesh Srivastava: Numerical Methods,OUP.
9. Srimanta Pal: Numerical Methods, OUP.

Course Outcomes:

CO-PO(PSO) Mapping

Subject Name: MATHEMATICS

Code: M401

Contacts: 3L +1T = 4 Credits: 4

Prerequisites: An introductory course on Relation and Function, preliminary understanding of Permutation and Combination and knowledge of basic graph theory.

Course Objective: The purpose of this course is to provide fundamental concepts of Basics of Probability and its Distribution, Discrete Mathematics, Algebraic Structures and Advanced Graph Theory.

Detailed Syllabus:

Note 1: The whole syllabus has been divided into five modules.

Note 2: Structure of the question paper

There will be three groups in the question paper. In Group A, there will be one set of multiple choice type questions spreading the entire syllabus from which 10 questions (each carrying one mark) are to be answered. From Group B, three questions (each carrying 5 marks) are to be answered out of a set of questions covering all the five modules. Three questions (each carrying 15 marks) are to be answered from Group C. Each question of Group C will have two or three parts covering not more than two modules. Sufficient questions should to be set covering the whole syllabus for alternatives.

Module I

Theory of Probability: Axiomatic definition of probability. Conditional probability. Independent events and related problems. Bayes theorem (Statement only) & its application. One dimensional random variable. Probability distributions-discrete and continuous. Expectation. Binomial, Poisson, Uniform, Exponential, Normal distributions and related problems. t, χ^2 and F-distribution (Definition only). Transformation of random variables. Central Limit Theorem, Law of large numbers (statement only) and their applications. Tchebychev inequalities (statement only) and its application.**(14L)**

Module II

Sampling theory: Random sampling. Parameter, Statistic and its Sampling distribution. Standard error of statistic. Sampling distribution of sample mean and variance in random sampling from a normal distribution (statement only) and related problems.

Estimation of parameters: Unbiased and consistent estimators. Point estimation. Interval estimation. Maximum likelihood estimation of parameters (Binomial, Poisson and Normal). Confidence intervals and related problems. **(7L)**

Module III

Testing of Hypothesis: Simple and Composite hypothesis. Critical region. Level of significance. Type I and Type II errors. One sample and two sample tests for means and proportions. χ^2 - test for goodness of fit. (**5L)**

Module IV

Advanced Graph Theory: Planar and Dual Graphs. Kuratowski's graphs. Homeo morphic graphs. Eulers formula (n - e

+ r = 2) for connected planar graph and its generalisation for graphs with connected components. Detection of planarity. Graph colouring. Chromatic numbers of C_n, K_n , $K_{m,n}$ and other simple graphs. Simple applications of chromatic numbers. Upper bounds of chromatic numbers (Statements only). Chromatic polynomial. Statement of four and five colour theorems. **(10L)**

Module V

Algebraic Structures**:** Group, Subgroup, Cyclic group, Permutation group, Symmetric group (S_3), Coset, Normal subgroup, Quotient group, Homomorphism & Isomorphism

(Elementary properties only).

Definition of Ring, Field, Integral Domain and simple related problems. **(12L)**

Text Books:

1. Banerjee A., De S.K. and Sen S.: Mathematical Probability, U.N. Dhur&Sons.
2. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics, Sultan Chand &Sons.
3. Mapa S.K. :Higher Algebra (Abstract & Linear), Sarat BookDistributors.
4. Sen M.K., Ghosh S. and Mukhopadhyay P.: Topics in Abstract Algebra, UniversityPress.
5. West D.B.: Introduction to Graph Theory, PrenticeHall.

References:

1. Babu Ram: Discrete Mathematics, Pearson Education.
2. Balakrishnan: Graph Theory (Schaum's Outline Series),TMH.
3. Chakraborty S.K and Sarkar B.K.: Discrete Mathematics,OUP.
4. Das N.G.: Statistical Methods, TMH.
5. Deo N: Graph Theory with Applications to Engineering and Computer Science, PrenticeHall.
6. Khanna V.K and Bhambri S.K. : A Course in Abstract Algebra, Vikas Publishing House.
7. Spiegel M R., Schiller J.J. and Srinivasan R.A. : Probability and Statistics (Schaum's Outline Series),TMH.
8. Wilson: Introduction to graph theory, Pearson Edication.

Course Outcomes:

CO-PO(PSO) Mapping

Communication Engineering & Coding Theory
Code: CS401
Contacts: 3L
Credits: 3

Prerequisites:

- Knowledge in different types of signals
- Exponential Fourier series
- Fourier transform and its properties
- Energy and power signal
- Probability and statistics

Course Objective(s)

To present the fundamentals of analog and modern digital communication system design. Students should evaluate the performance of analog and digital signaling schemes on realistic communication channels. Emphasis is placed on physical layer digital communications and coding techniques, including waveform analysis, transmitter design and receiver design. The student will learn about theoretical bounds on the rates of digital data transportation systems.

Detailed Syllabus:

Module - 1**: *Elements of Communication system, Analog Modulation & Demodulation, Noise, SNR* Analog-to- Digital Conversion**. (Basic ideas in brief) [8]

[Details: Introduction to Base Band transmission & Modulation (basic concept) ***(1L);*** Elements of Communication systems (mention of transmitter, receiver and channel); origin of noise and its effect, Importance of SNR in system design ***(1L);*** Basic principles of Linear Modulation (Amplitude Modulation) ***(1L);*** Basic principles of Non-linear modulation (Angle Modulation - FM, PM) ***(1L);*** Sampling theorem, Sampling rate, Impulse sampling, Reconstruction from samples, Aliasing ***(1L);*** Analog Pulse Modulation - PAM (Natural & flat topped sampling), PWM, PPM ***(1L);*** Basic concept of Pulse Code Modulation, Block diagram of PCM ***(1L);*** Multiplexing - TDM, FDM***(1L);***

Module - 2**: Digital Transmission:** [8]

[Details: Concept of Quantisation&Quantisation error, Uniform Quantiser***(1L);*** Non-uniform Quantiser, A-law &

□□law companding (mention only) ***(1L);*** Encoding, Coding efficiency ***(1L);*** Line coding & properties, NRZ& RZ, AMI, Manchester coding PCM, DPCM ***(1L);*** Baseband Pulse Transmission, Matched filter (mention of its importance and basic concept only), Error rate due to noise ***(2L);*** ISI, Raised cosine function, Nyquist criterion for distortion-less base-band binary transmission, Eye pattern, Signal power in binary digital signals ***(2L);***

Module - 3**: Digital Carrier Modulation & Demodulation Techniques:** [8]

[Details: Bit rate, Baud rate ***(1L);*** Information capacity, Shanon's limit ***(1L);*** M-ary encoding, Introduction to the different digital modulation techniques - ASK, FSK, PSK, BPSK, QPSK, mention of 8 BPSK, 16 BPSK***(2L);*** Introduction to QAM, mention of 8QAM, 16 QAM without elaboration ***(1L);*** Delta modulation, Adaptive delta modulation (basic concept and importance only, no details ***(1L);*** introduction to the concept of DPCM, Delta Modulation, Adaptive Delta modulation and their relevance ***(1L);*** Spread Spectrum Modulation - concept only. ***(1L)***.

Module - 4**: Information Theory & Coding**: [8]

[Details: Introduction, News value & Information content ***(1L);***, Entropy ***(1L);***, Mutual information ***(1L);***, Information rate ***(1L);***, Shanon-Fano algorithm for encoding ***(1L);***, Shannon's Theorem - Source Coding Theorem ***(1L);***, Channel Coding Theorem, Information Capacity Theorem (basic understanding only) ***(1L);***; Error Control & Coding - basic principle only. ***(1L);***

Text Books:

1. An Introduction to Analog and Digital Communications by Simon Haykin; Published by Wiley India.
2. Data Communication and Networking by Behrouz A. Forouzan, Published by Tata McGraw-Hill

References:

1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition)
2. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.
3. Communication Systems by A. B. Carlson, Published by McGraw-Hill.
4. Understanding Signals and Systems by Jack Golten, Published by McGraw Hill.

Course Outcome(s)

CS401.1 Apply the fundamental concepts of engineering principles in design issues in various communication systems.

CS401.2 Inspect recent trend and performance issues for different digital modulation techniques.

CS401.3 Demonstrate the concepts of sampling, Pulse Modulation techniques and their comparison.

CS401.4 Design Matched filter, demonstrate the effects of Inter Symbol Interference (ISI) and compare Eye pattern analysis.

CS401.5 Illustrate various types of coherent and non-coherent digital modulation techniques, analyze immunity parameters and calculate their error probabilities.

CO-PO(PSO) Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS401 .1	3	3	3		1	1			2			3
CS401 .2	3	3		3	3		2			1	2	3
CS401 .3	3	3	3	3	2	2			1			3
CS401 .4	3	3	3	2	3		2			2	2	3
CS401 .5	3	3		3	3	2						3

Formal Language & Automata Theory
Code: CS402
Contacts: 3L+1T
Credits: 4

Prerequisites:
Digita lLogic, Computer organization, Computer Fundamentals

CourseContent:

Module-1:[9L]
Fundamentals: Basic definition of sequential circuit, block diagram, mathematicalrepresentation,conceptoftransitiontableandtransitiondiagram,**[1L]**
IntroductiontoFiniteStateModel(FSM),Designofsequencedetector,FiniteStateMachine,FiniteAutomata,DeterministicFiniteAutomation(DFA)andNon-deterministicFiniteAutomation(NFA),Transitiondiagrams,TransitiontablesandLanguagerecognizers.**[3L]**
NFAwithemptytransitions,EquivalencebetweenNFAwithandwithoutemptytransitions.NFAtoDFA conversion.**[2L]**
MinimizationofFSM:MinimizationAlgorithmforDFA,IntroductiontoMyhill-NerodeTheorem**[2L]**
Limitations of FSM, Application of Finite Automata**[1L]**

Module-2:[7L]
FiniteAutomatawithoutput−Moore&Mealymachine.RepresentationofMoore&MealyMachine,ProcessingoftheStringthroughMoore&MealyMachine,EquivalenceofMoore&MealyMachine–Inter-conversion.**[2L]**
EquivalentstatesandDistinguishableStates,Equivalenceandk-equivalence,MinimizationofMealyMachine**[1L]**
Minimizationofincompletelyspecifiedmachine−MergerGraph,MergerTable,CompatibilityGraph[2L]
Loss less and Lossy Machine–Testing Table, Testing Graph**[2L]**

Module-3:[5L]
Regular Languages, Regular Sets, Regular Expressions, Algebraic Rules for Regular Expressions,
Arden's Theorem statement and proof**[1L]**
Constructing Finite Automata (FA)for given regular expressions, Regular string accepted by FA**[2L]**
Constructing Regular Expression foragiven Finite Automata**[1L]**
Pumping Lemma of Regular Sets.Closure properties of regular sets**[1L]**

Module-4:[9L]

Grammar Formalism - Context Free Grammars, Derivation trees, sentential forms. Right most andleftmostderivationofstrings,ParseTree,Ambiguityincontextfreegrammars.**[1L]**
MinimizationofContextFreeGrammars.**[1L],**Removalofnullandunitproduction**[1L]**
Chomsky normal form and Greibach normal form.**[1L]**
Pumping Lemma for Context Free Languages.**[1L]**
EnumerationofpropertiesofCFL,Closure property of CFL,Ogden'slemma&itsapplications**[1L],**
Regular grammars–right linear and left linear grammars**[1L]**
Push down Automata: Push down automata, definition. Introduction to DCFL, DPDA, NCFL,NPDA**[1L]**
Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence.**[1L]**
Equivalence of CFL and PDA ,inter-conversion.**1L]**

Module-5:[5L]
Turing Machine:Turing Machine, definition, model**[1L]**
DesignofTM,Computable functions**[1L]** Church'shypothesis, counter machine**[1L]** Types of Turing machines**[1L]**
Universal Turing Machine, Halting problem**[1L]**

TextBooks:

1. "IntroductiontoAutomataTheoryLanguageandComputation",HopcroftH.E.and UllmanJ.D.,PearsonEducation.

ReferenceBooks:

1. "Formal Languages and Automata Theory",C.K .Nagpal, Oxford
2. "SwitchingandFiniteAutomataTheory",ZviKohavi,2ndEdition.,TataMcGrawHill

Course Outcome:
CO1: To understand basic concepts in formal language theory, grammars, automata theory, computability theory, and complexity theory
CO2: To evaluate the power of abstract models of computing like deterministic (DFA), non-deterministic (NFA), Push Down Automata (PDA) and Turing (TM) machine to recognize the language.
CO3: To apply the knowledge of automata for recognizing various patterns.
CO4: To analyze the power and limitation of a computer, and take decisions on computability of a problem.
CO5: To construct automata for recognizing different kinds of formal languages

CO-PO(PSO) Mapping

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									
CO2	3	3		2								
CO3	3	3	3	2	2							
CO4	3	3		3								
CO5	3	3	3	3	2							

Computer Architecture
Code: CS403
Contacts: 3L+1T
Credits: 4

Objective(s)

- To learn the basics of stored program concepts.
- To learn the principles of pipelining.
- To learn mechanism of data storage
- To distinguish between the concepts of serial, parallel, pipeline architecture**.**

Pre-requisite: Basic Electronics in First year, Introduction to Computing in second semester, Analog & Digital Electronics and Computer Organisation in Third semester.

Detailed Syllabus

Module – 1: [12 L]
Introduction: Review of basic computer architecture (Revisited), Quantitative techniques in computer design, measuring and reporting performance. (3L)
Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards. Exception handling. Pipeline optimization techniques; Compiler techniques for improving performance. (9L)
Module – 2: [8L]
Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies. (8L)
Module – 3: [6L]
Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, super pipelined and VLIW processor architectures. Array and vector processors. (6L)
Module – 4: [12 L]

Multiprocessor architecture: taxonomy of parallel architectures; Centralized shared- memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture. Cluster
computers. (8L)
Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures. (4L)

Course Outcomes:

CS401.1	Demonstrate how computer hardware has evolved to meet the basic needs of multiprocessing systems, Instruction set and CPU Architecture.
CS401.2	Identify and compare the properties of memories and levels of parallelism.
CS401.3	Apply instruction set and pipelining concept to enhance the system's performance with modern tool usage.
CS401.4	Solve the problems related to computer architecture.
CS401.5	Analyze the cost issues and design trade-off in designing and constructing computer processors including memories.

CO-PO(PSO) Mapping

CO #	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CS401.1	2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CS401.2	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS401.3	3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CS401.4	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS401.5	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CS401	2.8	2.8	2.6	2.4	-	-	-	-	-	-	-	-	-	-	-

Practical

Technical Report Writing and Language Lab Practice
Code: HU481
Credits-2

Pre-requisites: A basic knowledge of listening and speaking skills and the ability to infer meaning from audio-video/online lessons.

Objectives of this Course: This course has been designed:

1. To inculcate a sense of confidence in the students.
2. To help them become good communicators both socially and professionally.
3. To assist them to enhance their power of Technical Communication.

Detailed Syllabus:

A. **Technical Report Writing**: 2L+6P

1. Report Types (Organizational / Commercial / Business / Project)
2. Report Format & Organization of Writing Materials
3. Report Writing (Practice Sessions &Workshops)

B. Language Laboratory Practice

1. Introductory Lecture to help the students get a clear idea of Technical Communication & the need of Language Laboratory PracticeSessions 2L

2. Conversation Practice Sessions: (To be done as real life interactions) 2L+4P

2. TrainingthestudentsbyusingLanguageLabDevice/RecommendedTexts/cassettes/cd'stogett heir Listening Skill & Speaking Skill honed

3. Introducing Role Play & honing overallCommunicative Competence

3. Group Discussion Sessions: 2L+6P

a) Teaching Strategies of Group Discussion

b) Introducing Different Models & Topics of Group Discussion

c) ExploringLive/RecordedGDSessionsformendingstudents' attitude /approach & for taking remedial measure Interview Sessions; 2L+6P

- Training students to face Job Interviews confidently and successfully
- Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking Skill in a formal situation for effective communication

4. Presentation: 2L+6P

a). Teaching Presentation as a skill

b). Strategies and Standard Practices of Individual /Group Presentation
c). Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids

5. Competitive Examination: 2L+2P

a) Making the students aware of Provincial /National/International Competitive Examinations
b) Strategies/Tactics for success in Competitive Examinations
c) SWOT Analysis and its Application in fixing Target

Books – Recommended:

NiraKonar: English Language Laboratory: A Comprehensive Manual

PHI Learning, 2011

D. Sudharani: Advanced Manual for Communication Laboratories &

Technical Report Writing Pearson Education (W.B. edition), 2011

References:

Adrian Duff et.al.(ed.): Cambridge Skills forFluency

A) Speaking (Levels 1-4 Audio Cassettes/Handbooks)
B) Listening (Levels 1-4 Audio Cassettes/Handbooks)
Cambridge University Press1998 MarkHancock: English Pronunciation inUse

4AudioCassettes/CD'S OUP2004

NUMERICAL METHODS
Lab Code : M(CS) 491
Contacts : 2L
Credits :1

Prerequisite: Any introductory course on C/ Matlab.

Course Objective: The purpose of this course is to provide basic programming skills for solving the problems in numerical methods and statistics.

Detailed Syllabus:

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's

rule.

3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.
5. Assignments on ordinary differential equation: Euler's and Runga-Kutta methods.
6. Introduction to Software Packages: Matlab / Scilab / Labview /Mathematica.

Course Outcomes:

CO-PO(PSO) Mapping

Communication Engineering & Coding Theory
Code : CS 491
Contacts : 3L
Credits :2

Prerequisites: Knowledge in Electronics and Communication

Course Objective: To provide the basic skills required to understand, develop, and design of various engineering applications involving analog and digital communication theory. To provide basic laboratory exposures for communication principles and applications.

Detailed Syllabus:

Practical Designs & Experiments:

Module - 1: Generation of Amplitude Modulation (Design using transistor or Balanced Modulator Chip (to view the wave shapes)

Module - 2: Generation of FM using VCO chip (to view the wave shapes)

Module - 3: Generation of PAM

Module - 4: Generation of PWM& PPM (using IC 555 Timer)

Text Books:

1. An Introduction to Analog and Digital Communications by Simon Haykin; Published by Wiley India.

2. Principles of Communication Systems, H. Taub and D .L.Schilling, TMH Publishing Co.

Reference Books:

1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition).

2. Communication Systems by A. B. Carlson, Published by McGraw-Hill.

3. Modern Digital and Analog Communication Systems, B.P.Lathi and Z.Ding, Oxford University Press.

4. Communications System (Analog and Digital) by Dr. Sanjay Sharma S K Kataria and Sons.

Course Outcomes:

CO-PO(PSO) Mapping

Software Tools
Code : CS 492
Contacts : 3L
Credits :2

Prerequisites:

Objectives:

Detailed Syllabus:

[Suggested; Feedback invited]

1. Introduction to Visual Basic/VC++& difference with BASIC. Concept about form Project, Application, Tools, Toolbox, Controls & Properties. Idea about Labels, Buttons, Text Boxes.
    - **a)** Data basics, Different type variables & their use inVB,
    - **b)** Sub-functions & Procedure details, Input box () & Msgbox().
    - **c)** Making decisions, looping
    - **d)** List boxes & Data lists, List Box control, Combo Boxes, data Arrays.
    - **e)** Frames, buttons, check boxes, timer control,
    - **f)** Programming with data, ODBC database connectivity.
    - **g)** Data form Wizard, query, and menus in VB Applications,
    - **h)** Graphics.
2. Casestudies using any of the following items including relevant form design with the help of visual programming aids.
    - a). Payroll accounting system.
    - b). Library circulation management system.
    - c). Inventory control system.

d). University examination & grading system.
e). Patient information system.
f). Tourist information system.
g). Judiciary information system.
h). Flight reservation system.
i). Bookshop automation software.
j). Time management software.

Course Outcomes:

CO-PO(PSO) Mapping

ComputerArchitecture Lab
Code : CS 492
Contacts :3L
Credits :2

Prerequisite: Computer Organization Lab

Course Objective(s): Simulate digital circuit using Xilinx tools

Detailed Syllabus:

All laboratory assignments are based on Hardware Description Language (VHDL or Verilog) Simulation.

[**System pre-requisite:** The hardware based design has been done in the Analog & Digital Electronics laboratory and Computer Organization laboratory]

1. HDL introduction
2. Basic digital logic base programming with HDL
3. 8-bit Addition, Multiplication, Division
4. 8-bit Register design
5. Memory unit design and perform memory operations.
6. 8-bit simple ALU design
7. 8-bit simple CPU design
8. Interfacing of CPU and Memory

Course Outcomes:

On completion of the course students will be able to

CS491.1	Demonstrate the working principles of the logic gates, combinational and sequential circuits as well as different components of a digital computer.
CS491.2	Identify the detailing of VHDL simulation and internal configuration of FPGA, major syntactic elements of VDHL entities, architectures, processes functions, common concurrent statements, and common sequential statements, user defined subprograms, packages using VHDL program and VDHL test bench.
CS491.3	Construct and compare different combinational circuits- adder, subtractor, multiplexer, De-multiplexer, decoder, encoder, Comparator using VHDL,
CS491.4	Analyze and implement sequential circuits - flip flops, register, counter using VHDL.
CS491.5	Construct ALU and RAM circuits and evaluate their performance for solving real world problems using VHDL.

CO-PO(PSO) Mapping

CO #	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS491.1	2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CS491.2	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS491.3	3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CS491.4	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS491.5	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CS491	2.8	2.8	2.6	2.4	-	-	-	-	-	-	-	-	-	-	-

SEMESTER – V

Theory

Economics for Engineers HU-501

Contracts: 3L

Credits- 3

Module-I

1. Economic Decisions Making – Overview, Problems, Role, Decision making process.
2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per- Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.

Module-II

1. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal & Effective Interest.
2. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.

Module-III

1. Inflation And Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.
2. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.
3. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.

Module-IV

1. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.
2. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems.

3. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.

Readings

1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case, DavidB.Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.PaneerSeelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

Design & Analysis of Algorithm
Code: CS501
Contact: 3L + 1T
Credits: 4

Complexity Analysis:[2L]
Time and Space Complexity, Different Asymptotic notations – their mathematical significance
Algortihm Design Techniques:
Divide and Conquer: [3L]
Basic method, use, Examples – Binary Search, Merge Sort, Quick Sort and their complexity. Heap Sort and its complexity [1L]
Dynamic Programming: [3L]
Basic method, use, Examples – Matrix Chain Manipulation, All pair shortest paths, single source shortest path. Backtracking: [2L]
Basic method, use, Examples – 8 queens problem, Graph coloring problem. Greedy Method: [3L]
Basic method, use, Examples – Knapsack problem, Job sequencing with deadlines, Minimum cost spanning ree by Prim's and Kruskal's algorithm.

Lower Bound Theory: [1L]
O(nlgn) bound for comparison sort

Disjoint set manipulation: [2L]
Set manipulation algorithm like UNION-FIND, union by rank.

Graph traversal algorithm: Recapitulation [1L]

Breadth First Search(BFS) and Depth First Search(DFS) – Classification of edges - tree, forward, back and cross edges – complexity and comparison

String matching problem: [3L]
Different techniques – Naive algorithm, string matching using finite automata, and Knuth, Morris, Pratt (KMP) algorithm with their complexities.

Amortized Analysis: [3L]
Aggregate, Accounting, and Potential Method.

Network Flow: [3L]
Ford Fulkerson algorithm, Max-Flow Min-Cut theorem (Statement and Illustration)

Matrix Manipulation Algorithm: [3L]
Strassen's matrix manipulation algorithm; application of matrix multiplication to solution of simultaneous linear equations using LUP decomposition, Inversion of matrix and Boolean matrix multiplication

Notion of NP-completeness: [3L]
P class, NP class, NP hard class, NP complete class – their interrelationship, Satisfiability problem, Cook's theorem (Statement only), Clique decision problem

Approximation Algorithms: [3L]
Necessity of approximation scheme, performance guarantee, polynomial time approximation schemes, vertex cover problem, travelling salesman problem.

Text Book:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms"

2. A. Aho, J.Hopcroft and J.Ullman "The Design and Analysis of Algorithms" D.E.Knuth "The Art of Computer Programming", Vol. 3
3. Jon Kleiberg and Eva Tardos, "Algorithm Design"

Reference:

1. K. Mehlhorn , "Data Structures and Algorithms" - Vol. I & Vol. 2.
2. S. Baase "Computer Algorithms"
3. E. Horowitz and Shani "Fundamentals of Computer Algorithms"
4. E.M. Reingold, J. Nievergelt and N.Deo- "Combinational Algorithms- Theory and Practice", Prentice Hall, 1997

Microprocessors & Microcontrollers
Code: CS502
Contact: 3L + 1T
Credits: 4

Prerequisite:

1. Familiarity with the number system
2. A solid background in digital logic.

CourseObjective(s):

- To learn the basics of a particular microprocessor.
- To learn the basics of a particular microcontroller.
- To learn the interfacing of microprocessor.

Module -1: **[8L]**

Introduction to Microcomputer based system. History of evolution of Microprocessor and Microcontrollers and their advantages and disadvantages. [1L]
Architecture of 8085 Microprocessor, Pin description of 8085. [2L]
Address/data bus Demultiplexing , Status Signals and the control signals. [1L] Instruction set of 8085 microprocessor, Addressing modes, [3L]
Timing diagram of the instructions (a few examples). [1L]

Module -2: **[9L]**

Assembly language programming with examples, Counter and Time Delays,
Stack and Subroutine, [6L]
Interrupts of 8085 processor(software and hardware), I/O Device Interfacing-I/O Mapped I/O and Memory Mapped I/O , Serial (using SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer,
[3L]

Module 3: **[10L]**

The 8086 microprocessor- Architecture, Addressing modes, [3L] [3L]
Interrupts Introduction to 8051 Microcontroller –Architecture, Pin Details. [4L]
Addressing modes, Instruction set, Examples of Simple Assembly Language.

Module -4: **[9L]**

Memory interfacing with 8085, 8086 [2L]
Support IC chips- 8255 ,8251,8237/8257,8259 [4L]
Interfacing of 8255 PPI with 8085 and Microcontroller 8051. [2L]
Brief introduction to PIC microcontroller (16F877) [1L]

TEXTS :

1. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan (Oxford university press)
2. 8051 Microcontroller – K. Ayala (Cengage learning)
3. MICROPROCESSOR architecture, programming and Application with 8085 - R.Gaonkar (Penram international Publishing LTD.) 4.Microcontrollers:Principles&Applications , Ajit Pal, PHI 2011.
5. Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing"Dhanpat Rai, 2003
6. 8051 Microprocessor –V. Udayashankara and M.SMallikarjunaswami (TMH).
7. Microprocessor 8085 and its Interfacing—S Mathur (PHI)
8. An Introduction to Microprocessor and Applications –Krishna Kant (Macmillan)

Reference:

1. 8086 Microprocessor –K Ayala (Cengage learning)
2. The 8085 Microprocessor, Architecture, Programming and Interfacing- K Uday Kumar, B .S Umashankar (Pearson)
3. The X-86 PC Assembly language, Design and Interfacing - Mazidi, Mazidi and Causey (PEARSON)
4. The 8051 microcontroller and Embedded systems - Mazidi, Mazidi and McKinley (PEARSON)
5. Microprocessors – The 8086/8088, 80186/80386/80486 and the Pentium family – N. B. Bahadure (PHI).
6. The 8051 microcontrollers – Uma Rao and Andhe Pallavi (PEARSON).

CourseOutcomes:

After completion of the course students will be able to

CO1	**Assess** and **solve** basic binary mathematical operations using the microprocessor and **explain** the microprocessor's and Microcontroller's internal architecture.
CO2	**Construct** and **explain** assembly language program.
CO3	**Design** interface for peripherals like I/O, A/D, D/A, timer etc.
CO4	**Develop** systems using different microcontrollers.
CO5	**Analyze** the performance of computers and its architecture to real-life applications

CO-PO(PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	2	–	1	1	1	1	3	3	3
CO2	3	3	3	2	3	3	2	–	1	1	1	1	3	3	3
CO3	3	3	3	2	3	3	2	–	1	1	1	1	3	3	3
CO4	3	3	3	2	3	3	2	–	1	1	1	1	3	3	3
CO5	3	3	3	2	3	3	2	–	1	1	1	1	3	3	3

Discrete Mathematics Code: CS503 Contact: 3L
Credits: 3

Module I: Introduction to Propositional Calculus: Propositions, Logical Connectives, Conjunction, Disjunction, Negation and their truth table. Conditional Connectives, Implication, Converse, Contra positive, Inverse, Bi conditional statements with truth table, Logical Equivalence, Tautology, Normal forms-CNF, DNF; Predicates and Logical Quantifications of propositions and related examples. 10L

Module II: Theory of Numbers: Well Ordering Principle, Divisibility theory and properties of divisibility; Fundamental theorem of Arithmetic; Euclidean Algorithm for finding G.C.D and some basic properties of G.C.D with simple examples; Congruencies, Residue classes of integer modulo n (Zn)and its examples. Order, Relation and Lattices: POSET, Hasse Diagram, Minimal ,Maximal, Greatest and Least elements in a POSET, Lattices and its properties, Principle of Duality, Distributive and Complemented Lattices. 10L

Module III: Counting Techniques: Permutations, Combinations, Binomial coefficients, Pigeon- hole Principle, Principles of inclusion and exclusions; Recurrence relations: Formulation / Modeling of different counting problems in terms of recurrence relations, Solution of linear recurrence relations with constant coefficients (up to second order) by (i) The iterative method (ii) Characteristic roots method (iii) Generating functions method. 10L

Module IV: Graph Coloring: Chromatic Numbers and its bounds, Independence and Clique Numbers, Perfect Graphs-Definition and examples, Chromatic polynomial and its determination, Applications of Graph Coloring.

Matchings: Definitions and Examples of Perfect Matching, Maximal and Maximum Matching, Hall's Marriage Theorem (Statement only) and related problems. 6L

Texts:

1. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics and Optimization

2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
4. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH

References:

1. J.K. Sharma, Discrete Mathematics, Macmillan
2. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.
3. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.
4. Douglas B. West, Introduction to graph Theory, PHI

Free Elective

Circuit Theory & Network

Code: CS504A

Contact: 3L + 1T Credits: 4

Module	Content	Hrs
1.	) ***Resonant Circuits***: Series and Parallel resonance [1L], (*) ***Impedance and Admittance Characteristics, Quality Factor, Half Power Points, Bandwidth [2L], Phasor diagrams, Transform diagrams [1L], Practical resonant and series circuits, Solution of Problems [Tutorial - 1L]***.	4
	) **Mesh Current Network Analysis**: Kirchoff's Voltage law, Formulation of mesh equations [1L], Solution of mesh equations by Cramer's rule and matrix method [2L], Driving point impedance, Transfer impedance [1L], Solution of problems with DC and AC sources [1L].	6
2.	) **Node Voltage Network Analysis**: Kirchoff's Current law, Formulation of Node equations and solutions [2L], driving point admittance, transfer Admittance [1L], Solution of problems with DC and AC sources [1L].	4
	) **Network Theorems**: Definition and Implication of Superposition Theorem [1L], Thevenin's theorem, Norton's theorem [1L], Reciprocity theorem, Compensation theorem [1L], maximum Power Transfer theorem [1L], Millman's theorem, Star delta transformations [1L], Solutions and problems with DC and AC sources [1L].	6
3.	***Graph of Network***: Concept of Tree and Branch [1L], tree link, junctions, ***(*) Incident matrix, Tie set matrix [2L], Determination of loop current and node voltages [2L]***.	4
	Coupled Circuits: Magnetic coupling, polarity of coils, polarity of induced voltage, concept of Self and mutual inductance, Coefficient of coupling, Solution of Problems.	4
	Circuit transients: DC transients in R-L and R-C Circuits with and without initial charge, ***(*) R-L-C Circuits, AC Transients in sinusoidal R-L, R-C and R-L-C Circuits, Solution of Problems [2L].***	2

4.	**Laplace transform**: Concept of Complex frequency [1L], transform of f(t) into F(s) [1L], transform of step, exponential, over damped surge, critically damped surge, damped and un-damped sine functions [2L], properties of Laplace transform [1L], linearity, real differentiation, real integration, initial value theorem and final value theorem [1L], inverse Laplace transform [1L], application in circuit analysis, Partial fraction expansion, Heaviside's expansion theorem, Solution of problems [1L].	8
	(*) Laplace transform and Inverse Laplace transform [2L]. **Two Port Networks**: Relationship of Two port network variables, short circuit admittance parameters, open circuit impedance parameters, transmission parameters, relationship between parameter sets, network functions for ladder network and general network.	4

Old module 9 viz. SPICE deleted for consideration in Sessional Subject.

Problems for Module 1a:

Ex. 1. A parallel RLC Circuit has R= 100 K Ohms, L= 10 mH, C= 10 nF. Find resonant frequency, bandwidth and Quality factor. **Ex. 2.** Two coils one of R= 0.51 Ohms,L= 32 mH, other of R= 1.3 Ohms, L= 15 mH, and two capacitors of 25 micro F and 62 micro F are in series with a resistance of 0.24 Ohms. Determine resonance frequency and Q of each coil.

Ex. 3. In a series circuit with R= 50 Ohms, l= 0.05 Ohms and C= 20 micro F, frequency of the source is varied till the voltage across the capacitor is maximum. If the applied voltage is 100 V, find the maximum voltage across the capacitor and the frequency at which this occurs. Repeat the problem with R= 10 Ohms.

Problems for Module 1b and 2:

Examples for mesh current in networks like T, π, bridged T and combination of T and π.

See Annexure-1 for the figures

Problems for Module- 2a:

Ex.1. The network of Fig.1 – Mod.4 is in the zero state until t= 0when switch is closed. Find the current i1(t) in the resistor R3. Hints: the Fig.1 – Mod.4 shows the same network in terms of transform impedance with the Thevenin equivalent network.

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Ex.2. Find the Norton's equivalent circuit for the circuit Fig.2 – Mod.4.

Hints: As a 1st. step, short the terminals ab. This results in the Circuit of Fig.2.(a). By applying KCL at node a, we have,

(0-24)/4+ isc = 0; i.eisc= 9 A. To find out the equivalent Norton's impedance RN, deactivate all the independent sources, resulting in a circuit of Fig.2.(b), RN= (4x12)/(4+12) = 3 Ohms. Thus we obtain Norton equivalent circuit of Fig.2 (c).

Problems for Module – 2b:

Ex.1. Draw the graph, one tree and its co tree for the circuit shown in Fig.1 – mod.5.

Hints: In the circuit there are four nodes (N= 4) and seven branches (B= 7). The graph is so drawn and appears as in Fig. 1 (a). Fig.1(b) shows one tree of graph shown in Fig. 1(a). The tree is made up of branches 2, 5 and 6. The co tree for the tree of Fig.1 (b) is shown in Fig. 1(c). The co tree has L= B-N+1 = 7-4+1 = 4 Links.

Ex.2. (a). For the circuit shown in Fig.2- Mod.5, construct a tree so that i1 is a link current. Assign a complete set of link currents and find i1 (t).

(b). Construct another tree in which v1 is a tree branch voltage. Assign a complete set of tree branch voltages and v1 (t). Take i(t) = 25 sin 1000t A, v(t)= 15 cos 1000t.

Tutorials: (*):Bold and Italics. Text Books:

1. Valkenburg M. E. Van, "Network Analysis", Prentice Hall./Pearson Education
2. Hayt "Engg Circuit Analysis" 6/e Tata McGraw-Hill

3. D.A.Bell- Electrical Circuits- Oxford

Reference Books:

1. A.B.Carlson-Circuits- Cenage Learning
2. John Bird- Electrical Circuit Theory and Technology- 3/e- Elsevier (Indian Reprint)
3. Skilling H.H.: “Electrical Engineering Circuits”, John Wiley & Sons.
4. Edminister J.A.: “Theory & Problems of Electric Circuits”, McGraw-Hill Co.
5. Kuo F. F., “Network Analysis & Synthesis”, John Wiley & Sons.
6. R.A.DeCarlo&P.M.Lin- Linear Circuit Analysis- Oxford
7. P.Ramesh Babu- Electrical Circuit Analysis- Scitech
8. Sudhakar: “Circuits &Networks:Analysis& Synthesis” 2/e TMH
9. M.S.Sukhija&T.K.NagSarkar- Circuits and Networks-Oxford
10. Sivandam- “Electric Circuits and Analysis”, Vikas
11. V.K. Chandna, “A Text Book of Network Theory & Circuit Analysis”,Cyber Tech
12. Reza F. M. and Seely S., “Modern Network Analysis”, Mc.Graw Hill .
13. M. H. Rashid: “Introduction to PSpice using OrCAD for circuits and electronics”, Pearson/PHI
14. Roy Choudhury D., “Networks and Systems”, New Age International Publishers.
15. D.Chattopadhyay and P.C.Rakshit: “Electrical Circuits” New Ag

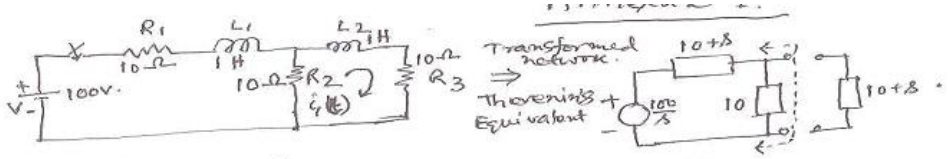

Fig. 1 - Mod. 4.

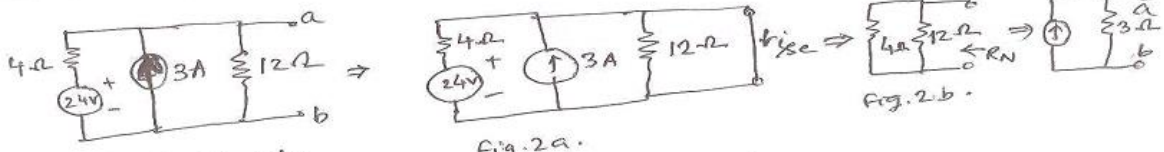

Fig. 2 - Mod. 4.

Fig. 2a.

Fig. 2.b.

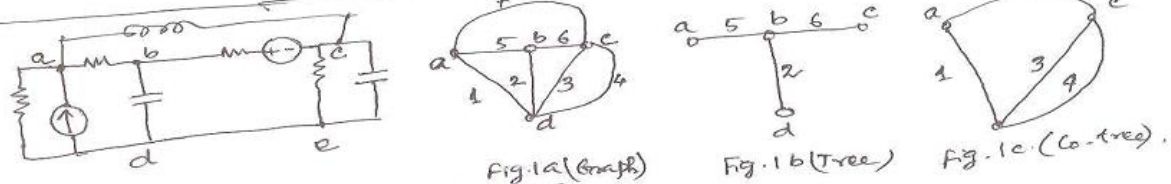

Fig. 1 - Mod-5.

Fig. 1a (Graph)

Fig. 1b (Tree)

Fig. 1c. (Co-tree).

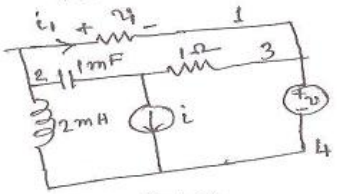

Fig. 2 - Mod-5.

Data Communication Code: CS504B
Contact: 3L + 1T Credits: 4

Module I:
Data Communication Fundamentals: Layered Network Architecture; Mode of communication, topology, Data and Signal; Transmission Media: Guided, Unguided; Transmission Impairments and Channel Capacity; Transmission of Digital Data: Interfaces- DTE-DCE, MODEM, Cable MODEM; The telephone network system and DSL technology; **[10L]**

Module II:
Data Link Control: Interfacing to the media and synchronization; Error Control: Error Detection and Correction (Single bit, Multi bit); Flow control: Stop-and-Wait ARQ, Go-Back-N ARQ, Selective-Repeat ARQ
Data Link Protocols: Synchronous, Asynchronous Protocols, Point-to-Point Protocol(PPP). **[12L]**

Module III:
Switching Communication Networks: Circuit switching; Packet switching; Routing in packet switched networks; X.25; Frame Relay; ATM, SONET. **[07L**]

Module IV:
Communication Network: Topology; Medium Access Control Techniques; IEEE CSMA/CD based LANs; IEEE Ring LANs; High Speed LANs – Token Ring Based(FDDI); High Speed LANs – CSMA/CD based; Wireless LANs: Bluetooth; **[07L]**
Network Security: Introduction to Cryptography; User Authentication; Firewalls. **[04L] References:**

a) Data Communications and Networking, Behrouz A. Forouzan, TMH
b) Data and Computer Communications, William Stallings, PHI
c) Computer Networks, Andrew S. Tanenbaum, PHI

Digital Signal Processing
Code: CS504C
Contact: 3L + 1T
Credits: 4

MODULE – I: 9L
Discrete-time signals:
Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem, sequences – periodic, energy, power, unit-sample, unit-step, unit-ramp, real & complex exponentials, arithmetic operations on sequences. 3L
LTI Systems:
Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlap-add methods to compute convolution supported with examples and

exercises, properties of convolution, interconnections of LTI systems with physical interpretations, stability and causality conditions, recursive and non-recursive systems. 6L

MODULE –II: 11L

Z-Transform:

Definition, mapping between s-plane and z-plane, unit circle, convergence and ROC, properties of Z-transform, Z-transform on sequences with examples and exercises, characteristic families of signals along with ROCs, convolution, correlation and multiplication using Z-transform, initial value theorem, Perseval's relation, inverse Z-transform by contour integration, power series & partial-fraction expansions with examples and exercises. 6L

Discrete Fourier Transform:

Concept and relations for DFT/IDFT, Twiddle factors and their properties, computational burden on direct DFT, DFT/IDFT as linear transformations, DFT/IDFT matrices, computation of DFT/IDFT by matrix method, multiplication of DFTs, circular convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, linear filtering using DFT, aliasing error, filtering of long data sequences – Overlap-Save and Overlap-Add methods with examples and exercises. 5L

Fast Fourier Transform:

Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs, Butterflies, computations in one place, bit reversal, examples for DIT&DIFFFT Butterfly computations and exercises. 4L

MODULE – III: 5L

Filter Design:

Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transforms, design of linear phase FIR filters, no. of taps, rectangular, Hamming and Blackman windows. 5L

MODULE – IV: 7L

Digital Signal Processor:

Elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor, writing of small programs in Assembly Language. 4L

FPGA:

Architecture, different sub-systems, design flow for DSP system design, mapping of DSP algorithms onto FPGA. 3L

TEXT BOOKS:

1. Digital Signal Processing – Principles, Algorithms and Applications, J.G.Proakis&D.G.Manolakis, Pearson Ed.
2. Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
3. Digital Signal Processing Signals, Systems and Filters, A. Antoniou, TMH Publishing Co.
4. VLSI Digital Signal Processing Systems Design and Implementation, Wiley International Publication.

5. Digital Signal Processing with Field Programmable Gate Arrays, U.Meyer-Baese, Springer.

REFERENCE BOOKS:

1. Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).
2. Digital Signal Processing, S.Salivahanan, A.Vallabraj& C. Gnanapriya, TMH Publishing Co.Digital Signal Processing; A Hands on Approach, C. Schuler &M.Chugani, TMH Publishing Co.
3. Digital Signal Processing, A. NagoorKani, TMH Education
4. Digital Signal Processing S. Poornachandra& B. Sasikala, MH Education
5. Digital Signal Processing; Spectral Computation and Filter Design Chi-Tsong Chen, Oxford University Press
6. Texas Instruments DSP Processor user manuals and application notes.
7. Digital Signal Processing – A practical Approach (second Edition) – Emmanuel C. Ifeacher& Barrie W. Jervis, Pearson Education
8. Xilinx FPGA user manuals and application notes.

Object Oriented Programming
Code: CS504D
Contact: 3L + 1T
Credits: 4

Object oriented design [10 L]
Concepts of object oriented programming language, Major and minor elements, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation, using, instantiation, meta-class, grouping constructs.

Object oriented concepts [4 L]
Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism

Basic concepts of object oriented programming using Java [22 L]
Implementation of Object oriented concepts using Java.

Language features to be covered:

Class & Object proprieties [6L]

Basic concepts of java programming – advantages of java, byte-code &JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts- String (discuss charAt() , compareTo(), equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() , trim() , valueOf() methods) &StringBuffer classes (discuss append(), capacity(),

charAt(), delete(), deleteCharAt(), ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods), concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using BufferedReader& Scanner classes.

Reusability properties[6L]– Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages.

Exception handling & Multithreading [6L]– Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, inter- thread communication, deadlocks for threads, suspending & resuming threads.

Applet Programming (using swing) [4L]– Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets, use of repaint(), getDocumentBase(), getCodeBase() methods, layout manager (basic concept), creation of buttons (JButton class only) & text fields. Textbooks/References:

1. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
2. Ali Bahrami – "Object Oriented System Development" – Mc Graw Hill
3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH
4. R.K Das – "Core Java For Beginners" – VIKAS PUBLISHING
5. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson
6. Ivor Horton's Beginning Java 2 SDK – Wrox
7. E. Balagurusamy – " Programming With Java: A Primer" – 3rd Ed. – TMH

Practical

Design & Analysis Algorithm Lab
Code: CS591
Contact: 3P
Credits: 2

Programming Language used :C
Lab :1 : Divide and Conquer :
>Implement Binary Search using Divide and Conquer approach
> Implement Merge Sort using Divide and Conquer approach
Lab :2 : Divide and Conquer :

>Implement Quick Sort using Divide and Conquer approach
> Find Maximum and Minimum element from a array of integer using Divide and Conquer approach

Lab :3 : Dynamic Programming :

>Find the minimum number of scalar multiplication needed for chain of matrix

Lab :4 : Dynamic Programming :

>Implement all pair of Shortest path for a graph (Floyed- Warshall Algorithm)
>Implement Traveling Salesman Problem

Lab :5 : Dynamic Programming :

>Implement Single Source shortest Path for a graph (Dijkstra , Bellman Ford Algorithm)

Lab :6 : Brunch and Bound :

>Implement 15 Puzzle Problem

Lab :7 : Backtracking :

>Implement 8 Queen problem

Lab :8 : Backtracking (implement any one of the following problem):

>Graph Coloring Problem
>Hamiltonian Problem

Lab :9 : Greedy method(implement any one of the following problem) :

>Knapsack Problem
>Job sequencing with deadlines

Lab :10 : Greedy method (implement any one of the following problem) :

>Minimum Cost Spanning Tree by Prim's Algorithm
>Minimum Cost Spanning Tree by Kruskal's Algorithm

Lab :11 : Graph Traversal Algorithm :

>Implement Breadth First Search (BFS)
>Implement Depth First Search (DFS)

Microprocessor & Microcontroller Lab
Code: CS592
Contact: 3P
Credits: 2

Prerequisites:

1. Familiarity with the number system
2. A solid background in digital logic and implementation of digital circuit in a bread board.

Course Objective(s)

- To learn the assembly language programming of a microprocessor.
- To learn the assembly language programming of a microcontroller.
- To learn the interfacing of microprocessor.
- To be familiar with microprocessor and microcontroller based projects.

Sl. No.	Experiment Name	No of Hours
1	**Study of Prewritten programs on 8085 trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical).** **Or,** **Familiarization with 8085 simulator on PC. Programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator.**	**3**
2	**Programming using kit or Simulator for:** **5. Table look up** **6. Copying a block of memory** **7. Shifting a block of memory** **iv) Packing and unpacking of BCD numbers** **8. Addition of BCD numbers** **9. Binary to ASCII conversion and vice-versa (Using Subroutine Call)** **10. BCD to Binary Conversion and vice-versa** **vii) String Matching, Multiplication**	**18**
3	**Program using IN/OUT instructions and 8255 PPI on the trainer kit e.g. subroutine for delay,** **x. Glowing all the LEDs one by one with particular delay** **xi. Reading switch state and glowing LEDs accordingly.**	**3**
4	**Serial communication between two trainer kits**	**3**
5	**Study of Prewritten programs on 8051 Microcontroller Kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical).** **Or,** **Familiarization with 8051 Simulator on PC. Study of prewritten programs using basic instruction**	**3**
	set (data transfer, Load/Store, Arithmetic, Logical).	
	Total 30 hours (10 classes each of 3 periods)	

CourseOutcomes:

After completion of the course students will be able to

CO1	**Apply** the fundamentals of assembly level programming of microprocessors and microcontroller.
CO2	**Illustrate** standard microprocessor, real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters and **use** in problem solving.
CO3	**Develop** systems using different microcontrollers.
CO4	**Analyze** abstract problems and **apply** a combination of hardware and software to address the problem.
CO5	**Explain** the interactions between software and hardware.

CO-PO(PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	2	−	1	1	1	1	3	3	3
CO2	3	3	3	2	3	3	2	−	1	1	1	1	3	3	3
CO3	3	3	3	2	3	3	2	−	1	1	1	1	3	3	3
CO4	3	3	3	2	3	3	2	−	1	1	1	1	3	3	3
CO5	3	3	3	2	3	3	2	−	1	1	1	1	3	3	3

Programming Practices Using C++
Code: CS593
Contact: 3P(1L+2P)
Credits: 2

Introduction of UNIX/Linux Operating System which includes preliminary commands, start-up & shutdown methodology, file handling as well as introduction to editors like Vi editor, introduction to GNU C & C++ compiler, as well as introduction to GNU &GDB script. **[4P]**

Introduction to C++, basic loop control, executing programs, writing functions, selection statements, review of functions and parameters, command line arguments, recursion, I/O streams, arrays and string manipulation, pointers, structures & unions**. [6P]**
Object-Oriented Programming in C++, fundamentals of classes, constructors-destructors. Dealing with member functions, operator overloading and polymorphism (both static & dynamic). **[6P]**

Dealing with inheritance, derived class handling, abstract class, virtual class, overriding, template class, name-space & exception handling. **[4P]**

Dynamic memory allocation, implementation of Linked Lists, using C++. **[4P]**

Note: GNU C++ can be used for the programming, since it is free and has no licensing anomaly

Circuits and Networks Lab
Code: CS594A
Contacts: 3P
Credits: 2

1. Characteristics of Series & Parallel Resonant circuits
2. Verification of Network Theorems
3. Transient Response in R-L & R-C Networks ; simulation / hardware
4. Transient Response in RLC Series & Parallel Circuits & Networks ; simulation / hardware
5. Determination of Impedance (Z), and Admittance (Y) parameters of Two-port networks
6. Generation of periodic, exponential, sinusoidal, damped sinusoidal, step, impulse, and ramp signals using MATLAB
7. Representation of Poles and Zeros in s-plane, determination of partial fraction expansion in s-domain and cascade connection of second-order systems using MATLAB

8. Determination of Laplace Transform, different time domain functions, and Inverse Laplace
9. Transformation using MATLAB

Note: An Institution / college may opt for some other hardware or software simulation wherever possible in place of MATLAB

Data Communication Lab Code:CS594B
Contact: 3P Credits: 2

List of Experiments

1. To study different types of transmission media
2. Familiarization with Networking cables (CAT5, UTP), Connectors (RJ45, T-connector), Hubs, Switches. Configuration of a HUB/Switch.
3. PC-to-PC Communication with the Data Communication Trainers for File Transfer.

Error detection codes, Data Encryption etc.

4. Experiments using LAN Trainer kit for Point-to-Point Communication Multicast/Broadcast Communication

Data Encryption and security protocols

5. To make inter-connections in cables for data communication in LAN and install LAN using (a) Tree topology (b)STAR topology (c) Bus topology (d) Token-Ring topology
6. Study of MODEMs: (a) configure the modem of a computer (b) Study Serial Interface RS-232 and its applications(c) Study the Parallel Interface and its applications

DSP Lab Code: CS594C
Contact: 3P
Credits: 2

Simulation Laboratory using standard Simulator:

c) Sampled sinusoidal signal, various sequences and different arithmetic operations.
d) Convolution of two sequences using graphical methods and using commands-verification of the properties of convolution.
e) Z-transform of various sequences – verification of the properties of Z-transform.
f) Twiddle factors – verification of the properties.
g) DFTs / IDFTs using matrix multiplication and also using commands.
h) Circular convolution of two sequences using graphical methods and using commands, differentiation between linear and circular convolutions.
i) Verifications of the different algorithms associated with filtering of long data sequences and Overlap –add and Overlap- save methods.

j) Butterworth filter design with different set of parameters.
k) FIR filter design using rectangular, Hamming and Blackman windows.

Hardware Laboratory using either 5416 or 6713 Processor and Xilinx FPGA:

3. Writing & execution of small programs related to arithmetic operations and convolution using Assembly Language of TMS320C 5416/6713 Processor, study of MAC instruction.
4. Writing of small programs in VHDL and downloading onto Xilinx FPGA.
5. Mapping of some DSP algorithms onto FPGA.

OOP Lab Code: CS594D

Contact: 3P Credits: 2

1. Assignments on class, constructor, overloading, inheritance, overriding
2. Assignments on wrapper class, arrays
3. Assignments on developing interfaces- multiple inheritance, extending interfaces
4. Assignments on creating and accessing packages
5. Assignments on multithreaded programming
6. Assignments on applet programming

Note: Use Java for programming

Preferably download "**java_ee_sdk-6u4-jdk7-windows.exe**" from **http://www.oracle.com/technetwork/java/javaee/downloads/java-ee-sdk-6u3-jdk-7u1-downloads-523391.html**

SEMESTER – VI

Theory
Principles of Management
HU-601
Contracts: 2L
Credits- 2

Module-I

1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.
2. Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives; Organization Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organizational Effectiveness.

Module-II

3. Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.
4. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.
5. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship.

Module-III

6. Leadership: Concept, Nature, Styles.
7. Decision making: Concept, Nature, Process, Tools & techniques.
8. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.

Module-IV

9. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
10. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Readings:

1. Management: Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).
2. Essentials for Management – Koontz, Revised edition, Tata McGraw Hill (TMH)

3. Management – Stoner, James A. F. (Pearson) 4.Management - Ghuman, Tata McGraw Hill(TMH)

Database Management System
CS-601
Contact: 3L
Credits: 3

Detailed Syllabus:

Introduction [4L]

Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Entity-Relationship Model [6L]

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Relational Model [5L]

Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

SQL and Integrity Constraints [8L]

Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Database security application development using SQL, Stored procedures and triggers.

Relational Database Design [9L]

Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF

Internals of RDBMS [7L]

Physical data structures, Query optimization : join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock base protocols, two phase locking.

File Organization & Index Structures [6L]

File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree .

Text Books:

1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, “Fundamentals of Database Systems”, Benjamin Cummings Publishing. Company.

3. Ramakrishnan: Database Management System , McGraw-Hill
4. Gray Jim and Reuter Address, “Transaction Processing : Concepts and Techniques”, Moragan Kauffman Publishers.
5. Jain: Advanced Database Management System CyberTech
6. Date C. J., “Introduction to Database Management”, Vol. I, II, III, Addison Wesley.
7. Ullman JD., “Principles of Database Systems”, Galgottia Publication. Reference:
8. James Martin, “Principles of Database Management Systems”, 1985, Prentice Hall of India, New Delhi
9. “Fundamentals of Database Systems”, RamezElmasri, ShamkantB.Navathe, Addison Wesley Publishing Edition
10. “Database Management Systems”, Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

Course Outcome(s)

CO1	**Apply** the fundamentals of assembly level programming of microprocessors and microcontroller.
CO2	**Illustrate** standard microprocessor, real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters and **use** in problem solving.
CO3	**Develop** systems using different microcontrollers.
CO4	**Analyze** abstract problems and **apply** a combination of hardware and software to address the problem.
CO5	**Explain** the interactions between software and hardware.

CO-PO (PSO) Mapping

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS503.1	2	2	2	2	-	-	-	-	-	-	-	-	2	2	-
CS503.2	3	3	3	2	-	-	-	-	-	-	-	-	2	2	-
CS503.3	3	3	3	2	-	-	1	-	-	-	-	-	2	1	-
CS503.4	3	3	3	2	3	2	2	-	-	-	-	-	3	-	-
CS503.5	3	2	3	2	3	2	2	-	-	-	1	1	3		
CS503	2.8	2.6	2.8	2.00	1.2	0.8	1	-	-	-	0.2	0.2	2.4	1	-

Computer Networks CS-602
Contact: 3L Credits: 3

Module I

Overview of Data Communication and Networking: [4L]

Introduction; Data communications: components, data representation (ASCII,ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical Level: [6L]

Overview of data(analog & digital), signal(analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit switching: time division & space division switch, TDM bus; Telephone Network;

Module II

Data link Layer: [5L]

Types of errors, framing(character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

Medium Access sub layer: [5L]

Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet(in brief);

Module III Network layer: [8L]

Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : IP addressing, subnetting; Routing : techniques, static vs. dynamic routing , Unicast Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, IP, ICMP, IPV6;.

Transport layer: [4L]

Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm,

Module IV Application Layer [5L]

Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls.

Modern topics: [5L]

ISDN services & ATM, DSL technology, Cable Modem: Architecture & Operation in brief Wireless LAN: IEEE 802.11, Introduction to blue-tooth.

Text Books:

1. B. A. Forouzan – "Data Communications and Networking (3rd Ed.) " – TMH
2. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
3. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education
4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP
5. Black, Data & Computer Communication, PHI
6. Miller, data Communication & Network, Vikas

7. Miller, Digital & Data Communication, Jaico
8. Shay, Understanding Data Communication & Network, Vikas

Reference Books:

1. Kurose and Rose – " Computer Networking -A top down approach featuring the internet" – Pearson Education
2. Leon, Garica, Widjaja – "Communication Networks" – TMH
3. Walrand – "Communication Networks" – TMH.
4. Comer – "Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)" – Pearson Education/PHI

Course Outcomes:

CS601.1	Understand the concepts of protocols, network interfaces, network models and design/performance issues in local area networks and wide area networks.
CS601.2	Comprehend basic computer network technology, explain Data Communications System and its components and to identify the different types of network devices and their functions within a network.
CS601.3	Solve the main problems related to error control, flow control, MAC and addressing, routing.
CS601.4	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
CS601.5	Evaluate why do networks need security and control, what errors might and identify deficiencies in existing protocols, and then propose new protocols.

CO-PO (PSO) Mapping:

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS601.1	2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CS601.2	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS601.3	3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CS601.4	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS601.5	3	2	2	2	-	-	-	-							
CS601	2.8	2.8	2.6	2.4	-	-	-	-	-	-	-	-	-	-	-

Operating System CS-603
Contact: 3L
Credits: 3

Introduction [4L]

Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

System Structure[3L]

Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

Process Management [17L]

Processes [3L]: Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication.

Threads [2L]: overview, benefits of threads, user and kernel threads.

CPU scheduling [3L]: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.

Process Synchronization [5L]: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

Deadlocks [4L]: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Storage Management [19L]

Memory Management [5L]: background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

Virtual Memory [3L]: background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.

File Systems [4L]: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

I/O Management [4L]: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management [3L]: disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , disk reliability, disk formatting, boot block, bad blocks.

Protection & Security [4L]

Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

Text Books / References **:**

1. Milenkovie M., “Operating System : Concept & Design”, McGraw Hill.
2. Tanenbaum A.S., “Operating System Design & Implementation”, Practice Hall NJ.
3. Silbersehatz A. and Peterson J. L., “Operating System Concepts”, Wiley.
4. Dhamdhere: Operating System TMH
5. Stalling, William, “Operating Systems”, Maxwell McMillan International Editions, 1992.
6. Dietel H. N., “An Introduction to Operating Systems”, Addison Wesley.

Course Outcome(s)

On completion of the course students will be able to:

CS503.1	**Understand** the basic concepts and utility of Database management system
CS503.2	**Design** an Entity Relationship (E-R) Diagram for an application.
CS503.3	**Analyze and create** therelational database based on normalization
CS503.4	**Determine** whether the transaction satisfies the ACID properties.
CS503.5	**Implement** and **maintain** the database of an organization.

CO-PO (PSO) Mapping

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS503.1	2	2	2	2	-	-	-	-	-	-	-	-	2	2	-
CS503.2	3	3	3	2	-	-	-	-	-	-	-	-	2	2	-
CS503.3	3	3	3	2	-	-	1	-	-	-	-	-	2	1	-
CS503.4	3	3	3	2	3	2	2	-	-	-	-	-	3	-	-
CS503.5	3	2	3	2	3	2	2	-	-	-	1	1	3		
CS503	2.8	2.6	2.8	2.00	1.2	0.8	1	-	-	-	0.2	0.2	2.4	1	-

Professional Elective

Information Theory & Coding

CS-604A

Contact: 3L

Credits: 3

Source Coding [7L]

Uncertainty and information, average mutual information and entropy, information measures for continuous random variables, source coding theorem, Huffman codes.

Channel Capacity And Coding [7L]

Channel models, channel capacity, channel coding, information capacity theorem, The Shannon limit.

Linear And Block Codes For Error Correction [8L]

Matrix description of linear block codes, equivalent codes, parity check matrix, decoding of a linear block code, perfect codes, Hamming codes.

Cyclic Codes [7L]

Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Golay codes.

BCH Codes [8L]

Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes.

Convolutional Codes [8L]

Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding.

Books

9. Information theory, coding and cryptography - Ranjan Bose; TMH.
10. Information and Coding - N Abramson; McGraw Hill.
11. Introduction to Information Theory - M Mansurpur; McGraw Hill.
12. Information Theory - R B Ash; Prentice Hall.
13. Error Control Coding - Shu Lin and D J Costello Jr; Prentice Hall.

Computer Graphics
CS-604B
Contact: 3L
Credits: 3

Prerequisites:

1. Mathematics – I,III
2. Computer Fundamentals & Principle of Computer Programming
3. Programming with C++

Course Objective(s)

- To provide comprehensive introduction about computer graphics system, design algorithms and two dimensional transformations.
- To make the students familiar with techniques of clipping, three dimensional graphics and three dimensional transformations.
- The computer graphics course prepares students for activities involving in design, development and testing of modeling, rendering, and shading.

Module I:

Introduction to computer graphics & graphics systems [6L]: Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

Scan conversion [8L]: Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Module II:

2D transformation & viewing [15L]: Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse. Cohen and Sutherland line clipping, Sutherland-Hodgeman Polygon clipping, Cyrus-beck clipping method

3D transformation & viewing [5L]: 3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, view port clipping, 3D viewing.

Module III:

Curves [3L]: Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

Hidden surfaces [3L]: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Painter's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal - geometry.Color& shading models [2L]: Light & color model; interpolative shading model; Texture. Introduction to Ray-tracing: [3L]
Human vision and color, Lighting, Reflection and transmission models.

Books:

1. Hearn, Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson education
2. Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3. D. F. Rogers, J. A. Adams – "Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH

Table 1: Course Outcomes

On completion of the course students will be able to

CS604.1	**Find** a basic knowledge of computer graphics system, input output devices and application of computer graphics.
CS604.2	**Understand** different scan conversion algorithms and geometric transformations techniques.
CS604.3	**Analyze** the numerical problems using the concept of algebra and geometry
CS604.4	**Apply** computer graphics principles and concepts to animation and game design
CS604.5	**Create** geometric model using geometric primitives

Table 2: Mapping of Course Outcomes with Pos (&PSOs)

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS501.1	3	2	2	2	2	1	-	-	-	-	-	2	1	3	1
CS501.2	2	2	2	2	3	-	-	-	-	-	-	-	2	3	2
CS501.3	2	3	2	2	2	2	-	-	-	-	-	-	2	2	2
CS501.4	2	2	3	3	2	1	-	-	-	-	-	-	3	2	3
CS501.5	2	2	3	3	2	1	1	1	1	1	1	1	3	1	2
CS501	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2

ERP
CS-604C
Contact: 3L
Credits: 3

Module 1: Overview of ERP (Lectures : 9)

a) The evolution of ERP systems: A historical perspective

Evolution through Payroll system, Inventory Control system, Materials Requirement Planning (MRP I) system, Manufacturing Resource Planning (MRP II) system, Their advantages and disadvantages. Definition and Concept of ERP, Business reasons for rise and popularity of ERP system - Benefits of an ERP system

b) Business processes supported by ERP systems

Various business functions in an Organization – Purchasing, Materials Management, Manufacturing, Sales & Distribution, Plant Maintenance, Quality Management, Finance & Accounting including Costing, Human Resources etc.

ERP market place – SAP, Oracle, PeopleSoft, JD Edwards, Baan, Microsoft's suit of products etc.
Business modules in these ERP packages – a brief comparative description of business function modules and sub-modules.

Overview of key end-to-end business processes supported in two major ERP systems (preferably SAP and Oracle) – Order to Cash, Procure to Pay, Plan to Produce and Despatch.

Module 2 : Information Technology and ERP systems (Lectures : 9)

1. The evolution of Information Technology (IT): A historical perspective

Evolution of computer generations (hardware and software) – Operating systems, File systems to Database Management systems, Communication Networks. Enabling of ERP systems by IT evolution.

2. The evolution of ERP systems architecture

Client-Server based architecture, Multi-Tier architecture – Presentation layer, Application layer, and Database layer (On- line Transaction Processing – OLTP). Brief discussion on Extended ERP systems - Web-enabled ERP architecture, Service-Oriented Architecture and Cloud Computing. Open Source ERP.

3. Related technology concepts

ERP and Supply Chain Management (SCM), and Customer Relationship Management (CRM), ERP and Business Intelligence (some of the popular tools like Cognos, Business Objects should be mentioned), ERP and Data warehousing (Data Mart, Data Mining and On-line Analytical Processing - OLAP), ERP and E-business.

Module 3 : Implementation of ERP system (Lectures : 11)

Types of services required in implementation – Consulting, Configuration, Customization and Support

1) **ERP implementation approach**

Single vendor versus Best-of Breed ERP implementation, Big Bang versus
Phased (by module/ site) implementation, Using ERP of Application Service Provider (ASP).

2) **ERP implementation life cycle**

Planning different aspects (Economic viability, Senior Management commitment, Resource requirements, Change management etc.), Understanding requirements and Process preparation – Gap analysis and Business Process Engineering, User Acceptance criteria, Design, Configuration, Customization (difference between Configuration and Customization, advantages and disadvantages), Extensions, Data migration, End-user training, User Acceptance, Going live, Roll-out.
Differences between ERP implementation life cycle and Custom Software development phases. Drawbacks of ERP system.

3) **Organizing implementation**

Interaction with Vendors, Consultants, and Users. Contracts with Vendors, Consultants, and Employees. Project Management and Monitoring. ERP Project Organization
– Formation of Steering Committee and different User Groups. Top Management Commitment and Steering Committee meetings. Change Management, Risks and Challenges in ERP implementation.

4) **Post-implementation Support, Review, Maintenance and Security of ERP systems**

A typical Support Cycle (Planning, Stabilization, Ongoing and Upgrade phases). Post-implementation Review of ERP systems – measures of review (Efficiency, Effectiveness, and Competitive Advantage), and approaches for review (User attitude survey, Cost/benefit analysis, Compliance audit, Budget performance review, Service level monitoring, Technical review, Product review, Integration review etc.). System maintenance and ERP system maintenance. Software upgrade (patch, release, version). Security and Access control of ERP systems.

Module 4 : Emerging Trends and Future of ERP systems (Lectures : 7)

1. **Emerging Technologies and ERP**

Service-oriented Architecture (SOA): Enterprise SOA layers – Business processes, Business services, Components and Integration services, Advantages and Drawbacks of
SOA, When to use SOA, Difference between multi-layered Client-server architecture and SOA, basic awareness of NetWeaver from SAP, Websphere from Oracle and .Net from Microsoft.

Enterprise Application Integration (EAI): Basic understanding of the concept, Types of EAI (levels) – User Interface, Method (logic), Application Interface, Data.
EAI architecture – Typical framework (Business Processes, Components &Services, Messaging service, and Transport service. Mention of some of the leading EAI vendors – IBM, Microsoft, Oracle, SAP, TIBCO.
Radio Frequency Identification (RFID) and ERP: awareness of RFID technology, Benefits of RFID integrated with ERPs.
M-Commerce: basic concept and applications, difference with E-Commerce, benefits of integration with ERPs.

2. **Future of ERP**

Technology transformation to SOA, more E-Commerce features, Growing mobile applications, Economical and Easy models of ERP deployment etc.

Books Recommended:

i) Enterprise Resource Planning – A Managerial Perspective by D P Goyal, Tata McGraw Hill Education, 2011
ii) Enterprise Resource Planning by Ashim Raj Singla, Cengage Learning, 2008

References:

1. Enterprise Resource Planning, 2nd Edition by Alexis Leon, Tata McGraw Hill Education, 2008

Operation Research
CS-605A
Contact: 3L
Credits: 3
Free Elective

Module I

Linear Programming Problems (LPP):

Basic LPP and Applications; Various Components of LP Problem Formulation.

Solution of Linear Programming Problems:
Solution of LPP: Using Simultaneous Equations and Graphical Method;

Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and explanation with examples. **5L**
Solution of LPP by Simplex Method; Charnes' Big-M Method; Duality Theory. Transportation Problems and Assignment Problems.
12L

Module II
Network Analysis:
Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded). **6L**

Inventory Control:
Introduction to EOQ Models of Deterministic and Probabilistic ; Safety Stock; Buffer Stock.
3L

Module III
Game Theory:
Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance.
5L

Module IV
Queuing Theory:
Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): (∞ / FIFO) and (M/M/1: N / FIFO) and problems.
5L

Text Books:

1. H. A. Taha, "Operations Research", Pearson
2. P. M. Karak – "Linear Programming and Theory of Games", ABS Publishing House
3. Ghosh and Chakraborty, "Linear Programming and Theory of Games", Central Book Agency
4. Ravindran, Philips and Solberg - "Operations Research", WILEY INDIA

References:

1. Kanti Swaroop — "Operations Research", Sultan Chand & Sons
2. Rathindra P. Sen—"Operations Research: Algorithms and Applications", PHI
3. R. Panneerselvam - "Operations Research", PHI
4. A.M. Natarajan, P. Balasubramani and A. Tamilarasi - "Operations Research", Pearson
5. M. V. Durga Prasad – "Operations Research", CENGAGE Learning
6. J. K. Sharma - "Operations Research", Macmillan Publishing Company

Human Resource Management (HSS)
CS-605B
Contact: 3L
Credits: 3

Introduction : HR Role and Functions, Concept and Significance of HR, Changing role of HR managers - HR functions and Global Environment, role of a HR Manager.

Human Resources Planning : HR Planning and Recruitment: Planning Process - planning at different levels - Job Analysis - Recruitment and selection processes - Restructuring strategies - Recruitment-Sources of Recruitment-Selection Process-Placement and Induction-Retention of Employees.

Training and Development : need for skill upgradation - Assessment of training needs - Retraining and Redeployment methods and techniques of training employees and executives - performance appraisal systems.
Performance Management System : Definition, Concepts and Ethics-Different methods of Performance Appraisal- Rating Errors- Competency management.

Industrial Relations : Factors influencing industrial relations - State Interventions and Legal Framework - Role of Trade unions - Collective Bargaining - Workers' participation in management.
Case study.

Books :

1. Gary Dessler, Human Resource Management - (8th ed.,) Pearson Education, Delhi
2. Decenzo & Robbins, Personnel / Human Resource Management, 3rd ed., John Wiley & Sons (Pvt.) Ltd.
3. Biswajeet Patanayak, Human Resource Management, PHI, New Delhi
4. Luis R. Gomez, Mejia, Balkin and Cardy, Managing Human Resources PHI, New Delhi.

Multimedia Technology
CS-605C
Contact: 3L
Credits: 3

Introduction [2L]
Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications

Text and Audio [6L]
Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption;
Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI

Image and Video (8L)
Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.

Synchronization [4L]
Temporal relationships, synchronization accuracy specification factors, quality of service

Storage models and Access Techniques [(4L]
Magnetic media, optical media, file systems (traditional, multimedia) Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD

Image and Video Database [8L]
Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- k- d trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing

Document Architecture and Content Management [9L]
Content Design and Development, General Design Principles
Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications

Multimedia Applications [4L]
Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors.

Books:

1. Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications & Applications , Pearson Ed.
2. Nalin K. Sharda , Multimedia Information System , PHI.
3. Fred Halsall , Multimedia Communications , Pearson Ed.
4. Koegel Buford , Multimedia Systems , Pearson Ed.
5. Fred Hoffstetter , Multimedia Literacy , McGraw Hill.
6. Ralf Steinmetz and Klara Nahrstedt , Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing , PHI.
7. J. Jeffcoate , Multimedia in Practice: Technology and Application , PHI.
8. Prabhat K. Andleigh& Kiran Thakrar , Multimedia Systems Design , PHI.

Practical

Database Management System Lab
Code: CS691
Contact: 3P
Credits: 2

Structured Query Language

1. **Creating Database**
   - Creating a Database
   - Creating a Table
   - Specifying Relational Data Types
   - Specifying Constraints
   - Creating Indexes
2. **Table and Record Handling**
   1. INSERT statement
   2. Using SELECT and INSERT together
   3. DELETE, UPDATE, TRUNCATE statements
   4. DROP, ALTER statements
3. **Retrieving Data from a Database**
   - The SELECT statement
   - Using the WHERE clause
   - Using Logical Operators in the WHERE clause
   - Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING **Clause**
   - Using Aggregate Functions
   - Combining Tables Using JOINS
   - Subqueries
4. **Database Management**
   - Creating Views
   - Creating Column Aliases
   - Creating Database Users
   - Using GRANT and REVOKE

Cursors in Oracle PL / SQL
Writing Oracle PL / SQL Stored Procedures

Network Lab
Code: CS692
Contact: 3P
Credits: 2

Detailed Syllabus:

- IPC (Message queue)
- NIC Installation & Configuration (Windows/Linux)
- Familiarization with
  - Networking cables (CAT5, UTP)
  - Connectors (RJ45, T-connector)
  - Hubs, Switches
- TCP/UDP Socket Programming
- Multicast & Broadcast Sockets
- Implementation of a Prototype Multithreaded Server
- Implementation of
  - Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
  - Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
  - Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

Course Outcome

On completion of the course students will be able to

CS692.1	Understand the socket program using TCP &UDP.
CS692.2	Develop simple applications using TCP &UDP.
CS692.3	Solve and analyze the Data link layer protocols and simulate them using network simulator.
CS692.4	Compare and contrast the performances of Routing protocol.
CS692.5	Evaluate congestion control algorithm using network simulator.

Mapping of Course Outcomes with POs (&PSOs)

CO #	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CS691.1	2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CS691.2	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-

CS691.3	3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CS691.4	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CS691.5	3	2	2	2	-	-	-	-							
CS691	2.8	2.8	2.6	2.4	-	-	-	-	-	-	-	-	-	-	-

Operating System Lab
Code: CS693
Contact: 3P
Credits: 2

Prerequisite:
1. Logic of programming language
2. Basic concepts of data structure and algorithms

Course Objectives

1. To learn the data models, conceptualize and depict a database system
2. To learn the fundamental concepts of SQL queries.
3. To understand the concept of designing a database with the necessary attributes.
4. To know the methodology of Accessing, Modifying and Updating data & information from the relational databases
5. To learn database design as well as to design user interface and how to connect with database.

Detailed Syllabus:

1. **Shell programming [6P]**: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).
2. **Process [6P]**: starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.
3. **Signal [9P]**: signal handling, sending signals, signal interface, signal sets.
4. **Semaphore [6P]**: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).
5. **POSIX Threads [9P]**: programming with pthread functions(viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel)
6. **Inter-process communication [9P]**: pipes(use functions pipe, popen, pclose), named pipes(FIFOs, accessing FIFO

Course Outcomes

On completion of the course students will be able to

CS693.1	Understand the basic concepts regarding database, know about query processing and techniques and related database facilities including concurrency control, backup and recovery.
CS693.2	Understand the introductory concepts of some advanced topics in data management like distributed databases, data warehousing, deductive databases and be aware of some advanced databases.
CS693.3	Differentiate between DBMS and advanced DBMS and use of advanced database concepts and become proficient in creating database queries.
CS693.4	Analyze database system concepts and apply normalization to the database
CS693.5	Apply and create different transaction processing and concurrency control applications

Mapping of Course Outcomes with Pos (&PSOs)

CO #	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CS593.1	2	2	2	2	3	2	1	1	2	2	3	3	2	2	1
CS593.2	2	3	3	3	3	1	1	1	2	2	3	3	2	2	2
CS593.3	3	3	2	3	3	2	2	2	3	3	3	3	3	2	2
CS593.4	3	3	2	2	2	1	1	1	1	1	2	3	2	1	3
CS593.5	3	3	3	3	3	2	2	2	3	3	3	3	3	2	2
CS593	2.6	2.8	2.4	2.6	2.8	1.6	1.4	1.4	2.2	2.2	2.8	3	2.4	1.8	2

VII Semester
Theory

Software Engineering
CS701
Contracts: 3L
Credits- 3

Module I
Software Engineering –Objectives, Definitions ,Software Process models - Waterfall Model , Prototype model, RAD, Evolutionary Models ,Incremental, Spiral (**4L)**
Software Project Planning- Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model. **[4L] Module II**
Structured Analysis , Context diagram and DFD, Physical and Logical DFDs ,Data Modeling, ER diagrams, Software Requirements
Specification **(5L) Module III**
Design Aspects :Top-Down And Bottom-Up design; Decision tree, decision table and structured English, Structure chart, Transform analysis Functional vs. Object- Oriented approach. **[3L]**
Unified Modelling Language
Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, implementation diagram. **(4L)**
Module V
Coding & Documentation – Structured Programming, Modular Programming, Module Relationship- Coupling, Cohesion, OO Programming, Information Hiding, Reuse, System Documentation. **[5L]**
Testing – Levels of Testing, Integration Testing, System Testing**.(5L)**
Software Quality, Quality Assurance, Software Maintenance, Software Configuration Management, Software Architecture. **[6L]**

Reference Books:

1. Software Engineering : A practitioner's approach– Pressman(TMH)
2. Software Engineering- Pankaj Jalote (Wiley-India)
3. Software Engineering- Rajib Mall (PHI)
4. Software Engineering –Agarwal and Agarwal (PHI)

Compiler Design
CS702
Contracts: 3L
Credits- 3

Module I

Introduction to Compiling [2L]
Compilers, Analysis-synthesis model , The phases of the compiler, Cousins of the compiler.
Lexical Analysis [5L]
The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of tokens, Finite automata, From a regular expression to an NFA, From a regular expression to NFA, From a regular
expression to DFA, Design of a lexical analyzer generator (Lex).
Module II
Syntax Analysis [8L]
The role of a parser, Context free grammars, Writing a grammar, Top down Parsing, Non-recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR, LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques.
Syntax directed translation [4L]
Syntax directed definitions, Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.
Module III
Type checking [3L]
Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions
Run time environments [4L]
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, Parameter passing (call by value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques.
Module IV
Intermediate code generation [3L]
Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).
Code optimization [4L]
Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag representation of basic blocks, The principle sources of optimization, Loops in flow graph, Peephole optimization.
Code generations [3L]
Issues in the design of code generator, a simple code generator, Register allocation & assignment.
Text books:

1. Aho, Sethi, Ullman - “Compiler Principles, Techniques and Tools” - Pearson Education.
2. Holub - “Compiler Design in C” – PHI
3. Tremblay and Sorenson Compiler Writing-McgrawHill International .
4. Chattopadhyay , S- Compiler Design (PHI)

Pattern Recognition
CS703A

Contracts: 3L
Credits- 3

Module – I	
Introduction – Definitions, data sets for Pattern Recognition	2
Different Paradigms of Pattern Recognition	1
Representations of Patterns and Classes	2
Metric and non-metric proximity measures	2
Module - II	
Feature extraction	
Different approaches to Feature Selection	2
Nearest Neighbour Classifier and variants	1
Efficient algorithms for nearest neighbour	2
classification	2
Module - III	
Different Approaches to Prototype Selection	2
Bayes Classifier	3
Decision Trees	3
Linear Discriminant Function	3
Module - IV	
Support Vector Machines	2
Clustering	3
Clustering Large datasets	2
Combination of Classifiers	2
Applications – Document Recognition	2

REFERENCES

1. Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad.
2. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, Wiley, 2000.

Soft Computing CS703B
Contracts: 3L
Credits- 3
Module-I [2L]

Introduction: Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm.

Module-II [10L]

Fuzzy sets and Fuzzy logic systems:

Classical Sets and Fuzzy Sets and Fuzzy relations : Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations.

Membership functions : Features of membership functions, standard forms and boundaries, different fuzzification methods.

Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods.

Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication

Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy Inference System- Mamdani Fuzzy Models – Sugeno Fuzzy Models.

Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting

Module-III [10L]

Neural Network

Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron.

Learning Methods : Hebbian, competitive, Boltzman etc.,

Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back-propagation and multi layer networks.

Competitive learning networks: Kohonenself organizing networks, Hebbian learning; Hopfield Networks.

Neuo-Fuzzy modeling:

Applications of Neural Networks: Pattern Recognition and classification

Module-IV[10L]

Genetic Algorithms: Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA). **Applications of Genetic Algorithm**: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition

Module-V [4L]

Other Soft Computing techniques: Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).

Text Books:

1. Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI
3. Principles of Soft Computing , S N Sivanandam, S. Sumathi, John Wiley & Sons
4. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
5. Neuro-Fuzzy and Soft computing, Jang, Sun, Mizutani, PHI
6. Neural Networks: A Classroom Approach,1/e by Kumar Satish, TMH,
7. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg, Pearson/PHI
8. A beginners approach to Soft Computing, Samir Roy & Udit Chakraborty, Pearson

Reference Books:

1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, George J. Klir and Bo Yuan, Prentice Hall
2. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.

Artificial Intelligence
CS703C
Contracts: 3L
Credits- 3 39L

Introduction [2]
Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.

Intelligent Agents [2]
Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.

Problem Solving [2]
Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

Search techniques [5]
Solving problems by searching :problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.

Heuristic search strategies [4]

Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems.

Adversarial search [3]

Games, optimal decisions & strategies in games, the min max search procedure, alpha-beta pruning, additional refinements, iterative deepening.

Knowledge & reasoning [3]
Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation.

Using predicate logic [2]
Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.

Representing knowledge using rules [3]
Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

Probabilistic reasoning [3]
Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics.

Planning [2]
Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.

Natural Language processing [2]
Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.

Learning [3]
Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.

Expert Systems [2]
Representing and using domain knowledge, expert system shells, knowledge acquisition.
Basic knowledge of programming language like Prolog & Lisp. **[3] Books:**

1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Poole, Computational Intelligence, OUP
5. Logic & Prolog Programming, Saroj Kaushik, New Age International

6. Expert Systems, Giarranto, VIKAS
7. Artificial Intelligence, Russel, Pearson

Image Processing CS703D
Contracts: 3L Credits- 3 38L
Introduction [3L]
Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.

Digital Image Formation [4L]
A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.

Mathematical Preliminaries [9L]
Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.

Image Enhancement [8L]
Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.

Image Restoration [7L]
Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation.

Image Segmentation [7L]
Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection - Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.

Books:

1. Digital Image Processing, Gonzalves,Pearson
2. Digital Image Processing, Jahne, Springer India
3. Digital Image Processing &Analysis,Chanda&Majumder,PHI 4.Fundamentals of Digital Image Processing, Jain, PHI
5. Image Processing, Analysis & Machine Vision, Sonka, VIKAS
6. Getting Started with GIS- Clarke Keith. C; PE.
7. Concepts & Techniques of GIS - Lo C.P, Albert, Yeung K.W- PHI.

Distributed Operating System
Code: CS704A
Contracts: 3L
Credits- 3 [36L]

Introduction to Distributed System [2]
Introduction, Examples of distributed system, Resource sharing, Challenges

Operating System Structures: [3]
Review of structures: monolithic kernel, layered systems, virtual machines. Process based models and client server architecture; The
micro-kernel based client-server approach.

Communication [4]
Inter-process communication , Remote Procedure Call, Remote Object Invocation, Tasks and Threads. Examples from LINUX, Solaris 2 and Windows NT.

Theoretical Foundations: [2]
Introduction. Inherent Limitations of distributed Systems. Lamport's Logical clock. Global State

Distributed Mutual Exclusion:[4]
Classification of distributed mutual exclusion algorithm. NonToken based Algorithm: Lamport's algorithm, Ricart-Agrawala algorithm. Token based Algorithm: Suzuki-Kasami's broadcast algorithm.

Distributed Deadlock Detection: [4]
Deadlock handling strategies in distributed systems. Control organizations for distributed deadlock detection. Centralized and Distributed deadlock detection algorithms: Completely Centralized algorithms, path pushing, edge chasing, global state detection algorithm.

Protection and Security: [4]
Requirements for protection and security regimes. The access matrix model of protection. System and user modes, rings of protection, access lists, capabilities. User authentication, passwords and signatures. Use of single key and public key encryption.

Distributed file systems: [6]
Issues in the design of distributed file systems: naming, transparency, update semantics and fault resilience. Use of the Virtual File System layer. Examples of distributed systems including Sun NFS, the Andrew filestore, CODA file system and OSFDCE.

Distributed Shared Memory: [4]
Architecture and motivations. Algorithms for implementing DSM. Memory Coherence

CORBA: [3]

The Common Object Request Broker Architecture model and software and its relationship to Operating Systems.

Books:

1 Andrew S. Tanenbaum and Maarten Van Steen, Distributed Systems Principles and Paradigms, PHI

2. Singhal Mukesh & Shivaratri N. G., Advanced Concepts in Operating Systems, TMH
3. Tanenbaum, A. S. Distributed Operating Systems, (ISBN 0-131-439-340), Prentice Hall 199
4. Tanenbaum, A. S. Modern Operating Systems, 2nd Edition (ISBN 0-13-031358-0), Prentice Hall 2001.
5. Bacon, J., Concurrent Systems, 2nd Edition, (ISBN 0-201-177-676), Addison Wesley 1998.
6. Silberschatz, A., Galvin, P. and Gagne, G., Applied Operating Systems Concepts, 1st Edition, (ISBN 0-471-36508-4), Wiley 2000.
7. Coulouris, G. et al, Distributed Systems: Concepts and Design, 3rd Edition, (ISBN 0-201- 61918-0), Addison Wesley 2001.
8. Galli, D.L., Distributed Operating Systems: Concepts and Practice (ISBN 0-13-079843-6), Prentice-Hall 2000.

Cloud Computing
CS704B
Contracts: 3L
Credits- 3

Module 1: Definition of Cloud Computing and its Basics (Lectures : 9)

1. **Definition of Cloud Computing:**

Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing

2. **Cloud Architecture:**

A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients

3. **Services and Applications by Type**

IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos
PaaS – Basic concept, tools and development environment with examples
SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS)
Compliance as a Service (CaaS)

Module 2 : Use of Platforms in Cloud Computing (Lectures : 12)

1. **Concepts of Abstraction and Virtualization**

Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D)
Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing
Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF)
Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance

2. **Concepts of Platform as a Service**

Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development
Use of PaaS Application frameworks

3. **Use of Google Web Services**

Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service.

4. **Use of Amazon Web Services**

Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon SimpleDB and Relational Database Service

5. **Use of Microsoft Cloud Services**

Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services

Module 3 : Cloud Infrastructure (Lectures : 7)

Types of services required in implementation – Consulting, Configuration, Customization and Support

1. **Cloud Management**

An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle)

2. **Concepts of Cloud Security**

Cloud security concerns, Security boundary, Security service boundary Overview of security mapping
Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)

Module 4 : Concepts of Services and Applications (Lectures : 8)

1. **Service Oriented Architecture:** Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs
2. **Applications in the Cloud:** Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs
3. **Cloud-based Storage:** Cloud storage definition – Manned and Unmanned

4. **Webmail Services:** Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services

Books Recommended:

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, McGraw Hill Education (India) Private Limited, 2013
3. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
4. Cloud Computing, Miller, Pearson
5. Building applications in cloud:Concept, Patterns and Projects, Moyer, Pearson

6.

References:

1. Cloud Computing – Second Edition by Dr. Kumar Saurabh, Wiley India

Data Warehousing & Data Mining
CS704C
Contracts: 3L
Credits- 3

Module 1: Overview and Concepts of Data Warehousing (Lectures : 9)

4. **Overview of Data warehousing**

Strategic information and the need for Data warehousing, Defining a Data warehouse, Evolution of Data warehousing, Data warehousing and Business Intelligence

5. **The Building Blocks of Data warehouse**

Defining features – Subject-oriented data, Integrated data, Time-variant data, Nonvolatile data, Data granularity Data warehouses and Data marts

Architectural Types – Centralized, Independent data marts, Federated, Hub-and-Spoke, Data mart bus

Overview of components - Source Data, Data Staging, Data Storage, Information Delivery, Metadata, and Management and Control components

6. **Business Requirements and Data warehouse**

Dimensional nature of Business data and Dimensional Analysis, Dimension hierarchies and categories, Key Business Metrics (Facts), Requirement Gathering methods and Requirements Definition Document (contents)

Business Requirements and Data Design – Structure for Business Dimensions and Key Measurements, Levels of detail

Business Requirements and the Architecture plan Business Requirements and Data Storage Specifications Business Requirements and Information Delivery Strategy

Module 2 : Data warehouse Architecture and Infrastructure (Lectures : 8)

6. Architectural components

Concepts of Data warehouse architecture – Definition and architecture in the areas of Data acquisition, Data storage, and Information delivery

Distinguishing characteristics – Different objectives and scope, Data content, Complex analysis for faster response, Flexible and Dynamic, Metadata-driven etc

Architectural Framework – supporting flow of data, and the Management and Control module Technical architecture – Data acquisition, Data storage, and Information delivery

Overview of the components of Architectural Types introduced in Module 1.

7. Infrastructure for Data warehousing

Distinction between architecture and infrastructure, Understanding of how data warehouse infrastructure supports its architecture

Components of physical infrastructure, Hardware and Operating systems for data warehouse, Database Software, Collection of Tools,

Data warehouse Appliances – evolution and benefits

8. The role of Metadata

Understanding the importance of Metadata

Metadata types by functional areas – Data acquisition, Data storage, and Information delivery Business Metadata – overview of content and examples

Technical Metadata – overview of content and examples

Metadata Requirements, Sources of Metadata, Metadata management – challenges, Metadata Repository, Metadata integration and standards

Module 3 : Data Design and Data Preparation (Lectures : 9)

3. Principles of Dimensional Modeling

Data Design – Design decisions, Basics of Dimensional modeling, E-R modeling versus Dimensional modeling The STAR schema – illustration, Dimension Table, Fact Table, Factless Fact Table, Data granularity

STAR schema keys – Primary, Surrogate, and Foreign Advantages of the STAR schema, STAR schema examples

4. Data Extraction, Transformation, and Loading

Overview of ETL, Requirements of ETL and steps

Data extraction – identification of sources and techniques

Data transformation – Basic tasks, Transformation types, Data integration and consolidation, Transformation for dimension attributes

Data loading – Techniques and processes, Data refresh versus update, Procedures for Dimension tables, Fact tables : History and incremental loads

ETL Tool options

5. Data Quality

Importance of data quality, Challenges for data quality, Data quality tools, Data cleansing and purification, Master Data Management

Module 4 : Information access and delivery (Lectures : 10)

5. Matching information to classes of users

Information from Data warehouse versus Operational systems, Users of information – their needs and how to provide information

Information delivery – queries, reports, analysis, and applications

Information delivery tools – Desktop environment, Methodology and criteria for tool selection, Information delivery framework, Business Activity Monitoring, Dashboards and Scorecards

6. OLAP in Data warehouse

Overall concept of Online Analytical Processing (OLAP), OLAP definitions and rules, OLAP characteristics

Major features and functions of OLAP – General features, Dimensional analysis, Hypercubes, Drill Down and Roll Up, Slice and Dice, Rotation, Uses and Benefits

Familiarity with OLAP models – Overview of variations, MOLAP, ROLAP, HOLAP, DOLAP, Database OLAP, Web OLAP

7. Data Warehouse and the web

Web-enabled Data Warehouse – adapting data warehouse for the web

Web-based information delivery – Browser technology for data warehouse and Security issues OLAP and Web – Enterprise OLAP, Web-OLAP approaches, OLAP Engine design

8. Data Mining

Overview of Data mining – Definition, Knowledge Discovery Process (Relationships, Patterns, Phases of the process), OLAP versus Data mining

Some aspects of Data mining – Association rules, Outlier analysis, Predictive analytics etc) Concepts of Data mining in a Data warehouse environment

Major Data Mining techniques – Cluster Detection, Decision Trees, Memory-based Reasoning, Link Analysis, Neural Networks, Genetic Algorithms etc

Data Mining Applications in industry – Benefits of Data mining, Discussion on applications in Customer Relationship Management (CRM), Retail, Telecommunication, Biotechnology, Banking and Finance etc

Books Recommended:

7. Data Warehousing Fundamentals for IT Professionals, Second Edition by Paulraj Ponniah, Wiley India

References:

2. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and Stephen J. Smith, Tata McGraw Hill Education
3. Data warehouse Toolkit by Ralph Kimball, Wiley India

Sensor Networks
CS704D
Contracts: 3L
Credits- 3

Module I: Introduction and Overview [4L]
Learning Objective: To provide an overview about sensor networks and emerging technologies.

Overview of wireless networks, types, infrastructure-based and infrastructure-less, introduction to MANETs (Mobile Ad-hoc Networks), characteristics, reactive and proactive routing protocols with examples, introduction to sensor networks, commonalities and differences with MANETs, constraints and challenges, advantages, applications, enabling technologies for WSNs.

Module II: Architectures [9L]
Learning Objective: To study about the node and network architecture of sensor nodes and its execution environment.

Single-node architecture - hardware components, design constraints, energy consumption of sensor nodes , operating systems and execution environments, examples of sensor nodes, sensor network scenarios, types of sources and sinks – single hop vs. multi hop networks, multiple sources and sinks – mobility, optimization goals and figures of merit, gateway concepts, design principles for WSNs, service interfaces for WSNs.

Module III: Communication Protocols [9L]
Learning Objective: To understand the concepts of communication, MAC, routing protocols and also study about the naming and addressing in WSN.

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, routing protocols-classification, gossiping, flooding, energy-efficient routing, unicast protocols, multi-path routing, data-centric routing, data aggregation, SPIN, LEACH, Directed-Diffusion, geographic routing.

Module IV: Infrastructure Establishment [9L]
Learning Objective: To learn about topology control and clustering in networks with timing synchronization for localization services with sensor tasking and control.

Topology control, flat network topologies, hierarchical networks by clustering, time synchronization, properties, protocols based on sender-receiver and receiver-receiver synchronization, LTS, TPSN, RBS, HRTS, localization and positioning, properties and approaches, single-hop localization, positioning in multi-hop environment, range based localization algorithms – location services, sensor tasking and control.

Module V: Sensor Network Platforms and Tools [9L]
Learning Objective: To study about sensor node hardware and software platforms and understand the simulation and programming techniques.

Sensor node hardware, Berkeley motes, programming challenges, node-level software platforms, node-level simulators, state-centric programming, Tiny OS, nesC components, NS2 simulator, TOSSIM.

TEXT BOOKS

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

REFERENCES

1. Kazem Sohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
3. Thomas Haenselmann, "Sensor Networks", available online for free, 2008.
4. Edgar Callaway, "Wireless Sensor Networks: Architectures and Protocols", Auerbach, 2003.

Mobile Computing CS704E
Contracts: 3L Credits- 3

Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signalling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signalling. **[5L**

General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.
[5L
Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML). Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies. **[7L**

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

[7L

Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols.
[7L

Server-side programming in Java, Pervasive web application architecture, Device independent example application
[8L

Text :

1. "Pervasive Computing", Burkhardt, Pearson
2. "Mobile Communication", J. Schiller, Pearson
3. "Wireless and Mobile Networks Architectures", Yi-Bing Lin &ImrichChlamtac, John Wiley & Sons, 2001
4. "Mobile and Personal Communication systems and services", Raj Pandya, Prentice Hall of India, 2001.

Reference :

1. "Guide to Designing and Implementing wireless LANs", Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.
2. "Wireless Web Development", Ray Rischpater, Springer Publishing,
3. "The Wireless Application Protocol", Sandeep Singhal, Pearson .
4. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers,

Internet Technology CS705A
Contracts: 3L Credits- 3 34L
Module I-6L
Introduction (1L):
Overview, Network of Networks, Intranet, Extranet and Internet.

World Wide Web (1L):
Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP.

Review of TCP/IP (1L):
Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6.

IP Subnetting and addressing (1L):
Classful and Classless Addressing, Subnetting. NAT, IP masquerading, IP tables.

Internet Routing Protocol (1L):
Routing -Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast.

Electronic Mail (1L):
POP3, SMTP.

Module II-9L

HTML (3L):
Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue.

Image Maps (1L):
map, area, attributes of image area.

Extensible Markup Language (XML) (4L):
Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief.

CGI Scripts (1L):
Introduction, Environment Variable, GET and POST Methods.

Module III-10L

PERL (3L):
Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling.

JavaScript (4L):
Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation.

Cookies (1L):
Definition of cookies, Create and Store a cookie with example.

Java Applets (2L):
Container Class, Components, Applet Life Cycle, Update method; Parameter passing applet, Applications.

Module IV-4L

Client-Server programming In Java (2L): Java Socket, Java RMI.

Threats (1L):
Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks.

Network security techniques (2L):
Password and Authentication; VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH).

Firewall (1L):
Introduction, Packet filtering, Stateful, Application layer, Proxy.

Module v-5L

Internet Telephony (1L):
Introduction, VoIP.

Multimedia Applications (2L):
Multimedia over IP: RSVP, RTP, RTCP and RTSP. Streaming media, Codec and Plugins, IPTV.

Search Engine and Web Crawler (2L):
Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO. Reference:

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013. (Chapters 1- 5,7,8,9).
2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011. (Chapters 5,6,12)

Microelectronics & VLSI Design CS705B
Contracts: 3L Credits- 3 36L

Module	Content	Hour
1	**Introduction to VLSI Design**: VLSI Design Concepts, Moor's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI – basic idea only), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioral, Structural, Physical), Y-Chart, Digital VLSI Design Steps.	6
2	**MOS structure**: E-MOS & D-MOS, Charge inversion in E-MOS, Threshold voltage, Flat- band voltage, Potential balance & Charge balance, Inversion, MOS capacitances. **Three Terminal MOS Structure:** Body effect. **Four Terminal MOS Transistor**: Drain current, I-V characteristics. Current-voltage equations (simple derivation). **Scaling in MOSFET**: Short Channel Effects, General scaling, Constant Voltage & Field scaling.] **CMOS**: CMOS inverter, Simple Combinational Gates - NAND gate and NOR Gate using CMOS.	10
3	**Micro-electronic Processes for VLSI Fabrication**: Silicon Semiconductor Technology- An Overview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion, Cleaning, Etching, Photo-lithography – Positive & Negative photo-resist	10

	Basic CMOS Technology – (Steps in fabricating CMOS), Basic n-well CMOS process, p-well CMOS process, Twin tub process, Silicon on insulator **Layout Design Rule**: Stick diagram with examples, Layout rules.	
4	**Hardware Description Language** – VHDL or Verilog Combinational & Sequential Logic circuit Design.	10

Text Books:

1. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education.
2. CMOS Digital Integrated Circuit, S.M.Kang&Y.Leblebici, TMH.
3. Modern VLSI Design, Wayne Wolf, Pearson Education.
4. VHDL, Bhaskar, PHI.
5. Advance Digital Design Using Verilog , Michel D. Celliti, PHI

References:

1. Digital Integrated Circuits, Demassa& Ciccone, John Willey & Sons .
2. Modern VLSI Design: system on silicon, Wayne Wolf; Addison Wesley Longman Publisher
3. Basic VLSI Design, Douglas A. Pucknell& Kamran Eshranghian, PHI
4. CMOS Circuit Design, Layout & Simulation, R.J.Baker, H.W.Lee, D.E. Boyee, PHI

Control System CS705C

Contracts: 3L Credits- 3 36L

Module – I:

a) INTRODUCTION

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems [4L]

Module – I:

b) TRANSFER FUNCTION REPRESENTATION

Transfer Function of linear systems, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

[4L]

Module – II:

a) TIME RESPONSE ANALYSIS

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants.

[4L]

b) STABILITY ANALYSIS IN S-DOMAIN

The concept of stability – Routh's stability criterion – limitations of Routh's stability.

Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci. [5L]

Module – III:

a)FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots. [5L]

b) : STABILITY ANALYSIS IN FREQUENCY DOMAIN

Polar Plots, Nyquist Plots Stability Analysis. [4L]

Module - IV :

a)CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers. [5L]

b) STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability

[5L]

TEXT BOOKS:

Automatic Control Systems 8th edition– by B. C. Kuo 2003– John Wiley and son's.,

2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International

(P) Limited, Publishers, 2nd edition.

REFERENCE BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems Engg. by NISE 3rd Edition – John Wiley

Modelling & Simulation CS705D

Contracts: 3L Credits- 3

Module-I: Introduction to Modelling and Simulation :

Nature of Simulation. Systems , Models and Simulation, Continuous and Discrete Systems, system modelling, Components of a simulation study, Introduction to Static and Dynamic System simulation , Application areas, Advantages ,Disadvantages and pitfalls of Simulation. **6L**

Module –II : System Dynamics & Probability concepts in Simulation :

Exponential growth and decay models, Generalization of growth models ,

Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers, Generation of a Random numbers, Generating Discrete distributions, Non-Uniform

Continuously Distributed Random Numbers, Rejection Method. **10L**

Module-III : Simulation of Queuing Systems and Discrete System Simulation :

Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in computer system. Discrete Events ,Generation of arrival patterns ,Simulation programming tasks , Gathering statistics, Measuring occupancy and Utilization , Recording Distributions and Transit times . **14L**

Module-IV : Analysis of Simulation output :
Sensitivity Analysis, Validation of Model Results **6L**

Text Books:

1. Jerry Banks, John Carson, B.L.Nelson and D.M.Nicol " Discrete Event System Simulation", Fifth Edition, Pearson.
9. Narsingh Deo, 1979, System Simulation with Digital Computers, PHI.
10. Geoffrey Gordon, "System Simulation", PHI.
11. Averill M. Law and W.David Kelton, "Simulation Modelling and Analysis", Third Edition, McGraw Hill
12. J. N. Kapoor.. Mathematical Modelling, Wiley eastern Limited.

Reference Books:

1. Sankar Sengupta, "System Simulation and Modeling", Pearson.
2. C.DennisPegden, Robert E.Shannon and Randall P.Sadowski, 1995, Introduction to Simulation using SIMAN, 2nd Edn., Tata McGraw-Hill.
3. A.M.Law and W.D.Kelton.. Simulation Modelling and Analysis, T.M.H. Edition.

Practical
Group Discussion HU781
Contracts: 3L Credits- 2

To be prepared

Software Engineering Lab CS791
Contracts: 3L Credits- 2
Assignments to be given from the following

1. Preparation of requirement document for standard application problems in standard format.(e.g Library Management System, Railway Reservation system, Hospital management System, University Admission system)

2. Project Schedule preparation .

3. Use Case diagram, Class diagram, Sequence diagram and prepare Software Design Document using tools like Rational Rose.(For standard application problems)

4. Estimation of project size using Function Point(FP) for calculation. 5.Design Test Script/Test Plan(both Black box and White Box approach)

6.Compute Process and Product Metrics (e.g, Defect Density, Defect Age, Productivity,Cost etc.)>Also by Cost Estimation models.

Pattern Recognition Lab CS793A
Contracts: 3L Credits- 2

Efficient algorithms for nearest neighbour classification, Example problem on Bayes classifier,
Decision tree construction.
Implementation of Linear Discriminant Function, Implementation of Support Vector Machine.

Soft Computing Lab CS793B
Contracts: 3L Credits- 2

In this laboratory the students need to implement the soft computing tools in Matlab. Some exposure in C also can be used for neural network and Genetic Algorithm.
A sample assignment list is given below:

FUZZY LOGIC:

1. Write a Matlab program to implement the different Fuzzy Membership functions.
2. Write a Matlab program to implement Fuzzy set operations and its properties.
3. Write a Matlab code to implement composition of Fuzzy and Crisp Relations.
4. Write Matalab code to implement Fuzzy Information System (develop the system using command line and GUI based Fuzzy toolbox)

Neural network:

5. Write Matlab code to implement McCulloh-Pitts neural network for generate AND, OR functions.
6. Write Matlab code to implement Perceptron learning for particular set of problem.
7. Write Matlab code for OR function with bipolar inputs and targets using Adaline network.
8. Write Matlab code for XOR function with bipolar inputs and targets using Madaline network.
9. Write C program to implement McCulloh-Pitts model to generate AND, OR functions.

Genetic Algorithm

10. Write a Matlab code for maximizing F(x)=x2, , where x ranges from say 0 to 31 using Genetic Algorithm.
11. Use of Genetic Algorithm toolbox in matlab for optimization problem solving.
12. Implantation Simple Genetic Algorithm in C for solving optimization problem.

Artificial Intelligence Lab CS793C
Contracts: 3L Credits- 2
Assignments to be framed
Programming Languages such as PROLOG & LISP

Image Processing Lab CS793D
Contracts: 3L Credits- 2

1. Display of Grayscale Images.
2. Histogram Equalization.
3. Non-linear Filtering.
4. Edge detection using Operators.
5. 2-D DFT and DCT.
6. Filtering in frequency domain.
7. Display of color images.
8. Conversion between color spaces.
9. DWT of images.
10. Segmentation using watershed transform.

Internet Technology Lab CS795A
Contracts: 3L Credits- 2

Applet

1. Create a banner using Applet
2. Display clock using Applet
3. Create different shapes using Applet
4. Fill colors in shapes using Applet
5. Goto a link using Applet
6. Create an event listener in Applet
7. Display image using Applet
8. Open a link in a new window using Applet
9. Play sound using Applet
10. Read a file using Applet
11. Write to a file using Applet JavaScript
12. Validate the fields of a form using JavaScript.
13. Guess a number based on user input.
14. Program on image rollover using JavaScript.
15. Display clock using JavaScript.
16. Prompt, alert, array, looping in JavaScript.
17. Calculator using JavaScript.
18. Validate e-mail, phone no. using reg-ex in JavaScript. Perl
19. Write a perl script to implement associative array.
20. Write a perl script to implement the regular expression as follows:

a). If a string contains any vowel, count the total number of vowels. b). If a string starts with MCA and end with bw, print 1 else 0.

c). If string starts with 0 or any no. a's, then print 1 else 0.

21. Write an html code to call a perl script from cgi-bin.
22. Implement the following with regular expression in Perl:

a). a*bc

b). a* at least 2 b's c). a*exactly 3 b's

23. A simple File operation using Perl.

Client Server Programming

24. Write a socket program to get the current date and time from the server.
25. Write a socket program where the client will send lowercase letters and the server will return uppercase letter.
26. Write a server and a client program to implement TCP chat server-client.
27. Create a simple calculator application using Java RMI.

HTML

1. Start your web page with an <html> tag
   i) Add a heading.
   ii) Add a title.
   iii) Start the <body> section.
   iv) Add the following text using <H1> and </H1> tags: This Web page was designed by (your name)
   v) Add the following text using <H2> and </H2> tags: My HTML assignment
   vi) Add a horizontal line
   vii) Insert an image to your web page.

Note: You should then refer to your image with just the filename, and NOT the entire pathname to the file.

   viii) Add another horizontal line.
   ix) Enter a paragraph of text.

Write about things you have learned in html.
Make sure the text in this paragraph is a color other than black, but something one can see.
Add a link that takes you to your favorite webpage.

   x) Start a new paragraph. Add a three item ordered list. Make it creative (don't just say item 1, item 2, etc… and keep it clean)!
   xi) Close out your body and html tags.

2. Start your web page with an <html> tag
   i) Add a heading.
   ii) Add a title.
   iii) Start the <body> section.
   iv) Start a new paragraph. Use alignment attribute,

Use bold, italic, underline tags,
Use font tag and associated attributes, Use heading tags,
Use preserve tag,
Use non breaking spaces (escape character).

3. Start your web page with an <html> tag
   i) Add a heading.
   ii) Add a title.

iii) Start the <body> section.

iv) Start a new paragraph. Create Hyperlinks:

(a) Within the HTML document.

(b) To another URL.

(c) To a file that can be rendered in the browser.

4. Start your web page with an <html> tag

i) Add a heading.

ii) Add a title.

iii) Start the <body> section. Create an unordered list,

Create an ordered list, Use various bullet styles, Created nested lists,
Use the font tag in conjunction with lists, Create definition lists,
Use graphics as bullets.

5. Start your web page with an <html> tag

i) Add a heading.

ii) Add a title.

iii) Start the <body> section.

a) Create a simple table

Create borders and adjust border size. Adjust table cell spacing. Change border color.
Change table background color.

b) Align a new table on HTML page. Perform cell text alignment,

Create multi-column tables,
Display information about your academic qualification into this table.

6. Start your web page with an <html> tag

i) Add a heading.

ii) Add a title.

iii) Start the <body> section. Create a frameset:

Use frame tags,
Create vertical (column) frames, Create horizontal (row) frames, Create complex framesets,
Use the hyperlink tag to target displaying an HTML page to another frame.

iv) Start your web page with an <html> tag

v) Add a heading.

vi) Add a title.

vii) Start the <body> section. Create a simple HTML form.

Use the input tag to create a: text box; text area box; check box; list box; radio button; password field; popup menu; hidden field. Use submit and reset buttons. Create an admission form using the above information.

7. Create a web page that will include an image. Then create image map to watch different parts of that image closely.

8. Using frames as an interface, create a series of web pages where the theme is to provide resources (internet, intranet, static HTML pages) pertaining to the subject of HTML. Ideally, your goal is to create a resource that you can use long after this module when needing information on HTML. As a minimum requirement to this assignment your webpage should:

- Consist of at least 3 frames.
- Contain at least 5 URLs to internet and/or intranet sites that you can reference as part of your job.
- Contain at least 5 references to documents that you have created that you use on a regular basis.
- Contain at least 5 references to documents others have created that you use on a regular basis.
- Be organized in a fashion that is logical and intuitive to you.
- Is done with enough quality that you would not be opposed to it being a link at another site.

9. Create a web page as you wish and the html elements of the page will be styled by CSS. XML

1. Write a XML program that will create an XML document which contains your mailing address.

2. Write a XML program that will create an XML document which contains description of three book category.

3. Create an XML document that contains the name and price per pound of coffee beans.
   i) In your XML document mention all properties of XML declaration.
   ii) The root element has name <coffee_bean>
   iii) Create nested elements for different types of coffee.
   iv) Validate the document and if any parsing error is present, fix them.

4. Create an XML document that contains airline flight information.
   i) In your XML document mention all properties of XML declaration.
   ii) The root element has name <airlines>
   iii) Create three nested <carrier> elements for three separate airlines. Each element should include a name attribute.
   iv) Within each <carrier> nest at least two <flight> ,each of which contains departure_city, destination_ city, fl_no, dept_time.
   v) Validate the document and if any parsing error is present fix them.

5. Create an XML version of your resume. Include elements such as your name and position desired. Nest each of your former employers within an <employer> element. Also, nest your educational experience within an <education> element. Create any other nested elements that you deem appropriate, such as <references> or <spcl_skills> elements.

6. Create a DTD on product catalog.

Contracts: 3L Credits- 2
To be Implemented..

Control System Lab CS795C
Contracts: 3L Credits- 2

Sl.No.	Name of the Experiment	Periods
□	Familiarization with MATLAB Control System tool Box, MATLAB-SIMULINK tool box &pSPICE.	3
□	Determination of step response for 1st order & 2nd order system with amity feedback on CRO & calculation of control system specifications for variations of system design.	3
□	Simulation of step response & impulse response for Type-I & Type-II system with unity feedback using MATLAB &pSPICE.	3
□	Determination of root locus, Bode-plot, Nyquist Plot, using MATLAB control system toolbox for a given 2nd order transfer function & determination of different control system specifications.	6
□	Determination of PI, PD, and PID controller action on 1st order simulated process.	3
□	Determination of approximate transfer function experimentally using Bode Plot.	3
□	Evaluation of steady-state error, setting time, percentage peak overshoots, gain margin, phase margin with addition of lead compensator in forward path transfer functions using MATLAB & pSPICE.	3
□	Study of position control system using servomotor.	3
□	Design and hardware implementation of a temperature controller using microprocessor/microcontroller.	6

Modelling & Simulation Lab CS795D
Contracts: 3L Credits- 2

In this laboratory the students will develop different simulation models. Students also may use any standard software to develop the models.(Using MATLAB?SCILAB/Any other simulation package)
A sample assignment list is given below:

1. Simulate CPU scheduling algorithm using queuing system a) FCFS b) SJF c) Priority Algo
2. Simulate congestion control algorithms.

3. Simulate disk scheduling algorithms.
4. Simulate Telephone system model
5. Simulate traffic system in computer networks

VIII Semester

Theory

Organisational Behaviour
HU801A
Contracts: 2L
Credits- 2

1. Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB. **[2]**
2. Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction. **[2]**
3. Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making. **[2]**
4. Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory. **[4]**
5. Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making. **[2]**
6. Communication: Communication Process, Direction of Communication, Barriers to Effective Communication. **[2]**
7. Leadership: Definition, Importance, Theories of Leadership Styles. **[2]**
8. Organizational Politics: Definition, Factors contributing to Political Behaviour. **[2]**
9. Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process. **[2]**
10. Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture. **[4]**

References:

1. Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15thEdn.
2. Luthans, Fred: Organizational Behavior, McGraw Hill, 12thEdn.
3. Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PHI
4. Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4thEdn.
5. Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Edn Leading Human Resources, PHI, 10th

.

Or

Project Management
HU801B
Contracts: 2L
Credits- 2

1. Project Management Concepts: Concept and Characteristics of a Project, Importance of Project Management.**[1]**
2. Project Planning: Project Evaluation, Financial Sources, Feasibility Studies. **[4]**
3. Project Scheduling: Importance of Project Scheduling, Work Breakdown Structure and Organization Breakdown Structure, Scheduling Techniques – Gantt Chart and LOB, Network Analysis – CPM/PERT. **[6]**
4. Time Cost Trade-off Analysis – Optimum Project Duration. **[2]**
5. Resource Allocation and Leveling. **[2]**
6. Project Life Cycle. **[2]**
7. Project Cost – Capital & Operating Costs, Project Life Cycle Costing, Project Cost Reduction Methods. **[2]**
8. Project Quality Management: Concept of Project Quality, TQM in Projects, Project Audit. **[1]**
9. Software Project Charateristics and Mangement**[2]**
10. IT in Projects: Overview of types of Softwares for Projects, Major Features of Project Management Softwares like MS Project, Criterion for Software Selection. **[2]**

References

1. Gopalkrishnan P. and Rama Mmoorthy: Text Book of Project Management, Macmillan
2. Nicholas John M.: Project Management for Business and Technology – Principles and Practice, Prentice Hall India, 2nd Edn.
3. Levy Ferdinand K., Wiest Jerome D.: A Management Guide to PERT/CPM with GERT/PDM/DCPM and other networks, Prentice Hall India, 2nd Edn.
4. Mantel Jr., Meredith J. R., Shafer S. M., Sutton M. M., Gopalan M. R.: Project Management: Core Text Book, Wiley India, 1st Indian Edn.
5. Maylor H.: Project Management, Pearson, 3rd Edn.
6. Nagarajan K.: Project Management, New Age International Publishers, 5th Edn.
7. Kelkar. S.A, Sotware Project Management: A concise Study, 2nd Ed., PHI

Advanced Computer Architecture
CS801A
Contracts: 3L
Credits- 3

Computer Architecture and Organization-Review, Fundamentals of Computer Design, Technology Trends Cost Performance Analysis (3L)
Parallel Processing Architectures- Taxonomy- SISD, MISD, SIMD,MIMD, PRAM models (3L)
Data and Resource Dependencies, Program Partitioning and Scheduling, Control Flow vs. Data Flow (3L) Network topologies-Static, Dynamic, Types of Networks (3L)
RISC vs. CISC, Memory Hierarchy, Virtual Memory (4L)

Concepts of Pipelining, Instruction Pipelining, dynamic pipelining, arithmetic pipelines. (4L) Multiprocessors- Multistage Networks, Cache Coherence, Synchronization, Message- passing (4L) Vector Processing Principles- Instruction types, Compound, Vector Loops, Chaining (4L)
Array Processors- Structure, Algorithms (3L)
Data Flow Architecture- Graphs. Petri Nets, Static and Dynamic DFA, VLSI Computations (4L) Parallel Programming Models, Languages, Compilers (4L)

Books:
Computer Architecture and Parallel Processing- Kai Hwang and A. .Brigggs International Edition, McGraw Hill Advanced Computer Architecture: D. Sima, T. fountain, P. Kacsuk, Pearson
Parallel Computer Architecture: D. Culler, J.P.Singh, A.Gupta, Elsevier

Parallel Computing
CS801B
Contracts: 3L
Credits- 3

37L
Module I
Introduction.-Parallel Processing Environment- Pipelining and Data Parallelism, Scalability, Flynn's Taxonomy,. (3L) Parallel Processing organization- Mesh, Hyper-tree, Pyramid, Butterfly, Hypercube network (4L) **Module II**
Parallel Algorithms –Structure, cost, Analysis ;Elementary Algorithms: Broadcast, Prefix sums, All sums (4L) Algorithms on Selection problem, Merging-Odd-even merging network, CREW Merging, N-ary searching (6L)
Matrix Transposition ,Matrix Multiplications- 2D Mesh SIMD ,Hypercube SIMD, Shuffle-Exchange SIMD models. Discrete Fourier Transform, Fast Fourier Transform (6L)
Module III
Linear system of equations- Gaussian Elimination, Gauss-Seidel algorithm, Jacobi algorithm (3L) Sorting – Enumeration sort, Odd-even transposition sort, Bitonic merge
Ellis's Algorithm (3L)
Module IV
Graph Algorithms, Spanning Tree Algorithms, (4L)
Parallel Programming Languages –FORTRAN 90, OCCAM(4L)

Books for reference:

1. Parallel Computing –Theory and Practice -Michael J. Quinn (McGraw Hill Inc.)
2. Design and Analysis of Parallel Algorithms- S.G. Akl (PH)

Natural Language Processing
CS801C
Contracts: 3L
Credits- 3

Module I

Regular Expressions and Automata Recap) [**2L**]

Introduction to NLP, Regular Expression, Finite State Automata

Tokenization [**5L**]

Word Tokenization, Normalization, Sentence Segmentation, Named Entity Recognition, Multi Word Extraction, Spell Checking – Bayesian Approach, Minimum Edit Distance

Morphology [**4L**]

Morphology – Inflectional and Derivational Morphology, Finite State Morphological Parsing, The Lexicon and Morphotactics, Morphological Parsing with Finite State Transducers, Orthographic Rules and Finite State Transducers, Porter Stemmer

Module II

Language Modeling [**4L**]

Introduction to N-grams, Chain Rule, Smoothing – Add-One Smoothing, Witten-Bell Discounting; Back off, Deleted Interpolation, N-grams for Spelling and Word Prediction, Evaluation of language models.

Hidden Markov Models and POS Tagging [**4L**]

Markov Chain, Hidden Markov Models, Forward Algorithm, Viterbi Algorithm, Part of Speech Tagging – Rule based and Machine Learning based approaches, Evaluation

Module III

Text Classification [**4L]**

Text Classification, Naïve Bayes' Text Classification, Evaluation, Sentiment Analysis – Opinion Mining and Emotion Analysis, Resources and Techniques

Context Free Grammar [**5L**]

Context Free Grammar and Constituency, Some common CFG phenomena for English, Top-Down and Bottom-up parsing, Probabilistic Context Free Grammar, Dependency Parsing

Module IV

Computational Lexical Semantics [**4L**]

Introduction to Lexical Semantics – Homonymy, Polysemy, Synonymy, Thesaurus – WordNet, Computational Lexical Semantics – Thesaurus based and Distributional Word Similarity

Information Retrieval [**5L**]

Boolean Retrieval, Term-document incidence, The Inverted Index, Query Optimization, Phrase Queries, Ranked Retrieval

– Term Frequency – Inverse Document Frequency based ranking, Zone Indexing, Query term proximity, Cosine ranking, Combining different features for ranking, Search Engine Evaluation, Relevance Feedback

Books:

1. Speech and Language Processing, Jurafsky and Martin, Pearson Education

2. Foundation of Statistical Natural Language Processing, Manning and Schutze, MIT Press

Cryptography & Network Security
CS801D
Contracts: 3L
Credits- 3

Total: - 38 Lectures
Module1: Attacks on Computers & Computer Security (5L)
Introduction, Need for Security, Security approaches, Principles of Security, Types of attack. Module2: Cryptography: Concepts & Techniques (7L)
Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography, Key Range & Key Size
Module3: Symmetric Key Algorithm (8L)
Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA(International Data Encryption Algorithm) algorithm, RC5(Rivest Cipher 5) algorithm.
Module4: Asymmetric Key Algorithm, Digital Signature and RSA (5L)
Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required).
Module5: Internet Security Protocols, User Authentication (6L)
Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication.
Module6 : Electronic Mail Security (4L)

Basics of mail security, Pretty Good Privacy, S/MIME. Module7: Firewall (3L)
Introduction, Types of firewall, Firewall Configurations, DMZ Network Text :

1. "Cryptography and Network Security", William Stallings, 2nd Edition, Pearson Education Asia
2. "Network Security private communication in a public world", C. Kaufman, R. Perlman and M. Speciner, Pearson
3. Cryptography & Network Security: Atul Kahate, TMH.

Reference :

1. "Network Security Essentials: Applications and Standards" by William Stallings, Pearson
2. "Designing Network Security", MerikeKaeo, 2nd Edition, Pearson Books
3. "Building Internet Firewalls", Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, Oreilly
4. "Practical Unix & Internet Security", Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

Business Analytics
CS801E
Contracts: 3L
Credits- 3
Total: - 38 Lectures

Module 1: Foundations of Business Analytics (4L)
Introduction to Business Analytics, Analytics on Spreadsheets.

Module 2: Product-Market Fit: Gap Analysis (6L)
Gap Analysis, Carrying Out Gap Analysis, Steps in Gap Analysis, Conducting a Representative Survey for Gap Analysis, Predicting Consumer Behaviour and Gap Analysis in Smartphone Market.

Module 3: Analytical Modeling by Factor and Cluster Analysis (8L)
Factor Analysis Concepts, Application of Factor Analysis
Concepts of Cluster Analysis, Similarity Measures, Application of Cluster Analysis.

Module 4: Analytical Modeling by Logistics Regression and Discriminant Analysis (10L)
Linear Discriminant Analysis Model, Predictive Modeling using Discriminant Analysis, Application of Linear Discriminant Analysis for Credit Scoring of Loan Applicants.
Theoretical Formulation of Logistics Regression, Mathematical Interpretation of Logistics Regression, Indicator for Model Fit, Applying Logistics Regression,
Application of Logistics Regression in Predicting Risk in Portfolio Management Testing the Reliability/Consistency of the Different Factors Measured.

Module 5: Segmentation of primary target market by Heuristic Modeling (4L)
Introduction to RFM Analysis
Enhancing Response Rates with RFM Analysis.

Module 6: Segmentation of target market based on large databases using Decision Tree approach. (6L)
Introduction to Chi-square Automatic Interaction Detection (CHAID) Predictive Modelling by CHAID.

Text:

1. “Business Analytics: An Application Focus”, Purba Halady Rao, Prentice Hall.
2. "Business Analytics" James R. Evans, Pearson. Reference:
1. "Modeling Techniques in Predictive Analytics", Thomas W. Miller, Pearson
2. "Enterprise Analytics: Optimize Performance, Process, and Decisions Through Big Data", Thomas H. Davenport, Pearson.
3. "Fundamentals of Business Analytics", Seema Acharya, Wiley India.

4. "Business Intelligence: A Managerial Perspective on Analytics", Ramesh Sharda, DursunDelen, Efraim Turban, David King, Prentice Hall

Technology Management
CS802A
Contracts: 3L
Credits- 3
:To be Implemented.

Cyber law and Security Policy
CS802B
Contracts: 3L
Credits- 3

Module – 1A: *Introduction of Cybercrime*: [4]
What is cybercrime?, Forgery, Hacking, Software Piracy, Computer Network intrusion [4]

Module – 1B: *Category of Cybercrime*:
how criminals plan attacks, passive attack, Active attacks, cyberstalking.

Module – 2: *Cybercrime Mobile & Wireless devices:* [8]
Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/cellphones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop.

Module -3: *Tools and Methods used in Cyber crime:* [8]
Proxy servers, panword checking, Random checking, Trojan Horses and Backdoors; DOS & DDOS attacks; SQL injection: buffer over flow.

Module – 4A: *Phishing & Identity Theft*: [4]
Phising methods, ID Theft; Online identity method.

Module – 4B: *Cybercrime & Cybersecurity*: [4]
Legal aspects, indian laws, IT act, Public key certificate

Text: Cyber security by Nina Gobole&SunitBelapune; Pub: Wiley India.

Optical Networking
CS802C
Contracts: 3L
Credits- 3

Optical Networks: [36 hours] Module – 1: [10]
Optical communications - Basics of: [2]
Sources. Transmitters. Modulators. Optical fiber. Photodetectors, and Receivers.
Switching in networks.[2] Circuit switched.
Packet switched. Cell switched.

Virtual circuit switched.
Burst switched (fast circuit switched).
Transmission [1]

3. Asynchronous.
4. Synchronous.

Layering in packet switched networks. [2]

8. Motivation.
9. Commonly used abstraction,

Physical layer.
Data link layer.
Network layer.
Transport layer.
Application layer. Layering in circuit switched networks. [3]

12. Physical layer.
13. Multiplexing standards.
14. Signalling - CAS, CCS.
15. SS7 concept.

Module – 2: [8]
Data plane, management plane, control plane - concept. [1] First generation networks. [2]

l) SDH/SONET.
m) Computer interconnections - ESCON, Fiber Channel, HIPPI.
n) FDDI.
o) ATM.
p) DQDB.

Components – description. [3]

6. Mode locked laser (for ps pulses).
7. Tunable filters.
8. Multiplexers.
9. De-multiplexers.
10. Tunable wavelength convertors.
11. Optical amplifiers.
    a. Fiber - EDFA.
    b. SOA.
12. Tunable transmitters.
13. Tunable receivers.
14. Dispersion compensating fibers. Multiplexing techniques. [2]
12. SDM.
13. TDMA.
14. WDMA (OFDMA).
    1. DWDM.
    2. SCM.
15. CDMA.

Module – 3 : [9]

Protocols for single channel broadcast networks. (Recapitulation) [1]

12. ALOHA, CSMA/CD.
13. Problems with CSMA/CD.
14. Definition of high speed network.

Classification of multiple access methods. (Recapitulation) [1]

11. Random access.
12. Reserved acces.
13. Scheduled access.

Multichannel multiple access protocols. [2]

3. Desirable characteristics of protocol.
    1. Scalability.
    2. Fairness.
4. TTTR.
5. TTFR.
6. FTTR.
7. FTFR.
8. Problem of wavelength stability.

Multi hop WDM network. [2]

xii. Shufflenet. xiii.MSN.

Wavelength routed networks. [3]

14. Mesh.
15. Ring-Traffic grooming problem.

Module – 4: [9]

IP over Optical framework. [2]

- ASON.
- MPëS.

Burst switched network (bufferless networks) [1] All-optical circuit switches. [1]

All-optical packet switches. [3]

iii) Broadcast and select.
iv) Wavelength routed.
v) Space switch based.
vi) Discussion on various switch architectures.
vii) Packet buffering techniques.
viii) Travelling type.
ix) Recirculating type. Protection and restoration. [2]

- Restoration mechanism.
- Restoration timing issues.
- Path protection.
- Span protection.
- P-cycles.

Text:

References:

1. WDM Networks: Biswanath Mukherjee.
2. Optical Networks - A Practical Perspective: Rajiv Ramaswamy & Kumar Sivarajan.

Low Power Circuits & Systems
CS802D
Contracts: 3L
Credits-3

Basics of MOS circuits: MOS Transistor structure and device modeling; MOS Inverters; MOS Combinational Circuits – Different Logic Families

Sources of Power dissipation: Dynamic Power Dissipation: Short Circuit Power; Switching Power; Gliching Power: Static Power Dissipation

Supply Voltage Scaling Approaches: Device feature size scaling; Multi-Vdd Circuits; Architectural level approaches: Parallelism, Pipelining; Voltage scaling using high-level transformations; Dynamic voltage scaling; Power Management.

Switched Capacitance Minimization Approaches: Hardware Software Tradeoff; Bus Encoding; Two's complement Vs Sign Magnitude; Architectural optimization; Clock Gating; Logic styles

Leakage Power minimization Approaches: Variable-threshold-voltage CMOS (VTCMOS) approach; Multi-threshold-voltage CMOS (MTCMOS) approach ; Dual-Vt assignment approach (DTCMOS); Transistor stacking.

Special Topics: Adiabatic Switching Circuits; Battery-aware Synthesis; Variation tolerant design References:

1. Sung_Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits, Tata McGraw Hill
2. Neil H. E. Weste and K. Eshraghian, Principles of CMOS VLSI Design, 2nd Edition, Addison Wesley (Indian reprint).
3. A. Bellamour, and M. I. Elmasri, *Low Power VLSI CMOS Circuit Design*, Kluwer Academic Press, 1995
4. Anantha P. Chandrakasan and Robert W. Brodersen, Low Power Digital CMOS Design, Kluwer Academic Publishers, 1995
5. Kaushik Roy and Sharat C. Prasad, Low-Power CMOS VLSI Design, Wiley-Interscience, 2000

E Commerce
CS802E
Contracts: 3L
Credits-3

Introduction to E-Commerce [6L]: Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

Business to Business E-Commerce [7L]: Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce.

Legal issues [5L]: Risks: Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract.

Security Issues [6L]: Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security.

Business to Consumer E-Commerce [8L]: Consumer trade transaction, Internet, Page on the Web, Elements of E-Commerce with VB, ASP, SQL.

E-business [7L]: Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet.

Books:

1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH
3. E-Commerce through ASP by W Clarke- BPB
4. Beginning E-Commerce with VB, ASP, SQL Server 7.0 & MTS by Mathew Reynolds, Wrox Publishers
5. Global Electronic Commerce- Theory and Case Studies by J. Christopher Westland and Theodore H. K Clark, University Press

Robotics
CS802F
Contracts: 3L
Credits- 3

No	Topic	Number of Lectures
	Module 0: Preface, Information for Students and Teachers, Acknowledgement	
1	**Module 1: Introduction** Introduction -- brief history, types, classification and usage, Science and Technology of robots, Some useful websites, textbooks and research journals.	1
2	**Module 2: Elements of robots – links, joints, actuators, and sensors**	5

Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common sensors – encoders, tachometers, strain gauge based force-torque sensors, proximity and distance measuring sensors, and vision.

3	**Module 3: Kinematics of serial robots**	4

Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Tractrix based approach for fixed and free robots and multi-body systems, simulations and experiments, Solution procedures using theory of elimination, Inverse kinematics solution for the general 6R serial manipulator.

4	**Module 4: Kinematics of parallel robots**	5

Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct kinematics problem, Mobility of parallel manipulators, Closed-from and numerical solution, Inverse kinematics of parallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.

5	**Module 5: Velocity and static analysis of robot manipulators**	5

Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysis for serial and parallel manipulators, Loss and gain of degree of freedom, Statics of serial and parallel manipulators, Statics and force transformation matrix of a Gough-Stewart platform, Singularity analysis and statics.

6	**Module 6: Dynamics of serial and parallel manipulators**	4

Mass and inertia of links, Lagrangian formulation for equations of motion for serial and

	parallel manipulators, Generation of symbolic equations of motion using a computer, Simulation (direct and inverse) of dynamic equations of motion, Examples of a planar 2R and four-bar mechanism, Recursive dynamics, Commercially available multi-body simulation software (ADAMS) and Computer algebra software Maple.	
7	**Module 7: Motion planning and control**	6
	Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model based control schemes, Simulation and experimental case studies on serial and parallel manipulators, Control of constrained manipulators, Cartesian control, Force control and hybrid position/force control, Advanced topics in non-linear control of manipulators.	
8	**Module 8: Modeling and control of flexible robots**	4
	Models of flexible links and joints, Kinematic modeling of multi-link flexible robots, Dynamics and control of flexible link manipulators, Numerical simulations results, Experiments with a planar two-link flexible manipulator.	
9	**Module 9: Modeling and analysis of wheeled mobile robots**	3
	Introduction and some well known wheeled mobile robots (WMR), two and three-wheeled WMR on flat surfaces, Slip and its modeling, WMR on uneven terrain, Design of slip-free motion on uneven terrain, Kinematics, dynamics and static stability of a three-wheeled WMR's on uneven terrain, Simulations using Matlab and ADAMS.	
10	**Module 10: Selected advanced topics in robotics**	3
	Introduction to chaos, Non-linear dynamics and chaos in robot equations, Simulations of planar 2 DOF manipulators, Analytical criterion for unforced motion. Gough-Stewart platform and its singularities, use of near singularity for fine motion for sensing, design of Gough-Stewart platform based sensors. Over-constrained mechanisms and deployable structures, Algorithm to obtain redundant links and joints, Kinematics and statics of deployable structures with pantographs or scissor-like elements (SLE's).	

Reference Books:

Practical

Design Lab
CS891
Contacts: 6
Credits- 4

The Spoken tutorials are designed by IIT-Bombay and promoted by MHRD, GoI, to make the students industry ready. These tutorials can be organised in Colleges and promoted among students. The tutorials followed by practice will enable the students to handle problems. After 2-3 weeks of practice there is a scope for evaluation and certification.

Please visit the website for details. http://www.spoken-tutorial.org

Any three topics from the following may be can be chosen:

1. **C and C++ ; Basic and Intermediate Levels**
2. **Advanced C++**
3. **Java and Netbeans**
4. **Java Business Application**
5. **PHP & MySQL**
6. **Python**
7. **Scilab**
8. **Linux and Ubuntu**