University Institute of Technology

(UIT)

Silver Wood Estate, H. P. University, Shimla-171005

(NAAC Accredited "A-Grade" University)

DEPARTMENT

of

COMPUTER SCIENCE ENGINEERING

Course Structure & Syllabus

for

Bachelor of Technology

in

Computer Science Engineering

Semester I to VIII
Effective for the Batch 2021-2025 and onwards

Also
Semester V-VIII
Effective for the Batch 2019-2023 and 2020-2024

Scheme of the Syllabus

Semester-I

Sr. No	Course Code	Course Title	L	T	P	Contact Hours	Credits	Semester End Marks	
								External Exam	Internal Assessment
1.	AS-1001	Applied Mathematics-I	3	1	0	4	**4**	100	50
2.	AS-1002	Applied Physics	3	1	0	4	**4**	100	50
3.	EC-1001	Basic Electronics	3	1	0	4	**4**	100	50
4.	IT-1001	Fundamentals of Computers	3	1	0	4	**4**	100	50
5.	AS-1003	Applied Physics Lab	0	0	2	2	**1**	50	50
6.	ME-1001	Engineering Graphics & Design Lab	0	0	4	4	**2**	50	50
7.	EC-1002	Basic Electronics Lab	0	0	2	2	**1**	50	50
TOTAL						**24**	**20**	**550**	**350**
								Total = 900	

Semester-II

Sr. No.	Course Code	Course Title	L	T	P	Contact Hours	Credits	Semester End Marks	
								External Exam	Internal Assessment
1.	AS-2001	Applied Mathematics-II	3	1	0	4	**4**	100	50
2.	IT-2001	Introduction to C Language	3	1	0	4	**4**	100	50
3.	HU-2001	Communication & Professional Skill in English	3	0	0	3	**3**	100	50
4.	EE-2001	Basic Electrical Engineering	3	1	0	4	**4**	100	50
5.	IT-2002	C Programming Lab	0	0	2	2	**1**	50	50
6.	EE-2002	Basic Electrical Lab	0	0	2	2	**1**	50	50
7.	CS-2001	Computer Science Engineering Trainer Workshop	0	0	2	3	**2**	50	50
TOTAL						**22**	**19**	**550**	**350**
								Total Marks = 900	

Semester-III

SN	Code	Course Title	Hours Per-week			C	Marks	
			L	T	P		Ext.	Int.
1	ES-3001	Discrete Mathematics	3	1	0	3	100	50
2	CS-3001	Data Structures	3	1	0	3	100	50
3	CS-3002	Computer Organization & Architecture	3	1	0	3	100	50
4	CS-3003	Object Oriented Paradigm	3	1	0	3	100	50
5	EC-3002	Digital Electronics	3	1	0	3	100	50
6	HS-3001	Principle of Engineering Economics and Management	3	1	0	2	100	50
7	CS-3051	Data Structures Lab with C/C++	0	0	2	1	50	50
8	CS-3052	Object Oriented Programming Lab with C++	0	0	2	1	50	50
9	EC-3052	Digital Electronics Lab	0	0	2	1	50	50
		Total	**30**			**20**	**1200**	

Semester-IV

SN	Code	Course Title	Hours Per-week			C	Marks	
			L	T	P		Ext.	Int.
1	ES-4001	Numerical Method	3	1	0	3	100	50
2	CS-4001	Operating System	3	1	0	3	100	50
3	CS-4002	Software Engineering	3	1	0	3	100	50
4	CS-4003	Analysis and Design of Algorithm	3	1	0	3	100	50
5	CS-4004	Theory of Computation	3	1	0	3	100	50
6	CS-4005	Python Programming	3	1	0	3	100	50
7	CS-4051	Operating System Laboratory	0	0	2	1	50	50
8	CS-4052	Analysis and Design of Algorithm Lab	0	0	2	1	50	50
9	CS-4053	Python Programming Lab	0	0	2	1	50	50
10	CS-4054	Software Engineering Project	0	0	2	1	50	50
	Total		**32**			**22**	**1300**	

Semester-V

Sr. No	Course Code	Course Title	L	T	P	Hrs/ Week	C	Semester End Marks	
								Ext. Exam	IA
1.	CS-5001	Advanced Computer Architecture	3	1	0	4	**3**	100	50
2.	CS-5002	Database Management System	3	1	0	4	**3**	100	50
3.	ES-5001	Statistical Methods	3	1	0	4	**3**	100	50
4.	EC-5001	Microprocessor, Theory & Applications	3	1	0	4	**3**	100	50
5.	CS-OE	Open Elective*	3	1	0	4	**3**	100	50
6.	CS-5003	Compiler Design	0	0	4	4	**3**	100	50
7.	CS-5051	RDBMS Lab	0	0	2	2	**1**	50	50
8.	CS-5052	Compiler Design Lab	0	0	2	2	**1**	50	50
9	EC-5052	Microprocessor Lab	0	0	2	2	**1**	50	50
10	CS-5053	Vocational Training*	-	-	-	-	**1**	50	50
TOTAL						**30**	**22**	**800**	**500**
								Total = 1300	

Note:-6 Weeks Vocational Training

S.No.	Course Code	Open Electives
1	CS-OE-501	Disaster Management
2	CS-OE-502	GIS/ Remote Sensing

Semester-VI

Sr. No	Course Code	Course Title	L	T	P	Hrs/ Week	C	Semester End Marks	
								Ext. Exam	IA
1.	CS-6001	Artificial Intelligence	3	1	0	4	**3**	100	50
2.	CS-6002	Computer Graphics & Multimedia	3	1	0	4	**3**	100	50
3.	CS-6003	Computer Networks	3	1	0	4	**3**	100	50
4.	CS-6004	Data Science	3	1	0	4	**3**	100	50
5.	CS-6005	Core Java Programming	3	1	0	4	**3**	100	50
6.	EC-6001	Digital Signal Processing	3	1	0	4	**3**	100	50
7.	CS-6051	Java Programming Lab	0	0	2	2	**1**	50	50
8.	CS-6052	Computer Network Lab	0	0	2	2	**1**	50	50
9	CS-6053	Computer Graphics & Multimedia Lab	0	0	2	2	**1**	50	50
10	CS-6054	Artificial Intelligence Lab	0	0	2	2	**1**	50	50
TOTAL						**32**	**22**	**800**	**500**
								Total = 1300	

Semester-VII

Sr. No	Course Code	Course Title	L	T	P	Hrs/ Week	C	Semester End Marks	
								Ext. Exam	IA
1.	CS-7001	Network Security	3	1	0	4	**3**	100	50
2.	CS-7002	Open Source Technologies	3	1	0	4	**3**	100	50
3.	CS-7003	Advanced Java Programming	3	1	0	4	**3**	100	50
4.	CS-PE	Professional Elective-I	3	1	0	4	**3**	100	50
5.	CS-7051	Advanced Java Programming Lab	0	0	2	2	**1**	50	50
6	CS-7052	Project-I	0	0	2	2	**4**	50	50
7	CS-7053	Vocational Training*	-	-	-	-	**1**	50	50
TOTAL						**22**	**18**	**550**	**350**
								Total = 900	

**Note:-6 Weeks VocationalTraining*

S.No.	Course Code	Professional Electives-I
1	CS-PE-I-701	Modeling and Simulation
2	CS-PE-I-702	E-Commerce and ERP
3	CS-PE-I-703	Mobile Application Development
4	CS-PE-I-704	Software Quality Engineering
5	CS-PE-I-705	Design of Embedded System
6	CS-PE-I-706	Neural Networks

Semester-VIII

Sr. No	Course Code	Course Title	L	T	P	Hrs/ Week	C	Semester End Marks	
								Ext. Exam	IA
1.	CS-8001	Data Warehouse and Data Mining	3	1	0	4	**3**	100	50
2.	CS-OE	Open Elective*	3	1	0	4	**3**	100	50
3.	CS-PE-II	Professional Elective-II*	3	1	0	4	**3**	100	50
4.	CS-8051	Project-II	-	-	2	2	**5**	150	100
5.	CS-8052	Project Seminar	-	-	2	2	**2**	50	50
6.	HS-8001	General Proficiency	-	-	1	1	**1**	50	50
TOTAL						**17**	**17**	**550**	**350**
								Total = 900	

S.No.	Course Code	Open Electives
1	CS-OE-801	Ethical Hacking
2	CS-OE-802	Software Maintenance
3	CS-OE-803	Entrepreneurship Development
4	CS-OE-804	Software Project Management
5	CS-OE-805	Software Testing

S.No.	Course Code	Professional Electives-II
1	CS-PE-II-801	Cloud Computing
2	CS-PE-II-802	Data Analytics
3	CS-PE-II-803	Bioinformatics
4	CS-PE-II-804	Mathematics and quantitative Planning for Financial Decision
5	CS-PE-II-805	Parallel Algorithms

TOTAL CREDITS – 160

L - No of lectures per week

T – No of tutorials per week

P – No of practical per week

C - Credits

Detailed Syllabus

Semester-I

Name of the Course	**Applied Mathematics- I**		
Course Code	**AS-1001**	Credits-4	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To learn operations of matrices, echelon form of matrices and system of equations
- To introduce the concept of limits, continuity and maximum and minimum behavior of functions.
- To compute curl, divergence of vector fields and definite integrals

Section	Course Content
Section-A	Review of Matrices, Eigen values, Eigen vectors, Properties of Eigen values, Eigen values of Hermitian, skew-Hermitian and unitary matrices, Cayley Hamilton Theorem, Rank of matrix, Normal and Echelon form of matrix, Solutions of Homogeneous and Non-Homogeneous system of equations.
Section-B	Limit and Continuity of functions of two variables, Partial Differentiation and its geometrical interpretation, Homogeneous functions, Euler's theorem, Jacobian, Taylor's and Maclaurin's infinite series, Maxima and minima of functions of two variables
Section-C	Double Integrals and Triple integrals (Cartesian and Polar Forms), Change of Order of Integration, Change of Variables, Applications of Double and Triple Integrals to find area and volume, Beta and Gamma functions
Section-D	Brief review of complex numbers, complex variable, concept of limit, continuity and derivatives of analytical function, Cauchy-Riemann equations, harmonic function, complex series, some elementary functions, logarithm.

Course Outcomes:

CO1: Perform matrix operations of addition, multiplication and solve system of linear equations.

CO2: Learn about the basic principle of calculus.

CO3: Calculate directional derivatives, gradient of vectors and understand their geometrical significance.

CO4: Learn to find maxima and minima of functions of two variables

Text Books:

1. Higher Engineering Mathematics: B.S. Grewal: KhannaPublishers.
2. Engineering Mathematics (2ndedition): Vol-I and Vol-II, S. S. Shastri, Prentice Hall ofIndia.

Reference Books:

1. Advanced Engineering Mathematics: E. Kreyszig, John Wiley & Sons.
2. Differential and Integral Calculus: N. Piskunov, CBS Publishers.
3. Advanced Engineering Mathematics: R. K. Jain & S. R. K. Iyengar,Narosa Publication House.
4. Advanced Engineering Mathematics: Michael D. Greenberg: Pearson Education.

Name of the Course	**Applied Physics**		
Course Code	**AS – 1002**	Credits-4	L-3, T-1, P-0
Total Lectures	**52 (1 Hr Each) (L = 39, T = 13 for each semester)**		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50
	Instructions		

For Paper Setters:

The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed.

Course Objectives:

- To develop understanding of Quantum Mechanics and its applications.
- To understand various free electron gas models.
- To know the fundamental concept of theory of relativity and Electromagnetic waves.
- To understand principle and design of various Laser systems, optical fiber and their applications in upcoming technologies like photonics.

Section	Course Content
Section-A	**Optics:** Methods of interference-division of wave front, division of amplitude, interference through thin films (qualitative only), Newton rings. Diffraction of light, diffraction through single slit, double slit and diffraction grating. **Theory of Relativity:** Galilean transformations. Postulates of Einstein's special theory of relativity, Lorentz transformations. Length contraction, time dilation, Variation of mass with velocity, mass-energy equivalence. **Electromagnetic Wave Theory:** Maxwell's equations and their significance, Electromagnetic waves, Poynting vector, Electromagnetic wave equation.
Section-B	**Quantum Mechanics:** Introduction to quantum mechanics, concept of de Broglie Waves, Davisson-Germer experiment, wave packet, Phase and Group Velocities (qualitative only), wave function and its properties, operators in quantum mechanics, expectation values, eigen values and eigen functions. Postulates of quantum mechanics, time dependent and time independent Schrodinger wave equation, Application: Particle in a box, Tunnel Effect.
Section-C	**Band Theory of Solids**: Free electron theory: Quantum theory of free electrons, Fermi Dirac distribution function and its variation with temperature. Periodic potential and Bloch theorem, Kronig Penney Model (qualitative), E-K diagrams, Brillouin Zones. **Superconductivity:**Superconductivity,effectofmagneticfield,Meissnereffect,typesof superconductors, BCS theory (qualitative only), Josephson effect, applications of superconductivity.

Section-D	**LASER**: Spontaneous and stimulated emission, LASER action schemes, characteristics of LASER beam, ruby LASER, He-Ne LASER, semiconductor LASER (simple Ideas), applications of LASERs. **Fibre Optics**: Principle, structure, acceptance angle and acceptance cone, numerical aperture, single mode and multi-mode fibres, step index and graded index fibres, optical fibre communications, losses in optical fibres.

Course Outcomes:

After successful completion of this course, students will be able to:

- CO1: understand new methods of interference and diffraction.
- CO2: understand the fundamentals of relativistic mechanics, Maxwell's equations and their relevance in the modern technology and the concept of electromagnetic waves.
- CO3: explain fundamentals of quantum mechanics and its applications in microscopic systems.
- CO4: understand the various models of free electron theories and basics of superconductivity.
- CO5: understand various laser systems and theory of fiber optics.

Text Books:

1. Modern Engineering Physics: A. S. Vasudeva: S. Chand Publications.
2.A text book of Engineering Physics: M. B. Avadhanulu, P. G. Kshirsagar: S. Chand Publications.

Reference Books:

1. Solid state Physics : Gupta &Saxena : Pragati Publications
2. Concepts of Modern Physics: Arthur Beiser : Tata McGraw Hill
3. Modern Engineering Physics : Bhattacharya Tando : Oxford
4. Modern Engineering Physics : Sharma & Sharma : Pearson

Name of the Course	**Basic Electronics**		
Course Code	**EC– 1001**	Credits-4	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L = 39, T = 13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non- programmable calculators is allowed.

Course Objectives:

- To understand operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To apply concepts for the design of Regulators and Amplifiers
- To verify the theoretical concepts through laboratory and simulation experiments.
- To implement mini projects based on concept of electronics circuit concepts.

Section	Course Content
Section-A	Brief review of Band Theory, transport phenomenon in semiconductors, Electrons and holes in Intrinsic semiconductor, Donor and acceptor Impurities, charge densities in semiconductor. PN Junction, Reverse and Forward bias conditions, Diode Characteristic and parameter, Ideal vs. Practical diode. Equivalent circuits and frequency response. Rectification: half and full wave, Zener and Avalanche diode, its role as regulator, photodiode.
Section-B	Bipolar junction transistor (BJT) and their characteristics as circuit and gain elements. Two port network analysis, h-parameters and trans-conductance. Equivalent circuits for JFET and MOSFET, enhancement mode and depletion mode MOSFETS. Uni-junction transistor (UJT), UJT characteristics, parameters and circuit operation.
Section-C	Bias for transistor amplifier: fixed bias, emitter feedback bias. Feedback principles. Types of feedback, Stabilization of gain, reduction of non-linear distortion, change of inputs and output resistance by negative feedback in amplifier. Amplifiers coupling, types of coupling, Amplifier pass band, Eq circuits for BJT at high frequency response of CE, RC-Coupled amplifiers at mid, low and high frequencies.
Section-D	Semiconductor processing, active and passive elements, Integrated circuits, bias for integrated circuits. Basic operational amplifier, applications of operational amplifier – adder, subtractor, Integrator, differentiator and comparator, Photo transistor: its characteristics and applications.

Course Outcomes:

CO1: Understand the current voltage characteristics of semiconductor devices.
CO2: Analyse dc circuits and relate ac models of semiconductor devices with their physical Operation.
CO3: Design and analyse of electronic circuits.
CO4: Evaluate frequency response to understand behaviour of Electronics circuits.

Text Books:

1. Electronic Principles : A.P.Malvino : TMH
2. Basic Electronic & Linear Circuits: N. N. Bhargava&Kulshrestha: TMH

Reference Books:

1. Electronic Fundamentals and Applications: J.D. Ryder : PHI
2. Electronic Circuits & Devices : J.Millman and C.C.Halkias: TMH
3. Integrated Circuits & Devices: J.Millman& C.C.Halkias : TMH

Name of the Course	**Fundamentals of Computer**		
Course Code	**IT–1001**	Credits-4	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L = 39, T = 13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non- programmable calculators is allowed.

Course Objectives:

- To understand Computer System and its applications in daily life.
- To study the hardware and software of computer.
- To understand how computers are integrated into large system through network.

Section	Course Content
Section-A	Computer Appreciation: Definition of an Electronic Digital Computer, history, Generations, Characteristics and applications of Computers, classification of Computers. Information and Data Hardware: CPU, Primary and Secondary storage, I/O devices, Bus structure, Computer Peripherals - VDU, Keyboard, Mouse, Printer. Software: System software, Application software, open source software. Concept of Programming Languages: Machine Language, Assembly Language, High Level Language, Object Oriented Language, Introduction to 4GLS, linker , loader, assembler.
Section-B	Number systems and Codes: Number representation: Weighted codes, Non-weighted codes, Positional, Binary, Octal, Hexadecimal, Binary Coded Decimal (BCD), Conversion of bases. Complement notations, Binary Codes: Gray, Alphanumeric, ASCII, EBCDIC Basic Computer Organization: IAS Computer, Von Neumann Computer, System Bus. Instruction Cycle, Data Representation (bit, byte, word), CPU Organization, Arithmetic and Logic Unit, Control Unit, CPU Registers, Instruction Registers, Program Counter, Stack Pointer.
Section-C	Storage: memory hierarchy, caparison of memories on the basis of speed, capacity and cost. Operating system: evaluation of Operating system, definition and function: batch processing OS, multi programming and multi-tasking OS, time sharing OS, Real time OS, Spooling Data communication and network :Data transmission modes : Simplex, half-duplex, full-duplex, Data transmission speed: narrowband, voiceband, broadband. Transmission media: Guided and unguided media, twisted wires, coaxial cable, optical fiber, microwave. Switching techniques: Circuit switching,

	message switching, Packet switching.
Section-D	Introduction to Networking: Basic Features, LAN, MAN and WAN; Mode of operation and characteristics. LAN Topologies, OSI model of networking, client – Server Architecture's. Intranet and Internet: Servers and Clients; Ports; Domain Name Server (DNS); WWW, Browsers, Dial up, ISDN, ADSN; Cable, Modem; E-mail, Voice and Video Conferencing.

Course Outcomes:

CO1: To exacerbate knowledge by studying Evolution of computer, Basic components of a Digital Computer, Computer Classification.

CO2: To expedite knowledge by studying about Information Representation, Integer Representation, and Binary Arithmetic.

CO3: To gain the knowledge about Memory, Storage Fundamentals, and Various Storage Devices.

CO4: To gain knowledge about operation system, data communication and computer networks.

Text Books:

1. Computer Fundamentals, P.K. Sinha, BPB Publications
2. Fundamentals of Computers, V. Rajaraman, PHI

Reference Book:

1. Computer Organization, Morris Mano, Pearson Publications
2. Introduction to Information Technology, V. Rajaraman, PHI

Name of the Course	**Applied Physics Lab**		
Course Code	**AS-1003**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	To find the wavelength of sodium light by Newton's rings experiment.
2	To find the wavelength of sodium light by Fresnel's bi-prism experiment
3	To find the wavelength of various colours of white light using plane transmission diffraction rating.
4	To find the wavelength of sodium light by Michelson interferometer
5	To find the refractive index and Cauchy's constant of a prism by using spectrometer
6	To find the resolving power of a telescope
7	To study the beam parameters of a helium-neon laser
8	To find flashing & quenching potentials of argon & hence to find the capacitance of unknown capacitor.
9	To find the value of high resistance by Substitution method
10	To convert a galvanometer into an ammeter of a given range
11	To study the variation of magnetic field with distance for Stewart and Gee's apparatus
12	To find the reduction factor of two turn coil tangent galvanometer using copper voltammeter
13	To find the value of e/m for electrons by Helical method.
14	To determine the charge of an electron by Millikan's oil drop method
15	To find the value of Planck's constant by using a photoelectric cell
16	To calculate the hysteresis loss by tracing a B-H curve for a given sample
17	To determine the band gap of an intrinsic semiconductor by four probe method
18	To determine the resistivity of a semi-conductor by four probe method at different temperatures
19	To determine the Hall co-efficient
20	To study the photovoltaic cell & hence to verify the inverse square law

Course Outcomes:

CO1: After performing the experiments related to optics, students shall be able to visualise fringe patterns and use them in determination of wavelength of light used.

CO2: Students shall be able to perform experiments based on electricity and magnetism.

CO3: Students shall be able to determine various properties of semiconducting materials.

CO4: Students shall be able to perform experiments based on bridges to determine the characteristic values of various circuit components.

Text Books:

1. Practical Physics: S. L. Gupta & V. Kumar: PRAGATI Publications.
2. Practical Physics for B.Sc. I, II and III: S. L. Arora: S. Chand Publications.

Name of the Course	Engineering Graphics and Design Lab		
Course Code	**ME-1001**	Credits-2	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Drawing Techniques: Various type of lines, principal of dimensioning, size & location as per IS code of practice (SP-46) for general engineering drawing. Practice of drawing, various types of lines & dimensioning exercises. Drawing exercises pertaining to symbols. Conventions & Exercise of lettering techniques. Free hand printing of letters & numerals in 3,5,8 & 12-mm sizes, vertical & inclined at 75^{o}. Instrumental lettering in single stroke. Linear Scale, Diagonal scale &vernierscale. Projection of Points, Lines and Planes: Concept of horizontal and vertical planes. First and third angle projections: projections of point & lines, true length of lines and their horizontal & vertical traces, projection of planes & their traces.
2	Projections of Solids: Right regular solids of revolution & polyhedrons etc. and their auxiliary views. Sectioning of Solids: Principal of sanctioning, types of sanctioning & their practice on projection of solids.
3	Practice In: Orthographic projections of individual blocks/ parts. Isometric Projection: Concept of isometric views: isometric scale and exercise on isometric views.
4	Development of Surfaces: Development of surfaces of cylinders, cones, pyramid, prism etc. exercises involving development of unique surfaces like Y-piece, hopper, tray, truncated pieces etc. Intersection of Surfaces: Intersection of cylinders, cones & prisms with their axes being vertical, horizontal or inclines. Exercise on intersection of solids-cylinder & cylinder, cylinder & cone, prism & prism.

Course Outcomes:

CO1: Student's ability to hand letter will improve.
CO2: Student's ability to perform basic sketching techniques will improve
CO3: Students will be able to draw orthographic projections and sections
CO4: Student's ability to use architectural and engineering scales will increase

Text Books:

1. Elementary Engineering Drawing: N.D. Bhatt: Charotar Pub. House.
2. Engineering Drawing &Engg. Graphics. P.S.Gill: S.K.Kataria& sons
3. Engineering Graphics: L.V. Lakshminarayan & R.S. Vaish

Reference Books

1. Engineering Graphics with AutoCAD 2002: James D. Bethune: Pearson Education
2. Engineering Graphics and Drawing: P.S.Gill: S.K.Kataria.
3. Engineering Graphics using AUTOCAD 2000: T. Jeyapoovan:VikasPublishing House.
4. Engineering Drawing and Graphics + AutoCAD 4th Edition: K. Venugopal:NewAge International
5. Engg. Drawing: Harwinder Singh: DhanpatRai Publications.
6. Engg. Drawing:R. K. Dhawan :S. Chand Publications.

Name of the Course	**Basic Electronics Lab**		
Course Code	**EC-1002**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	To study the use and scope of using an oscilloscope as a measuring device in an electronic laboratory
2	To study the use and scope of using a millimetre (digital and analog) as a measuring device in an electronics laboratory
3	To study the use and scope of function generator as a signal source in an electronics laboratory.
4	Draw forward bias and reverse bias characteristics of a p-n junction diode and use it as a half wave and full wave rectifier
5	Draw the characteristics of a zener diode and use it as a voltage regulator
6	Draw characteristics of common base configuration of p-n-p transistor
7	Draw characteristics of common emitter configuration of an npn transistor
8	Draw characteristics of common drain configuration of a MOSFET
9	Find the voltage and current gain of single stage common emitter amplifier.
10	Draw the characteristics curve of UJT.
11	Find the voltage gain of single stage voltage series feedback amplifier
12	Use operational amplifier as: a) Inverting amplifier , b) Non-inverting amplifier, c) Comparator, d) Integrator e) Differentiator, f) Adder, g) Precision amplifier

Course Outcomes:

CO1: To study basics of semiconductor & devices and their applications in different areas
CO2: To study different biasing techniques to operate transistor, FET, MOSFET and operational amplifier in different modes.
CO3: Analyse output in different operating modes of different semiconductor devices

Text Books:

1. Basic Electronic & Linear Circuits : N.N.Bhargava & Kulshrestha: TMH
2. Electronic Devices & Circuit Theory: Robert L.Boylestad, Louis Nashelsky: Pearson Edu.

Semester-II

Name of the Course	**Applied Mathematics – II**		
Course Code	**AS – 2001**	**Credits-4**	**L-3, T-1, P-0**
Total Lectures	**52 (1 Hr Each) (L = 39, T = 13 for each semester)**		
Semester End Examination	**Max Marks: 100**	**Min. Pass Marks: 40**	**Max. Time: 3 Hrs.**
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			**Max Marks: 50**

Instructions

For Paper Setters:

The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non- programmable calculators is allowed.

Course Objectives:

- To explain the basics of linear algebra including matrix theory, system of linear equations, eigen values and eigenvectors.
- To elaborate the basic concepts of complex algebra and analysis for applications in engineering subjects.
- To demonstrate the basics of numerical methods for different kind of interpolations; finding roots of algebraic and transcendental equations etc.
- To demonstrate the basics of numerical differentiation and integrations and their applications.
- To display the theories of Laplace, Fourier transformations and their applications in differential equations.
- To impart competence to the students for solving problems of the standards pertaining to standards of the various national level competitive examinations like GATE, UPSC, PSUs etc.

Section	Course Content
Section-A	**Vector Calculus**: Tangent, curvature and torsion, Directional derivative, Gradient of a scalar field, divergence and curl of a vector field. Line, surface and volume integrals, theorem of gauss and Stoke's (proofs not needed).
Section-B	**Integral Transforms**: Fourier series, Euler's formula, even and odd functions, half range expansions. Fourier and Laplace transform, Inverse transform of derivatives and integrals, shifting theorem, application to periodic functions, unit step function.
Section-C	**Second order Differential Equations**: Solution by: Power series method and its basis, Solution of Bessel and Legendre differential equations, properties of Bessel and Legendre functions.
Section-D	**Partial Differential Equations (PDE)**: Formulation and classification. Solution of wave equation heat equation in one dimension and Laplace equation in two dimensions by the method of separation of variables.

Course Outcomes:

CO1: Gain the knowledge to develop the concepts of surface Z= f (x, y) its partial derivatives, Euler Theorem & modified Euler Theorem for homogenous function & deduction develops ability to solve problems related to partial derivatives.

CO2: Learn to expand any functions of two variables in the ascending power of variables and also develops error and approximation, extremum value of a given function related to engineering application.

CO3: Develops the ability to solve higher order & first degree linear non homogenous differential equation arising in various branch of engineering and related mathematical model develops arising to form mathematical modelling of Real-World Problem with its physical interpretation.

CO4: Solve some differential equation which is not solvable in ordinary case but its series solution gives an idea of developing special function which has important role in some physical phenomena arising in engineering problems.

Text Books:

1. Higher Engineering Mathematics: B.S. Grewal: Khanna Publishers.
2. Advanced Engineering, Mathematics: R.K.Jain and. S. R. K Iyengar:Narosa Publishing House.

Reference Books:

1. Advanced Engineering Mathematics: E. Kreyszig:John Wiley & Sons (Asia) Pvt. Ltd.
2. Engineering Mathematics (2nd edition):S.S.Shastri: Prentice Hall of India Pvt. Ltd. Vol-I and Vol-II.
3. Differential and Integral Calculus: N.Piskunov: CBS Publishers and Distributors.
4. Advanced Engineering Mathematics: Michael D Greenberg: Pearson Education Asia.

Name of the Course	**Introduction to C Language**		
Course Code	**IT-2001**	**Credits-4**	**L-3, T-1, P-0**
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To introduce the concept of computer fundamentals and computer programming
- To enable the student to design algorithms
- To enable the students to understand "C" language and its application in problem solving.

Section	Course Content
Section-A	Problem solving with Computers: Algorithms, pseudo codes and Flowcharts. Overview of C Programming: Structure of C program, character set, keywords & identifiers, Data types, Constants, variables, expressions (arithmetic and logical), typedef, enum Operators: Arithmetic, relational, logical, bitwise, conditional and modulus operator, operator's precedence & associativity, preprocessors statements, data inputs and output functions, assignments statements.
Section-B	Conditional statements: If-else, nested if-else, switch case statement Control statements: for loop, while loop, do-while, nested loops, jump control statements: break, continue, goto, exit, return. Functions: Declaration of functions, definition of functions, calling of functions, call by value and call by reference
Section-C	Arrays: One dimensional arrays,–Declaration of 1D arrays –Initialization of 1D arrays –Accessing element of 1D arrays –Reading and displaying elements – Two dimensional arrays –Declaration of 2D arrays –Initialization of 2D arrays –Accessing element of 2D arrays –Reading and displaying elements. Storage classes, recursion. Strings versus character arrays:–Initializing strings, Reading strings, displaying string, String-handling functions.
Section-D	Pointer Concepts: Need of Pointers, Integer & Character pointers, array and functions, Array & pointers, function & pointers, Parameter passing by reference. Structure & Union: Definition of Structure & union, Structure & Pointers, Nesting of Structures, Structure and arrays, Arrays of pointer to structures

	Files Concepts in C: Using files in C, Buffer and streams, working with text files and Binary Files, file operations using standard library and system calls, File management I/O functions, Random Access Files Reading, Writing text and binary files.

Course Outcomes:

CO1: Know the basic components of the computer and working of each device.
CO2: Design algorithms and flowcharts.
CO3: Understand the fundamentals of C programming.
CO4: Use suitable data structure for problem solving.

Text Books:

1. Kanetkar, "Let us C", BPB Publications
2. E. Balaguruswamy, "Programming in C", Tata McGraw Hill

Reference Books:

1. V Rajaraman "Fundamentals of Computers"
2. D.Dromey, "How to Solve it by Computers" (Prentice Hall)
3. Richie and Kerningham, "C Programming"

Name of the Course	**Communication & Professional Skills in English**		
Course Code	**HU-2001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To develop independent perspective through critical thinking.
- To communicate their perspective in clear and correctly articulated language through LSRW skills.
- To instil a lifelong habit of language learning.

Section	Course Content
Section-A	**Reading Skills:** The skill of effective reading – eye movements, fixations, regression and visual wandering, the right approach to reading; Factors affecting the style of reading – reader, related material related and environmental; Memory, retention, association of reading material. **Kinds of Reading:** Introduction to phonetics – familiarization with speech sounds and their symbols– articulation of speech sounds – stress and intonation. Grammar: Word building use of punctuation marks, articles, tenses, abbreviations, prepositions, idioms & phrases, transformation of sentences, incorrect to correct English, single word for a group of words.
Section-B	Writing Skills: Business letters: principles, structure and style of writing business i.e., sales letters, claim and adjustment letters, inviting quotations/tenders, writing a memo, job application letters, preparing a personal resume; Effective Meetings: Qualities i.e. planning, processing the discussion, conducting a meeting, use of different type of questions, summaries, handling problem situations and problem people, writing notices, agenda and minutes of meetings; Report writing: Characteristics, types of reports, structure of technical/research reports, preparatory steps to report writing; Elements of style: Definition of style, characteristics of a good technical style– practical hints to improve the style of writing; précis writing; Comprehension of passages.
Section-C	Listening Skills: Barriers to listening, effective listening and feedback

	skills, Telephone techniques. Considerations of listening and voice, developing telephone skills – preparing for the call, controlling the call, follow up action. Handling difficult calls and difficult callers.
Section-D	Speaking And Discussion Skills: Effective speaking: Preparation i.e., deciding the objective, preparing the environments, organizing the material selection of words, voice modulation, speed, expression, body language, dealing with questions, dealing with nervousness, presentation of audio-visual aids; Group Discussions: The art of participating in group discussion i.e., initiative, cooperation with group members, analysis of the issue, putting one's views effectively, establishing leadership. Assignments / Seminars / discussions may be given for following skill development. a) Word processing a (b) Report writing c) Preparing agenda for (d) Preparing minutes of the e) Press Releases (f) Preparing a Brochure g) Advertisements (h) Preparing a power point slide

Course Outcomes:

CO1. Identify the importance of Communication Skills.
CO2: Apply Critical Thinking to what they read, listen to and observe.
CO3: Apply principles of effective LSRW skills in professional & Social Communication.
CO4: Assess the verbal and non-verbal messages effectively.

Text Books:

1	An Approach to Communication skills	:I. Bhatacharya	:DhanpatRai& Co.
2	Business Correspondence and Report writing	: R.C.Sharma& Krishna Mohan	:Tata McGraw Hill
3	Business Communication	: K.K.Sinha	: Galgotia Publishing

Name of the Course	**Basic Electrical Engineering**		
Course Code	**EE-2001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non- programmable calculators is allowed.

Course Objectives:

- To impart knowledge about the electrical quantities and to understand the impact of electricity in a global and societal context.
- To introduce the fundamental concepts relevant to DC and AC circuits and network theorems.
- Highlight the importance of electromagnetism and transformers in transmission and distribution of electric power.
- To explain the working principle, construction, applications of DC machines, AC machines & measuring instruments.

Section	Course Content
Section-A	**D.C. circuits**: V- I characteristics of ideal voltage and ideal current sources, various types of controlled sources, passive circuit components, V-I characteristics and ratings of different types of R, L, C elements. Ohm's law, Kirchoff's Laws, delta-star transformation, Nodal and Mesh analysis, Thevenin's, Norton's, superposition theorem, Maximum power transfer theorem, Reciprocity, Compensation, Millman and Tellegan's Theorem.
Section-B	**A.C. Circuits,** Sinusoidal signal, instantaneous and peak values, RMS and average values, phase angle, polar and rectangular, exponential and trigonometric representations RL and C components, Concept of complex power, power factor. Series and Parallel A.C. circuit, Series and Parallel resonance. Q factor, cut off frequency and bandwidth. **Three phase circuits**: Phase and line voltages and currents, balanced star and delta circuits, power equation, measurement of power by 2-wattmeter method.
Section-C	**Magnetic Circuits:** Amperes circuital law, B-H curve, concept of reluctance, flux and mmf, analogies between electrical and magnetic quantities, solution of magnetic circuits, hysteresis and eddy current losses, mutual inductance and

	dot convention.
Section-D	**Electromagnetic Theory of Electric Machines: Electrical Machines:** Basic concepts including principle, construction and working of transformers and D.C. Machines.

Course Outcomes:

Upon successful completion of the course, the students will be able to:

CO1: Identify and predict the behaviour of any electrical and magnetic circuit.

CO2: Formulate and solve complex AC and DC circuits.

CO3: Realize the requirement of transformers in transmission and distribution of electric power and other applications.

CO4: Identify the type of electrical machines used for that particular application.

Books and References

1. Fundamental of Electric Circuits by Charles K Alexander and Matthew N. O. Sadiku, MH Publication.
2. Electrical Engineering Fundamentals by Vincent Del Toro, PHI Publication.
3. Basic Electrical Engineering by V N Mittal & Arvind Mittal, TMH Publication.

Reference Books:

1. Basic Electrical Technology by A.E. Fitzgerald, McGraw Hill Publication.
2. Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH Publication

Name of the Course	**C Programming Lab.**		
Course Code	**IT -2002**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Write a program to find the largest of three numbers (if-then-else).
2	Write a program to find the largest number out of ten numbers (for statement).
3	Write a program to find the average male height & average female heights in the class (input is in form of sex code, height).
4	Write a program to find roots of quadratic equation using functions and switch statement.
5	Write a program using arrays to find the largest and second largest no.
6	Write a program to multiply two matrices.
7	Write a program to read a string and write it in reverse order
8	Write a program to concatenate two strings.
9	Write a program to sort numbers using the Quick sort Algorithm. Represent a deck of playing cards using arrays.
10	Write a program to compute the Fibonacci series.
11	Write a program to find weather the number is palindrome or not.

Course Outcomes:

CO1: Identify and abstract the programming task involved for a given problem.
CO2: Design and develop modular programming skills.
CO3: Understanding pointers and their use in program.
CO4: Trace and debug a program.

Text Books:

1. Let us C: Yashwant Kanetkar: BPB Publication
2. Programming in C: E. Balaguruswamy: Tata McGraw Hill
3. Understanding Pointers in C: Yashwant Kanetkar: BPB Publication

Name of the Course	**Basic Electrical Engineering Lab**		
Course Code	**EE – 2002**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	To verify KCL and KVL.
2	To study frequency response of series RLC circuit and determine resonance frequency and power factor for various values of R,L,C.
3	To study frequency response of parallel RLC circuit and determine resonance frequency and Q factor for various values of R,L,C
4	To perform direct load test of transformer and plot efficiency v/s load characteristics.
5	To perform direct load test of the DC shunt generator and plot load v/s current curve
6	To study and verify Thevenins, Norton's, superposition, Milliman's, maximum power, reciprocity theorems.
7	To perform O.C and S.C test of transformer.
8	To study various types of meters.
9	Measurement of power by 3 voltmeter/ 3 ammeter method.
10	Measurement of power in 3-phase system by 2-wattmeter method.

Course Outcomes:

CO1: Verify fundamental laws like Ohm's Law, KCL, KVL, etc.

CO2: Use different meters and instruments for the measurement of common electrical quantities

CO3: Understand the importance of various theorems and transformer tests

Text Books:

1. Experiment in Basic Electrical Engineering: S. K. Bhattachrya& K. M. Rastogi: New Age International Pub.
2. Experiment and Viva – Voce on Electrical Machines: V.N. Mittal & A. Mittal: Standard Publishers.

Name of the Course	**Computer Science Engineering Trainer Workshop**		
Course Code	**CS – 2002**	Credits-2	L-0, T-0, P-2
Total Practical Sessions	39Hrs (Lab Session=13(3hrs.each))		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment: 20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

Instructions for paper setter/candidates

Laboratory examination will consist of two parts:

(i) Performing a practical exercises assigned by the examiner (25marks).

(ii) Viva-voce examination(25marks)

Viva-voce examination will be related to the practical performed/project executed by the candidate related to the paper during the course of the semester.

The workshop will provide training of hardware and software theory of a computer based on Pentium-IV CPU with windows98 as an operating system with DMP/DeskJet Printer/Laser Printer.

List of Experiments

Sr. No.	Name of the Experiment
1	Study of Computer Mother Board:- CPU, DMA, Wait state, RAM/ROM, NMI, Logic Address, reset, I/O Ports, Device Drivers, Power Management, Block Diagram. Hard Disk – Jumper Setting, Configuration, HDC, Installation Software, Testing, Block Diagram.
2	Study of bus, Slots and Ports:- ISA,EISA,VESA,PCI,MCA,AGP,USB,AMR Parallel, Serial – RS232C,USB
3	Study of Memories on a PC:- Memory – Types, Selection, Installation ROMBIAS – Types, Setup, Installation Floppy Drive – Types, R/Whead, Control Card, Spindle Motor, Stepper Motor, Termination Resistor, Block Diagram, Write protect, Testing. Hard Disk – Jumper Setting, Configuration, HDC, Installation Software, Testing, Block Diagram.
4	Study of Input/output Device:- Monitor–Types, Working principle, Configuration, modes, scanning, Block diagram. Adapter Card – Types, Dot pitch, Resolution. Keyboard – Types, Construction, Working Principle. Mouse – Types, Construction, Working Principle.
5	Study of Hardware, Accessories (Mechanical/Electrical):- Cabinet – Types, Selections SMPS – Rating, Green PC, EPA Compliance Cables – HD Cable, FDD Cable, Printer Cable. Connectors – 9pinM/F,25PinM/F
6	Study of Printers:-

	Printers: Types, construction, working Principle, Fonts, DeskJet, Dot Matrix, Laser Jet, Line Printer, Plotters, Block Diagram.
7	Study of Multimedia Hardware Modules CDROM drive Jumper setting, Installation, Cables, Block Diagram, Configuration. DVD drive – Types, Working Principle, Installation, Configuration Speakers/Mike – Different Types Tuner Cards – Different Types Digital Cameras – Different Types Video Conferencing Kit.
8	Study of Clean Power Supply Equipments:- CVT's ,UPS
	Note: Industrial visits can be undertaken to various industries available in the vicinity of the concerned Engineering College. One project at the end of semester has to be submitted by a group of six students

Course Outcomes:

CO1: Identify the Hardware components such as motherboard, processor, memory, disk,

CO2: Explain the features (speed, capacity etc.) of hardware components of computer.

CO3: Explain the relationships between the components of computer and how data are transferred among the components.

CO4: Identify the peripheral devices outside computer.

CO5: Identify the software running on a computer.

Text Books:

1. Modern Computer Hardware Course: Manahar Lotia, Pradeep Nair, Payal Lotia, BPB Publication.
2. Computer Hardware Course: Singh Vishnu P., Asian Publishers

SEMESTER-III

Name of the Course	**Discrete Mathematics**		
Course Code	**ES–3001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To introduce techniques and reasoning processes involved in the study of discrete mathematical structures.
- To introduce techniques for counting, permutations and combinations.
- To introduce set theory, graphs and trees.

Section	Course Content
Section-A	Mathematic Logic: Statements and Notation, Connectives: Negation, Conjunction, Disjunction; Statement Formulas and Truth Tables; Logical Capabilities of programming Languages: Conditional and Biconditional; Tautologies; Equivalence of Formulas; Duality Law; Tautological Implications; Other connectives; Normal forms: principal disjunctive normal forms, principal conjunctive normal form; ordering and Uniqueness of Normal Forms.
Section-B	Permutations and Combinations: Introduction, The Rules of Sum and product, Permutations, Combinations, Generation of permutations and combinations, Information and Mutual Information, Relations and Functions: Introduction, A Relational Model for Data Bases; properties of Binary Relations; Equivalence Relations and partitions; Partial Ordering Relations and Lattices; Chains and Antichains; A Job Scheduling problem; Functions and the Pigeonhole principle.
Section-C	Graphs and Planner Graphs: Introduction, Basic Terminology, Multigraphs and Weighted Graphs, Paths and Circuits; Shortest paths in Weighted Graphs, Eulerian paths and circuits; Hamiltonian paths and circuits, The Travelling Salesperson problem; Factors of Graph; planar Graph. Trees and cut-sets: Trees, Rooted Trees, path, Lengths in Rooted trees; prefix codes; Binary search trees; Spanning Trees and cut-sets; Minimum Spanning Trees; Transport Networks.
Section-D	Recurrence Relations and Recursive Algorithms: Introduction; Recurrence

	Relations; Linear Recurrence Relations with constant coefficients; Homogeneous Solutions; Particular Solutions; total Solutions; solution by the Method of Generating Functions; Sorting Algorithms; Matrix Multiplication Algorithms. Permutation groups and Burnside's theorem; Codes and Group codes; Group Homomorphisms, Group Isomorphisms and Group Automorphisms; Normal Subgroups.

Course Outcomes:

CO1: Construct mathematical arguments using propositional logic, truth tables, logical connectives and quantifiers.

CO2: Solve problems related to recurrence relations and generating functions.

CO3: Apply discrete mathematics in formal representation of various computing constructs.

CO4: Solve problems due to permutation groups and group homomorphisms, isomorphisms & automorphisms

Text Books:

1. Discrete mathematics Structures with Applications to Computer Science : J. P. Trembley and R. Manohar: TaTa McGraw-Hill, 1997.
2. Elements of Discrete Mathematics : C. L. Liu, 2nd Edition: TaTa McGraw-Hill, 1985.
3. Discrete Mathematics and its Applications: Kenneth H. Rosen: McGraw-Hill Education, Eighth Edition, 2019.

Reference book:

1. Essential Discrete Mathematics for Computer Science: Harry Lewis and Rachel Zax: Princeton University Press, 2019.

Name of the Course	Data Structures		
Course Code	**CS - 3001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To impart knowledge about linear and non-linear data structures as the foundational base for computer solutions to problems.
- To introduce the fundamental concepts relevant to binary trees, binary tree traversals, binary search trees and perform related analysis to solve problems.
- To enable the students to understand various types of sorting algorithms.

Section	Course Content
Section-A	Data types, data structures, abstract data types, the running time of a program, the running time and storage cost of algorithms, complexity, asymptotic complexity, big O notation, obtaining the complexity of an algorithm. Notations and Analysis, Storage structures for arrays - sparse matrices - structures and arrays of structures, Stacks and Queues: Representations, implementations and applications.
Section-B	Linked List: Singly linked lists, Linked stacks and queues, operations on Polynomials, Doubly Linked Lists, Circularly Linked Lists, Operations on linked lists- Insertion, deletion and traversal, dynamic storage management – Garbage collection and compaction. Trees: Basic terminology, General Trees, Binary Trees, Tree Traversing: in-order, pre-order and post-order traversal, building a binary search tree, Operations on Binary Trees - Expression Manipulations - Symbol Table construction, Height Balanced Trees(AVL), B-trees, B+-trees.
Section-C	Graph: Basic definitions, representations of directed and undirected graphs, the single-source shortest path problem, the all-pair shortest path problem, traversals of directed and undirected graphs, directed acyclic graphs, strong components, minimum cost spanning tress, articulation points and disconnected components, graph matching.
Section-D	Sorting and Searching Techniques: Bubble sorting, Insertion sort, Selection sort, Shell sort, Merge sort, Heap and Heap sort, Quick sort, Radix sort and Bucket sort, Address calculation, Sequential searching, Binary Searching, Index searching, Hash table methods.

Course Outcomes:

CO1: Interpret and compute asymptotic notations of an algorithm to analyze the time complexity.

CO2: Use of linear and non-linear data structures as the foundational base for computer solutions to problems.

CO3: Demonstrate the ability to implement various types of static and dynamic lists.

CO4: Implement binary trees, binary tree traversals, and binary search trees.

CO5: Implementation of various types of sorting algorithms.

Text Books:

1. Seymour Lipschutz "Data Structures" Schaum's outlines (Revised edition) McGraw Hill Education Pvt.Ltd. New Delhi

Reference Books:

1. J.P. Tremblay and P.G. Sorenson, "An Introduction to Data Structures with applications", Tata McGraw Hill.
2. S.Sahni, "Data structures, Algorithms ad Applications in C++", WCB/McGrawHill.
3. Aho ,Ullman and Hopcroft, " Data Structures and Algorithms".
4. Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C", Pearson Education
5. Richard F. Gilberg, Behrouz A. Forouzan,"Data Structures–A Pseudocode Approach with C",Thomson Brooks /COLE

Name of the Course	Computer Organization & Architecture		
Course Code	CS - 3002	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives

- To impart knowledge about the organization of any computing system.
- To introduce the fundamental concepts relevant to design instruction set architectures and develop their micro architectures.
- To enable the students to understand the factors various caching and architecture memory system architectures and instruction level parallelism.

Section	Course Content
Section-A	An introduction to computers with block diagram, Computers generation, Impact of technology. Logic Design Techniques: Designing combinations logic using Karnaugh-Maps with building blocks of basic gates , Multiplexers, de-multiplexer, decoders and encoders, arithmetic, logics units, Instruction codes, Computers registers and instructions, timing and control, instruction cycle, memory reference instruction, I –O interruption, Basic sequential logic blocks flip-flops, registers, shift registers and counters, Finite state Machine using state tables.
Section-B	Computer Arithmetic: Adder and Subtract or circuits, Booth Multiplication algorithm, Performance bench marks. Control Path Design: Sequence counter method, Micro programmed controllers, address sequencing, symbolic micro –instructions Central Processing Unit: Registers general register origination, stack origination, Instruction formats, address instructions, addressing modes, data transfer and manipulations, programmed control RISC instruction set design, three address instructions and arithmetic pipelines with example of floating point adder, instruction pipe lines, advanced pipe lining using instruction level parallelism.
Section-C	The Processor: Data path and Control: Introduction, Building a Data path for Supporting the ISA, Single Cycle Implementation, Multi Cycle Implementation, Exceptions, Micro-programming, Hard-wired Control Enhancing Performance with Pipelining: An Overview of Pipelining, Pipelined Data path, Pipelined Control, Data Hazards and Forwarding, Data

	Hazards and Stalls, Control Hazards, Exception Handling. Instruction Level Parallelism and its Exploitation: Instruction Level Parallelism: Concepts and Challenges, Basic Compiler Techniques for Exposing ILP, Reducing Branch Cost with Speculation, Overcoming Data Hazards with Dynamic Scheduling, Exploiting ILP Using Multiple Issue and Scheduling, Advanced Techniques for Instruction Delivery and Speculation. Assessing and understanding Performance: Introduction, CPU Performance and its Factors, Evaluating Performance.
Section-D	Instruction Set Principles and Examples (example of MIPS):Introduction, Classifying Instruction Set Architectures, Memory Addressing, Type and Size of Operands, Operations in the Instruction Set, Instructions for Control Flow, Encoding an Instruction Set, Role of Compilers, MIPS Instruction Set Architecture. Caches and Memory Hierarchy Design: Introduction, the Basics of Caches, Measuring and Improving Cache Performance, Basic Cache Optimizations, Virtual Memory, Memory Hierarchies, Scratch pad Memories.

Course Outcomes:

CO1: Appreciate macro organization of any computing system.
CO2: Design instruction set architectures and develop their micro architectures.
CO3: Understand various digital arithmetic algorithms.
CO4: Analyze various caching and architecture memory system architectures.
CO5: Understand instruction level parallelism.

Text Books

1. M. Moris Mano , Computer System &Architecture, PHI

Reference Books:

1. Hayes J. P Computer Architecture & Organization. William C Brown Publisher
2. David A Patterson & John L Hennessy, "Computer Organization & Design: A Hardware/Software Interface", Morgan Kaufmann Publishers.
3. John L Hennessy & David A Patterson, "Computer Architecture: A Quantitative Approach", Morgan Kaufmann Publishers.

Name of the Course	**Object Oriented Paradigm**		
Course Code	**CS - 3003**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To impart knowledge about the concept of Object Oriented programming.
- To introduce the fundamental concepts relevant to Arrays, Pointers and Functions, Classes, Objects, etc.
- To enable the students to understand the standard library, exception handling, streams and files.

Section	Course Content
Section-A	Concepts of Object-Oriented Programming Paradigm, Benefits of OOPS, Introduction to object oriented design and development, Object oriented languages, Comparison of structured and object-oriented programming languages, Introduction to C++ Arrays, Pointers and Functions, Storage of arrays in memory, Initializing Arrays, Multi-Dimensional Arrays, Pointers, accessing array elements through pointers, Passing pointers as function arguments, Arrays of pointers, Pointers to pointers, Functions, Arguments, Inline functions, Function Overloading Polymorphism.
Section-B	Classes and Objects: Data types, operators, expressions, control structures, arrays, strings, Classes and objects, access specifies, constructors, destructors, operator overloading, type conversion. Storage classes, Fixed vs. Automatic declaration, Scope, Global variables, register specified, Dynamic memory allocation. Inheritance, single Inheritance, Multiple Inheritance, Multi-level inheritance, hierarchical inheritance, hybrid inheritance, Virtual functions, Friend functions, Generic programming with templates.
Section-C	Streams and Files: Opening and closing a file, File pointers and their manipulations, Sequential Input and output operations, multi-file programs, Random Access, command line argument, string class, Date class, Array class, List class, Queue class, User defined class, Generic Class.

	Exception Handling List of exceptions, catching exception, handling exception,
Section-D	Graphics: Text Mode, Graphics mode functions, Rectangles, and Lines, Polygons & Inheritance, Sound &Motion, Text in Graphics Mode. Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, Container Classes, General Theory of Operation, Vectors.

Course Outcomes:

CO1: Understand the concept of object oriented paradigm and programming.
CO2: Apply the concept of polymorphism and inheritance.
CO3: Implement exception handling and templates.
CO4: Handling of files and streams during programming.

Text Books:

1. Robert Lafore, "Object Oriented Programming in Turbo C++", Galgotia Publications,
2. Balagurusamy, 'Object Oriented programming with C++", Tata McGrawHill.

Reference Books:

1. Bjarne Strustrup, "The C++ programming Language", Addison Wesley,
2. Booch, "Object Oriented Analysis and Design with Applications, Addison Wesley.5. Chair H. Pappas & William H. Murray, "The Complete Reference Visual C++",TMH.

Name of the Course	**Digital Electronics**		
Course Code	**EC - 3002**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To impart knowledge about the concept of digital design, number system and codes
- To introduce the fundamental concepts related to design of combinational logic circuits
- To enable the students to understand the design of Sequential Circuits

Section	Course Content
Section-A	Number Systems And Boolean Algebra: Subtraction using 1's & 2's complements and using 9's&10's complements, Binary codes, Error detecting and Correcting codes, Theorems of Boolean algebra, Canonical Forms, Logic gates.
Section-B	Combinational Circuits: Representation of logic functions, Simplification using Karnaugh map, Tabulation method, Implementation of combinational logic using standard logic gates, Multiplexers and De multiplexers, Encoders and Decoders, Code Converters, Adders, Sub tractors, Parity Checker and Magnitude Comparator.
Section-C	Sequential Circuits: Flip flops - SR, JK, D and T flip flops - Level triggering and edge triggering, Excitation tables - Counters - Asynchronous and synchronous type Modulo counters, design with state equation state diagram, Shift registers, type of registers, circuit diagrams Digital Logic Families: Introduction to bipolar Logic families: RTL, DCTL, DTL, TTL, ECL and MOS Logic families: NMOS, PMOS, CMOS, Details of TTL logic family - Totem pole, open collector outputs, TTL subfamilies, Comparison of different logic families
Section-D	D/A And A/D Converters: Weighted resistor type D/A Converter, Binary ladder D/A converter, Steady state accuracy test, D/A accuracy and resolution, Parallel A/D Converter, counter type A/D converter, Successive approximation A/D converter, Single and Dual slope A/D converter, A/D accuracy and resolution.

	Semiconductor Memories: Memory organization, Classification, and characteristics of memories, Sequential memories, ROMs, R/W memories, Content Addressable memories, Charged-Coupled Device memory, PLA, PAL and Gate Array.

Course Outcomes:

CO1: Understand about the concept of digital system
CO2: Apply principles of minimization techniques to simplify digital functions
CO3: Design and analyse the combinational electronic circuit based on digital logic
CO4: Design and analyse the sequential electronic circuit based on digital logic

Text Books:

1. Mano M. Morris, "Digital Design", 3rd edition, PHI
2. Jain R. P. "Modern Digital Electronics", 3rd edition, Tata McGraw-Hill 2003.
3. Malvino and Leach "Digital principles and Applications", 5th edition, Tata McGraw Hill, 2003.

Reference Books:

1. James W. Bignell and Robert Donovan, "Digital Electronics", 5th edition, Delmar Publishers, 2007.
2. Flecther "An Engineering Approach to Digital Design", 1st edition, PHI, 2009.
3. Tocci Ronald J. "Digital Systems-Principles and Applications" 10th edition, PHI, 2009.
4. Flecther "An Engineering Approach to Digital Design", 1st edition, PHI,2009.
5. Tocci Ronald J. "Digital Systems-Principles and Applications" 10th edition, PHI, 2009.

Name of the Course	Principles of Engineering Economics & Management		
Course Code	HS – 3001	Credits-2	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To impart knowledge about the Economics and its applicability to the Engineers
- To introduce the fundamental concepts of Economics and Management.
- To enable the students to understand the factors that causes the changes in economic conditions of the entrepreneur.

Section	Course Content
Section-A	Economics: Definitions; Nature & scope of Economics; Economics Systems-meaning of Capitalism; Socialism & mixed economy. Demand and supply analysis: Law of demand and supply, exception to the law of demand; Elasticity of demand and supply and their types; Methods of measuring elasticity of demand and supply.
Section-B	Theory of production: Scales of production, Law of returns; Break even analysis. Monetary and Fiscal policy: Meaning & objectives of fiscal policy in a developing country like India; Functions of Reserve Bank of India and commercial banks. Economics & business environment: Privatization; Growth of private capitalism in India; Business/Trade Cycles – Meaning; Characteristics & classification; foreign capital & economic development.
Section-C	Management principles: Meaning & types of Management; Concept of Scientific Management; Management by Objectives; System Approach to Management. Financial management: Meaning; Functional areas of financial management; Sources of Finance; Meaning of financial accounting; accounting principles-concepts & conventions; Importance of final accounts – profit & loss a/c and balance sheet; Need and importance of capital budgeting. Marketing management: Introduction to marketing management; Market segmentation; Developing & managing advertising programs; Deciding on media & measuring effectiveness.

Section-D	Production Management: Procedure for production planning & Control; Plant Location & Lay-out; Routing; Scheduling; CPM & PERT Quality Management: Quality Management System, Quality Management Principles, ISO 9001 Structure, Quality Audits, ISO Registration, Requirements, Benefits of ISO registration.

Course Outcomes:

CO1: Identify the challenges of the economy as entrepreneur/manufacturer as well as consumer

CO2: Describe the economic system at the micro and macro level

CO3: Apply principles of economics and management in the professional, personal and societal life

CO4: Assess the role of engineering economics and accounting in attaining economic efficiency

Text Books:

1. Principles of Engineering Economics and Management by Ranbir Singh. Publisher: SK Karatia & Sons
2. Business Organisation & Management by B.P. Singh, T.N.Chabra, Dhanpat Rai& Sons
3. Modern Economic Theory by K .K. Dewett, S. Chand & Co.
4. Personnel Management by, Edwin B. Flippo, Tata McGraw Hill
5. Production Operation Management by Dr. B.S. Goel, Pragati Prakashan

Reference Books:

1. Marketing Management by Philip Kotler, Prentice Hall of India
2. Financial Management by I.M. Pandey, Vikas Publishing House
3. Indian Economic by Ruddar Dutt, K. P. M. Sundaram, S. Chand & Co
4. Statistical Quality Control by Grant, Leaven worth, Tata McGraw Hill
5. Management – A Global Perspective by Grant, Leaven worth ,TM
6. Advanced Economic Theory by H.L.Ahuja, S .Chand & Co

Name of the Course	**Data Structures Lab with C/C++**		
Course Code	**CS -3051**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Write a program to insert and delete an element at a specified location in an array.
2	Write a program to print array elements in row and column major order.
3	Write a program to search an element in an array using Linear Search.
4	Write programs to search an element in the array using Binary Search.
5	Write a menu driven program to perform various operations on strings (string length, reverse, concatenate, comparison) using user defined programs.
6	Write a program to implement stack using arrays.
7	Write a program to implement queue using arrays.
8	Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices ❖ Addition and Subtraction of two matrices ❖ Finding upper and lower triangular matrices ❖ Trace of a matrix, Transpose of a matrix, Check of matrix symmetry
9	Write a program to implement tree traversal algorithms.
10	Write a program to implement Binary search tree.
11	Write a program to perform insertion & deletion operation on Binary Search trees.
12	Write a program for implementation of a file and performing operations such as insert, delete and update a record in a file.
13	Write a program to create a linked list & display elements of a linked list.
14	Create a linked list and perform the following operation on it a) Add a node b) Delete a node c) Count no. of nodes
15	Write a program to implement breadth first search on a graph.
16	Write a program to implement depth first search on a graph.
17	Write a program to implement Bubble sort, Merge sort, Insertion sort, Selection sort, Radix Sort, Quick Sort

Course Outcomes:

CO1: Design and analyze the time and space efficiency of the data structure.
CO2: Identity the appropriate data structure for given problem.
CO3: Apply practical knowledge on the applications of data structures.
CO4: Demonstrate different methods for traversing trees.

Text Books:

1. Understanding Pointers in C, Yashwant Kanetkar, BPB Publications
2. Programming in C: E. Balaguruswamy:Tata McGraw Hill

Name of the Course	**Object Oriented Programming Lab C++**		
Course Code	**CS -3052**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Raising a number n to a power of p is the same as multiplying n by itself p times. Write a function called power( ) that takes a double value for an int value for p and returns the result as double value . Use a default argument of 2 of p, so that if this argument is omitted, the number will be squared. Write a main ( ) function that gets values from the user to test this function.
2	A point on the two dimensional plane can be represented by two numbers: an X coordinate and a Y coordinate. For example (4,5) represents point 4 unit to the right of origin along the X axis and 5 units up the y-axis. The sum of the two points can be defined as new point whose X and Y coordinates.
3	Write a program that uses a structure called point to model a point. Define three points and have the user input values to two of them. Then set the third point equal to the sum of the other two. And display the value of new points. Interaction with the program might look like this. Enter Coordinate of P1: 3 4 Enter Coordinate of P2: 5 7 Coordinates of P1+P2 are : 8 11
4	Create the equivalent of four function calculator. The program should request the to user to enter a number, an operator and another number. It should carry out the specified arithmetical operation: adding, subtracting, multiplying or dividing the two numbers. (it should use a switch statement to select the operation) finally it should be display the result. When it finishes the calculation, the program should ask if the user want to do another calculation. The response can be 'Y' or 'N', Some sample interaction with the program might look like this. Enter first number ,operators and second number 12+100 Answer =112 Do another (Y/N)?N
5	A phone no. such as (212)767-8900, can be thought of as having three parts area code(212), the exchange (767) and the number (8900). Write a program that uses a structure to store these three parts of phone both no. separately. Call the structure phone. Create two structure Enter your area code Exchange and number:4155551212 My number is (415)555-1212.
6	Create two classes DM and DB which stores the value of distances DM stores distance in meters and centimeters and DB in feet and inches. Write a program that can read value for the classes objects and add one object of DM with another object DB. Use a friend function to carry out the addition operation .The object that stores the

	result may be a Dm object or DB object depending on the units in which result are required. The display should be in the format of feet and inches or meters and centimetres depending on the object on display.
7	Create a class rational which represents numerical value by two double value NUMERATOR & DENOMENATOR. Include the following public memberfunctions: ❖ Constructor with noarguments.(defaults) ❖ Constructor with twoarguments. ❖ Void reduce( ) that reduce the rational number by eliminating the highest common factor between the numerator and denominator. ❖ Overload +operator to add two rational number ❖ Overload operator >> operator to be enabled input through cin ❖ Overload <<operator to be enabled input through count Write a main ( ) to test all the functions in the class

8	Consider the following class definition class father { Protected :
	int age;
	Public:
	Father (int x) {age = x;} Virtual void iam()
	{
	{cout<<"I AM THE FATHER , my age is ",<<age<<endl;}
	};
	Derive the two classes son and daughter from the above classes and for each define iam() to write our similar but appropriate message .You should also define suitable constructors for these classes Now write a main ( ) that creates objects of three classes and then call iam( ) them .Declare pointer to father , successively assign addresses of object of the two derived classes to this pointer and in each case , call iam( ) through the pointer to demonstrate polymorphism in action.

9	Write a program that create a binary files by reading the data from the students The data of each student consist of roll no, name (a string of 30 or lesser no. of character) and marks.
10	A hospital wants to create a database regarding its indoor patients. The information to store include. a) Name of the patient b) Date of admission c) Disease d) Date of discharge Create a structure to store the data (year, month, date as its members). Create a base class to store the above information. The member function should include function to enter information and display a list of all the patients in database Create a drive class to store the age of patients. List the information about all to store the age of the patients. List the information about all the pediatric (less then twelve years in age)
11	Makes a class Employee with the name and salary. Makes a class manager inherit from the Employee Add an instance variable named :department, type: string. Supply a method to String that print the manager's name, department and salary. Make a class Executive inherit from information store in the manager super class object. Supply a test program that test these classes and methods.
12	Imagine a tollbooth with a class called Toll booth . The two data item are a type

	unsigned into to hold the total number of cars and type double to hold the total amount of money collected. A constructor initializes both these to 0. A member function called nopaycar( ). Increments the car total and adds 0.50 to the cash total. Another function, called nopaycar( ), increment the car total but adds nothing to the cash total. Finally, a member function called display the two totals . Include a program to test this class. This program should allow the user to push one key to count paying a car and another to count a non paying car. Pushing the ESC key should cause the program to print out the total cars and total cash and then exit.
13	Create some objects of the string class, and put them in a Deque – some at the head of the Deque and some at the tail. Display the contents of the Deque using the for Each( ) function and a user written display function. Then search the Deque for a particular strings, using the first That ( ) Function and display any string that match, finally remove all the item from the date using the get left( ) Function and display each item. Not ice is the order in which the item are displayed: Using Get Left ( ), Those inserted on the left (head),of the Deque are removed in "last and first out" order while those put on the right side are removed in "first in first out" order. The opposite would be true if Get right ( ) were used.
14	Write a function called reverse it ( ) that reverses a string(an array of char) use a for loop that swap the first and last characters, then the second and next to last character and so on. the string should be passed to reversesit( ), and print out the result. Use an input method that allows embedded blanks. Test the program with Napoleon's famous phrase , "Able was ere I saw Elba".
15	Assume that a bank maintain two kinds of accounts for customer. One called as saving accounts and another is current account. The saving account provides compound interest and withdrawal facility but no cheque book facility, The current account provides cheque book facility but no interest Current account holders should also maintain a minimum balance and if the balance false below this level, a service charge is imposed. Create a class account that store customer name, account number and type of account. From this drive the classes cur_acct and sav_account to make them more specific to their requirement. Include necessary member function in order to achieve the following task a) Accept deposit from a customer and update the balance b) Display the balance c) Compute and deposit interest d) Permit withdrawal and update the balance e) Check for the minimum balance, impose penalty, necessary and update the balance. f) Do not use any constructor , use member function to initialize the class members
16	Create a base class called shape .Use this class to store two double type values that could be used to compute the area of figure, Derive to specific classes called triangle and rectangle from the base shape . Add to the base class, a member function get data ( ) to initialize base class data member and another member function display area ( ), To compute and display the area of figures make display area ( ) as virtual function and redefine this function in the derived classes to suit the requirements. Using this three classes design a program that will accept dimension of triangle or

	rectangle interactively and display the area Remember the two value given as input will be treated as length of two sides in the case of rectangle and as base and height in the case of triangle and used as follows Area of rectangle= x * y Area of triangle =1/2 * x * y Programming of exercise in C++ in the form of project (based on "object oriented programming in TURBO C++") , Robert lafore , Galgotia Publication Pvt. Ltd.1994 to be done in consultation with the faculty in-charge for the course

Course Outcomes:

CO1: Identify and abstract the programming task involved for a given problem.
CO2: Design and develop object oriented programming skills.
CO3: Trace and debug a program.
CO4: Develop program using code reuse.

Text Books:

1. Robert Lafore, "Object Oriented Programming in Turbo C++", Galgotia Publications,

Name of the Course	**Digital Electronics Lab**		
Course Code	**EC -3052**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Verify truth tables of AND, OR, NOT, NAND, NOR and XOR gates.
2	Implement (i) half adder (ii) full adder using AND – OR gates.
3	Implement full adder using NAND gates as two level realization.
4	Implement full subtractor using 8 to 1 multiplexer.
5	Verify truth tables of RS & JK flip flops and convert JK flip fops int type & T type flip fops.
6	Realization of Gates (AND, OR, NOT) with discrete components.
7	Use of 4-bit shift register for shift left and shift right operations.
8	Use 4-bit shift register as a ring counter.
9	Implement mod –10 counter and draw its output wave forms.
10	Implement 4-bit DAC using binary weighted resistance technique/R- ladder network technique.
11	Implement 8 – bit ADC using IC (ADC 0800/0801).
12	Construct bounce less switch.
13	Construct a pulser of 1 Hz and 10 Hz, 1k Hz and manual.
14	Construct logic state detector.
15	Construct opto – sensor based.
16	Measurement rotational speed of motor.
17	Measurement time elapse between two events.
18	Measurement of linear velocity.
19	Measurement of acceleration.
20	Construct a memory using TTL Circuits. Read and write data onto a memory from bus.

Course Outcomes:

CO1: Understand the digital signals, applications of ICs and logic circuits

CO2: Develop skills for designing combinational logic circuits and their practical implementation on breadboard

CO3: Analyze, design and implement sequential logic circuits.

CO4: Develop sensor base circuits.

Text Books:

1. Digital Design: M. Morris Mano, Prentice Hall of India.
2. Fundamentals of Digital Electronics: Anand Kumar, Prentice Hall of India.
3. Modern Digital Electronic: R.P.Jain Tata Mc-Graw Hill

SEMESTER-IV

Name of the Course	**Numerical Methods**		
Course Code	**ES – 4001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To introduce the field of numerical analysis.
- To introduce numerical methods for finding roots of algebraic and transcendental equations.
- To introduce numerical methods for solving interpolation problems.

Section	Course Content
Section-A	Solution of algebraic and transcendental equations: Bisection method, method of false position, secant method, Iteration method Newton-Raphson method. Solution Of Simultaneous Algebraic Equations: Gauss elimination method, Jacobi's method, Gauss-Seidal method.
Section-B	Finite Differences & Interpolation: Forward and Backward difference operators, Newton's Forward and Backward interpolation formulae, Central Difference Interpolation formulae, Gauss's forward and Backward Interpolation formulae, Lagrange's interpolation formulae and Newton's Divided Difference formulae.
Section-C	Numerical Methods To Solve Differential Equations: Solution of first order differential equations using Taylor's Series, Euler's, Picard's and Runge-Kutta method up to 4th order, Predictor- Corrector methods, Simultaneous differential equations of first order, differential equations of second order.
Section-D	Numerical Integration: Numerical integration using Trapezoidal rule, Simpson's 1/3rd and 3/8th rules, Two point and three point Gauss quadrature method.

Course Outcomes:
CO1: Understand the theoretical and practical aspects of the use of numerical methods.
CO2: Solve differential equations using numerical methods.
CO3: Use numerical methods to obtain approximate solutions.
CO4: Use numerical methods for solving interpolation problems

Text Books:

1. Sastry SS, Introductary Methods of Numerical Analysis, Prentice Hall of India
2. Grewal, BS, "Numerical Methods", Khanna Publishers

Reference Books:

1. Chapra SC and Canale RP, Numerical Methods for Engineers, McGraw Hill Book Company
2. Computer Oriented Numerical Methods By: V. Rajaraman, PHI Learning Pvt. Ltd

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Name of the Course	**Operating Systems**		
Course Code	**CS – 4001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To impart knowledge about the concepts of operating system and its management.
- To introduce the fundamental concepts scheduling of processes for a given problem instance.
- To enable the students to understand memory management techniques and implement replacement algorithms and understand and implement file systems.

Section	Course Content
Section-A	What is an Operation System? Simple Batch Systems; Multiprogrammed Batched Systems; Time-Sharing System; Personal-Computer systems; Parallel System; Distributed System; Real- Time Operating Systems. System Components, System Calls, System Programs; System Structure; Virtual Machines. Process concept: Process Scheduling; Operation on processes, Interprocess Communication, CPU Scheduling fundamental concepts, Scheduling criteria; Scheduling Algorithms; Multi- processor Scheduling; Real Time Scheduling, Threads: Overview; Multithreading
Section-B	Process Synchronization: Race conditions; mutual exclusion requirements; Critical Section problem; s/w and h/w solutions; Semaphores; monitors; Classical IPC problem and solutions. Deadlock: System Model; Deadlock Characterization, Methods of Handling Deadlock, deadlock Prevention; Deadlock Avoidance; Deadlock Detection, Recovery from deadlock; Combined approach to deadlock handling File System Interface: File Concept; Access Methods; Directory Structure; Protection; Consistency Semantics; File System Implementation: File System Structure; Allocation Methods,

	Free Space Management Directory Implementation; Efficiency and Performance; Recovery.
Section-C	Memory Management: Logical Versus Physical Address Space, Swapping, Contiguous Allocation; Paging; Segmentation; Segmentation with paging. Virtual Memory: Demand Paging, Performance of Demand Paging Replacement Page Replacement Algorithms; Allocation of Frames Thrashing; Demand Segmentation; Cache memory and implementation. Secondary Storage Structure: Disk Structure; Disk Scheduling; Disk Management; Swap-space management; Disk Reliability; Stable-Storage Implementation.
Section-D	I/O Systems: I/O hardware; I/O channels; Structure of I/O System; Principles of I/O Software Goals; interrupt handlers; device drivers; device independent I/O software; Protection: Goals of protection; Domain of protection; Access matrix and its implementation; Revocation of Access Right; Capability- Based Systems; Language Based Protection. Security: The Security Problem; Authentication; One Time passwords program Threats, System Threats; Threat Monitoring; Encryption and decryption; Computer-Security Classification; An example Security Model: windows NT.

Course Outcomes:

CO1: Understand and analyze the concepts of operating system and its management.

CO2: Illustrate the scheduling of processes for a given problem instance.
CO3: Identify the dead lock situation and provide appropriate solution.
CO4: Analyze memory management techniques and implement replacement algorithms.
CO5: Understand and implement file systems.

Text Books:

1. Operating System Concepts by Silberschatz & Galvin, Wiley Publication.
2. Operating System (5th) – Internals & Design Principles by William Stallings, Prentice Hall.
3. Operating Systems by D. M. Dhamdhare, TMH.

Reference Books:

1. Operating Systems by Achiest S. God bole, McGraw Hill Publication.
2. Understanding Operating System by Flynn & Métiers Thomson.
3. Operating Systems Design & Implementation by Andrew Dagenham. Albert S. Wood Hull, Pearson Publication.

Name of the Course	Software Engineering		
Course Code	**CS – 4002**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To impart knowledge about the concept of software development and software engineering
- To introduce the fundamental concepts relevant to comprehend different software engineering process models.
- To enable the students to understand the factors those affects the design of software projects and do the cost estimation.

Section	Course Content
Section-A	Introduction: Need for software engineering, issue in the design of large software, software life cycle models, overview of software development process.
Section-B	Software Requirement Analysis and Specification-Requirements Engineering, Crucial process step, State of the practice, problem analysis, Data dictionaries, Entity relationship diagram, code object diagram, approaches to problem analysis, Structured requirements definition, structured analysis & design techniques, Software prototyping, Software requirements specification, Nature of SRS, characteristics of good SRS. Organization of the SRS, Specifying behavioural requirements, finite state machines, decision tables & tree, PDL
Section-C	Software Matrics: What and why: Definition, areas of applications, problems during implementation, size matrics, The basic information Flow Model, the more sophisticated information Flow Model, Metrics analysis using statistics for Assessment, problems with metric data, The common of pool of data. A pattern for successful applications
Section-D	Software Project Planning: Cost estimation: Models , Static ,single variable model, Static multivariable model, The constructive cost model: Basic model, International model, Detailed COCOMO Model, The Putnam resource allocation model: The trade off- -of-time versus cost, development sub cycle, Software Risk Management: what is Risk, typical software risks, Risk management Activities, Risk identification, Risk projection, Risk management activity.

Course Outcomes:

CO1: Understand and analyze the concept of software development and software engineering.

CO2: Compare and comprehend different software engineering process models.
CO3: Design of software projects and do the cost estimation.
CO4: Apply different software testing techniques.

Text Books:

1. An Integrated Approach to Software Engineering by Pankaj Jalote, Narosa Publishing.
2. Software Engineering: A Practitioner's Approach by Roger. S. Pressman, Tata McGraw Hill.
3. Software Engineering by K.K. Aggarwal and Yogesh Singh, New Age International Publishers.

Reference Books:

1. Fundamentals of Software Engineering by Rajib Mall, Prentice Hall of India.
2. UML Bible by Tom Pender, Wiley Dreamtech.
3. Software Engineering by Ian Sommerville, Addison-Wesley

Name of the Course	**Analysis & Design of Algorithms**		
Course Code	**CS – 4003**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To impart knowledge about the asymptotic notations to analyze the performance of algorithms.
- To introduce the fundamental concepts various problem solving techniques such as divide and conquer, greedy algorithm, etc.
- To enable the students to understand the concepts of P, NP, NP-hard and NP-complete problems.

Section	Course Content
Section-A	Introductory Concepts: The notation of algorithm; fundamentals of algorithmic problem solving; analysing algorithms; Review of fundamental data structures; Arrays, Stacks; Queue; Linked list Fundamentals of analysis of algorithms efficiency: Asymptotic notation and standard efficiency classes; mathematical analysis of recursive and non-recursive algorithms Divide and Conquer: General Method; Merge sort; Quick sort; Selection sort; Sorting in Linear time: Counting sort; Radix sort and Bucket sort, Search: Linear Search; Binary Search.
Section-B	Graphs: Review of Graphs; Representation of Graphs; Breadth-first search; Depth-first Search; Topological Sort; Strongly connected Components Trees: Review of Trees; Minimum spanning tree; Kruskal and Prim's algorithm; Single source shortest paths; Bellaman-Ford algorithm; Single source shortest path in directed acyclic graphs; Dijkstra's algorithm; All pairs shortest paths; Shortest paths and matrix multiplication; Floyd-Warshall algorithm; Johnson's algorithm.
Section-C	Dynamic Programming: Introduction; Elements of Dynamic Programming; Matrix Chain Multiplication; Longest Common Subsequence; Optimal binary search tree; Knapsack problem; Travelling sales person problem. Greedy Method: An activity selection problem; Elements of Greedy Programming; Huffmann codes; A task scheduling problem. Backtracking and Branch and Bound: The 8 Queens problem; Graph colouring;

	Hamiltonian cycles; Least Cost Search(LC); The 15puzzle Bounding: Fifo branch and bound; LC branch and bound.
Section-D	Maximum Flow:Flow Networks; The Ford-Fulkerson method; Maximum Bipartite matching; Sorting Networks:Comparison networks; Zero-one principle; Bitonic sorting network; merging network; sortingnetwork NP hard and NP complete problems: P; NP; NP hard and NP complete problems; Cook's theorem(proof not required); Basic introduction to clique problem; vertex cover problem; Hamiltonian cycle problem; Approximation algorithms; vertex cover problem; Travelling sales-man problem.

Course Outcomes:

CO1: Understand asymptotic notations to analyze the performance of algorithms.

CO2: Understand and apply various problem solving techniques

CO3: Solve given problem by selecting the appropriate algorithm design technique and justify the selection.

CO4: To know the concepts of P, NP, NP-hard and NP-complete problems.

Text Books:

1. Cormen, Leiserson, Rivest, Stein "Introduction to Algorithms" The MIT Press &McGraw Hill Publication
2. Horowitz Ellis and Sartaj Sahni "Fundamentals of Computer Algorithms" Universities Press.

Reference Books:

1. Anany V. Levitin "Introduction to Design and analysis of algorithms" Pearson Education Publisher
2. Aho-Hopcroft and Ullman "The Design and Analysis of computer algorithms"Addison

Name of the Course	**Theory of Computation**		
Course Code	**CS - 4004**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To impart knowledge about the basic concept of finite automata and formal languages.
- To introduce the fundamental concepts relevant to context free grammars and ability to construct grammars for specific tasks.
- To enable the students to understand the Turing Machine and push down automata.

Section	Course Content
Section-A	Finite Automata and Regular Expression: Finite State System; Basic Definitions; Non-Deterministic finite Automata (NDFA); Deterministic finite Automata(DFA);Equivalence of DFA and NDFA Finite Automata with E-moves; Regular expression; Equivalence of finite Automata and expression; Regular expression conversion and vice–versa.
Section-B	Introduction to Machines: Concept of basic machines; Properties and limitation of FSM; Moore and Mealy Machines; Equivalence of Moore and Mealy Machines; Conversion of NFA to DFA by Arden's method. Properties of Regular Sets: The Pumping Lemma for Regular sets; Application of the pumping lemma; Closure properties of regular sets; Myhill-Nerode Theorem and minimization of Finite Automata; Minimization Algorithm; Kleene's Theorem.
Section-C	Grammars: Definition; Context Free and context sensitive grammar; Ambiguity; Regular grammar; Reduced forms; Removal of useless Symbols and unit production; Chomsky Normal Form(CNF); Griebach Normal Form(GNF). Push down Automata: Introduction to push-down machines; Application of pushdown machines.
Section-D	Turing Machines: Deterministic and Non-Deterministic Turing Machines; Design of T.M; Halting problem of T.M; PCP problem. Chomsky Hierarchy: Chomsky hierarchies of grammars; Unrestricted grammar; Context sensitive Language; Relation between languages of classes. Computability**:** Basic Concepts; Primitive Recursive Functions.

Course Outcomes:

CO1: Understand the basic concept of finite automata and formal languages.

CO2: Demonstrate understating of regular expressions and their connection to FSM.

CO3: Demonstrate understating of context free grammars and ability to construct grammars for specific tasks.

CO4: Demonstrate understanding of Turing Machine and push down automata.

Text Books:

1. Hopcroaft & O.D.Ullman, R.Motwani: Introduction to Automata Theory, languages & computations, Pearson Publication
2. K.L.P.Mishra & N.Chandershekaran: Theory of Computer Sc.(Automata, Language &Computation), Prentice-Hall of India

Reference Books:

1. Peter Linz: Introduction to formal language &Automata, Jones and Bartlett Publishers
2. John C. Martin: Introduction to Languages and the TheoryofComputation, McGraw Hill Publication.
3. Introduction to the Theory of Computation by Michael Sipser, PWS Publishing company
4. Computation Complexity -A Modern Approach by Sanjeev Arora and Boaz Barak

Name of the Course	**Python Programming**		
Course Code	**CS-4005**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Non- programmable calculators allowed using in examinations.

Course Objectives:

- Master the fundamentals of writing Python scripts.
- Learn core Python scripting elements such as variables and flow control structures
- Discover how to work with lists, sequence data, read and write files.
- Write Python functions to facilitate code reuse.

Section	Course Content
Section-A	Basics of Python Programming Language, Identifiers, Keywords, Statements Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language, Control Flow Statements, The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The if…else-if…else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Catching Exceptions Using try and except Statement, Functions, Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.
Section-B	Strings, Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, Lists, Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, The del Statement. Dictionaries, Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement, Tuples and Sets, Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Traversing of Sets, Frozen set.

Section-C	Files, Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules, Regular Expression Operations, Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with glob Module.
Section-D	Object-Oriented Programming, Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, The Polymorphism.

Course Outcomes:

CO1: To provide basic knowledge of Python.
CO2: To understand problem solving and programming capability.
CO3: To understand how to read and write files.
CO4: To know code reuse in program.

Text Books:

1. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372
2. Jake Vander Plas, **"**Python Data Science Handbook: Essential Tools for Working with Data"**,** 1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058

Reference Books:

1. Aurelien Geron, Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition,O'Reilly Media, 2017. ISBN – 13: 978-1491962299.
2. Wesley J Chun, "Core Python Applications Programming"**,** 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365
3. Miguel Grinberg, "Flask Web Development: Developing Web Applications with Python", 2nd Edition, O'Reilly Media, 2018. ISBN-13: 978-1491991732.

Name of the Course	**Operating System Lab**		
Course Code	**CS-4051**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr. Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	CASE STUDIES on the following operating system to be done in consultation with the faculty in-charge for the course: Single User System: MS-DOS and Windows98
2	CASE STUDIES on the following operating system to be done in consultation with the faculty in-charge for the course: Network Operating System: Windows 2000/Windows NT
3	CASE STUDIES on the following operating system to be done in consultation with the faculty in-charge for the course: Multiuser System: Unix/Linux
4	Study the Linux operating system and implement various commands.
5	Write shell script to show various system configuration like: ❖ Currently logged user and his log-in name. ❖ Your current shell ❖ Your home directory ❖ Show Currently logged number of users.
6	Write shell script to show various system configuration like: ❖ About your OS and version, release number, kernel version ❖ Show all available shells ❖ Show computer CPU information like processor type, speed, etc. ❖ Show memory information ❖ File system (Mounted)
7	Write the program to mount the various devices (i.e. floppy, CD-ROM etc)
8	Write a program do the following things: ❖ Find the attribute of file. ❖ To change the attribute of file. ❖ Create the directory. ❖ Delete the directory.
9	Write a program do the following things: ❖ Create the file. ❖ Delete the file.

10	Learn the top command to display resource utilization statistics of processes.
11	Write a program to display the IP address and MAC address of a machine.
12	Installation and configuration of MS Windows and Linux OS.

Outcomes of Course:

CO1: Implement elementary UNIX system commands.
CO2: Devise programs to test synchronization problems.
CO3: Design and develop user level thread library.
CO4: Design and implement file system.

Text Books:

1. Operating Systems - A Design Oriented Approach by C. Crowley, Irwin Publishing.
2. The Linux Programming Interface by Michael Kerrisk, No Starch Press
3. How Linux works by Brian Ward, Publisher William Pollock.

Name of the Course	**Analysis and Design of Algorithm Lab**		
Course Code	**CS-4052**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr. Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Obtain the Topological ordering of vertices in a given digraph.
2	Compute the transitive closure of a given directed graph using Warshall's algorithm.
3	Implement 0/1 Knapsack problem using Dynamic Programming.
4	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra's algorithm.
5	Find Minimum Cost Spanning Tree of a given undirected graph using Kristal's algorithm. a. Print all the nodes reachable from a given starting node in a digraph using BFS method. **b.** Check whether a given graph is connected or not using DFSmethod.
6	Find a subset of a given set S={sl,s2,.....,sN}of n positive integers whose sum is equal to a given positive integer. For example, if S={1,2,5,6,8} and d=9 there are two solutions{1,2,6} and{1,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
7	Implement any scheme to find the optimal solution for the Traveling Sales person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
8	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
9	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using Open and determine the speed-up achieved.
10	Implement N Queen's problem using Back Tracking.

Outcomes of Course:

CO1: Understand and apply various problem solving techniques

CO2: Solve given problem by selecting the appropriate algorithm design technique and justify the selection.

CO3: Know the concepts of P, NP, NP-hard and NP-complete problems.

CO4: Understand parallel algorithms and their implementations.

Text Books:

1. The Design and Analysis of Computer Algorithms by A.V. Aho, J.E. Hopcroft and J.D. Ullman, Addison Wesley.
2. http://vtucsenotes.files.wordpress.com/2013/06/design-and-analysis-of-algorithms-laboratory1.pdf

Name of the Course	**Python Programming Lab**		
Course Code	**CS-4053**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr. Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Write Program to print "HELLO PYTHON" and get input from user and print it on screen.
2	Write a program to swap two numbers and basic calculator operations.
3	Write a Program to illustrate common string operations in python. Write a Program to check if string is palindrome or not. Write a Program to reverse the string.
4	Write a Program to print prime numbers and Write a Program that uses ten different inbuilt Mathematical functions.
5	Write a Program to find factorial of given number and to print Fibonacci series.
6	Write a Program to explain different types of loop control statements and Write a Program to show different types of functions in Python.
7	Write a Program showing concept of 'Scope of Variable's and Write a Program to show use of five dictionary functions.
8	Write a Program to show types of inheritance in Python.
9	Write a Program to explain method overloading and method overriding.
10	Write a Program to show Exception Handling in Python and Write a program to explain User-Defined Exception.
11	Write a Program to sort the list entered by the user and Write a Program to delete and update the element in list.
12	Write a Program the shows the use of mkdir(), chdir(), getcwd(), rmdir() function.
13	Program to write "Hello Python" in file.
14	Write a Program to explain match and search functions. (Related to Regular Expressions).
15	Write a Program that works as chat application between client and server.
16	Write a Program to get following output using GUI.

Outcomes of Course:

CO1: To understand problem solving and programming capability of Python.

CO2: To understand exception handling in Python.

CO3: To understand how to read and write files.

CO4: To learn implementation of inheritance in Python.

Text Books:

1. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372
2. Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365.

Name of the Course	**Software Engineering Project**		
Course Code	**CS-4054**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr. Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

Note:
Aim of this Project is to equip students in the methodology of Software Engineering of a Live Project in the institute in which he is studying or in a place of work such as Bank, School, College and office in the vicinity of the institute. This will be a guide Project under the Close supervision of the faculty of the institute. Project should be presented in the form of a project report giving a candidate system for solving a real life problem.

Outcomes of Course:

CO1: To understand the software life cycle models used to solve real world problems.
CO2: To learn various analyses and design tools.
CO3: To learn how to write good SRS.
CO4: To understand cost benefit analysis.

Text Books:

1. Software Engineering: A Practitioner's Approach by Roger. S. Pressman, Tata McGraw Hill.

Semester-V

Name of the Course	Advanced Computer Architecture		
Course Code	CS-5001	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- To introduce the advanced processor architectures to the students.
- To make students know about the Parallelism concepts in Programming.
- To make the students know about the importance of multiprocessor and multicomputer.
- To study about data flow computer architectures.

Section	Course Content
Section-A	Review of Computer Architecture: Taxonomy of MIMD Computers, Multi-vector and SIMD, Computers, Vector Supercomputers SIMD Supercomputers. PRAM and VLSI Models: Parallel Random Access Machines, VLSI Complexity Model. Conditions and Parallelism: Data and Resource Dependences, Hardware and Software Parallelism, The role of compilers. Program partitioning and scheduling: grain Sizes and Latency, Grain Packing and scheduling. Program Flow Mechanisms: control flow Mechanism, Demand-Driven Mechanism, Comparison of Flow Mechanisms, System Interconnect Architectures: Network properties and Routing, Static Connection networks, Dynamic Connection Networks.
Section-B	Performance Metrics and Measures: Parallelism Profile in Programs, Harmonic mean Performance, Efficiency, Utilization and Quality. Speedup performance Law: Amdahl's law for a fixed workload, Gustafron's Law for scaled problems. Advance Processor Technology: Instruction set architecture, CISC and RISC Scalar processors Superscalar and Vector Processors: the VLIW Architecture, Vector and Symbolic Processors. Memory Hierarchy Technology: Hierarchical Memory Technology Inclusion, Coherence and Locality.
Section-C	Multiprocessor System Interconnects: Hierarchical Bus system, Crossbar Switch and Multiport Memory, Multistage and Combining networks. Cache Coherence and Synchronization Mechanism: The Cache coherence problem, Snoopy bus protocol, Hardware Synchronization Mechanisms. Vector

	Processing principles: Vector Instruction Types, SIMD Computer Organization: The CM-2 Architecture.
Section-D	Software for parallel Programming: Shared variable Model, Message Passing Model, Data parallel Model, Function and Logic Models. Parallel Language and Compilers: Language feature for parallelism, Parallel language Constructs, Optimizing Compiler for parallelism. Parallel Programming Environment: Software tools and environment, CM-5 Environment. Mapping Programs on to Multicomputers: Domain Decomposition Techniques, Control Decomposition techniques, Heterogeneous Processing.

Course Outcomes:

CO1: Demonstrate concepts of parallelism in hardware/software.
CO2: Describe architectural features of advanced processors.
CO3: Interpret performance of Parallel Computer.
CO4: Explain how program can be decomposed for parallel execution

Books and References

1. Kai Hawang: Advance Computer Architecture – Parallelism, Scalability and Programmability, McGraw Hill International Edition, Computer Series 1993.
2. Michael J. Quinn: Parallel Computing – Theory and Practice, McGraw Hill International Edition, Computer Science Series, 2nd Edition, 1994.

Reference Book

1. S. G. Akl: Design and Analysis of parallel algorithms, Prentice Hall, Englewood Cliff NJ.
2. S. Lakshmivarahan and S. K. Dhail: Analysis and Design of Parallel Algorithms-arithmetic and Matrix Problems, McGraw Hill International Edition, Computer Science Series.1990.
3. A practical approach to parallel Computing by S.K. Ghosal, University press (India) Ltd.

Name of the Course	Database Management System		
Course Code	CS-5002	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Section	Course Content
Section-A	Overview of DBMS, comparison of DBMS with File system Components of DBMS:(users, language, structure, data-dictionary, data manager, DBA, etc.). File processing versus Data Management, File Oriented approach versus Database Oriented approach. SPARC 3-level architecture. A brief overview of three traditional models (hierarchical mode, network model and relational model).
Section-B	Properties of relational model {Codd's 12 rules (integrity rules (concept of keys))}, Relational algebra (select, project, cross product, joins (theta-join, equi-join, natural-join, outer join)), Tuple relational calculus, Domain relational calculus, Entity-Relationship model as a tool for conceptual design entities, attributes and relationships, Converting ER-Model into relational schema.
Section-C	Functional Dependencies, Multi-valued Dependencies, Normalization (up to 5^{th}level), Structured Query language (with special reference of SQL of Oracle): (INSERT, DELETE, UPDATE, VIEW definitions and use of Temporary tables, Nested Queries, Integrity constraints: Not null, unique, check, primary key, foreign key references), File Organization (Sequential file, index sequential files, direct files, Hashing, B-trees, index files).
Section-D	Query processing (Introduction, steps in Query processing, General Processing Strategies, Query Optimization), Recovery and security, Introduction to Object-Oriented Database, C/S Database, Knowledge Based Database and Distributed Database Management System.

Course Outcomes:

CO1: Describe the fundamental elements of relational database management systems
CO2: Explain the basic concepts of relational data model, relational algebra, and SQL.
CO3: Design ER-models to represent simple database application scenarios
CO4: Improve the database design by normalization.
CO5: Familiar with basic database storage structures and access techniques.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S.Sudershan, Database System Concepts, 3rd edition, The McGraw Hill Companies, Inc.,1997.
2. Bipin C Desai, An Introduction to Database Management System. Galgotia Publications Vick, S.G., Planning,

Reference Books:

1. Naveen Prakash,"Introduction to Database management", Tata McGraw HillPublishing Company Ltd., New Delhi,1991.
2. C.J. Date, "An introduction to data base System", 7th ed. Addison Wesly,2000.

Name of the Course	**Statistical Methods**		
Course Code	**ES-5001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- The basic aim of statistics to provide methods of organising and simplifying data so that their significance is comprehensible.

Section	Course Content
Section-A	Introduction: Theory of probability, probability concepts, random experiment and events, Mathematical Notion, probability function, law of addition of probability, extension of general law of addition of probabilities, multiplication law of probability and conditional probability, extension of multiplication law of probability, probability of occurrence of n independent events, independent events, conditions for mutual independence of n events, Bayes theorem.
Section-B	Random Variables and Distribution Functions: Random variable, distribution function, discrete random variable, probability mass function, discrete distribution function, continuous random variable, probability density function, various measures of central tendency, dispersion, skewness and kurtosis for continuous distribution, continuous distribution function.
Section-C	Discrete Distribution, Bernoulli Distribution, binomial distribution, fitting of binomial distribution, Poisson distribution, the Poisson process, probability generating function of Poisson distribution, fitting of Poisson distribution, Normal distribution as a limit of binomial. Inferential statistics: Sampling, Sampling distribution, theory of estimation, hypothesis testing, z-test, student t -test, f- test, chi square test.
Section-D	Measures of Central Tendency: Central tendency arithmetic mean, median & mode. Measures of Dispersion: Meaning of dispersion, range, mean deviation, standard derivation, quartile derivation, measures of relative dispersion

Course Outcomes:

CO1: Describe and discuss the key terminology, concepts, tools and techniques used in business statistical analysis.

CO2: Critically evaluate the underlying assumptions of analysis tools

CO3: Understand and critically discuss the issues surrounding sampling and significance.
CO4: Conduct basic statistical analysis of data.

Text Books:

1. Introduction to mathematical statistics Hogg and Craig PrenticeHall
2. Fundamentals of Mathematics Statistics S.C. Gupta and V.K. Kapoor, Sultan Chand &Sons

Reference Books:

1. Operational Research Kanti Swarup, P.K. Gupta, Manmohan, Sultan Chand and Sons
2. Probability & Statistics with Reliability, Queuing, and Computer Science Application Kishore S. Trivedi Prentice Hall

Name of the Course	**Microprocessor Theory & Applications**		
Course Code	**EC-5001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non-programmable calculators allowed to use in examinations.

Course Objectives:

- This subject deals about the basic 16-bit (8086) processor and an 8-bit (8051) controllers, their architecture, internal organization and their functions, interfacing an external device with the processors/ controllers.

Section	Course Content
Section-A	Introduction: Evolution of microprocessor; General Architecture of microprocessor; Registers; ALU; System buses; Instruction cycle; Fetch cycle; Execute cycle; Machine cycle; T states; Architecture of 8085; Block diagram; Pin diagram; Instruction formats; Addressing Modes; Timing diagrams.
Section-B	Instruction Set & Programming: Instructions set of 8085; Data manipulation; Data transfer; Arithmetic & logical instructions; Status management instructions; Development of Assembly language program.
Section-C	Interrupts & data transfer: Interrupts; Hardware & Software Interrupts; Polled and vectored interrupts; Level and edge triggered interrupts; Enabling, disabling and masking of interrupts; Data transfer schemes: DMA, Memory mapped, I/O mapped; Schemes of I/O interfacing; Interfacing memory Chips with a microprocessor; RAM; Concept of wait states.
Section-D	Peripheral devices & applications of microprocessor: Description of peripheral IC's;8155(Multi-Function Device); 8251(Universal Synchronous Asynchronous Receiver; Transmitter); 8255(Programmable I/O); 8253(Programmable Interval Timer/Counter); 8257(Programmable DMA controller); 8259(Priority Interrupt Controller); 8279(Key board and Display Controller); Applications of microprocessor; A temperature Monitoring system; Water level control; Traffic control; Generation of square waves using I/O port and SOD lines

Course Outcomes:

- Recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.

- Identify a detailed s/w & h/w structure of the Microprocessor.
- Illustrate how the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
- Distinguish and analyze the properties of Microprocessors & Microcontrollers.

Text Books:

1. Ramakant Gaonkar, Microprocessor & Architecture, programming and applications, Penram International Publisher.
2. A.P. Mathur, An introduction to microprocessor, Tata McGraw Hills.

Reference Books:

1. B. Ram, Fundamentals of microprocessor & microcomputers, Dhanpat Rai & Sons.

Open Electives

Name of the Course	**Disaster Management**		
Course Code	**CS-OE-501**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non-programmable calculators allowed to use in examinations.

Course Objectives:

- To provide basic conceptual understanding of disasters and its relationships with development.
- To gain understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.

Section	Course Content
Section-A	Understanding disaster: Concept of disaster, Different approaches , Concept of Risk , Levels of disasters , Disaster phenomena and events (Global, national and regional).Hazards and Vulnerability: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards, Characteristics and damage potential of natural hazards; hazard assessment, Dimensions of vulnerability factors; vulnerability assessment, Vulnerability and disaster risk, Vulnerabilities to flood and earthquake hazards.
Section-B	Disaster management mechanism: Concepts of risk management and crisis management, Disaster management cycle, Response and Recovery, Development, Prevention, Mitigation and Preparedness, Planning for relief Capacity building: Capacity building: Concept ,Structural and non-structural measures, Capacity assessment; strengthening capacity for reducing risk, Counter-disaster resources and their utility in disaster management, Legislative support at the state and national levels
Section-C	Coping with disaster: Coping strategies; alternative adjustment processes, Changing concepts of disaster management, Industrial safety plan; safety norms and survival kits, Mass media and disaster management.
Section-D	Planning for disaster management: Strategies for disaster management planning, Steps for formulating a disaster risk reduction plan, Disaster management Act and Policy in India, Organisational structure for disaster management in India, Preparation of state and district disaster management plans

Course Outcomes:

CO1: Understand disasters, disaster preparedness and mitigation measures.

CO2: Understand role of IT, remote sensing, GIS and GPS in risk reduction.

CO3: Understand disaster management acts and guidelines along with role of various stockholders during disasters.

CO4: Understand risk and safety norm.

Text Books:

1. Alexander, D. Natural Disasters, ULC press Ltd, London,1993.
2. Chakrabarty, U. K. Industrial Disaster Management and Emergency Response, Asian Books Pvt. Ltd., New Delhi2007.

Reference Books:

1. Carter, W. N. Disaster Management: A Disaster Management Handbook, Asian Development Bank, Bangkok,1991.

Name of the Course	**GIS/Remote Sensing**		
Course Code	**CS-OE-502**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non-programmable calculator allowed to use in examinations.

Course Objectives:

- To acquire knowledge about concepts of Remote sensing, sensors and their characteristics.
- Gain skills in image analysis and interpretation in preparing thematic maps.
- Acquire knowledge in basic concepts of Photogrammetry and Mapping.

Section	Course Content
Section-A	Concepts and Foundations of Remote Sensing: Introduction, Energy Sources and Radiation Principles, energy Interactions in the Atmosphere, energy Interactions with Earth Surface Features, Data Acquisition and Interpretation, An Ideal Remote Sensing System, characteristics of Real Remote Sensing System, successful application of Remote Sensing, Land and Geographic Information Systems.
Section-B	Multispectral, Thermal and Hyperspectral Scanning: Introduction, Across-Track Multispecial Scanning, Along-track Multispecial Scanning, across – Track Thermal Scanning. Thermal Radiation principles Interpreting Thermal Scanner Imagery, geometry Characteristics of Across-Track Scanner Imagery, Radiometric Calibration of Thermal Scanners, Temperature Mapping with Thermal Scanner Data, FLR Systems, Imaging Spectrometry.
Section-C	Earth Resource Satellites Operating in the Optical Spectrum: Entry History of Space Imaging, Landsat Satellite Program, Orbit Characteristics of Landsat-1, -2 and –3, Sensor Onboard Landsat-1, -2 and –3, Landsat MSS image Interpretation, Orbit characteristics of Landsat-4 and –5, Sensors Onboard Landsat-4 and –5, Landsat TM Image Interpretation, Landsat-6 Planned Mission, Landsat ETM Image Simulation, Landsat-7, SPOT HRV Image Interpretation, APOT-4 and –5, Meteorological Satellites, Ocean Monitoring Satellites, Earth Observing system.
Section-D	Digital Image Processing: Image Rectification and Restoration, Image Enhancement, contrast Manipulation, spatial Feature Manipulation, Multi-Image Manipulation, Image Classification, Supervised classification, The Classification Stage, The Training Stage, Unsupervised Classification, The

	output Stage, Post classification Smoothing, Classification Accuracy Assessment, Data Merging and GIS Integration. Microwave Sensing: Introduction, Radar Development, SLAR System Operation, Spatial Resolution of SLAR system, Geometric Characteristics of SLAR Imagery.

Course Outcomes:

CO1: Explain and communicate the concept of various kinds of maps and geospatial data.

CO2: Develop, edit, and update geospatial data.

CO3: Create digital maps; apply projections and other characteristics of mapping.

CO4: Integrate various kinds of data from various sources and analyse the same using GIS concept and tools.

Text Books:

1. M. Anji Reddy, Sensing and geographical Information Systems, BS Publcations.
2. Remote Sensing and GIS by Basudev Bhatta. Oxford press

Reference Books:

1. Fundamentals of Remote Sensing by Geoge Joseph, C Jeganathan. Publisher: The Orient Blackswan.

Name of the Course	**Compiler Design**		
Course Code	**CS-5003**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculatoris allowed to use in examinations.

Course Objectives:

- To Provide an understanding of the fundamental principles in compiler design
- Provide the skills needed for building compilers for various situations that one may encounter in a career in Computer Science.
- Learn the process of translating a modern high-level language to executable code required for compiler construction.

Section	Course Content
Section-A	Introduction: Assembler; Linker; Loader; Preprocessors; Compiler and Translators; Structure of Compiler; Different Phases of Compiler; Bookkeeping, Error Handling; Compiler Writing Tools; Bootstrapping. Lexical Analysis: Role of Lexical Analyser; Design of Lexical Analyser; Language for Specifying Lexical analyzer; Implementation of lexical Analyser.
Section-B	Syntax Analysis: Context-free Grammars; Derivation and Parse trees. Basic Parsing Techniques:Parsers; Shift Reduce Parsing; Operator Precedence Parsing; Top-down Parsing; Predictive Parsers. Automatic Construction of Efficient Parsers: LR Parsers; Canonical collection of LR (0) items; Constructing SLR parsing tables; Constructing canonical LR Parsing tables; Constructing LALR Parsing tables; Automatic Parser generators; Implementation of LR parsing tables.
Section-C	Syntax Directed Translation: Syntax- directed translation schemes; Implementation of syntax directed translators; Intermediate code; Post fix notation; Parse trees and syntax trees; Three address code; Quadruples and triples; Translation of assignment statements; Boolean expressions; Control statements Symbol Tables:The contents of a symbol table; Data structures for symbol tables; Representing scope informationRun Time Storage Administration: Implementation of a simple stack allocation scheme; Implementation of block structured languages; storage allocation in block-structured languages.

Section-D	Error Detection and Recovery: Error; Lexical-phase errors; syntactic-phase errors; Semantic errors. Code Optimization: The principle sources of optimization; Loop optimization; The DAG representation of basic blocks; Global data flow analysis. Code Generation: Object programs; problems in code generation; A machine model; A Simple code generator; Register allocation and assignment; code generation from DAGs; Peephole optimization.

Course Outcomes:

CO1: Understand fundamentals of compiler and identify the relationships among different phases of the compiler.

CO2: Understand the application of finite state machines, recursive descent, production rules, parsing, and language semantics.

CO3: Understand problem in code generation.

CO4: Understand the code optimization techniques.

Text Books:

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", Pearson Education
2. Allen I. Holub "Compiler Design in C", Prentice Hall of India,
3. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings,
4. J.P. Bennet, "Introduction to Compiler Techniques", TataMcGraw-Hill

Reference Books:

1. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C",PHI.
2. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning.

Name of the Course	**RDBMS Lab**		
Course Code	**CS-5051**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Familiarization with the contemporary RDBMS (MySQL,ORACLE etc.) to design small databases
2	Create a database and write the programs to carry out the following operations: i)Add a record in the database.(ii)Delete a record in the database. (iii) Modify the record in the database. (iv) Generate queries.(v) Generate the report. (vi) List all there cords of database in ascending order.
3	Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
4	Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
5	Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char,to_date).
6	Creation of simple PL/SQL program (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
7	Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
8	Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
9	Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
10	Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

11	Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.
12	Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
13	Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
14	Develop a menu driven project management of database system: a) Library information system for Engineering and MCA department. b) Inventory control system for Computer Lab and College Store. c) Student Information System for Academic and Finance. d) Time Table development system CSE, IT & MCA Departments. Electrical, ECE & Civil Departments.
15	**Usage of S/W:** 1. VB, ORACLE and/orDB2 2. VB, MSACCESS, MySQL 3. VB, MS SQL SERVER2002 **Note:** At least 5 or 10 more exercises to be given by the teacher concerned.

Course Outcomes:

CO1: Understand the basic of Database software.
CO2: Understand basic concepts and develop application using DBMS tools and techniques.
CO3: Use relational data model, entity-relationship model, relational database design, relational algebra and SQL. Improve the database design by normalization.
CO4: Understand the concepts of normalization.

Text Books:

1. Ivan Bayross, SQL, PL/SQL: The Programming Language of ORACLE. BPB Publications.
2. Database Management System: A practical approach by Rajiv Chopra, S.Chand Publications

Name of the Course	**Compiler Design Lab**		
Course Code	**CS-5052**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Write a C/C++ program to search the number of occurrences of any word, string and sub sequence in a given string.
2	Write a C/C++ program to find the number of occurrences of any word in a file and replace that with another word.
3	Implement the lexical analyzer using JLex, Flex or other lexical analyzer generating tools and write the following program using LEX.
4	Write a program to check whether a string belongs to the grammar or not. Write a program to generate a parse tree.
5	Program to count the number of characters, words, spaces, and lines in a given input file.
6	Program to count the number of comment lines in a given C program. Also eliminate them and copy the resulting program into separate file.
7	Program to recognize a valid arithmetic expression and to recognize the identifiers and operators present. Print them separately.
8	Program to recognize and count the number of identifiers in a given input file.
9	Write a program to check whether a grammar is left recursive and left factoring. Write a program to remove left recursion and left factoring.
10	Write a program to implementation FIRST and FOLLOW for the given grammar.
11	Write a program to implementation to implement recursive-Descent and Non-recursive Predictive parser.
12	Write a program to check whether a given grammar is LL (1) or not.
13	Write a C/C+ + program to implementation of shift reduce parsing Algorithm
14	Write a C/C++ program to construct i) LR Parsing table and Implement LR parsing algorithm, ii) CLR Parsing table and implement CLR parsing algorithm, iii) LALR Parsing table and implement LALR parsing algorithm.
15	Write a C/C++ program to construct i) LR Parsing table and Implement LR parsing algorithm, ii) CLR Parsing table and implement CLR parsing algorithm, iii) LALR Parsing table and implement LALR parsing algorithm.

Course Outcomes:

CO1: Design Lexical analyzer for given language using C and LEX tools.
CO2: Design and convert BNF rules into YACC form to generate various parsers.
CO3: Implement various parsing algorithms
CO4: Implement Symbol table and compiler design aspects.

Text Books:

1. Des Watson, A Practical Approach to Compiler Construction, UTICS, Springer Publication

Name of the Course	**Microprocessor Lab**		
Course Code	**EC-5052**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
	This laboratory will based on microprocessor 8085/8086 kits with following interfaces:
1	Keyboard & Display.
2	Analog to Digital conversion using DAC.
3	Analog to Digital conversing using Dual slope ADC.
4	Elevator simulator.
5	Logic controller.
6	DC motor.
7	General purpose PCB with connector
8	Crystal Oscillator.
9	Modulator/Demodulator.
10	Serial data communication.
11	Hexadecimal addition
12	Flash a message like 'UP'
13	Count up/countdown
14	Timing delay

15	Moving display
16	Display the code for the key pressed on the keyboard.
17	Display a digital clock with minutes and seconds.
18	Interfacing motor, keyboard etc.

Course Outcomes:

CO1: Understand the concepts of microcomputer and microprocessors and internal architecture of 8085/8086 microprocessors.
CO2: Write and implement assembly language programs to solve a given problem.
CO3: Write and implement programs to interface the 8085 microprocessor with peripheral devices.
CO4: Use standard test and measurement equipment to evaluate digital interfaces.

Text Books:

1. Ramakant Gaonkar, Microprocessor & Architecture, programming and applications, Penram International Publisher.

Name of the Course	**Vocational Training**		
Course Code	**CS-5053**	Credits-1	L-0, T-0, P-0
Total Duration	6 weeks		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

Instructions for paper Setter / Candidates

This 6 weeks training will be related to Industrial Projects to be undertaken under the guidance of Faculty preferably at Industry / Software Park / Incubation Centre or related areas. This may also be undertaken with in the Institute. This training will be undertaken during vacation. Student is supposed to submit the project report at the end of the training. Evaluation will be based on Project Report, presentation and comprehensive Viva-voce examination related to the project.

Course Outcomes:

CO1: To provide students the opportunity to test their interest in a particular career before permanent commitments are made.

CO2: To develop skills in the application of theory to practical work situations.

CO3: To develop skills and techniques directly applicable to their careers.

CO4: To learn new technologies.

Semester-VI

Name of the Course	**Artificial Intelligence**		
Course Code	**CS-6001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- The objectives of this course are to provide students with comprehensive and in-depth knowledge of AI principles and techniques by introducing AI's fundamental problems, and the state-of-the-art models and algorithms used to undertake these problems.
- This course is also designed to expose students to the frontiers of AI-intensive computing and information systems, while providing a sufficiently strong foundation to encourage further research.

Section	Course Content
Section-A	Fundamental Concepts: Introduction to AI, Brief history, AI Applications, NLP, vision, robotics, etc. AI techniques, Introduction to intelligent agent, Agents and rationality, task environments, agent architecture types, Artificial Intelligence programming techniques. Production systems, its Architecture and characteristics. Problems Solving: Problem as a state-space, Solving problems by Searching, DFS, BFS, heuristic search techniques, constraint satisfaction problems, stochastic search methods, Best-first search (A*), Problem Reduction (AO*), Constraint satisfaction, Means End Analysis, Game Playing and Search: Introduction Min-Max Algorithm, Alpha-beta cut off, Examples of games
Section-B	Knowledge and Reasoning: Introduction of knowledge representation and reasoning about objects, relations, events, actions, time, and space; ontologies, frame representation, semantic network, predicate logic, resolution, natural deduction, situation calculus, description logics, reasoning with defaults, reasoning about knowledge. Propositional Logic: Proposition; Tautologies; Theorem proving; Semantic method of theorem proving; Forward chaining; Backward chaining standard theorems; Method of substitution; Theorem proving using Wang's algorithm; Predicate Logic: Alphabet of first order logic(FOL),Predicate, well formed formula, Clause form, Algorithm for writing sentence into clause form, Unification of predicates, Unification algorithm, Resolution Robinson's

	interface rule, Scene interpretation using predicate logic.
Section-C	Uncertain Knowledge and Reasoning: Probability, connection to logic, independence, certainty factor, Bayes rule, Bayesian networks, probabilistic inference. Dempster-Shafer theory of evidence, Fuzzy logic. Planning: Planning as search, partial order planning, construction and use of planning graphs. Representing and Reasoning with Uncertain Knowledge Probability, connection to logic, independence, Bayes rule, bayesian networks, probabilistic inference.
Section-D	Decision-Making Basics of utility theory, decision theory, sequential decision problems, elementary game theory. Machine Learning and Knowledge Acquisition Learning from memorization, examples, explanation, and exploration. Learning nearest neighbor, naive Bayes, and decision tree classifiers, Q-learning for learning action policies. Expert System: Expert System Architecture, Component of an expert system, Categories of an Expert System; Stages in development of Expert System; Expert System Development Tools.

Course Outcomes:

CO1: Understand concept of knowledge representation and predicate logic and transform the real life information in different representation.

CO2: Understand state space and its searching strategies.

CO3: Understand machine learning concepts and range of problems that can be handled by machine learning.

CO4: Apply the machine learning concepts in real life problems.

Text Books:

1. Introduction to Artificial Intelligence & Expert System by D.W. Patterson, Prentice hall of India, New Delhi
2. Artificial Intelligence by Rich, E & Knight K , Tata McGraw Hill PubCo, New Delhi
3. Principles of Artificial Intelligence by Nilson, N.J.,Narosa Publication House

Reference Books:

1. Artificial Intelligence and Soft Computing- Behavioral and cognitive Modeling of Human Brains by A. Konar, CRC Press, USA
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning.

Name of the Course	**Computer Graphics & Multimedia**		
Course Code	**CS-6002**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator is allowed to use in examinations.

Course Objectives:

- The main objective of this course is to introduce to the students the concepts of computer graphics.
- Make students aware about interactive computer graphics, two dimensional system and mapping.
- To enable the students to understand drawing algorithm, two-dimensional transformation; Clipping, filling and an introduction to 3-D graphics.

Section	Course Content
Section-A	Introduction to computer graphics & graphics systems, Computer Graphics Applications; Computer Graphics Hardware and software; Video Display Devices(Refresh cathode- ray tube, raster scan displays, random scan displays, color CRT-monitors, direct view storage tube,flat-panel display,3D viewing devices); raster scan systems; random scan systems; graphics monitors and workstations. Two dimensional Graphics Primitives: Points and Lines; Line drawing algorithms; DDA, Bresenham's(Circle drawing algorithms, Using polar coordinates, Bresenham's circle drawing, mid point circle drawing algorithm) Filled area algorithms: Scanline, Polygon filling algorithm, boundary filled algorithm
Section-B	Two/Three Dimensional Viewing: The 2-D viewing pipeline; Windows; Viewports; window to view port mapping; Clipping point, clipping line (algorithms); 4 bit code algorithm; Sutherland-cohen algorithm Polygon clipping algorithm: Sutherland-Hodgeman polygon clipping algorithm Two dimensional transformations: Transformations; Translation; Scaling; Rotation; Reflection; composite transformation Three dimensional transformations: Three dimensional graphics concept; Matrix representation of

	3-D Transformations; Composition of 3-D transformation Viewing in 3D: Projections; types of projections; the mathematics of planner geometric projections.
Section-C	Curves: Curve representation(surfaces, designs, Bezier curves, B-spline curves, End conditions for periodic B-spline curves, rational B-spline curves) Hidden surfaces: 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: Illumination; Shading; image manipulation; Illumination models; shading models for polygons; shadows; transparency.
Section-D	Multimedia: Introduction to Multimedia; uses of multimedia; hypertext and hypermedia; Image; video and audio standards. Audio: digital audio; MIDI; processing sound; sampling; compression Video: MPEG compression standards; compression through spatial and temporal redundancy; inter-frame and intra-frame compression; overview of other image file formats GIF, TIFF, BMP, PNG etc. Animation: Types; Techniques; key frame animation; utility; morphing; Virtual Reality concepts.

Course Outcomes:

CO1: Have a knowledge and understanding of the computer graphics & multimedia systems and the separation of system components.

CO2: Be able to create interactive graphics applications.

CO3: Perform simple 2D graphics with lines, curves and can implement algorithms to rasterizing simple shapes, fill and clip polygons and have a basic grasp of anti-aliasing techniques.

CO4: Also learn to create 3-D and multimedia applications.

Text Books:

1. Hearn and Baker: Computer Graphics, 2nd Ed., Prentice Hall of India,1999.
2. Foley, van Dam et al: Computer Graphics: principles and Practice In C, 2nd Ed., Addison Wesley, 1997.
3. Multimedia Systems Design, P.K. Andleigh and K.Thakrar, Prentice hall PTR, 1996

Reference Books:

1. Woo, Neider, Davis, and Shreiner: Open GL Programming Guide, 3rd Addison Wesle 2000.
2. Steven Harrington: Computer Graphics: A programming approach, 2nd Addison Wesle 1997.
3. Watt: Three-dimensional Computer Graphics, 3rd Ed. Addison Wesley, 2000.
4. Multimedia systems, Ed. By John F.K. Buford, Addison – Wesley Publishing Co., 1994
5. Multimedia Technology & Applications, David Hillman, Galgotia Publications.

Name of the Course	**Computer Networks**		
Course Code	**CS-6003**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Section	Course Content
Section-A	Introduction: Networks, Hardware and software, switching, Internet, TCP/IP protocol suit, OSI model. Application Layer: Services, Client server Paradigm, WWW, HTTP, FTP, Telnet, SSH, DNS, P2P Networks, (Distributed Hash table).
Section-B	Transport layer: Services, stop and wait protocol , go back n, selective repeat, bi-directional protocol, Piggybacking , User Data gram Protocol (datagram, services, Applications) Transmission Control Protocol (TCP): Services, features, segment, state transition diagram, Windows in TCP, flow control, error control, congestion control, timer, Options.
Section-C	Network Layer: **S**ervices, Packet switching, IPv4 Protocol (Data gram, address), IP packet forwarding, ICMPv4, Unicast Routing algorithms (Distance vector routing, Path vector routing, Unicast Routing protocols (RIP, OSPF, BGP4) Data-Link Layer: Framing, error control, flow control, Random access, controlled access, channelization, Ethernet protocols (IEEE project 802, standard Ethernet, fast Ethernet, gigabit Ethernet, 10 gigabit Ethernet, virtual LAN)
Section-D	Network Management: Configuration management, fault, performance, security, accounting, SNMP. Network security: security goals, Attacks, Services & Techniques, Symmetric key Ciphers, Asymmetric–key ciphers, Digital signatures, firewalls.

Course Outcomes:

CO1: To understand basic computer network technology.

CO2: Identify the different types of network topologies and protocols.

CO3: Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.

CO4: Identify the different types of network devices and their functions within a network.

CO5: Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Text Books:

1. Behrouz A Forouzan & Firouz Mosharraf, "Computer Networks", McGraw Hill, (Special Indian Edition (SIE2012.
2. S. Tanenbaum, "Computer Networks", Second Ed., Prentice Hall,India.
3. J. F. Hayes, "Modelling and analysis of Computer Communication Networks", Plenum Press (Reprinted in India by Khana Publishers).

Reference Books:

1. Bertsekas and R. Gallager, "Data Networks", Second Ed., Prentice Hall, India.
   D. E. Comer, "Internetworking with TCP/Ip", Vol. 1, Prentice Hall, India.
2. G. E. Keiser, "Local Area Networks", McGraw Hill, International Edition.
3. W. Stalling, "Data & Computer Communication", Maxwell Macmillan International Edition.

Name of the Course	**Data Science**		
Course Code	**CS-6004**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- To gain knowledge of Data Science
- Develop in depth understanding of the key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics.
- Be familiar with Python and Panda

Section	Course Content
Section-A	Introduction to Data Science - Why Python? - Essential Python libraries - Python Introduction- Features, Identifiers, Reserved words, Indentation, Comments, Built-in Data types and their Methods: Strings, List, Tuples, Dictionary, Set - Type Conversion- Operators. Decision Making- Looping- Loop Control statement- Math and Random number functions. User defined functions - function arguments & its types.
Section-B	User defined Modules and Packages in Python- Files: File manipulations, File and Directory related methods - Python Exception Handling. OOPs Concepts - Class and Objects, Constructors – Data hiding- Data Abstraction- Inheritance. NumPy Basics: Arrays and Vectorized Computation- The NumPyndarray - Creating ndarrays - Data Types for ndarrays - Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes. Universal Functions: Fast Element-Wise Array Functions- Mathematical and Statistical Methods-Sorting Unique and Other Set Logic.
Section-C	Introduction to Pandas Data Structures: Series, Data Frame, Essential Functionality: Dropping Entries Indexing, Selection, and Filtering- Function Application and Mapping- Sorting and Ranking. Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format.
Section-D	Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping,

	Replacing Values, Detecting and Filtering Outliers- String Manipulation: Vectorized String Functions in pandas. Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.

Course Outcomes:

CO1: To have comprehensive knowledge of Data Science and working of Python and Panda as an advanced course.

CO2: To understand quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques.

CO3: Learn principles of Data Science to the analysis of business problems.

CO4: Gain knowledge of statistical data analysis techniques utilized in business decision making.

Text Books:

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson, 2012.
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and I Python", O'Reilly, 2nd Edition, 2018.

Reference Books:

1. Wesley J. Chun, "Core Python Programming", Prentice Hall, 2006.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.

Name of the Course	**Core Java Programming**		
Course Code	**CS-6005**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the Java SDK environment to create, debug and run simple Java programs.

Section	Course Content
Section-A	Introduction to Java, Difference between C/C++ and Java, Applets and Applications, Java Development Kit, Advantages of Java, (Data types, modifiers, expressions, operators in Java), Control Statements in Java, Classes statements and methods in Java.
Section-B	Classes, Inheritance (single, multilevel, hierarchical), Multiple Inheritance using Interfaces, Arrays, Strings and Object class, Java packages and interfaces, Exception handling, Exploring Wrapper classes, Enumeration Interface, Multithreading: Java Thread Model, Thread Priorities, Creating Multiple Threads, Synchronization, Inter thread communication.
Section-C	Applets: Applet Basic, Applet Architecture, Display Methods, HTML APPLET tag. Java I/O: I/O Package, Input Stream and Output Stream classes, Reader and Writer classes. Event Handling: Event Handling Models, Event classes, Event Listener Interfaces, Adapter Classes.
Section-D	AWT Classes: Window fundamentals, working with frames windows, Panels, working with color, fonts, AWT Controls, layout Manager & Menus. Applets, Graphics and AWT Swing: Swing components classes and their brief description such as buttons, boxes, panes, tables, fields and trees. Basic concepts of networking: Working with URLs; Concepts of URLs; Sockets.

Course Outcomes:

CO1: Summarize the strengths and weaknesses of Java programming and the basic concepts of object-oriented programming.

CO2: Identify Java code utilities in applets, Java packages, and classes.

CO3: Write Java code using advanced Java features.

CO4: Develop web based applications

Text Books:

1. Programming with JAVA, John R. Hubbard, Schaum's Outline Series, McGraw Hill, NewYork.
2. Java Script, Don Gosselin, Thomson Learning, Cambridge,2000.
3. Programming with Java, E. Balagurusamy, Tata McGraw Hill, New Delhi,2002

Reference Books:

1. The Complete Reference, Java 2, 3rd Edition, Patrick Naughton, Herbert Schildt, Tata McGrawHill.

Name of the Course	**Digital Signal Processing**		
Course Code	**EC-6001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis of DSP systems.

Section	Course Content
Section-A	Discrete-Time Signals And Systems: Basic Elements of a Digital Signal Processing System, Advantages of Digital Signal Processing, Classification of Signals, The Concept of Frequency In Continuous-Time and Discrete-Time Domain, Discrete-Time Signals and Systems, Analysis Of Discrete-Time Linear Shift-Invariant Systems, Linearity, Causality And Stability Criterion, Discrete-Time Systems Described By Difference Equations.
Section-B	DISCRETE-TIME FOURIER TRANSFORM: The Fourier Transform Of Discrete-Time Signals (DTFT), Properties Of The DTFT, The Frequency Response Of An LTI Discrete-Time System, The Fourier Series Of Discrete-Time Signals (DTFS). DISCRETE FOURIER TRANSFORM: Frequency Domain Sampling And The DFT, Properties Of The DFT, Linear Filtering Methods Based On The DFT, Efficient Computation Of The DFT: Decimation-In-Time And Decimation-In Frequency Fast Fourier Transform Algorithms.
Section-C	Z-TRANSFORM: Introduction To The Z-Transform & The Inverse Z-Transform, Properties Of The Z-Transform, Relationship Between The Fourier Transform And The Z-Transform, Rational Z-Transforms & The System Function, Analysis Of Linear Time-Invariant Systems In The Z-Domain. DIGITAL FILTER STRUCTURES: Digital Filter Categories, Realization Structures For FIR & IIR Digital Filters, Representation Of Numbers: Fixed-Point, Floating Point, Error Resulting From Rounding And Truncation.
Section-D	DIGITAL FILTER DESIGN: General considerations; design of IIR filter from analog filters: IIR filter design using Approximation of derivative, impulse invariant method, Bilinear transformation; Design of linear phase FIR digital filters: Symmetry and Anti-symmetry FIR filters, FIR digital filter design using the windowing method and the frequency-sampling method.

Course Outcomes:

CO1: Interpret, represent, and process discrete/digital signals and systems.

CO2: Thorough understanding of frequency domain analysis of discrete time signals.

CO3: Ability to design & analyze DSP systems like FIR and IIR Filter etc.

CO4: Practical implementation issues such as computational complexity, hardware resource limitations, as well as cost of DSP systems or DSP Processors.

CO5: Understanding of spectral analysis of the signals.

Text Books:

1. Digital Signal Processing: Principles, Algorithms and Applications by John G. Proakis & Dimitris G. Manolakis; Pearson Education.
2. Digital Signal Processing by Sanjit K. Mitra; Tata McGraw Hill Publication.

Reference Books:

1. Digital Signal Processing by P Ramesh Babu; SCITECH Publication (India) Pvt Ltd.

Name of the Course	**Java Programming Lab**		
Course Code	**CS-6051**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Programming in Java Script, ASP and JAVA / Swing / JDBC / Servlets / Beans. * To be done in consultation with the faculty in charge for the course and should lead to the projects in groups of two. Write an application that demonstrates some static method of character class. Create a string buffer object to illustrate how to (a) Display capacity and length of string buffer (b) Insert character at the beginning. **(c)** Append & Reverse the string.
2	Write a program that display all the factors of a number entered by user: e.g. If entered 8 it would response with 2 & 4.
3	Write an application that defines sphere class with three constructors first from accepts no arguments. It assumes that sphere is entered at origin & has radius of one unit. The record from accept one double value and represents radius and centred at origin, third from accepts four double arguments and specify radius and origin.
4	Write down a program to implement polymorphism using Overloading and Overriding
5	Write a program that illustrate how to use throw statement, create class that has static method main(), a( ), b( ), c( ) and d( ). Main invokes a( ),a( ) invokes b( ), b( ) invokes c( ) and so on. Method d( ) declares an array with ten elements and then attempts to access 20^{th}element. Therefore array index out of bond exception is generated.
6	Write an application that execute two threads one after another, Create threads by implementing. Thread Class and Runnable Interface.
7	Write a Multithreaded program that simulate a set of grasshoppers jumping around in abode. Each grasshopper jumps to a different location Every 2 to 12 seconds. Display the new location of grasshopper after each of these jumps.
8	Write down program in java to implement following in java. **(a)** Linked List (b) Vector Class (c) Hash table (d)Enumeration

9	Write a program to implement Applet that displays different Images based on the days of week. The Applet should accept seven parameters that identify the Image file.
10	Write a program that shows a solid circle that moves from left to right across the applet display area. The flicker effect should be noticeable.
11	Write a program to event handling in Java.
12	Write a program to implement frame, panels through different layout managers in applets and swings.

Course Outcomes:

CO1: Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO2: Write Java application programs using OOP principles and proper program structuring
CO3: Demonstrate the concepts of polymorphism and inheritance
CO4: Write Java programs to implement error handling techniques using exception handling.

Text Books:

1. The Complete Reference, Java 2, 3rd Edition, Patrick Naughton, Herbert Schildt, Tata McGrawHill.

Name of the Course	**Computer Network Lab**		
Course Code	**CS-6052**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	To become familiar with networking accessories and facilities in the Department of Computer Science and Engineering: ❖ Find out what networking devices are installed in the department ❖ Describe the network type and topology of the department ❖ File and printer sharing in different OSs ❖ Network address configuration in different OSs ❖ Finding IP and MAC address in different OSs ❖ Workgroup and domain configuration ❖ Use of utilities: arp, ipconfig/ifconfig, tracert, nslookup
2	Construct a network of 2 or 3 system.
3	Simple communication between the systems in exchanging a binary word.
4	Encryption and decryption on the ASCII character set being transmitted.
5	Experimentation with standard set of protocols (Tanebaum).
6	Experimentation with protocol kit.
7	Experimentation with modulation.
8	Assure cables, connections, crimping.
9	JDM
10	Bridges, Routers, Hubs etc.

Course Outcomes:

CO1: Understand the structure and organization of computer networks; including the division into network layers, role of each layer, and relationships between the layers.

CO2: Understand the basic concepts of application layer protocol design; including client/server models, peer to peer models, and network naming.

CO3: In depth understanding of transport layer concepts and protocol design; including connection oriented and connection-less models, techniques to provide reliable data delivery and algorithms for congestion control and flow control.

CO4: Ability to invoke analytical studies of Computer Networks through network simulation.

Text Books:

1. S. Tanenbaum, "Computer Networks", Second Ed., Prentice Hall, India.
2. Kurose James F., Computer Networking: A Top Down Approach by Pearon

Name of the Course	**Computer Graphics & Multimedia Lab**		
Course Code	**CS-6053**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Familiarize yourself with creating and storing digital images using scanner and digital camera(compute the size of image when stored in different formats) and convert the stored images from one format to another (BMP, GIF, JPEG, TIFF, PNG, etc.) and analyze them.
2	Implement Bresenham's line algorithm. Also provide Provision to change attributes of graph primitives such as stippling (Dotted and Dashed pattern), colours and Butt & round Caps.
3	Implement Bresenham's circle algorithm. Also provide to change attributes of graph primitives such as stippling (Dotted and Dashed pattern) and colours.
4	Implement 2-D transformation with translation, scaling, rotation, reflection, Shearing and scaling.
5	Construct Bezier curves and Spline curves with 6 or more control points entered through mouse.
6	Construct fractal geometric shapes using linear or non-linear procedures.
7	Consider a scene with two or more three dimensional polygonal object. Generate Different perspective views of scene by changing various 3D viewing parameters interactively.
8	Implement tweening procedure for animation with key frames having equal or different no. of edges.
9	Write a program for as Raster Graphics Display. And Write a program for 2D line, Circle and polygon filling drawing as Raster Graphics Display.
10	Write a program for line clipping and polygon clipping.
11	Write a program for displaying 3D objects as 2D display using perspectives transformation.
12	Write a program for rotation of a 3D object about arbitrary axis and Write a program for hidden surface removal from a 3D object.

Course Outcomes:

CO1: Draw Geometric primitives
CO2: Execute scan line polygon filling
CO3:Implement basic transformations on objects
CO4: Implement clipping algorithm on lines
CO5: Understand various 3D Transformation techniques and multimedia compression techniques and applications.

Text Books:

1. Foley, van Dam et al: Computer Graphics: principles and Practice In C, 2nd Ed., Addiso Wesley,1997.

Name of the Course	**Artificial Intelligence Lab**		
Course Code	**CS-6054**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	Study of PROLOG/LISP/Python.
2	Write a program to find a factorial of a number. Write a program to the maximum of two numbers.
3	Write a program to illustrate the use of predicate not/fail.
4	Write a program to illustrate the procedural meaning of Prolog.
5	Introduction to LISP and write LISP programs to demonstrate i) List manipulations ii) iii)Functions iv) Predicates v) Conditionals statements, Input, output local variables, Iteration vi) recursion vii) Lists & Arrays;
6	Medical diagnosis of Patient.
7	Write a program to solve 8 queens problem.
7	To find the various relationships of a family.
8	Solve any problem using breadth first search.
9	Solve any problem using depth first search.
10	Solve 8-puzzle problem using best first search.
11	Solve any problem using best first search.
12	Solve travelling sales man problem.
13	Implement these practical in LISP or Prolog in which you feel comfortable. a) Depth –bounded depth first search. b) A *Search. c) AO*Search. d) Min max Search. e) Alpha Beta Pruning.
14	Solve the water jug problem using AI technique.
15	Solve the Missionaries problem using AI technique.
16	Design the following expert system using LISP or Prolog in which you feel comfortable. a) Weather Fore casting System. b) Legal Expert System.
17	Design parser for NLP using Lex and Yacc utilities

Course Outcomes:

CO1: Understand knowledge/information processing
CO2: Develop AI programs
CO3: Develop expert systems
CO4: Understand design of parser.

Text Books:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning

Semester-VII

Name of the Course	**Network Security**		
Course Code	**CS-7001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non-programmable calculator allowed to use in examinations.

Course Objectives:

- Have a good understanding of how applications can communicate securely and what tools and protocols exist in order to offer different levels of security
- Have detailed knowledge and the ability to critically analyze and design secure networks, applications and systems
- Have a fundamental understanding of what makes systems vulnerable and be able to predict new attack methods before they become a reality.

Section	Course Content
Section-A	Introduction: Introduction to OSI Network Security Architectures, Services, Mechanisms and Attacks, Classical Encryption Techniques, Symmetric cipher model, Substitution techniques, Transposition techniques, Rotor Machines, Steganography. Introduction To Finite Fields: Groups, Rings, and Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields of the Form *GF(p)*, Polynomial Arithmetic, Finite Fields of the Form *GF(2n).*
Section-B	Cryptographic Techniques: An overview of Cryptology, Primality test, *Perfect* security, Stream Cipher *Stream ciphers:* The one time pad. Pseudorandom key streams - properties and generation. Block Cipher -, Introduction to DES, differential and Linear Cryptanalysis, Block Cipher Cryptography, Triple DES Algorithm, International Data Encryption Algorithm (IDEA), Blowfish Algorithm, RC-x Algorithms, CAST-x Algorithms, Symmetric Block Cipher Schemes, Encryption Function Placement and Confidentiality problems. Cryptographic hash functions, Digital signatures. Public-Key Cryptography and Message Authentication: The Key Distribution Problem, Random Number Generation, Public-Key Cryptosystems, The RSA Algorithm, The Key Management riddle, The Diffie-Hellman Key Exchange, Elliptic Curve Cryptography. The Chinese Remainder Theorem, Discrete Logarithms., Introduction to Message Authentication, requirements and functions, Message Authentication Codes, Hash Functions, their Security and other considerations..
Section-C	Authentication Applications: The Message Digest (MD5) Algorithm, Secure Hash Algorithm (SHA-1, SHA-2), RIPEMD-x and HMAC fundamentals,

	Digital Signature basics, Authentication Protocols, The Digital Signature Standard, Introduction to the Kerberos Authentication scheme, The X.319 Directory Authentication scheme. Systems and Applications Security: Authentication, Access control policies, Mail security, PGP, *Data* (base) security, File system security, Program security, Memory security, Session security, SSH, Web security, Web applications security, Sandboxing, Linux security, Windows.
Section-D	Security Protocols: Security properties, attacks, Design of a security protocol, Examples of security protocols, Contract signing protocols, *Formal* models of protocols and detecting leaks, Electronic voting protocols, IPSec, SSL, TLS worms and viruses, micro payments, smart card security, Security of wired / wireless networks. Intrusion detection: Key Management in Group Communication Systems, Router security, Denial of service and side- channel attacks, *Intrusion* Detection Systems, Intrusion detection techniques - centralized and distributed.

Course Outcomes:

CO1: Develop Concept of Security needed in Communication of data through computers and networks along with Various Possible Attacks

CO2: Understand Various Encryption mechanisms for secure transmission of data and management of key required for required for encryption.

CO3: Understand authentication requirements and study various authentication mechanisms.

CO4: Understand network security concepts and study different Web security mechanisms.

Text Books:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education.
2. DStinson,"Cryptography: Theory and Practice", Chapman &Hall.
3. C. Kaufman, R. Perlman and M. Spenser, "Network Security",PHI.

Reference Books:

1. S. Bellovin and W. Chesvick, "Internet Security and Firewalls", Addison-Wesley,Reading.
2. Trappe & Washington, "Introduction to Cryptography with Coding Theory",Prentice-Hall.

Name of the Course	Open Source Technologies		
Course Code	CS-7002	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- To expose students to free open source software environment and introduce them to use open source softwares.

Section	Course Content
Section-A	Introduction to open source software : Need of Open Sources- Advantages of Open Sources- Applications of Open Sources- commercial aspects of Open source Movement The FOSS Ecosystem, Linux operating system, Roles of Operating System, Choosing the operating system, Installing different distributions of GNU/Linux, FreeBSD/Open Solaris
Section-B	Open source development: Proprietary software development model vs. Open Source software development model, models for FOSS- Cathedral model and Bazaar model. Introduction to collaborative development (Developer commSectionies, mailing lists, IRC, wiki, version control, bug tracking, handling non-technical issues, localization, accessibility, documentation by doxygen). Software package management (RPM, DEB - building, and creating software repositories) Open Standards, Licensing and legal aspects in detail.
Section-C	Configuration of Network communication services and File system, DHCP, DNS, WINES, NFS, NIS, Web server, Ftp Server, E-mail Server, Telnet Server, etc. Configuration through webmin or usermin, Installing and configuring of Cygwin, Installing and configuring of CMS – moodle, druple etc.
Section-D	Useful tool and Scripting languages. Shell programming, AWK, python etc, Report writing tools. Operating System utilities, TCP/IP utilities, Network analyzer, Traffic analysis, Protocol analysis, Network Management Using SNMP.

Course Outcomes:

CO1: Demonstrate the configuration of software services on servers.
CO2: Exercise the FOSS tools for the software development.
CO3: Contribute to existing FOSS in FOSS environment.

CO4: Understand Content Management Softwares (CMS)

Text Books:

1. "The complete reference Linux" by Richard L. Peterson Tata Mcgraw Hill Publication.
2. "Introduction to Free Software" - by SELF project.

Reference Books:

1. "Code Reading" - the Open Source Perspective by DiomidisSpinellis.
2. Remy Card, Eric Dumas and Frank Mevel, "The Linux Kernel Book", Wiley Publications, New York, 2003.
3. Peter Wainwright, "Professional Apache", Wrox Press, USA, 2002.

Name of the Course	**Advanced Java Programming**		
Course Code	**CS-7003**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.
- Design and develop Web applications
- Designing Enterprise based applications by encapsulating an application's business logic and designing applications using pre-built frameworks.

Section	Course Content
Section-A	Java EE: Introduction Enterprise Architecture, their types and Goals, Introducing Java EE platform, Architecture of Java EE and concepts, Web Applications and Java EE 5. JDBC: Introduction to JDBC, Components of JDBC, JDBC Specifications and Architecture, JDBC Drivers, JDBC API, Implementing a Simple JDBC example.
Section-B	Servlets: Features of Java Servlets, Servlet API, Servlet Life Cycle, Servlet Configuration, A simple Example of Servlet. Session Handling and Event Handling:- Introduction to Sessions, Session Tracking Mechanisms with examples, Events, Event Handling and Types of Servlet Events. RMI: RMI Architecture; Designing RMI application; Executing RMI application
Section-C	Introduction to JSP: Overview of JSP Technology, JSP Architecture, JSP Page Life-Cycle, JSP Elements (Directives, Scripting Elements, Action Elements, Implicit Objects and Comments), Using JSP Best Practices. Brief introduction to JSP Tags, JSTL (JSP Standard Tag Library) and Filters. Enterprise Java Beans: EJB 3.0 Fundamentals, EJB Architecture and Concepts, Classifications and Configurations of EJBs.
Section-D	Design Patterns in Java: Java Design Patterns. Factory Method, Abstract Factory Pattern: Singleton Pattern, Prototype Pattern, Builder Pattern, Object Pool Pattern,Adapter Pattern, Bridge Pattern, Composite Pattern, Decorator Pat tern, Facade Pattern, Flyweight Pattern, proxy Pattern. Introduction and XML Basics, XML Syntax, Declaration, XML Elements and Attributes, XML Parser.

Course Outcomes:

CO1: Learn to access database through Java programs, using JDBC.

CO2: Create dynamic web pages, using Servlets and JSP.

CO3: Make a reusable software component, using Java Bean.

CO4: Invoke the remote methods in an application using Remote Method Invocation (RMI).

CO5: Understand the multi-tier architecture of web-based enterprise applications using Enterprise JavaBeans (EJB).

CO6: Learn design patterns in java

Text Books:

1. Java Server Programming, Black Book, Kogent Solutions Inc.,2010 dreamtech Press.

Reference Books:

1. Head First Servlets and JSP, Willey Estern Publications
2. Head First EJB Willey Estern Publications.

Name of the Course	**Advanced Java Programming Lab**		
Course Code	**CS-7051**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	To create a user interface which inputs user's Name, email-ID, City etc. to store in the database through JDBC using SQL server or MS Access or MySQL.
2	To display Juggler Bean by setting its properties and events.
3	To display the applet designed by the user in Bean Box.
4	To create a user interface using swings which displays pop-up window containing list of courses, option buttons for inputting Male or Female, Check Boxes to display the choices of various institutes and menu bars using event handling. Put the other controls accordingly.
5	To display a stop watch that rings the alarm at the time specified by the user using multithreading.
6	To create a user defined bean that may be used as Font selector in other applications.
7	To study the various types of beans and their corresponding properties: (a) Jelly bean b) Tick Tock Bean c) Change Reporter Bean d) Our Button Bean.
8	To create a chat server using RMI or socket programming.
9	Develop programs on Patterns.

Course Outcomes:

CO1: Learn the Internet Programming,
CO2: Using Java Applets create a full set of UI widgets and components
CO3: Using AWT & Swings apply event handling on AWT and Swing components.
CO4: Learn to access database through Java programs, using Java Data Base Connectivity (JDBC)
CO5: Create dynamic web pages, using Servlets and JSP.
CO6: Make a reusable software component, using Java Bean.

Text Books:

1. Java Server Programming, Black Book, Kogent Solutions Inc.,2010 dreamtech Press.

Name of the Course	**Project I**		
Course Code	**CS-7052**	Credits-4	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

List of Experiments

Sr. No.	Name of the Experiment
1	This project work shall be carried out by the students during the entire semester under the guidance of Supervisor allotted by the institute and its viva will be conducted at the end of the semester. **Instructions for paper setter/candidates** Project Evaluation will consist of Three parts: 1. Evaluation of the project report along with source code in a CD in the required format by an external examiner 40% marks. Continuous evaluation by internal examiner 30%marks. 2. Viva-voce examination (20%marks). 3. Software evaluation with test runs (10%marks) Viva-voce examination will be related to the projects executed by the candidate during the course of the semester.

Aim of this project is to equip students in the methodology of the system analysis and design of a live project in the institution in which he is studying or in a place of work such as bank, school, college and office in the vicinity of the institute. This minor project can be a precursor to the major project to be undertaken in the eighth semester.

Course Outcomes:

CO1: Ability to identify, formulate, and solve complex problems by applying principles of software engineering.

CO2: Plan, analyze, design and implement a software project or gather knowledge over the field of research and design or plan about the proposed work.

CO3: Demonstrate the ability to locate and use technical information from multiple sources.

CO4: Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project.

CO5: Demonstrate the ability to communicate effectively in speech and writing.

CO6: Apply principles of project management to plan, track, and present the progress of a project.

Name of the Course	**Vocational Training**		
Course Code	**CS-7053**	Credits-1	L-0, T-0, P-0
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

Instructions for paper setter / Candidates

This training will be related to Industrial Projects / Software Projects to be undertaken under the guidance of Faculty preferably at Industry / Software Park / Incubation Centre or related areas. This may also be undertaken within the Institute. The training will be undertaken during vacation. Student is supposed to submit the project report at the end of the training.

Evaluation will be based on Project Report, presentation and comprehensive. Vive-voce examination related to the project.

Course Outcomes:

CO1: Learn new languages/technologies

CO2: To develop skills in the application of theory to practical work situations.

CO3: To develop skills and techniques directly applicable to their careers.

CO4: To develop software project.

Professional Electives-I

Name of the Course	**Modeling and Simulation**		
Course Code	**CS-PE-I-701**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- Introduce various system modeling and simulation techniques.
- Highlight their applications in different areas.

Section	Course Content
Section-A	Definition of systems: Types of system, continuous and discrete modeling process and definition of a model. Common type of mathematical models used for engineering and non-engineering system (such as differential and partial differential equation models.
Section-B	Simulation Process: Discrete and continuous simulation procedures. Random number generation and its testing discrete and continuous random variables, density and distributive functions, study of few distributions such as Poisson, Norma.
Section-C	Simulation of Queuing System: Elementary idea about networks of queuing with particular emphasis to computer system, environment (refer to section 9.1, 9.2& 9.3 of Trivedi's book.) Verification & Validation: Design of simulation experiments and validation of simulation experiments comparing model data units and real system data.
Section-D	Simulation Language: A brief introduction to important discrete and continuous languages such as GPSS (Study & use of the language). Use of data base & AI techniques in the area of modeling and simulation.

Course Outcomes:

CO1: Gain insight into the operation of a system.
CO2: Develop operating or resource policies to improve system performance.
CO3: Test new concepts and/or systems before implementation.
CO4: To learn simulation automation tools.

Text Books:

1. Deo, Narsing: System Simulation with Digital Computers.
2. Gorden G: System Simulation, Prentice Hall (Two books above can be used as textbooks).
3. Shridhar Bhai Trivedi, Kishore: Probability & Statistics with reliability Queuing, Computer science Application.

Reference Books:

1. Payer, T.A., Introduction to System Simulation, McGraw Hill.
2. Reitman, J., Modeling and performance measurement of Computer System.
3. Spriet, WI A., Computer Aided Modeling and Simulation (Academic Press).

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Name of the Course	**E-Commerce & ERP**		
Course Code	**CS-PE-I-702**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non-programmable calculator allowed to use in examinations.

Course Objectives:

- This course provides an introduction to information systems for business and management.
- It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems.

Section	Course Content
Section-A	Introduction and Concepts: Networks and Commercial Transactions – Internet and other novelties: networks and electronic transactions today, Model for commercial transactions; Internet environment –Internet advantage, worlds wide web and other Internet Sales venues; online commerce solutions. Electronic Payment Methods: Updating traditional transactions; secure online offline secure processing; private data networks, Security protocols.
Section-B	Electronic Commerce Providers: On-line Commerce options; Company profiles, Electronic Payment System: Digital payment system; First virtual Internet payment system; cyber cash model. On-line Commerce environments; E-commerce Servers, Digital Currencies Operational process of Digicash, Ecash Trail; Using Ecash; Smart cards; Electronic Data interchange: basics, EDI versus Internet and EDI over Internet. Strategies, Techniques and Tools, Shopping techniques and online selling techniques.
Section-C	ERP - an Enterprise Perspective: Production finance, Personnel disciplines and their relationships, Transiting environment, MIS Integration for disciplines, Information / workflow, Network Structure, Client Server Integrator System, VirtualEnterprise.ERP – Resource Management Perspective: Functional and Process of Resource, Management, Introduction to basic Modules of ERP System: HRD, Personnel Management, Training and Development, Skill Inventory, Material Planning and Control, Inventory, forecasting, Manufacturing, Production Planning, Production Scheduling, Production

	Control, Sales and Distributions, Finance, Resource Management in global scenario.
Section-D	ERP – Information System Perspective: Functional to OLAP (Online Analysis and Processing), TP, OAS, KBS, MRP, BPR, SCM, REP, CRM, and Information Communication Technology. ERP–Key Managerial Issues: Concept Selling, IT Infrastructure, Implication, of ERP System on business Organization, Critical success factors in ERP System, ERP Culture Implementation Issues, resistance to change, ERP Selection issues, return on Investment, pre and post Implementation Issues.

Course Outcomes:

CO1: Understand the concepts and technologies used in the field of management information systems.

CO2: Have the knowledge of the different types of management information systems.

CO3: Understand the processes of developing and implementing information systems.

CO4: Be aware of the ethical, social, and security issues of information systems.

Text Books:

1. Ravi Lalakota, Andrew Whinston: Frontiers of Electronics Commerce, 1996, Addison Wesley.
2. V.K. Garg and N.K. Venkita Krishna: Enterprise Resource Planning –Concepts and practice, 1998,PHI.

Reference Books:

1. John Antonio, Fernandz: The SAP/3 Handbook, TMH.
2. Denial Amor: The E-Business Revolution, Addison Welsey.
3. Electronic Commerce–Security, Risk Management and Control, Greenstein,Geinman, 2002, TMH.

Name of the Course	**Mobile Application Development**		
Course Code	**CS-PE-I-703**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- Android Application Development course is designed to quickly get you up to speed with writing apps for Android devices.
- The student will learn the basics of Android platform and get to understand the application lifecycle.

Section	Course Content
Section-A	**Introduction**: Introduction to Mobile Computing: Introduction to Android Development Environment. Factors in Developing Mobile Applications: Mobile Software Engineering, Frameworks and Tools. Generic UI Development. Android User.
Section-B	Mobile devices vs. desktop devices, ARM and Intel architectures, Power Management, Screen resolution, Touch interfaces, Application deployment, App Store, Google Play, Windows Store, Development environments: XCode, Eclipse, VS2012, Phone GAP, etc. Native vs. web applications.
Section-C	VUIs and Mobile Apps: Text to Speech Techniques, Designing the Right UI, Multichannel and Multimodial UIs Comparing and Contrasting architectures of all three: Android, iOS and Windows.
Section-D	Underlying OS (Darwin vs. Linux vs. Win 8), Kernel structure and native level programming. Mobile malware, Device protections.

Course Outcomes:

CO1: Recognizes the concept of application development for mobile devices.
CO2: Write simple GUI applications, use built-in widgets and components, work with the database to store data locally, and much more.
CO3: Recognizes the structure of an Android application project.
CO4: To understand mobile malware and device protection.

Text Books:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

Reference Books:

1. http://www.saylor.org/site/syllabus.php?cid=258
2. http://www.sap.com/pc/tech/mobile/software/solutions/platform/overview.html
3. http://www.impetus.com/mobility
4. http://mobile.openxcell.com/mobile-application-development.html

Name of the Course	Software Quality Engineering		
Course Code	**CS-PE-I-704**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculators allowed to use in examinations.

Course Objectives:

- To get knowledge about the SQA activities.
- To understand the software test engineer's role during software project life cycle.
- To understand how to perform the software test planning.
- To be able to write the software test scenarios, test cases, test plans and various matrices

Section	Course Content
Section-A	Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.
Section-B	Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.
Section-C	Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.
Section-D	Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

Course Outcomes:
CO1: Basic knowledge and understanding of the analysis and design of complex systems.
CO2: Ability to apply software engineering principles and techniques.

CO3: Ability to develop, maintain, and evaluate large-scale software systems.
CO4: To produce efficient, reliable, robust and cost-effective software solutions.
CO5: Ability to understand and meet ethical standards and legal responsibilities.

Text Books:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley-Inter science, 2005; ISBN0-471-71345-7.

Reference Books:

1. Metrics and Models in Software Quality Engineering, Stephen H. Kan, Addison-Wesley (2002), ISBN:0201729156

Name of the Course	**Design of Embedded Systems**		
Course Code	**CS-PE-I-705**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- To introduce the Building Blocks of Embedded System.
- To Educate in Various Embedded Development Strategies.
- To Introduce Bus Communication in processors, Input/output interfacing.

Section	Course Content
Section-A	Embedded Computers, Characteristics of Embedded Computing Applications, and Challenges in Embedded Computing system design, Embedded system design process, Overview of embedded system development-embedded system IDE- ARM Family-Core Types,-Memory Mapping, and ARM Based embedded development system.
Section-B	Organization of CPU – Bus architecture –Memory management unit: virtual memory to physical memory address translation, TLB, Domains and memory access permission ,cache and write buffer ,single stage and two stage cache accessing ,significance of co-processor Fast Context Switch Extension.
Section-C	Basic Embedded system Development Tools-Embest embedded IDE for ARM, Study of S3C3V40 based University Teaching Kit and Unet ICE JTAG emulator.-Embedded software development based on ARM including: ARM basic instruction set, Thumb instruction set- assembly programming- ARM processor mode switching-embedded C programming- C and assembly language mixed programming.
Section-D	I/O interface concepts-interrupts-types of interrupts-ARM interrupts-serial communication real-time clock and simple digital LED interface - LCD display interfacing- GLCD display interfacing – TFT display interfacing -the keyboard interfacing-the touch screen interfacing. Synchronous and asynchronous data transfer- UART based communication-I2C Protocol basics -serial communication using I2C bus: RTC Interfacing, EEPROM data transfer Ethernet communication – I2S voice bus interface communication.

Course Outcomes:

CO1: Acquire a basic knowledge about fundamentals of microcontrollers.

CO2: Acquire a basic knowledge about programming and system control to perform a specific task.

CO3: Acquire knowledge about devices and buses used in embedded networking.

CO4: Develop programming skills in embedded systems for various applications.

CO5: Acquire knowledge about basic concepts of circuit emulators.

CO6: Acquire knowledge about Life cycle of embedded design and its testing.

Text Books:

1. Steve Furber, "ARM System-on-Chip Architecture", Second Edition, Addison - Wesley,2000
2. Todd D. Morton, "Embedded Microcontrollers", Prentice Hall,2001.
3. "Embest ARM Teaching System User Manual", Embest Info & Tech, Ltd,Version2.01.

Reference Books:

1. **"**ARM Architecture Reference Manual", 2011, ARMLtd.
2. "The ARM-Thumb Procedure Call Standard", 2011 ARMLtd**.**
3. Embedded System Development and Labs for ARM, (Edited, revised and updated by RaduMuresan)

Name of the Course	Neural Networks		
Course Code	CS-PE-I-706	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- To introduce the fundamental techniques and principles of Neural Networks.
- To study the different models in ANN and their applications.

Section	Course Content
Section-A	Overview of biological neurons: Structure of biological neurons relevant to ANNS. Fundamental concepts of Artificial Neural Networks: Models of ANNS; Fees forward & feedback networks; learning rules; Hebbian learning rule, perception learning rule, delta learning rule, Widrow-Hoff learning rule, correction learning rule, Winner-take all learning rule etc.
Section-B	Single layer Perception classifier: Classification model, Features & Decision regions; training & classification using discrete perceptron, algorithm, single layer continuous perceptron networks for linearly separable classifications. Multiplayer Feed forward Networks: linearly non-separable pattern classification, Delta learning rule for multi perceptron layer. Generalized delta-learning rule. Error back-propagation training, learning factors. Examples
Section-C	Single layer feedback Networks: Basic concepts Hopfield networks, training & Examples. Associative Memories: Linear Association, Basic Concepts of recurrent Auto associative memory: retrieval algorithm, storage algorithm; By directional associative memory, architecture, Association encoding & decoding, Stability.
Section-D	Self-organizing networks: Unsupervised learning of clusters, winner – take – all learning, recall mode, Initialization of weights, seperability limitations of weights, seperability limitations.

Course Outcomes:

CO1: Explain the basic concepts in Neural Networks and applications.

CO2: Discuss feed forward networks and their training issues.

CO3: Distinguish different types of ANN architectures.

CO4: Understand Neural Networks applications.

Text Books:

1. Introduction to Artificial Neural System by Jacek M. zurada, 1994, Jaico Publ. House.
2. "Neural Networks: A Comprehensive formulation", SimonHeykin,1998,AW.

Reference Books:

1. "Neural Networks", Kosko,1992, PHI
2. "Neural Networks Fundamentals – N.K. Bose, P.Liang,2002. T.M.H.

Semester-VIII

Name of the Course	Data Warehouse and Data Mining		
Course Code	**CS-8001**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time:3Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non-programmable calculator allowed to use in examinations.

Course Objectives:

- Be familiar with mathematical foundations of data mining tools.
- Understand and implement classical models and algorithms in data warehouses and data mining
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- Master data mining techniques in various applications like social, scientific and environmental context.
- Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Section	Course Content
Section-A	Data ware housing Definition, usage and trends, DBMS vs. Data warehouse, data marts, metadata, Multidimensional data mode, data cubes, Schemas for Multidimensional database: stars, snowflakes and fact constellations. Data warehouse process & architecture, OLTP vs. OLAP, ROLAP vs. MOLAP types of OLAP, servers, 3–Tier data warehouse architecture, distributed and virtual data warehouses, data warehouse manager.
Section-B	Data mining definition & task, KDD versus data mining, data mining techniques, tools and applications**,** DBMS versus Data Mining, Data Mining application areas, Issues and challenges in Data Mining. Data mining query languages, data specification, specifying knowledge, hierarchy specification, pattern presentation & visualization specification, Data mining techniques, tools and applications, Association rules, apriori algorithm.
Section-C	Clustering techniques: Clustering paradigms, partition algorithm, hierarchical clustering, Decision tree knowledge discovery through neural Networks & Generic Algorithm, Rough Sets, Support Victor Machines and Fuzzy techniques.
Section-D	Mining Complex data objects, Spatial databases, Multimedia databases, Time series and sequence data; mining text Databases and mining World Wide Web.

Course Outcomes:

CO1: Understand the functionality of the various data mining and data warehousing component

CO2: Appreciate the strengths and limitations of various data mining and data warehousing models

CO3: Explain the analyzing techniques of various data

CO4: Describe different methodologies used in data mining and data ware housing.

Text Books:

1. Data Mining – Concepts & Techniques; Jiawei Han & Micheline Kamber–2001, Morgan kaufmann.
2. Data warehousing in Real World; Sam Anahory & Dennis Murray; 1997, Pearson
3. Data Mining Techniques; ArunPujar; 2001, University Press; Hyderabad.
4. Building the Data Warehouses; W.H. Longhman, C.Klelly, John Wiley & Sons

Reference Books:

1. Data Mining; Pieter Adriaans & DolfZantinge; 1997,Pearson
2. Data Warehousing, Data Mining and OLAP; Alex Berson, 1997, McGrawHill
3. Data Warehousing System; Mallach; 2000, McGraw Hill.

Name of the Course	**Project II**		
Course Code	**CS-8051**	Credits-5	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 150	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 100 Min. Pass Marks: 25

This project work shall be carried out by the students during the entire semester under the guidance of Supervisor allotted by the institute and its viva will be conducted at the end of the semester.

Instructions for paper setter/candidates

Project Evaluation will consist of Three parts:

1. Evaluation of the project report along with source code in a CD in the required format by an external examiner 40% marks. Continuous evaluation by internal examiner 30%marks.
2. Viva-voce examination (20%marks).
3. Software evaluation with test runs (10%marks)

Viva-voce examination will be related to the projects executed by the candidate during the course of the semester.

Course Objectives: Aim of this project is to equip students in the methodology of the system analysis and design of a live project in the institution in which he is studying or in a place of work such as bank, school, college, and office in the vicinity of the institute.

Course Outcomes:

CO1: Ability to identify, formulate, and solve complex problems by applying principles of software engineering.

CO2: Demonstrate the ability to communicate effectively in speech and writing.

CO3: Demonstrate the ability to locate and use technical information from multiple sources.

CO4: Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project.

CO5: Learn about and go through the software development cycle with emphasis on different processes - requirements, design, and implementation phases.

CO6: Apply principles of project management to plan, track, and present the progress of a project.

<table>
<tr><td>Name of the Course</td><td colspan="3">Project Seminar</td></tr>
<tr><td>Course Code</td><td>CS-8052</td><td>Credits-2</td><td>L-0, T-0, P-2</td></tr>
<tr><td>Total Practical Sessions</td><td colspan="3">15 (2 Hr Each)</td></tr>
<tr><td>Semester End Examination</td><td>Max Marks: 50</td><td>Min. Pass Marks: 20</td><td>Max. Time: 3 Hrs.</td></tr>
<tr><td colspan="3">Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)</td><td>Max Marks: 50
Min. Pass Marks: 25</td></tr>
<tr><td colspan="4">Instructions for paper setter / Candidates
This Seminar / Viva will be conducted on the project done by the candidate</td></tr>
<tr><td colspan="4">Course Outcomes:

CO1: To present and discuss the main features of the project.
CO2: To understand key issues of preparation of the project proposal and drafting of the final report.
CO3: To understand the purpose of planning as a necessary preparatory activity in any project
CO4: To understand and justify the relevance, soundness and research scope of the project’s topic</td></tr>
</table>

Name of the Course	**General Proficiency**		
Course Code	**HS-8001**	Credits-1	L-0, T-0, P-2
Total Practical Sessions	15 (2 Hr Each)		
Semester End Examination	Max Marks: 50	Min. Pass Marks: 20	Max. Time: 3 Hrs.
Internal Assessment: (based on Continuous Lab Work Assessment:20%, Experiment Performance: 30%, Attendance 10%, Viva: 40%)			Max Marks: 50 Min. Pass Marks: 25

Instructions for paper setter / Candidates

a) Aim of this course id to judge the overall development of the candidate as a professional in the respective branch of skill and fitness to the profession

b) To test the general fitness of candidate for the pr4ofession of Engineering

c) A comprehensive viva-voce examination will be conducted by a committee of five members of the institute.

1. Director/ Principal of the institute

2. Head of the concerned branch of Engineering.

3. An eminent professional from industry/ Public Sector/ Technical; Institute nominated by the Director/Principal.

4. A member drawn from among the faculty of Applied Science &Humanities.

5. A Faculty member of the concerned branch ofengineering.

d) The topic of the Group Discussion will be decided by the Committee as Due weight age be given to technical papers presented at National, International level, Prizes won by the candidate both in curricular and extra curricular activities. Extracurricular activities should include participation in clubs, NCC/ NSS organizational capacity, physical education, Yoga, community service, Technology for a common man and overall conduct.

Course Outcomes:

CO1: Effectively communicate through verbal/oral communication and improve the listening skills.

CO2: Write precise briefs or reports and technical documents.

CO3: Actively participate in group discussion / meetings / interviews and prepare & deliver presentations

CO4: Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

Open Electives

Name of the Course	**Ethical Hacking**		
Course Code	**CS-OE-801**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- Be familiar with the ethical hacking methodologies.
- To understand cyber security concepts to discover and report vulnerabilities in a network.
- Explores legal and ethical issues associated with ethical hacking.

Section	Course Content
Section-A	Introduction: Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking
Section-B	The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges, Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement, Preparing for a Hack: Technical Preparation, Managing the Engagement, Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance.
Section-C	Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase, Exploitation: Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password, Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern.
Section-D	Deliverable: The Deliverable, The Document, Overall Structure, Aligning Findings, Presentation. Integration: Integrating the Results, Integration

	Summary, Mitigation, Defence Planning, Incident Management, Security Policy, Conclusion.

Course Outcomes:

CO1: Plan a vulnerability assessment and penetration test for a network.
CO2: Execute a penetration test using standard hacking tools in an ethical manner.
CO3: Report on the strengths and vulnerabilities of the tested network.
CO4: Identify legal and ethical issues related to vulnerability and penetration testing.

Text Books:

1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press.

Reference Books:

1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning.

Name of the Course	**Software Maintenance**		
Course Code	**CS-OE-802**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- Study a variety of techniques, tools and methodologies to help building software systems that are easier to understand, maintain, reuse and evolve
- Apply software maintenance fundamentals, including terminology; the nature of and need for maintenance; maintenance costs; evolution and categories of maintenance
- Incorporate key issues in software maintenance, to include technical issues; management issues; cost estimation; and software maintenance measurement.
- Exercise best practices techniques for maintenance.

Section	Course Content
Section-A	Fundamentals: Meaning of software maintenance, software change, ongoing support, economic implications of modifying software, the nomenclature and image problem, software maintenance framework, potential solutions to maintenance problem. Maintenance Process models: Definitions, critical appraisal of traditional process models, maintenance process models. Program understanding: Aims of program comprehension, maintainers and their information needs, comprehension process models, mental models, program comprehension strategies, factors that affect understanding, implication of comprehension theories and studies.
Section-B	Reverse Engineering: Definitions, purposes and objectives, level of reverse engineering, supporting techniques and benefits. Reuse and reusability: Definitions, objectives and benefit of reuse, approach to reuse, domain ANALYSIS, COMPONENTS engineering, reuse process model, factors that impact upon reuse. Maintenance measures: Definitions, objectives of software maintenance, example measures, guidelines for selecting maintenance measures.
Section-C	Configuration management: Definitions, configuration management, change control, documentation. Management and organizational issues, Management responsibilities, enhancing maintenance productivity, maintenance teams, personnel education and training, organizational modes.
Section-D	Building and sustaining maintainability: Quality assurance, fourth generation languages, object-oriented paradigms. Maintenance tools: Criteria for selecting

	tools, taxonomy of tools, program understanding and reverse engineering, testing, configuration management, other tasks Past present and future of software maintenance.

Course Outcomes:

CO1: Understand technical issues; management issues; cost estimation; and software maintenance measurement in software maintenance process.

CO2: Assess the impact of a change request to an existing product of medium size.

CO3: Describe techniques, coding idioms and other mechanisms for implementing designs that are more maintainable.

CO4: Understand how design patterns can improve the design of a software system.

CO5: Identify the principal issues associated with software evolution and explain their impact on the software lifecycle.'

CO6: Discuss the advantages and disadvantages of different types of software reuse.

Text Books:

1. Software Maintenance: concepts and practice, Armstrong A, Takang and Penny A. Grubb, International Thomson Computer press, London.
2. Software Maintenance Management: Evaluation and Continuous Improvement, Alain April, Alain Abran, Wiley Online Library.

Name of the Course	**Entrepreneurship Development**		
Course Code	**CS-OE-803**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- Acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities,
- To develop the ability of analysing and understanding business situations in which entrepreneurs act and to master the knowledge necessary to plan entrepreneurial.

Section	Course Content
Section-A	Introduction to Entrepreneurship, Role of the entrepreneur in India and around the globe; forces that are driving the growth of entrepreneurship; benefits and drawbacks of entrepreneurship; mistakes of entrepreneurship and how to avoid them; entrepreneurial failure. Overview of business and its functioning Business and industry; Components of macro and micro business environment; Business Idea and Feasibility Creativity, innovation and entrepreneurship; mental locks" that limit individual creativity; steps in the creative process; techniques for improving the creative process; protection of intellectual property involving patents, trademarks, and copyrights
Section-B	Strategic Management and Entrepreneur Importance of strategic management to a (small) business; understanding competitive advantages; steps in the strategic planning process; basic strategies: low-cost, differentiation, and focus; balanced scorecard in the planning process. Forms of Business Ownership Advantages and the disadvantages of the three major forms of ownership: the sole proprietorship, the partnership, and the corporation. Types of franchising: trade name, product distribution, and pure. Major trends shaping franchising. Building the business plan : marketing considerations Marketing concept and evolution; marketing process; guerilla marketing
Section-C	Foundations of New Venture Finance Understanding capital requirements; identifying the sources of finance; angel investing and venture finance; managing cash flow. Creating the Organization: structure and design Forms of organization structure; factors contingent on organizational structure and design.

Section-D	Technical entrepreneur and The E-entrepreneur Process of creating and growing high potential ventures; basic approaches to launch an e-commerce effort. Entrepreneurship Concept and importance in corporate environment. Crafting a winning business plan Need and importance of business plan; elements of a solid business plan.

Course Outcomes:

CO1: Have the ability to discern distinct entrepreneurial traits
CO2: Know the parameters to assess opportunities and constraints for new business ideas
CO3: Understand the systematic process to select and screen a business idea
CO4: design strategies for successful implementation of ideas
CO5: write a business plan.

Text Books:

1. Essentials of Entrepreneurship and Small Business management (5/ed.): Thomas W. Zimmerer, and Norman M. Scarborough. PHI
2. Entrepreneurship: Strategies and Resources, 3/E -: Marc Dollinger; Prentice Hall

Reference Books:

1. Bringing New Technology to Market- Kathleen R. Allen, Prentice Hall
2. Entrepreneurship in Action, 2/E - Mary Coulter; Prentice Hall

Name of the Course	**Software Project Management**		
Course Code	**CS-OE-804**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- This course is aimed at introducing the primary important concepts of project management related to managing software development projects.
- They will also get familiar with the different activities involved in Software Project Management. Further, they will also come to know how to successfully plan and implement a software project management activity, and to complete a specific project in time with the available budget.

Section	Course Content
Section-A	Introduction and Software Project Planning: Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.
Section-B	Project Organization and Scheduling: Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.
Section-C	Project Monitoring and Control: Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.
Section-D	Software Quality Assurance and Testing: Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes,

	Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process. Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring.

Course Outcomes:

CO1: Identify the different project contexts and suggest an appropriate management strategy.

CO2: Practice the role of professional ethics unsuccessful software development.

CO3: Identify and describe the key phases of project management.

CO4: Determine an appropriate project management approach through an evaluation of the business s context and scope of the project.

Text Books:

1. Software Project Management by M.Cotterell, McGraw Hill Publications

Reference Books:

1. Software Project Managemnet by S. A.Kelka, PHI.

Name of the Course	**Software Testing**		
Course Code	**CS-OE-805**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- To study fundamental concepts in software testing.
- To discuss various software testing issues and solutions in software unit test, integration and system testing.

Section	Course Content
Section-A	Fundamentals of Testing types: First, second and later cycles of testing. Objectives and limits of testing. Overview of S/W development stages, Planning and Design stages and testing during these stages. Glass box code, Regression and Black box testing Software errors, Categories of software error. Reporting and analyzing bugs: Problem reports, Content and characteristics of Problem Report, analysis and tactics for analyzing a reproducible bug. Making a bug reproducible.
Section-B	Problem Tracking System: Objective of Problem Tracking system, tasks of the system, problem tracking overview, users of the tracking system, mechanics of the database. Test Case Design: Characteristics of a good test, equivalence classes and boundary values, visible state transitions, Race condition and other time dependencies, load testing, Error guessing, Function equivalence testing, Regression testing, General issues in configuring testing, printer testing.
Section-C	Localization and User Manual testing: Translated test expands, Character sets, keyboards, Text filters, Loading, saving, importing and exporting high and low ASCII, Operating system language, Hot keys, Error message identifiers, Hyphenation rules, Spelling rules, Sorting rules, Uppercase and lower case conversion, Printers, Sizes of paper, CPU's and video, Rodents Data formats and setup options, Rulers and measurements, Culture-bound Graphics and output, European product compatibility, Memory availability, automated testing, Testing user manuals, Effective documentation , documentation tester's objective, How testing documentation contributes to software reliability.
Section-D	Testing Tools and Test Planning: Fundamental tools, Automated acceptance and regression standards, Translucent box testing, Overall objective of the test plan: Product or tool? Detailed objective, type of test, strategy for developing

	components of test planning documents, components of test planning documents, documenting test materials.

Course Outcomes:

CO1: List a range of different software testing techniques and strategies and be able to apply specific (automated) unit testing method to the projects.

CO2: Distinguish characteristics of structural testing methods.

CO3: Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible.

CO4: Learn automated testing tools.

Text Books:

1. Testing Computer Software, by CemKanern , Jack Falk, Hunk QuoeGuyen,1999, Pub:Wiley,(Second edition).
2. Software Testing: A Craftsman's Approach, Fourth Edition, Paul C. Jorgensen, CRC Press.

Professional Electives-II

Name of the Course	**Cloud Computing**		
Course Code	**CS-PE-II-801**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculators allowed to use in examinations.

Course Objectives:

- To provide students with the fundamentals and essentials of Cloud Computing.
- To provide students a sound foundation of the Cloud computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- To enable students exploring some important cloud computing driven commercial systems and applications.
- To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

Section	Course Content
Section-A	Overview of Computing Paradigm: Recent trends in Computing ,Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. Evolution of cloud computing, Business driver for adopting cloud computing. Introduction to Cloud Computing Cloud Computing (NIST Model),Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages, Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing. Role of Open Standards.
Section-B	Cloud Computing Architecture Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services. Service Models (XaaS): Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud.
Section-C	Infrastructure as a Service(IaaS): Introduction to IaaS, IaaS definition, Introduction to virtualization, Different approaches to virtualization,

	Hypervisors, Machine Image, Virtual Machine(VM), Resource Virtualization: Server, Storage, Network Virtual Machine(resource)provisioning and manageability, storage as a service, Data storage in cloud computing(storage as a service)Platform as a Service(PaaS):Introduction to PaaS, What is PaaS, Service Oriented Architecture (SOA), Cloud Platform and Management, Computation & Storage, Software as a Service(PaaS):Introduction to SaaS, Web services, Web 2.0, Web OS, Case Study on SaaS.
Section-D	Service Management in Cloud Computing: Service Level Agreements(SLAs),Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously ,Managing Data: Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud ,Large Scale Data Processing. Cloud Security: Infrastructure Security: Network level security, Host level security, Application level security, Data security and Storage, Data privacy and security Issues, Jurisdictional issues raised by Data location, Identity & Access Management, Access Control, Trust, Reputation, Risk. Authentication in cloud computing: Client access in cloud, Cloud contracting Model, Commercial and business considerations.

Course Outcomes:

CO1: Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

CO2: Apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost.

CO3: Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.

CO4: Analyze various cloud programming models and apply them to solve problems on the cloud.

Text Books:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India,2010
2. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wile,2011

Reference Books:

1. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer,2012
2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India,2010.

Name of the Course	**Data Analytics**		
Course Code	**CS-PE-II-802**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:

The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:

Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculatoris allowed to use in examinations.

Course Objectives:

- To introduce fundamental algorithms and techniques used in Data Analytics.•
- To cover statistical foundations followed by various machine learning and data mining algorithms.
- To introduce technological aspects like data management (Hadoop), scalable computation (MapReduce) and visualization.

Section	Course Content
Section-A	Data Definitions and Analysis Techniques: elements, variables, and data categorization, levels of measurement, data management and indexing, introduction to statistical learning and R-programming. Descriptive Statistics: Measures of central tendency, Measures of location of dispersions, Practice and analysis with R
Section-B	Basic Analysis Techniques: Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Correlation analysis, Maximum likelihood test, Practice and analysis with R.
Section-C	Data Analysis Techniques: Regression analysis, Classification techniques, Clustering, Association rules analysis.
Section-D	Case Studies and Projects: Understanding business scenarios, Feature engineering and visualization, Scalable and parallel computing with Hadoop and Map-Reduce, Sensitivity Analysis.

Course Outcomes:

CO1: Find a meaningful pattern in data and graphically interpret data
CO2: Implement the analytic algorithms
CO3: Handle large scale analytics projects from various domains
CO4: Develop intelligent decision support systems.

Text Books:

1. Probability and Statistics for Engineers & Scientists By Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Prentice Hall.

2. The Elements of Statistical Learning, Data Mining, Inference, and Prediction by Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer.
3. An Introduction to Statistical Learning: with Applications in R by G James, D. Witten, T Hastie, and R. Tibshirani, Springer.

Reference Books:

1. Mining Massive Data Sets by Jure Leskovec, AnandRajaraman and Jeff Ullman, Cambridge University Press.

Name of the Course	**Bioinformatics**		
Course Code	**CS-PE-II-803**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- Describe how bioinformatics data is stored and organised.
- Describe the different types of data found at the different resources.
- Explain how to locate and extract data from key bioinformatics databases and resources.

Section	Course Content
Section-A	Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary & reference systems, finding new type of data online. Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, Overview of the bioinformatics applications.
Section-B	Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, - Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.
Section-C	Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, Understanding and Using Biological Databases, Java clients, CORBA, Introduction to biostatics. sequences, macromolecular structures, chemical compounds, generic variability and its connection to clinical data.
Section-D	Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

Course Outcomes:

CO1: Locate and use the main databases at the different resources.

CO2: Know the difference between databases, tools, repositories and be able to use each one to extract specific information.

CO3: Extract data from specific databases using accessions numbers, gene names etc.

CO4: Use selected tools at different resources to run simple analyses on genomic sequences

Text Books:

1. O'Reilly, " Developing Bio informatics computer skills", Indian Edition'spublication
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics concepts, skills & Applications", CBSPublishers

Reference Books:

1. Rashidi, Hooman and Lukas K. Buehler, "Bioinformatics Basic Applications" CRCPress.
2. Stephen Misner& Stephen Krawetz, " Bioinformatics- Methods &Protocols"
3. Bryan Bergeron, "Bioinformatics Computing", Pearson Education

Name of the Course	Mathematics and Quantitative Planning for Financial Decision		
Course Code	**CS-PE-II-804**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- To apprise students about relevance of mathematical & quantitative techniques in business decision making in today's competitive world.

Section	Course Content
Section-A	Time Value of Money: Concept and Applications – Present Value, Future/Compound Value, Annuities (Ordinary Due and Perpetual) Amortization, Discount rate, Equal Monthly Installments. Bonds and Debentures: Simple yield, current yield, yield to maturity, redemption yield, coupon rate, principal, Face value, Maturity, Discount, Premium, Simple Interest, Compound Interest, Quarterly Compounding, Semi- annual Compounding, duration, Conversion premium. Warrants, futures, Options, Swaps, GDRs, ADRs, ECBs, Rights.
Section-B	Concept of Index Numbers : Stock Exchange Indices- Sensex, Down Jones, Nasdaq etc., Composition of indices, full Capitalisationvs Free Float, Basic applications of Indices, Beta. Mathematics of Life Insurance and Mutual Funds(Amortization of Front – end Fees, NAV discount/premium to NAV, impact of 'loading' on returns). Simulation.
Section-C	Business forecasting – Importance of Forecasting – Techniques of forecasting –Theories of Forecasting. Operation Research Techniques: an Introduction, Linear Programming, Transportation and Assignment Problems, Replacement Decisions.
Section-D	Operation Research Techniques: Network analysis – PERT and CPM, Game Theory, Queuing Theory, Sequencing Problems.

Course Outcomes:
CO1: The meaning of quantitative techniques.
CO2: Basics of decision making in financial decisions.
CO3: The relevance of quantitative techniques in business decision making.
CO4: The classification of quantitative techniques.

Text Books:

1. Mathematics of Finance – Frank Ayres
2. Financial Management – Prasanna Chandra
3. Operations Research – Kanti Swarup

Reference Books:

1. Operations Research –V.K.Kapoor

Name of the Course	**Parallel Algorithms**		
Course Code	**CS-PE-II-805**	Credits-3	L-3, T-1, P-0
Total Lectures	52 (1 Hr Each) (L=39, T=13 for each semester)		
Semester End Examination	Max Marks: 100	Min. Pass Marks: 40	Max. Time: 3 Hrs.
Internal Assessment: (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max Marks: 50

Instructions

For Paper Setters:
The question paper will consist of five Sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

For Candidates:
Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. A non- programmable calculator allowed to use in examinations.

Course Objectives:

- The aim of the course is introducing the main concepts and methods in parallel algorithm design, together with performance evaluation & comparison with sequential algorithms.

Section	Course Content
Section-A	Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.
Section-B	Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost optimality, An example of illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.
Section-C	Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC/, Parallel Sorting Networks on CREW/EREW/MCC/, linear array , Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms- Permutation, Combinations, Derrangements.
Section-D	Parallel Searching Algorithm, K^{th} element, K^{th} element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.

Course Outcomes:

CO1: Understand parallel from distributed world,
CO2: Apply techniques and methods presented along the course aiming to design efficient parallel algorithms.
CO3: Analyze required computational resources, in order to assess performance and correctness of algorithms.
CO4: Understand parallel programming models

Text Books:

1. M.J. Quinn, "Designing Efficient Algorithms for Parallel Computer" by McGrawHill.

Reference Books:

1. S.G. Akl, "Parallel Sorting Algorithm" by AcademicPress.
2. S.G. Akl, "Design and Analysis of Parallel Algorithms"