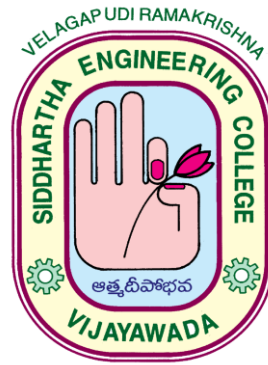


B. Tech.
COMPUTER SCIENCE AND ENGINEERING
SYLLABUS



Department of Computer Science and Engineering
(B. Tech. CSE Programme Accredited by NBA)

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE

(An Autonomous, ISO 9001:2008 Certified Institution)

(Approved by AICTE, Accredited by NAAC with 'A' Grade, Affiliated to JNTUK, Kakinada)

(Sponsored by Siddhartha Academy of General & Technical Education)

Kanuru, Vijayawada

Andhra Pradesh - 520007, INDIA.

www.vrsiddhartha.ac.in

PROGRAMME OUTCOMES

Program outcomes identify the knowledge, skills and attitudes that students should be able to demonstrate upon completion of the program.

- a. An ability to apply knowledge of mathematics, science and engineering appropriate to the discipline.
- b. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- c. An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.
- d. An ability to function effectively on teams to accomplish a common goal.
- e. An understanding of professional, ethical, legal, security, and social issues and responsibilities.
- f. An ability to communicate effectively with a range of audiences.
- g. An ability to analyze the local and global impact of computing on individuals, organizations and society.
- h. Recognition of the need for, and an ability to engage in, continuing professional development.
- i. An ability to use current techniques, skills, and tools necessary for computing practice.
- j. Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- k. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
- l. An ability to apply design and development principles in the construction of software systems of varying complexity

**Velagapudi Ramakrishna
Siddhartha Engineering College: Vijayawada - 7**
Scheme of Instruction and Examination – VR14
Department of Computer Science and Engineering
Semester I

S.No	Subject Code	Subject Title	L	T	P	C	CE	SE	T
1	14MA1101	Linear Algebra and Differential Equations	4	1		4	30	70	100
2	14PH1102	Engineering Physics	3	1		3	30	70	100
4	14CS1103	Introduction to Computing	2			2	30	70	100
3	14HS1104	Technical English and Communication Skills	2		2	2	30	70	100
5	14EE1105	Basics of Electrical Engineering	2			2	30	70	100
6	14ME1106	Basics of Mechanical Engineering	2			2	30	70	100
7	14ME1107G	Engineering Graphics	2		6	5	30	70	100
8	14PH1151	Engineering Physics Lab			3	2	30	70	100
9	14CS1152	Basic Computing Lab			3	2	30	70	100
			17	2	14	24	270	630	900

L – Lecture, T – Tutorial, P – Practical, C – Credits,
CE - Continuous Evaluation, SE - Semester-end Evaluation, T – Total Marks

**Velagapudi Ramakrishna
Siddhartha Engineering College: Vijayawada - 7**
Scheme of Instruction and Examination – VR14
Department of Computer Science and Engineering
Semester II

S.No	Sub. Code	Subject Title	L	T	P	C	CE	SE	T
1	14MA1201	Calculus	4	1		4	30	70	100
2	14CH1202	Engineering Chemistry	3	1		3	30	70	100
3	14CS1203	Programming in C	3	1		3	30	70	100
4	14CE1204	Basics of Civil Engineering	2			2	30	70	100
5	14HS1205	Professional Ethics	2			2	30	70	100
6	14EC1206	Basics of Electronics Engineering	2			2	30	70	100
7	14ME1207	Mechanics for Engineers	4			4	30	70	100
8	14CH1251	Engineering Chemistry Lab			3	2	30	70	100
9	14CS1252	C Programming Lab			3	2	30	70	100
10	14ME1253	Workshop Practice			3	2	30	70	100
			20	3	9	26	300	700	1000

L – Lecture, T – Tutorial, P – Practical, C – Credits,
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**Velagapudi Ramakrishna
Siddhartha Engineering College: Vijayawada - 7**
Scheme of Instruction and Examination – VR14
Department of Computer Science and Engineering
Semester III

S.No	Sub. Code	Subject Title	L	T	P	C	CE	SE	T
1	14MA1301	Complex Analysis and Numerical Methods	4	1		4	30	70	100
2	14CS3302	Discrete Mathematical Structures	3	1		3	30	70	100
3	14CS3303	Data Structures	4	1		4	30	70	100
4	14HS1304	Environmental Studies	3			3	30	70	100
5	14CS3305	Data Communications	3	1		3	30	70	100
6	14CS3306	Digital Logic Design	3	1		3	30	70	100
7	14CS3351	Digital Logic Design Lab			3	2	30	70	100
8	14CS3352	Data Structures Lab			3	2	30	70	100
9	14HS1353	Communication Skills Lab			2	2	30	70	100
			20	5	8	26	270	630	900

L – Lecture, T – Tutorial, P – Practical, C – Credits,

CE - Continuous Evaluation, SE - Semester-end Evaluation, T – Total Marks

Velagapudi Ramakrishna

Siddhartha Engineering College: Vijayawada - 7

Scheme of Instruction and Examination – VR14

Department of Computer Science and Engineering

Semester IV

S.No	Sub. Code	Subject Title	L	T	P	C	CE	SE	T
1	14MA1401	Probability and Statistics	4	1		4	30	70	100
2	14CS3402	Web Technologies	3	1		3	30	70	100
3	14CS3403	Advanced Data Structures	4			4	30	70	100
4	14CS3404	Computer Organization	3	1		3	30	70	100
5	14CS3405	Object Oriented Programming using Java	4	1		4	30	70	100
6	14CS3406	Computer Networks	4			4	30	70	100
7	14CS3451	Web Technologies Lab			3	2	30	70	100
8	14CS3452	Java Programming Lab			3	2	30	70	100
			22	4	6	26	240	560	800

L – Lecture, T – Tutorial, P – Practical, C – Credits,

CE - Continuous Evaluation, SE - Semester-end Evaluation, T – Total Marks

**Velagapudi Ramakrishna
Siddhartha Engineering College: Vijayawada - 7
Scheme of Instruction and Examination – VR14
Department of Computer Science and Engineering**

Semester V

S. No	Sub. Code	Subject Title	L	T	P	C	CE	SE	T
1	14CS3501	Database Management Systems	4	1		4	30	70	100
2	14CS3502	Microprocessor and Micro Controllers	3	1		3	30	70	100
3	14CS3503	Operating Systems	4	1		4	30	70	100
4	14CS3504	Advanced Java Programming	3	1		3	30	70	100
5	14CS2505	Institutional Elective	4			4	30	70	100
6	14CS5506	Independent Learning (MOOCs) A: Programming in Python B: Introduction to Linux C: Web Application Architectures D: Meteor Framework and MongoDB E: Any other MOOC Course decided by the department				2	30	70	100
7	14CS3551	Database Management Systems Lab			3	2	30	70	100
8	14CS3552	Microprocessor Lab			3	2	30	70	100
9	14CS3553	Advanced Java Programming Lab			3	2	30	70	100
			18	4	9	26	270	630	900

L – Lecture, T – Tutorial, P – Practical, C – Credits,

CE - Continuous Evaluation, SE - Semester-end Evaluation, T – Total Marks

**Velagapudi Ramakrishna
Siddhartha Engineering College: Vijayawada - 7
Scheme of Instruction and Examination – VR14
Department of Computer Science and Engineering**

Semester VI

S.No	Sub. Code	Subject Title	L	T	P	C	CE	SE	T
1	14CS3601	Design and Analysis of Algorithms	4	1		4	30	70	100
2	14CS3602	Internet of Things	3			3	30	70	100
3	14CS3603	Software Engineering	3	1		3	30	70	100
4	14CS3604	Theory of Computation	3	1		3	30	70	100
5	14CS3605	Data Analytics	3	1		3	30	70	100
6	14CS3606	Cyber Security	4	1		4	30	70	100
7	14CS3651	CASE Tools Lab			3	2	30	70	100
8	14CS3652	Internet of Things Lab			3	2	30	70	100
9	14CS3653	Data Analytics Lab			3	2	30	70	100
10	14CS5654	Term Paper		1		2	30	70	100
			20	6	9	28	300	700	1000

L – Lecture, T – Tutorial, P – Practical, C – Credits,

CE - Continuous Evaluation, SE - Semester-end Evaluation, T – Total Marks

**Velagapudi Ramakrishna
Siddhartha Engineering College: Vijayawada - 7
Scheme of Instruction and Examination – VR14
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Semester VII**

S. No	Sub. Code	Subject Title	L	T	P	C	CE	SE	T
1	14CS3701	Compiler Design	4	1		4	30	70	100
2	14CS3702	Cloud Computing	4			4	30	70	100
3	14CS4703	Program Elective – I A: Mobile Computing B: Information Retrieval Systems C: Bioinformatics D: High Performance Computing E: Data Visualization F: Industry Need Based	3			3	30	70	100
4	14HS1704	Engineering Economics and Finance (Institutional Core)	3			3	30	70	100
5	14CS4705	Program Elective – II A: Image Processing B: Semantic Web and Social Networks C: Artificial Intelligence D: Software Project Management E: Information Security Assessment and Audit F: Industry Need Based	3			3	30	70	100
6	14CS3751	Cloud Computing Lab			3	2	30	70	100
7	14CS5752	Mini Project			3	1	30	70	100
8	14CS6753/ 14CS6754	Internship/ Industry offered Course				2		100	100
			17	1	6	22	210	590	800

L – Lecture, T – Tutorial, P – Practical, C – Credits,

CE - Continuous Evaluation, SE - Semester-end Evaluation, T – Total Marks

**Velagapudi Ramakrishna
Siddhartha Engineering College: Vijayawada - 7
Scheme of Instruction and Examination – VR14
Department of Computer Science and Engineering
Semester VIII**

S. No	Sub. Code	Subject Title	L	T	P	C	CE	SE	T
1	14CS3801	Software Testing and Quality Assurance	4			4	30	70	100
2	14CS4802	Program Elective – III A: TCP/IP Protocol suite B: Natural Language Processing C: User Interface Design D: Geographical Information Systems (GIS) E: Entrepreneurship and New Ventures F: Industry Need Based	3			3	30	70	100
3	14CS4803	Program Elective – IV A: Pattern Recognition B: Adhoc and Sensor Networks C: Machine Learning D: Information Security Risk Management E: M-Commerce F: Industry Need Based	3			3	30	70	100
4	14CS3851	Software Testing Lab			3	2	30	70	100
5	14CS5852	Project		6	6	10	30	70	100
			10	6	9	22	150	350	500

L – Lecture, T – Tutorial, P – Practical, C – Credits,

CE - Continuous Evaluation, SE - Semester-end Evaluation, T – Total Marks

INSTITUTIONAL ELECTIVES OFFERED BY CSE DEPARTMENT:

14CS2505 A- Data Structures

14CS2505 B- Internet Technologies

14CS2505 C- Java Programming

*May change based on the faculty availability

SEMESTER – I

14MA1101

LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

Course Category:	Institutional Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-1-0
Prerequisites:	Fundamentals of Matrices, Integration, Differentiation.	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the concept of Rank of Matrix, Nature of solution of system of linear equations (consistent or inconsistent) and able to find Eigen values and Eigen vectors, able to find inverse of a matrix and able to reduce a quadratic form to canonical form.											
	CO2	Able to solve the linear differential equations by using appropriate methods.											
	CO3	Able to form Partial Differential equations and solve Partial Differential Equations.											
	CO4	Understand the concept of Laplace Transforms and able to apply to solve Differential Equations, Integral Equations by Transform method.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	H							L			M
	CO2	H	H							L			M
	CO3	H	H							L			H
	CO4	H	M							L			H
Course Content	UNIT I Linear Algebra: Rank of a Matrix, Elementary transformations, Inverse of a matrix (Gauss Jordan Method) Consistency of Linear System of Equations, Linear Transformations, Vectors, Eigen Values, Properties of Eigen Values, Cayley - Hamilton Theorem (Without Proof), Reduction to Diagonal Form, Reduction of quadratic form to canonical form, Nature of a Quadratic Form, Complex Matrices.												

UNIT II

Differential Equations of First Order: Formation of a Differential Equation, Solution of a Differential Equation, Linear Equations, Bernoulli's Equation, Exact Differential Equations, Equations Reducible to Exact Equations, Orthogonal Trajectories, Newton's Law of Cooling, Rate of Decay of Radio-Active Materials.

UNIT III

Linear Dependence of Solutions, Method of Variation of Parameters, Equations reducible to Linear Equations With Constant Coefficients: Cauchy's Homogeneous Linear Equation, Legendre's Linear equation, Simultaneous linear differential equations with constant coefficients.

Partial Differentiation: Total Derivative, Change of Variables, Jacobians. Partial Differential Equations: Introduction, Formation of Partial Differential Equations, Solutions of a Partial Differential Equations, Equations Solvable by Direct Integration, Linear Equations of First Order.

UNIT IV

Laplace Transforms: Introduction, Definition, Conditions for Existence, Transforms of Elementary Functions, Properties of Laplace Transforms, Transforms of Periodic Functions, Transforms of Derivatives, Transforms of Integrals, Multiplication by tn , Division by t , Evaluation of Integrals by Laplace Transforms, Inverse Transforms, Method of Partial Fractions, Other Methods of Finding Inverse, Convolution Theorem, Application to Differential Equations, Unit Step and Unit Impulse Functions.

Text books and Reference books**Textbooks**

- [1] B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition Khanna Publishers, 2012.

Reference Books

- [1] Kreyszig "Advanced Engineering Mathematics", 8th Edition, JohnWiley & Sons, 2007
- [2] Peter V.O.Neil, Thomson "Advanced Engineering Mathematics" Canada.
- [3] R.K.Jain and S.R.K.Iyengar "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishers.
- [4] N.P.Bali, Manish Goyal, "A Text Book of Engineering Mathematics" Laxmi Publications(P) Limited.
- [5] B.V.Ramana "A text book of mathematics", Tata MC Graw Hill.

14PH1102

ENGINEERING PHYSICS

Course Category:	Institutional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-1-0
Prerequisites:	-	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the differences between classical and quantum mechanics and learn about statistical mechanics											
	CO2	Understand various properties and applications of magnetic & dielectric materials and the theory of super conductivity											
	CO3	Analyse and understand semiconductor technology and various types of lasers & optical fibers.											
	CO4	Understand the fabrication of nanomaterials, carbon nanotubes and their applications in various fields											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1							M	L			M	L
	CO2		M	L					M			M	
	CO3		M	M					M				
	CO4			L	L				M			M	
Course Content	UNIT I Quantum Mechanics: Dual nature of light, Matter waves and Debroglie's hypothesis, G.P.Thomson experiment, Heisenberg's uncertainty principle and its applications (Non existence of electron in nucleus, Finite width of spectral lines), Classical and quantum aspects of particle, One dimensional time independent Schrödinger's wave equation, physical significance of wave function, Particle in a box (One dimension). Statistical Mechanics: Phase space, Differences between Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics (qualitative), Fermi-Dirac probability function, Fermi energy level.												

UNIT II

Magnetic properties: Magnetic permeability, Magnetization, Origin of magnetic moment, Classification of magnetic materials - dia, para, ferro magnetic materials, Hysteresis curve.

Dielectric properties: Fundamental definitions: Dielectric constant, Electric polarization, Polarizability, Polarization vector, Electric displacement, Electric susceptibility, Types of Polarization: Electronic, Ionic, Orientation, Space charge polarization, Internal fields in solids (Lorentz method), Clausius-Mossotti equations, Frequency dependence of polarization, Ferroelectrics and their applications.

Superconductivity: Introduction, Critical parameters, Flux quantization, Meissner effect, Types of Superconductors, BCS theory, Cooper pairs, London's equation penetration depth, high temperature super conductors, Applications of superconductors.

UNIT III

Semiconductor Physics: Classification of materials based on energy diagram, Fermi level in Intrinsic and extrinsic semiconductors, Carrier drift and Carrier diffusion, Generation and recombination process (qualitative), Hall Effect.

Lasers: Spontaneous emission, Stimulated emission, Population inversion, Solid state (Ruby) laser, Gas (He-Ne) laser, Semiconductor (Ga-As) laser, Applications of lasers.

Fiber optics: Propagation of light through optical fiber, Types of optical fibers, Numerical aperture, Fiber optics in communication and its advantages.

UNIT IV

Nanotechnology: Basic concepts of Nanotechnology, Nano scale, Introduction to nano materials, Surface to volume ratio, General properties of Nano materials, Fabrication of nano materials: Plasma Arcing, Sol-gel, Chemical vapour deposition, Characterization of nano materials: AFM, SEM, TEM, STM, MRFM, Carbon nano tubes: SWNT, MWNT, Formation of carbon nanotubes: Arc discharge, Laser ablation, Properties of carbon nano tubes, Applications of CNT's & Nanotechnology.

Textbooks and Reference books**Textbooks**

[1] M.N. Avadhanulu & P.G. Kshirsagar "A text of Engineering Physics", S. Chand publications.

	<p>[2] P.K. Palanisamy “Applied Physics”, Scitech Publishers.</p> <p>Reference Books</p> <p>[1] R.K.Gaur and S.L.Gupta “Engineering Physics”, Dhanpatrai publishers.</p> <p>[2] S.O. Pillai “Solid State Physics”, New age international publishers.</p> <p>[3] M.R. Srinivasan “Engineering Physics”, New age international publishers.</p> <p>[4] M.Armugam “Engineering Physics”, Anuradha publishers.</p>
<p>E-resources and other digital material</p>	<p>[1] http://www.light and matter.com/bk4.pdf</p> <p>[2] http://www.ifw-resden.de/institutes/itf/members/helmut/sc1.pdf</p> <p>[3] http://www.microscopy.ethz.ch/history.htm</p> <p>[4] http://nptel.ac.in/courses.php?disciplineId=115</p> <p>[5] http://aph.huji.ac.il/courses/2008 9/83887/index.html</p> <p>[6] http://freevideolectures.com/Course/3048/Physics-of-Materials/36</p>

14CS1103

INTRODUCTION TO COMPUTING

Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	2-0-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:													
	CO1	Understand the changes in hardware and software components.												
	CO2	Understand the concept of operating system and its functionalities.												
	CO3	Understand types of networks and most common ways of transmitting data via networks and internet.												
	CO4	Identify the ways in which a program can work towards a solution by using some processes and tools.												
	CO5	Develop algorithms and prepare flow charts to simple mathematics and logical problems												
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	
	CO1	H												
	CO2		M											
	CO3	L												
	CO4	H												
	CO5	H									L			
Course Content	UNIT I Exploring Computers and their uses: Overview: Computers in our world, The computer defined, Computers for individual users, Computers for organizations, Computers in society, Why are computers so important. Looking inside the computer system Overview: Detecting the ultimate machine, The parts of a computer system, The information processing cycle, Essential computer hardware: processing devices, memory devices, Storage devices, System software, Application software, Computer data, Computer users.													

Input and Output devices: Overview: Input devices and output devices, various types of input/output devices.

UNIT II

Transforming data into information: Overview: The difference between data and information, How computers represent data, How computers process data, Machine cycles, Memory, Factors effecting processing speed, The computer's internal clock, The Bus, Cache memory.

Types of storage devices: Overview: An ever-growing need, Categorizing storage devices, Magnetic storage devices-How data is stored on a disk, How data is organized on a magnetic disk, How the operating system finds data on a disk, Diskettes, hard disks, Removable high-capacity magnetic disks, Tape drives, Optical storage devices, Solid-state storage devices, Smart cards, Solid-state disks.

Operating systems basics: Overview, The purpose of operating systems, Types of operating systems, Providing a user interface.

Networking Basics: Overview, Sharing data anywhere, anytime, The uses of a network, Common types of networks, Hybrid networks, How networks are structured,

Network topologies and protocols, Network media, Network hardware.

UNIT III

Data Communications: Overview, The local and global reach of networks, Data communications with standard telephone lines and modems, Modems, uses for a modem, Using digital data connections, Broadband connections, Wireless networks.

Productivity Software: Overview: Software to accomplish the work of life, Acquiring Software, Commercial software, Freeware and public domain software, Open-source software, Word processing programs, Spreadsheet programs, Presentation programs, Presenting information managers.

Database management Systems: Overview, The mother of all computer applications, Databases and Database Management Systems, Flat-File and Relational Database Structure, DBMS, Working with a database.

UNIT IV

Programming languages and the programming process: Overview,The keys to successful programming, The evolution of programming languages,World wide web development languages, The Systems development life cycle forpro- gramming.

	Creating Computer programs: Overview: What is a computer program, Hardware/ Software interaction, Code, machinecode, programming languages, Compilers and interpreters, planning a computer program, How programs solve problems, Purpose of flowcharts and algorithms, flow chart symbols, drawing flow charts, developing algorithms.
Text books and Reference books	Textbooks [1] Peter Norton, Introduction to Computers, sixth Edition, Tata McGraw Hill [2] Reema Thareja, Computer Fundamentals and C Programming, 1 st edition, OXFORD University Press.
E-resources and other digital material	[1] Lecture Series on Computer Organization by Prof.S. Raman, Department of CSE, IIT Madras Available at: https://www.youtube.com/watch?v=leWKvuZVUE8 [2] Lecture Series on Data Communication by Prof.A. Pal, Department of CSE, IIT Kharagpur. Available at: https://www.youtube.com/watch?v=sG6WGvzmVaw

14HS1104**TECHNICAL ENGLISH AND COMMUNICATION SKILLS**

Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	2-0-2
Prerequisites:	Basic understanding of the language skills	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Be proficient in administrative and professional compilation skills, including web related communication											
	CO2	Attain practice in Interpersonal Communication, in addition to standard patterns of Pronunciation											
	CO3	Be aware of the elements of Functional English for authentic use of language in any given academic and/or professional environment											
	CO4	Enhance Reading skills, along with a wide range of Vocabulary											
	CO5	Acquire competence in Technical communication skills											
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1				M		H		M		M		
	CO2				H		H		M		M		
	CO3				M		H		H		M		
	CO4				M		H		M		M		
	CO5				H		H		H		M		
Course Content	UNIT I Professional Writing Skills 1. Professional Letters-Business, Complaint, Explanation and Transmittal 2. Essay Writing-Descriptive, Reflective and Analytical 3. Administrative drafting and correspondence - Memos, Minutes and Web notes												

	<p>UNIT II</p> <p>Interpersonal Communication Skills</p> <ol style="list-style-type: none"> 1. Communicative Facet- Speech acts- Extending Invitation, Reciprocation, Acceptance, Concurrence and Disagreeing without being disagreeable. 2. Articulation-oriented Facet- Phonetic Transcription using IPA symbols with Vowel and Consonant charts - Word Stress. <hr/> <p>UNIT III</p> <p>Vocabulary and Functional English</p> <ol style="list-style-type: none"> 1. A basic List of 500 words - Overview 2. Verbal Analogies, Confusibles, Idiomatic expressions and Phrasal Collocations. 3. Exposure through Reading Comprehension- Skimming, Scanning, Understanding the textual patterns for tackling different kinds of questions and Taming Regression. 4. Functional Grammar with special reference to Concord, Prepositions and Pronoun - referent analysis. <hr/> <p>UNIT IV</p> <p>Technical Communication Skills</p> <ol style="list-style-type: none"> 1. Technical Proposal Writing 2. Technical Vocabulary- a representative collection will be handled 3. Developing Abstract 4. Introduction to Executive summary 5. Technical Report writing (Informational Reports and Feasibility Reports)
<p>Text books and Reference books</p>	<p>Textbooks</p> <ol style="list-style-type: none"> [1] TM Farhathullah “Communication Skills for Technical Students”, Orient Longman, 2002 [2] Krishna, Duvvuri “English Language Communication Skills”, Publications , 2008 [3] B.S .Sarma “Structural Patterns & Usage in English”, Poosha Series, 4th edition, 2008. [4] Eclectic Learning materials offered by the Department

	<p>Reference Books</p> <p>[1] Randolph Quirk “Use of English”, Longman, 2004.</p> <p>[2] Thomson A.J & Martinet A.V “Practical English Grammar”, Oxford University Press,2001</p> <p>[3] Thomas Eliot Berry “Common Errors in English”, TMH, 2001</p> <p>[4] John Langan “College Writing Skills”, McGraw Hill, 2004.</p> <p>[5] Selinkar, Larry et al “English for Academic and Technical Purposes”, Newbury House Publishers, 1981.</p> <p>[6] Martin Cutts “Oxford guide to Plain English” -, Oxford University Press, 2004.</p> <p>[7] J.Sethi and P.V. Dhamija “A course in Phonetics and spoken English” , PHI, 2006.</p>
<p>E-resources and other digital material</p>	<p>[1] Learn English www.britishcouncil.org/learning-english-gateway.htm up dated 2014</p> <p>[2] pdfstuff.blogspot.com/2013/.../the-oxford-guide-to-english-usage-pdf.ht.</p> <p>[3] Apps for English Learning www.cambridgeapps.org/ up dated 2014</p>

14EE1105

BASICS OF ELECTRICAL ENGINEERING

Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	2-0-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Analyze electric circuit fundamentals											
	CO2	Understand the basic concepts of Electromagnetism.											
	CO3	Analyze electric machines											
	CO4	Understand measuring instruments & utilization concepts.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M											
	CO2	M											
	CO3	L											
	CO4	L											
Course Content	UNIT I												
	<p>DC circuits: Definitions of work, power, energy and torque; Ohm's law; Kirchhoff's laws; Series-parallel resistive circuits; Star-delta transformation;</p> <p>AC circuits: Generation of sinusoidal signal; RMS, Average values, Form factor, Peak factor.</p>												
Course Content	UNIT II												
	Magnetic effect of an electric current; cross and dot conventions; concept of m.m.f., flux, flux density, reluctance, permeability and field strength; Self and Mutual inductances; Fleming's left hand rule; Faradays laws of electromagnetic induction, statically and dynamically induced e.m.f.,.												

	<p>UNIT III</p> <p>DC Machines: Classification of DC machines; Principle of motor and generator; back emf; Torque of a DC machine; Load characteristics of shunt, series motors</p> <p>AC Machines: Classification of AC machines; Production of rotating field; Constructional features – principle of operation; Torque-slip characteristics;</p> <p>UNIT IV</p> <p>Measuring Instruments: Classification of instruments; Principle of operation of moving-coil and moving-iron instruments; – Dynamometer –type watt meter</p> <p>Utilization:Principles of resistance and induction heating – principles of electrical traction – speed time characteristics</p>
<p>Text books and Reference books</p>	<p>Text Books:</p> <p>[1] I.J.Nagrath and Kothari, "Theory and Problems of Basic Electrical Engineering ", Prentice-Hall of India Pvt Ltd.</p> <p>[2] Dr. K. Uma Rao, Dr. A. Jayalakshmi,"Basic Electric Engineering", Pearson Publications.</p> <p>[3] T.K. Nagasarkar and M.S. Sukhja,: "Basic Electric Engineering":, oxford University press.</p> <p>[4] Ashfaq Husain "fundamentals of electrical engineering" Dhanpat Rai & Co</p> <p>[5] J.B.Gupta " Electrical Technology Volume-I" Kat Son Books</p> <p>Reference Books:</p> <p>[1] U.A.Bakshi, V.U.Bakshi, "Basic Electrical Engineering", Technical Publications.</p>
<p>E-resources and other digital material</p>	<p>Web Resources:</p> <p>[1] http://www.textbooksonline.tn.nic.in/books/11/stdxi-voc-ema-em-1.pdf</p> <p>[2] http://nptel.ac.in/courses/108108076/</p>

14ME1106

BASICS OF MECHANICAL ENGINEERING

Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	2-0-0
Prerequisites:	Knowledge of Mathematics, Physics, Chemistry at Intermediate Level	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the basic manufacturing methods and power transmission in Mechanical engineering.											
	CO2	Attain basic knowledge of simple stress and strains.											
	CO3	Realize the importance of energy and identify various sources of energy..											
	CO4	Understand the principle of operation of different IC engines and their Applications											
	CO5	Describe the performance of different types of refrigeration systems.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H			M			M					H
	CO2	H			M	H							H
	CO3	H			H								H
	CO4	H			H			H					H
Course Content	UNIT I Manufacturing Methods: CASTING :- Principles of casting, Advantages and applications of casting, green sand mould. Lathe: Description, Main components, Basic operations performed on a Lathe (turning, thread cutting, taper turning, drilling) Welding: Types, Equipments, Principles of Gas welding and Arc Welding, Applications, Advantages & disadvantages of welding, Brazing and soldering.												

	<p>UNIT II</p> <p>Simple Stress and Strain: Stress and Strain Elasticity and Hook's Law-Relations between elastic constants.</p> <p>Power Transmission: Belt Drives :- Introduction, Types, Length of open belt drive and cross belt drive , velocity ratio and difference between Open belt drive and cross belt drive, power transmitted by belt.</p>
	<p>UNIT III</p> <p>Energy Resources: Conventional Energy Resources :- Energy scenario ,types of sources , working principle of steam power plant , nuclear power plant.</p> <p>Non-Conventional Energy Resources: Working principle of solar power plant, wind power plant, Geo-thermal and OTEC power plant.</p>
	<p>UNIT IV</p> <p>Internal Combustion Engines: Classification , Main components of I.C. Engine, Working principle of Two stroke and four stroke petrol, engine and diesel engine.</p> <p>Refrigeration: Types of refrigeration, Unit of refrigeration , COP , Working of vapour compression Refrigeration system, applications of refrigeration.</p>
<p>Text books and Reference books</p>	<p>Text Books:</p> <p>[1] T S Rajan “Basic Mechanical engineering”,3rd Edition,New Age International Ltd.First Reprint 1999.</p> <p>[2] R.S Khurmi, J.K . Gupta “Machine Design”, Eurasia publications House 2005.</p> <p>[3] T.J.Prabhu, V.Jaiganesh, S.Jebaroj “Basic Mechanical Engineering”, SCI Tech Publications (India) Pvt Ltd.</p> <p>Reference Books:</p> <p>[1] R Rudramoorthy “Thermal Engineering,4th Reprint 2006 ,Tata McGraw- Hill publishing Company Ltd .New Delhi.(2003).</p> <p>[2] R.K . Rajput “Manufacturing procees”, FireWall media, 2007.</p> <p>[3] P.K.Nag “Power Plant Engineering”, Tata McGraw-Hill Publishing company Ltd, New Delhi (2011).</p>
<p>E-resources and other digital material</p>	<p>Web Resources</p> <p>[1] www.englishblogger.com/mechanical/mechanical</p> <p>[2] www.indiastudychannel.com/resources</p>

14ME1107G

ENGINEERING GRAPHICS

Course Category:	Institutional Core	Credits:	5
Course Type:	Theory & Practice	Lecture-Tutorial-Practice:	2-0-6
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Represent various Conics and Curves.											
	CO2	Construct Plain and Diagonal Scales.											
	CO3	Draw Orthographic projections of Lines, Planes, and Solids.											
	CO4	Construct Isometric Scale, Isometric Projections and Views and also convert Pictorial views to Orthographic Projections.											
	CO5	Draw Sectional views of the Solids.											
	CO6	Understand Development of surfaces and their representation.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H				H	H						
	CO2	M				M	M						
	CO3	H				H	H						
	CO4	H				H	H						
	CO5	M				M	M						
	CO6	M				M	M						
Course Content	UNIT I General: Use of Drawing instruments, Lettering - Single stroke letters, Dimensioning, Representation of various type lines - Geometrical Constructions. Scales: Construction and use of plain and diagonal scales. Conic Sections: Conic sections - general construction method for ellipse, parabola and hyperbola. Special methods for conic sections. Curves: Curves used in Engineering practice - Cycloid, Involute of circle.												

UNIT II

Method of Projections: Principles of projection - First angle projection and third angle projection of points and straight lines.

Projection of Planes: Projections of planes of regular geometrical lamina.

- Introduction to Auto CAD
- Introduction to Auto CAD software, drawing different two dimensional and three dimensional views.
- 2 D Objects: Triangles, Square, Rectangle, Pentagon, Hexagon, Circle & Ellipse.

UNIT III

Projections of Solids: Projections of simple solids such as Cubes, Prisms, Pyramids, Cylinders and Cones - axis inclined to one of the reference plane.

Sections of Solids: Sections of solids such as Cubes, Prisms, Pyramids, Cylinders and Cones. True shapes of sections. (Limited to the Section Plane perpendicular to one of the Principal Plane).

* 3 D Objects: Prisms, Pyramids, Cylinder and a Cone.

* Sectional view of a Prism, Pyramid, Cylinder and a Cone in simple positions

UNIT IV

Development of Surfaces: Lateral development of cut sections of Cubes, Prisms, Pyramids, Cylinders and Cones.

Isometric Projections: Isometric Projection and conversion of Orthographic Projections into isometric views. (Treatment is limited to simple objects only). Introduction to Isometric Projections to Orthographic Projections.

- Isometric View of Prism, Pyramid, Cylinder and a Cone and also simple 3 Dimensional Objects.
- These topics are only for internal assessment.

Text books & Reference books**Text Books:**

[1] N.D. Bhatt & V.M. Panchal “Elementary Engineering Drawing” Charotar Publishing House, Anand. 49th Edition - 2006.

	<p>[2] DM Kulkarni, AP Rastogi, AK Sarkar “Engineering Graphics with Auto CAD”, PHI Learning Private Limited, Delhi. Edition - 2013</p> <p>Reference Books:</p> <p>[1] Prof. K. L. Narayana & Prof. P. Kannaiah “Engineering Drawing” , Scitech publications(India) Pvt. Ltd., Chennai 2nd Edition - fifth reprint 2006.</p> <p>[2] K. Venugopal Engineering Drawing and Graphics + Auto CAD , New Age International, New Delhi.</p>
<p>E-resources and other digital material</p>	<p>Web Resources</p> <p>[1] http://www.youtube.com/watch?v=XCWJXrkWco</p> <p>[2] http://www.me.umn.edu/courses/me2011/handouts/drawing/blano-tutorial.html# isodrawing</p> <p>[3] http://www.slideshare.net</p> <p>[4] http://edpstuff.blogspot.in</p>

14PH1151**ENGINEERING PHYSICS LAB**

Course Category:	Institutional Core	Credits:	2
Course Type:	LAB	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	-	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Elucidate the concepts of physics through involvement in the experiment by applying theoretical knowledge											
	CO2	Illustrate the basics of electro magnetism, optics, mechanics, and semi-conductors & quantum theory											
	CO3	Develop an ability to apply the knowledge of physics experiments in the later studies											
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1			M	M								M
	CO2		L			L							
	CO3			M									
Course Content/ Tasks	LIST OF EXPERIMENTS												
	<ol style="list-style-type: none"> 1. AC Sonometer -Verification of vibrating laws. 2. Measurement of thickness of a foil using wedge method. 3. Photo tube-Study of V-I Characteristics, determination of work function. 4. Torsional Pendulum-Rigidity modulus calculation. 5. Variation of magnetic field along the axis of a current carrying circular coil. 6. Compound pendulum-Measurement of 'g'. 7. LCR circuit-Resonance. 8. Solar cell -Determination of Fill Factor. 												

	<p>9. Hall effect -Study of B & I Variation.</p> <p>10. Fiber Optics-Numerical aperture calculation.</p> <p>11. Newton's Rings-Radius of curvature of plano convex lens.</p> <p>12. Diffraction grating-Measurement of wavelength.</p> <p>13. Lissajous figures- calibration of an audio oscillator.</p> <p>14. B-H curves- determination of hysteresis loss.</p> <p>15. Figure of merit of a galvanometer.</p>
Text Books	<p>Textbooks</p> <p>[1] Indu Prakash&Rama Krishna, "A text book of practical physics", 25th ed., Kitab Mahal Publishers, Allahabad, 2003.</p> <p>[2] J.C.Mohanty&D.K.Mishra, "University Practical Physics", Ist ed., Kalyani Publishers, 1990.</p> <p>[3] D.P.Khandelwal, "A laboratory manual of Physics" Ist ed., Vani educational books , 1991.</p> <p>[4] Dr.Y.Aparna & Dr.K.Venkateswara Rao, "Laboratory manual of engineering physics", Ist edition, VGS Publications, 2010.</p>

14CS1152

BASIC COMPUTING LAB

Course Category:	Institutional Core	Credits:	2
Course Type:	LAB	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Design & develop basic software's (Application and System software)											
	CO2	Attain basic knowledge on hardware (I/O devices, Mother board, processor etc...)											
	CO3	Understand and Apply MS Office tools											

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H		M									
	CO2		H	L									
	CO3									H			

Course Content/ Tasks	<p>CYCLE I</p> <p>Word Processing, Presentations and Spread Sheets</p> <p>1. Word Processing:</p> <p>(a) Create personal letter using MS Word.</p> <p>(b) Create a resume using MS Word.</p> <p>2. Spread Sheets:</p> <p>(a) Create a worksheet containing pay details of the employees.</p> <p>(b) Create a worksheet which contains student results.</p> <p>(c) Create a worksheet importing data from database and calculate sum of all the columns.</p> <p>3. Presentations:</p> <p>i. Create a presentation using themes.</p> <p>ii. Save, edit, print and import images/videos to a presentation.</p> <p>iii. Adding animation to a presentation.</p>
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4.MS Access:

- i. Create a simple table in MS Access for results processing.
- ii. Create a query table for the results processing table.
- iii. Create a form to update/modify the results processing table.
- iv. Create a report to print the result sheet and marks card for the result.

CYCLE II**Hardware Experiments**

1. Identification of System Layout: Front panel indicators & switches and Front side & rear side connectors. Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards. Install Hard Disk. Configure CMOS-Setup. Partition and Format Hard Disk.
2. Install and Configure a DVD Writer or a Blu-ray Disc writer.
3. Install windows operating system and check if all the device (graphics, sound, network etc.) drivers are installed.
4. Install Linux operating system and check the working of all devices (graphics, sound, network etc.) in the computer.
5. Assemble a Pentium IV or Pentium Dual Core Pentium Core2 Duo system with necessary peripherals and check the working condition of the PC.
6. PC system layout: Draw a Computer system layout and Mark the positions of SMPS, Mother Board, FDD, HDD, and CD-Drive/DVDDrive add on cards in table top / tower model systems.
7. Mother Board Layout: Draw the layout of Pentium IV or Pentium Dual core or Pentium Core2 DUO mother board and mark Processor, Chip set ICs. RAM, Cache, cooling fan, I/O slots and I/O ports and various jumper settings..
8. Configure BIOS setup program to change standard and advanced settings to troubleshoot typical problems.
9. Install and configure Printer/Scanner/Web cam/Cell phone/bio-metric device with the system. Troubleshoot the problems

CYCLE III

1. Prepare an Ethernet/UTP cable to connect a computer to network switch. Crimp the 4 pair cable with RJ45 connector and with appropriate color code.

	<ol style="list-style-type: none"> 2. Manually configure TCP/IP parameters (Host IP, Subnet Mask and Default Gateway) for a computer and verify them using IPCONFIG command. Test connectivity to a server system using PING command. 3. Creating a shared folder in the computer and connecting to that folder using Universal Naming Convention (UNC) format. (Ex: computername sharename) 4. Configure a computer to connect to internet (using college internet settings) and troubleshoot the problems using PING, TRACERT and NETSTAT commands. 5. Using scan disk, disk cleanup, disk Defragmenter, Virus Detection and Rectifying Software to troubleshoot typical computer problems. 6. Configure DNS to establish interconnection between systems and describe how a name is mapped to IP Address.
E-resources and other digital material	Web Resources <ol style="list-style-type: none"> [1] Numerical Methods and Programing by Prof.P.B.Sunil Kumar, Department of Physics, IIT Madras https://www.youtube.com/watch?v=zjyR9e-#1D4&list=PLC5DC6AD60D798FB7 [2] Introduction to Coding Concepts Instructor: Mitchell Peabody View the complete course: http://ocw.mit.edu/6-00SCS11

SEMESTER - II

14MA1201
CALCULUS

Course Category:	Institutional Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-1-0
Prerequisites:	Fundamentals of calculus, vectors and geometry.	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the concept of mean value theorems and apply them to expand functions as Taylors series and determine curvatures.											
	CO2	Able to test the convergence of infinite series, tracing of the curves.											
	CO3	Understand the concept of multiple integrals and apply them to evaluate areas and volumes.											
	CO4	Apply the concepts of calculus to scalar and vector fields and establish the relation between the line , surface and volume integrals.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	L								L		M
	CO2	H	L								L		M
	CO3	H	M								L		M
	CO4	H	M								L		H
Course Content	UNIT I Differential Calculus: Rolle’s Theorem, Lagrange’s Mean Value Theorem, Cauchy’s Mean Value Theorem, Taylors Theorem, Maclaurins Series, Taylor’s Theorem for Function of Two Variables, Curvature, Radius of Curvature.												
	UNIT II Asymptotes, Curve Tracing, Maxima and Minima of Functions of Two Variables, Lagrange’s Method of undetermined Multipliers. Sequence and Series: Convergence of series -Comparison test -D’												

	<p>Alembert's Ratio test -Cauchy's Root Test -Alternating series - Absolute convergence -Leibnitz's Rule</p> <p>UNIT III Integral Calculus: Double Integrals, Change of Order of Integration, Double Integrals in Polar Coordinates, Area Enclosed by Plane Curves, Triple Integrals, Volumes of Solids, Change of Variables. Special Functions: Beta Function, Gamma Function, Relation between Beta and Gamma Functions, Error Function or Probability Integral.</p> <p>UNIT IV Vector Calculus: Scalar and Vector Point Functions, Del Applied to Scalar point Functions, Gradient, Del Applied to Vector point Functions, Physical Interpretation of Divergence, Del Applied Twice to Point Functions, Del Applied to Products of Point Functions, Integration of Vectors, Line Integral, Surface Integrals, Green's Theorem in The Plane (without Proof), Stokes's Theorem (without proof), Volume Integral, Gauss Divergence Theorem (without proof), Irrotational Fields.</p>
Text books and Reference books	<p>Textbooks [1] B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition Khanna Publishers, 2012.</p> <p>Reference Books [1] Kreyszig "Advanced Engineering Mathematics", 8th Edition, JohnWiley & Sons, 2007 [2] Peter V.O.Neil, Thomson "Advanced Engineering Mathematics" Canada. [3] R.K.Jain and S.R.K.Iyengar "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishers. [4] N.P.Bali, Manish Goyal, "A Text Book of Engineering Mathematics" Laxmi Publications(P) Limited. [5] B.V.Ramana "A text book of mathematics", Tata MC Graw Hill.</p>

14CH1202

ENGINEERING CHEMISTRY

Course Category:	Institutional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-1-0
Prerequisites:	Knowledge of Chemistry at Intermediate level	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Analyze various water treatment methods and boiler troubles.											
	CO2	Apply the knowledge of different phases in materials, working principle of electrodes and batteries and their application in chemical and other engineering areas.											
	CO3	Evaluate corrosion processes as well as protection methods and apply the principles of UV-visible spectroscopy in chemical analysis.											
	CO4	Apply the knowledge of nature of polymeric materials for their application in technological fields and of fuels for their conservation.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1		H										
	CO2	M											
	CO3									H			
	CO4			M									
Course Content	UNIT I Water technology-I: Sources and impurities of water, WHO standards – Water treatment for drinking purpose - sedimentation, coagulation, filtration, various methods of disinfection and concept of break-point chlorination – Desalination of brackish water - principle and process of electrodialysis and reverse osmosis.												

Water technology-II: Boiler troubles - scales, sludges, caustic embrittlement and boiler corrosion - causes, disadvantages and prevention, Internal conditioning methods - phosphate, calgon and sodium aluminate - External treatment methods - zeolite and ion-exchange methods.

UNIT II

Phase rule: Concept of phase, component, degree of freedom, Gibb's phase rule definition - phase equilibrium of one component - water system - phase equilibrium of two - component system - sodium chloride-water system and silver-lead system - advantages, limitations and application of phase rule

Electrochemistry: Calomel electrode, silver-silver chloride electrode and glass electrode, determination of pH using glass electrode - Electrochemical energy systems -Zinc-air battery, Lead-acid battery, Ni-Cd battery, LiC/LiCoO₂ battery – Advantages of lithium batteries.

UNIT III

Corrosion science: Introduction - chemical and electrochemical corrosion - electrochemical theory of corrosion - corrosion due to dissimilar metals, galvanic series - differential aeration corrosion - cathodic protection, anodic protection, corrosion inhibitors - types and mechanism of inhibition - principle and process of electroplating and electroless plating.

Instrumental techniques of analysis: Introduction of spectroscopy – interaction of electromagnetic radiation with matter - UV-visible spectroscopy: Frank- Condon principle - types of electronic transitions. Lambert-Beer's law, numerical (simple substitution) - Instrumentation - single beam UV-visible spectrophotometer - applications-qualitative analysis, quantitative analysis, detection of impurities and determination of molecular weight.

UNIT IV

Polymer technology: Polymerization - Addition and condensation, thermoplastics and thermo settings - conducting polymers - examples, classification intrinsically conducting polymers and extrinsically conducting polymers- mechanism of conduction of undoped, p-doped and n-doped poly acetylenes – applications of conducting polymers, Fibre reinforced plastics (FRP) - composition and applications.

	<p>Fuel technology: Fuels - classification, calorific value, coal – proximate analysis and ultimate analysis, Petroleum - refining, concept of knocking, octane number and cetane number, flue gas analysis by Orsat’s apparatus and numericals based on combustion.</p>
<p>Text books and Reference books</p>	<p>Textbooks</p> <p>[1] P.C. Jain “Engineering Chemistry”, 15th edition, Dhanpat Rai Publishing Company (P) Limited, New Delhi.</p> <p>Reference Books:</p> <p>[1] S.S. Dara “A text book of Engineering Chemistry”, 10th edition, S. Chand & Company Limited, New Delhi.</p> <p>[2] Shashi Chawla “A text book of Engineering Chemistry”, Dhanpat Rai & Company Pvt. Ltd., New Delhi.</p> <p>[3] Sunita Rattan “A Textbook of Engineering Chemistry”, First edition 2012, S.K. Kataria & Sons, New Delhi.</p> <p>[4] B.S. Bahl, G. D. Tuli and Arun Bahl “Essentials of Physical Chemistry” , S. Chand and Company Limited, New Delhi.</p> <p>[5] Y.Anjaneyulu, K. Chandrasekhar and Valli Manickam “A Text book of Analytical Chemistry”, Pharma Book Syndicate, Hyderabad.</p> <p>[6] O. G. Palanna “Engineering Chemistry”, Tata McGraw Hill Education Pvt. Ltd., New Delhi.</p>
<p>E-resources and other digital material</p>	<p>[1] http://www.cip.ukcentre.com/steam.htm</p> <p>[2] http://corrosion-doctors.org/Modi;es/mod-basics.htm</p> <p>[3] http://chemwiki.ucdavis.edu/Analytical Chemistry.htm</p> <p>[4] http://teaching.shu.ac.uk/hwb/chemistry/tutorials/molspec/uvvisabl.htm</p> <p>[5] http://www.prenhall.com/settle/chapters/ch15.pdf</p>

14CS1203
PROGRAMMING IN C

Course Category:	Institutional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-1-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the programming terminology and implement various c-tokens & input-output statements to solve simple problems											
	CO2	Able to compare and differentiate various looping & branching constructs and apply the best looping structure for a given problem											
	CO3	Interpret and implement the need of arrays and structure/union to store homogeneous and heterogeneous groups of data											
	CO4	Understand pointers and implement the programs to directly access memory locations											
	CO5	Identify the necessity of modularity in programming and design various function types											
	CO6	Contrast the need of using files in programming and implement file operations											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H		L									
	CO2		L	H									
	CO3		L	H									
	CO4	H		L									
	CO5			H									
	CO6			H									
Course Content	UNIT I Structure of a C Program: Expressions, Precedence and Associativity, Evaluating Expressions, Type Conversion, Statements, Sample Programs. Selection: Logical Data and												

Operators, Two -Way Selection, Multiway Selection, More Standard Functions.

UNIT II

Repetition: Concept of a Loop, Loops In C, Loop Examples, Recursion, The Calculator Program.

Arrays: Concepts, Using Array in C, Inter-Function Communication, Array Applications, Two Dimensional Arrays, Multidimensional Arrays.

Functions: Functions in C, User Defined Functions, Inter Function Communication, Standard Functions, Scope. Strings: String Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions, String Data Conversion.

UNIT III

Pointers: Introduction, Pointers For Inter Function Communications, Pointers to Pointers, Compatibility, LvalueandRvlaue. Pointer Applications: Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocations Functions, Array Of Pointers. Text Input/Output:Files, Streams, Standard Library Input/Output Functions, Formatting Input/Output Functionsand CharacterInput/Output Functions.

UNIT IV

Enumerations: The Type Definition (Typedef), Enumerated Types: Declaring an Enumerated Type, Operations on Enumerated Types, Enumeration Type Conversion, Initializing Enumerated Constants, Anonymous Enumeration: Constants, Input/Output Operators.

Structures: Structure Type Declaration, Initialization, Accessing Structures, Operations on Structures, Complex Structures, Structures and Functions, Sending the Whole Structure, Passing Structures Through Pointers. Unions: Referencing Unions, Initializers, Unions and Structures, Internet Address, Programming Applications.

Text books and Reference books

Textbooks

[1] Behrouz A. Forouzan & Richard F. Gilberg ,Computer Science A Structured Programming Approach using C ,Third Edition, , CENGAGE Learning.

	<p>Reference Books</p> <p>[1] Balagurusamy, Programming in ANSI C4ed.: TMH, 2009</p> <p>[2] B. Gottfried, Programming with C (Schaum's Outlines) Tata Mcgraw-Hill.</p> <p>[3] Kernighan and Ritchie, The C programming language: Prentice Hall.</p> <p>[4] Venugopal, et al., Programming with C: TMH.</p> <p>[5] A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, DataStructures Using C, PHI/Pearson education.</p>
<p>E-resources and other digital material</p>	<p>[1] Numerical Methods and Programing by Prof.P.B.Sunil Kumar, Department of Physics, IIT Madras https://www.youtube.com/watch?v=zjyR9e-N1D4&list=PLC5DC6AD60D798FB7</p> <p>[2] Introduction to Coding Concepts Instructor: Mitchell Peabody View the complete course: http://ocw.mit.edu/6-00SCS11</p>

14CE1204

BASICS OF CIVIL ENGINEERING

Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	2-0-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Attain basic knowledge on civil engineering materials and civil engineering structures..											
	CO2	Attain basic knowledge on masonry's, sub-structure and super structure of a building.											
	CO3	Attain basic knowledge on principles of supervising, various types of surveying and various types of transportation systems.											
	CO4	Attain basic knowledge on water supply,sewage.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H											
	CO2	H											
	CO3	H											
	CO4	H											
Course Content	UNIT I												
	Building Materials: Introduction - Civil Engineering - Materials: Bricks – composition - classifications - properties -uses. Stone - classification of rocks – quarrying - dressing - properties -uses. Timber - properties -uses -ply wood. Cement - grades -types - properties -uses. Steel - types - mild steel - medium steel – hard steel - properties - uses - market forms. Concrete - grade designation – properties - uses.												
UNIT II													
Building Components: Building - selection of site - classification - components. Foundations -functions - classifications - bearing capacity. Flooring - requirements - selection - types - cement concrete marble - terrazzo floorings. Roof - types and requirements.													

	<p>UNIT III</p> <p>Surveying And Transportation: Surveying - objectives - classification – principles of survey. Transportation - classification - cross section and components of road - classification of roads. Railway - cross section and components of permanent way - functions. Water way - docks and harbor - classifications - components. Bridge - components of bridge.</p> <p>UNIT IV</p> <p>Water Supply And Sewage Disposal: Dams - purpose - selection of site – types -gravity dam (cross section only). Water supply - objective - quantity of water -sources - standards of drinking water - distribution system. Sewage - classification- technical terms - septic tank - components and functions.</p>
<p>Text books and Reference books</p>	<p>Textbooks</p> <p>[1] Raju .K.V.B, Ravichandran .P.T, ”Basics of Civil Engineering”, Ayyappa Publications, Chennai, 2012.</p> <p>[2] Rangwala .S.C,” Engineering Material”s, Charotar Publishing House, Anand, 2012.</p> <p>[3] M.S.Palanichamy “Basic Civil Engineering”, Tata McGraw-Hill Publishing Company limited.</p> <p>Reference Books</p> <p>[1] Dr. K.N. Duggal “Elements of Environmental Engineering”, S. Chand and company LTD. Ram Nagar, New Delhi.</p> <p>[2] R.Srinivaas, “Chartor Publishing House”, Arand, 2012</p>
<p>E-resources and other digital material</p>	<p>[1] nces.org/exmas/fe-exma/</p> <p>[2] www.aboutcivil.com/</p>

14HS1205

PROFESSIONAL ETHICS

Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	2-0-0
Prerequisites:	Knowledge about Morals and Values	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Know the moral autonomy and uses of ethical theories.											
	CO2	Understand morals, Honesty & character.											
	CO3	Understand about safety, risk and professional rights.											
	CO4	Know the Ethics regarding Global Issues like Environment, Computers & weapon's development.											

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M											
	CO2					H							
	CO3						M						
	CO4										H		

Course Content	UNIT I
	Engineering Ethics: Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - theories about right action - Self-interest - customs and religion- uses of ethical theories.
	UNIT II
	Human Values: Morals, Values and Ethics - Integrity- Work Ethic – Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring – Sharing - Honesty - Courage - Valuing Time - Co-operation - Commitment –Empathy - Self-Confidence - Character - Spirituality .
	UNIT III
	Engineering as Social Experimentation: Engineering as

	<p>experimentation – engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study, Safety, Responsibilities and Rights: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the three mile island and chernobyl case studies. Collegiality and loyalty – respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.</p> <p>UNIT IV</p> <p>Global Issues: Multinational corporations- Environmental ethics- computer ethics - weapons development - engineers as managers- consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).</p>
<p>Text books and Reference books</p>	<p>Textbooks</p> <p>[1] Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York.1906</p> <p>[2] Govindarajan M, Natarajan S, Senthil Kumar V. S. (2004), "Engineering Ethics", Prentice Hall of India, New Delhi.</p> <p>Reference Books:</p> <p>[1] Baum, R.J. and Flores, A., eds. (1978), "Ethical Problems in Engineering, Center for the studyof the Human Dimensions ofScience and Technology", Rensellae Polytechnic Institute,Troy, New York, 335.</p> <p>[2] Beabout, G.R., Wennemann, D.J. (1994), "Applied Professional Ethics: A Developmental Approach for Use with Case Studies", University Press of America Lanham, MD, 175 pp</p>

14EC1206

BASICS OF ELECTRONICS ENGINEERING

Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	2-0-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Fundamentals of electronic components, devices, transducers											
	CO2	Principles of digital electronics											
	CO3	Principles of various communication systems.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2	M											
	CO3	L											
Course Content	UNIT I:												
	Electronic Components: Passive components - resistors, capacitors & inductors (properties, common types, I-V relationship and uses). Semiconductor Devices: Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, Zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell, photo couplers).												
	UNIT II:												
Transducers: Transducers - Instrumentation - general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers - piezoelectric and thermocouple.													
UNIT - III													
Digital Electronics: Number systems - binary codes - logic gates- Boolean algebra, laws & theorems - simplification of Boolean													

	<p>expression - implementation of Boolean expressions using logic gates – standard forms of Boolean expression.</p> <p>UNIT - IV</p> <p>Communication Systems: Block diagram of a basic communication system - frequency spectrum - need for modulation - methods of modulation - principles of AM, FM, pulse, analog and pulse digital modulation - AM / FM transmitters & receivers (block diagram description only).</p>
Text books and Reference books	<p>Textbooks:</p> <p>[1] Thyagarajan.T, SendurChelvi.K.P, Rangaswamy.T.R, “Engineering Basics: Electrical, Electronics and computer Engineering”, New Age International, Third Edition, 2007.</p> <p>[2] Somanathan Nair.B, Deepa.S.R, ”Basic Electronics”, I.K. International Pvt. Ltd., 2009.</p> <p>Reference Books:</p> <p>[1] Thomas L. Floyd, ”Electronic Devices”, Pearson Education, 9th Edition,2011.</p> <p>[2] Rajput.R.K, ”Basic Electrical and Electronics Engineering”, Laxmi Publications, First Edition, 2007.</p>
E-resources and other digital material	<p>[1] http://www.nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/ BASIC-ELECTRONICS/ home page.htm</p> <p>[2] http://nptel.ac.in/video.php?subjectId=117102059</p>

14ME1207

MECHANICS FOR ENGINEERS

Course Category:	Institutional Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-1-0
Prerequisites:	Basic Knowledge of Mathematics and Physics	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Construct free body diagrams and develop appropriate equilibrium equations.											
	CO2	Locate centroids and simplify the system of forces and moments to equivalent systems.											
	CO3	Analyze systems with friction.											
	CO4	Determine the kinematic relations of particles.											
	CO5	Apply equations of motions to particle motion.											
	CO6	Analyze motion of particles using the principle of energy and momentum methods.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	M										
	CO2	H											
	CO3		H										
	CO4	H											
	CO5	M	H										
	CO6		H										
Course Content	UNIT I Concurrent Forces In A Plane: Principles of statics, Force, Addition of two forces: Parallelogram Law - Composition and resolution of forces - Constraint, Action and Reaction. Types of supports and support reactions, free body diagram, Equilibrium of concurrent												

	<p>forces in a plane - Method of Projections -Moment of a force, Theorem of Varignon, Method of moments.</p> <p>Parallel Forces In A Plane:Introduction, Types of parallel forces, Resultant, Couple, Resolution of Force into force and a couple, General case of parallel forces in a plane.</p> <p>Centroids: Determination of centroids by integration method, Centroids of composite plane figures.</p> <hr/> <p>UNIT II</p> <p>General Case Of Forces In A Plane:Composition of forces in a plane - Equilibrium of forces in a plane.</p> <p>Friction: Introduction, Classification of friction, Laws of dry friction, Coefficient of friction, Angle of friction, Angle of repose, Cone of friction, Wedge friction.</p> <p>Kinematics Of Rectilinear Translation: Introduction, displacement, velocity and acceleration, Motion with Uniform acceleration.</p> <hr/> <p>UNIT III</p> <p>Kinetics Of Rectilinear Translation: Equations of rectilinear motion, Equations of Dynamic Equilibrium: D'Alembert's Principle. Work and Energy Principle, Conservation of energy principle, Impulse and Momentum principle, Impact-Direct central Impact.</p> <hr/> <p>UNIT IV</p> <p>Kinematics Of Curvilinear Motion - Introduction, rectangular Components of velocity & acceleration, Normal and Tangential acceleration, Motion of projectiles</p> <p>Kinetics Of Curvilinear Translation:D'Alembert's Principle in curvilinear motion: Rectangular components, Normal & tangential components, Work & Energy Principle.</p>
<p>Text books and Reference books</p>	<p>Text Books:</p> <p>[1] A.K.Tayal "Engineering Mechanics Statics and dynamics" 13th Edition, 2006, Umesh Publication, Delhi, (For numerical Problems using S.I.System of Units).</p> <p>[2] S.Timoshenko, D.H.Young, J.V.Rao & Sukumar Pati "Engineering Mechanics" , Fifth Edition, 2013, Mc Graw Hill Education (India) Pvt Ltd. (For Concepts and symbolic Problems using S.I.System of Units).</p>

	<p>Reference Books:</p> <p>[1] Beer and Johnston “Vector Mechanics for Engineers Statics and Dynamics”, 3rd SI Metric Edition, Reprint 2010, Tata McGraw Hill Publishing</p> <p>[2] SS Bhavikatti and KG Rajasekharappa “Engineering Mechanics”. 4th Edition, 2012, New Age International Private Limited.</p> <p>[3] K.Vijaya Kumar Reddy and J Suresh Kumar “Singer’s Engineering Mechanics Statics and Dynamics”, 3rd Edition 2010, SI Units-BS Publications.</p> <p>[4] Andrew pytel & Jaan Kiwsalaas “Engineering Mechanics: Statics and Dynamics”, Third Edition, 2013, Cengage Learning.</p>
<p>E-resources and other digital material</p>	<p>Web Resources</p> <p>[1] http://openlibrary.org/books/OL22136590M/Basic engineering mechanics</p> <p>[2] http://en.wikibooks.org/wiki/Engineering Mechanics</p> <p>[3] http://nptel.iitm.ac.in/video.php?courseId=1048</p> <p>[4] http://imechanica.org/node/1551</p> <p>[5] http://emweb.unl.edu/</p> <p>[6] http://ebooks-freownload.com/2009/11/engineering-mechanics-statics-12.html</p> <p>[7] http://www.ebookee.com/Engineering-Mechanics-Statics-37859.html</p>

14CH1251

ENGINEERING CHEMISTRY LAB

Course Category:	Institutional Core	Credits:	2
Course Type:	Lab	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	Knowledge of Chemistry Practicals at Intermediate level	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Analyze quality parameters of water samples from different sources.											
	CO2	Perform quantitative analysis using instrumental methods.											
	CO3	Apply the knowledge of mechanism of corrosion inhibition, metallic coatings and photochemical reactions.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1			H									
	CO2									M			
	CO3		M										
Course Content/ Tasks	List of Experiments: <ol style="list-style-type: none"> Determination of total alkalinity of water sample <ol style="list-style-type: none"> Standardisation of HCl solution Determination of total alkalinity. Determination of chlorides in water sample <ol style="list-style-type: none"> Standardisation of AgNO₃ solution Determination of chlorides in the water sample Determination of hardness of water sample <ol style="list-style-type: none"> Standardization of EDTA solution. Determination of total hardness of water sample. 												

	<p>4. Determination of available chlorine in bleaching powder</p> <p>(a) Standardisation of sodium thiosulphate</p> <p>(b) Determination of available chlorine</p> <p>5. Determination of copper in a given sample</p> <p>(a) Standardization of EDTA solution</p> <p>(b) Determination of copper</p> <p>6. Determination of Mohr's salt - Dichrometry</p> <p>(a) Standardization of $K_2Cr_2O_7$ solution</p> <p>(b) Estimation of Mohr's salt</p> <p>7. Determination of Mohr's salt - Permanganometry</p> <p>(a) Standardization of $KMnO_4$ solution</p> <p>(b) Estimation of Mohr's salt</p> <p>8. Determination of zinc in a given sample</p> <p>(a) Standardization of potassium ferrocyanide solution</p> <p>(b) Determination of zinc</p> <p>9. Conductometric determination of a strong base using a strong acid</p> <p>10. pH metric titration of a strong acid vs. a strong base</p> <p>11. Determination of corrosion rate of mild steel in the absence and presence of an inhibitor</p> <p>12. Chemistry of Blue Printing</p> <p>13. Colorimetric determination of potassium permanganate</p> <p>14. Preparation of Phenol-Formaldehyde resin</p> <p>15. Spectrophotometry</p>
<p>Reference books</p>	<p>Reference Books:</p> <p>[1] S.K. Bhasin and Sudha Rani "Laboratory Manual on Engineering Chemistry", 2nd edition, Dhanpat Rai Publishing Company, New Delhi.</p> <p>[2] Sunita Rattan "Experiments in Applied Chemistry", , 2nd edition, S. K. Kataria & Sons, Delhi.</p> <p>[3] V. Alexeyev "Quantitative Analysis" , MIR Publishers, Moscow.</p>

14CS1252

C PROGRAMMING LAB

Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand basic Structure of the C-PROGRAMMING, declaration and usage of variables											
	CO2	Develop an algorithm for solving a problem											
	CO3	Exercise conditional and iterative statements to inscribe C programs											
	CO4	Exercise user defined functions to solve real time problems											
	CO5	Inscribe C programs using Pointers to access arrays, strings and functions											
	CO6	Inscribe C programs using pointers and allocate memory using dynamic memory management functions											
	CO7	Exercise user defined data types including structures and unions to solve problems											
	CO8	Exercise files concept to show input and output of files in C											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L		H									
	CO2		L	H									
	CO3			M									
	CO4			H									
	CO5			M									
	CO6			H									
	CO7		M	H									
	CO8		L	H									

**Course
Content****CYCLE - I:**

Programming constructs and control structures

1. Introduction to C programming :

- (a) Use of Turbo C IDE
- (b) The Structure of a C Program
- (c) Writing C Programs
- (d) Building an Executable Version of a C Program

2. Data Types and Variables:

- (a) Data Types
- (b) Operands, Operators
- (c) Arithmetic Expressions

3. Branching and Selection:

- (a) Simple-if
- (b) Nested-if

4. Control statements:

- (a) Break
- (b) Continue
- (c) Go to

5. Looping constructs-I

- (a) While
- (b) Do-while
- (c) Case control structure: Switch

6. Looping constructs-II

- (a) Simple for
- (b) Nested for

7. Arrays

- (a) Single dimensional arrays
- (b) Multi dimensional arrays

8. Strings

- (a) Declaration and initialization of string variables
- (b) Reading & Writing strings

CYCLE - II:

Advanced programming constructs

1. Concept of user defined functions

- (a) With arguments and no return value
- (b) Without arguments and no return value
- (c) Without arguments and return value
- (d) With arguments and return value

2. File handling operations

- (a) FILE structure
- (b) Opening and closing a file, file open modes
- (c) Reading and writing operations performed on a file
- (d) File Pointers: stdin, stdout and stderr
- (e) FILE handling functions: fgetc(), fputc(), fgets() and fputs()
functions

3. Pointers

- (a) Uses of Pointers
- (b) Passing Arrays and Pointers as a function arguments
- (c) Pointers to Character Strings

4. User defined data types

- (a) Type-def
- (b) Enumeration

5. Structures

- (a) Declaring and accessing structure members
- (b) Passing of structure as a function argument

6. Unions

- (a) Referencing Unions
- (b) Difference between structure and union

**E-resources
and other
digital
material**

Web Resources:

- [1] Numerical Methods and Programing by Prof.P.B.Sunil Kumar, Department of Physics, IIT Madras <https://www.youtube.com/watch?v=zjyR9e-N1D4&list=PLC5DC6AD60D798FB7>
- [2] Introduction to Coding Concepts Instructor: Mitchell Peabody View the complete course: <http://ocw.mit.edu/6-00SCS11>

14ME1253

WORKSHOP PRACTICE

Course Category:	Institutional Core	Credits:	2
Course Type:	Practice	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	To model and develop various basic prototypes in the Carpentry trade such as Lap Joint, Lap Tee Joint, Dove Tail Joint, Mortise and Tenon Joint, and Cross Lap Joint.											
	CO2	To develop various basic prototypes in the trade of Welding such as Lap Jont, Lap Tee Joint, Edge Joint, Butt Joint and Corner Joint											
	CO3	To develop various basic prototypes in the trade of Tin Smithy such as Saw Edge, Wired Edge, Lap Seam, Grooved Seam and Funnel Preparations											
	CO4	To understand various basic House Wiring techniques such as Connecting One lamp with one switch, Connecting two lamps with one switch, Connecting a Fluorescent tube, Staircase Wiring, Godown Wiring											

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	
	CO1	H	H										L	
	CO2	M	H											L
	CO3	M	H											L
	CO4	L	H											L

Course Content/ Tasks	<p>LIST OF EXPERIMENTS</p> <p>1. Carpentry: To make the following jobs with hand tools</p> <p style="padding-left: 40px;">A. Lap Joint</p>
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- B. Lap Tee Joint
- C. Dove Tail Joint
- D. Mortise & Tenon Joint
- E. Cross-Lap Joint

2. **Welding** : To Make the following Jobs using Electric Arc Welding Process / Gas Welding.

- A. Lap Joint.
- B. Tee Joint.
- C. Edge Joint.
- D. Butt Joint.
- E. Corner Joint.

3. **Tin Smithy**: To do Sheet Metal Operations with Hand Tools:

- A. Saw Edge.
- B. Wired Edge.
- C. Lap Seam.
- D. Grooved Seam.
- E. Funnel.

4. House wiring:

- i. To connect one lamp with one switch.
- ii. To connect two lamps with one switch.
- iii. To connect a fluorescent tube.
- iv. Stair case wiring.
- v. Go down wiring.

Reference Books

Reference Books:

[1] Kannaiah P. & Narayana K. C., "Manual on Work Shop Practice", Scitech Publications, Chennai. Velagapudi



SEMESTER - III

14MA1301

COMPLEX ANALYSIS & NUMERICAL METHODS

Course Category:	Institutional Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-1-0
Prerequisites:	14MA1101-Linear Algebra & Differential Equations 14MA1201CALCULAS	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Determine analytic and non analytic functions and understand the concept of complex integration.											
	CO2	Analyze Taylor and Laurent series and evaluation of real definite integrals using residue theorem and understand the concept of transformations.											
	CO3	Solve Algebraic and transcendental, system of equations and understand the concept of polynomial interpolation.											
	CO4	Understand the concept of Numerical differentiation and integration. Solve initial and boundary value problems numerically.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	M									M	
	CO2	H	M									M	
	CO3	H	M							M		M	
	CO4	H	M							M		M	
Course Content	UNIT I Complex Analysis: Introduction, continuity, Cauchy-Riemann equations. Analytic functions, Harmonic functions, Orthogonal systems, Complex integration, Cauchy's integral theorem, Cauchy's integral formula UNIT II Taylor's series, Laurent's series, Zeros and singularities. Residue theorem, calculation of residues, evaluation of real definite												

	<p>integrals (by applying the residue theorem).</p> <p>Standard transformations: Translation - Magnification and Rotation – Inversion and reflection - Bilinear transformation.</p> <p>UNIT III</p> <p>Numerical Methods: Solution of Algebraic and Transcendental Equations : Introduction, Newton - Raphson method, Solution of simultaneous linear equations – Gauss Elimination Method - Gauss - Seidel iterative method.</p> <p>Interpolation: Introduction, Finite Differences – Forward, Backward, Central Differences, Symbolic Relations, Differences of a polynomial, Newton’s formulae for interpolation, Central difference interpolation formulae –Gauss’s, Sterling’s, Bessel’s formulae, Interpolation with unequal intervals – Lagrange’s and Newton’s Interpolation formulae.</p> <p>UNIT IV</p> <p>Numerical Differentiation And Integration : Finding first and second order differentials using Newton's formulae. Trapezoidal rule and Simpsons 1/3 Rule, Simpsons 3/8th Rule.</p> <p>Numerical Solutions of Differential Equations: Taylor's series method Picard's method. Euler's method, Runge - Kutta method of 4th order, Boundary value problems, Solution of Laplace's and Poisson's equations by iteration.</p>
<p>Text books and Reference books</p>	<p>Text Book:</p> <p>[1] B.S.Grewal, “Higher Engineering Mathematics”, 42nd Edition Khanna Publishers, 2012.</p> <p>Reference Books:</p> <p>[1] Krezig, “Advanced Engineering Mathematics”, 8th Edition, JohnWiley & Sons.2007,</p> <p>[2] R.K.Jain and S.R.K.Iyengar, “Advanced Engineering Mathematics”, 3rd Edition, Narosa Publishers.</p> <p>[3] N.P.Bali, Manish Goyal, “A Text book of Engineering Mathematics”, 1st Edition, Lakshmi Publications (P) Limited, 2011</p> <p>[4] H.K.Das, Er. RajnishVerma, “Higher Engineering Mathematics”, 1st Edition, S.Chand & Co., 2011.</p> <p>[5] S. S. Sastry, “Introductory Methods of Numerical Analysis”, PHI , 2005.</p>
<p>E-resources and other digital material</p>	<p>[1].Resources for Teaching Complex Variables, 18-05-2015, available: faculty.gvsu.edu/fishbacp/complex/complex.html.</p> <p>[2].IIT’s and IISC’s Elearning Courses(NPTEL Online Courses), 18-05-2015, available: nptelvideolectures/iitm.ac.in</p>

14CS3302

DISCRETE MATHEMATICAL STRUCTURES

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-1-0
Prerequisites:	Set Theory, relations	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Analyzation of propositional calculus and first order logic.											
	CO2	Examining the basic and advanced counting techniques.											
	CO3	Apply basic counting techniques to solve the combinatorial problems.											
	CO4	Apply sets,relations & groups to solve applied & theoretical problems.											

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	H					L		L		H	
	CO2	H	H					L		L		H	
	CO3	H	H							L	L	H	
	CO4	H	H					L		L	L	H	

Course Content	UNIT I: Propositional Calculus Fundamentals Of Logic: Propositions, Connectives, Propositional functions, Truth Tables, Tautology, Contradiction, Logical equivalences, Normal forms, Logical inferences, Methods of proof of an implication. First Order Logic: Predicate, Quantifiers, and Rules of inference for Quantified propositions.
	UNIT II Counting Techniques Basics Of Counting: Sum and product rules, Indirect counting, One to One Correspondence, Combinations and permutations, Enumerating Combinations and Permutations with and without repetitions.
	Advanced Counting Techniques: Generating function of

	<p>sequences, recurrence relations, Solving recurrences relations – substitution- Generating functions-The method of characteristic roots, Solution of Inhomogeneous recurrence relations.</p> <p>UNIT III</p> <p>Relations And Digraphs: Relations and basic graphs, Special properties of binary relations, Equivalence relation, Partially ordered sets, Hasse diagrams, Lattices, Operations on relations, Paths and closures, Directed graphs and Adjacency matrices, Transitive closure, Warshall’s algorithm.</p> <p>UNIT IV</p> <p>Graph Theory: Introduction(graphs,subgraphs,circuits, trees) Sum of degrees theorem, Isomorphism and sub graphs, planar graphs, Euler’s formula, Multi graphs and Euler’s circuits, Hamiltonian graphs, Grin-berg’s theorem, Graph coloring, Chromatic numbers.</p>
<p>Text books and Reference books</p>	<p>Text Book(s):</p> <p>[1] J.L.Mott,Kandel,Baker Discrete Mathematics for Computer Scientists & Mathematicians, Second edition,2008,Prentice Hall of India.</p> <p>Reference Books:</p> <p>[1] Trembly& Manohar, Discrete Mathematical structures with applications to computer science,27th edition, 2006.</p> <p>[2] Rosen, TMH ,Discrete Mathematics and its Applications,</p> <p>[3] Malik & Sen Thomson, Discrete Mathematical Structures:Theory and applicatons.</p>
<p>E-resources and other digital material</p>	<p>[1] The Mathamatics Form @Drexel, 15-5-2015, available:http://mathforum.org/library/topics/discrete/</p> <p>[2] Dr.Sugata Gangopadhyay, NPTEL, 15-5-5015, Available: http://nptel.iitr.ac.in</p>

14CS3303

DATA STRUCTURES

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-1-0
Prerequisites:	14CS1203 – Programming in C	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Apply linear data structures to different applications.											
	CO2	Solve problems using linked list.											
	CO3	Implement operations on binary trees and binary search trees.											
	CO4	Implement different searching and sorting algorithms.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											M
	CO2		M	H								M	M
	CO3		M	H								M	M
	CO4			H								M	M
Course Content	<p>UNIT I</p> <p>Introduction: Basic Concepts, Algorithm Specification Data Abstraction, Performance Analysis-Time complexity, Space complexity.</p> <p>Stacks: Definition, Representing stacks, Applications: Infix, Postfix and Prefix, Recursion, Towers of Hanoi problem.</p> <p>Queues: Queue and its Sequential Representation, Queue as an abstract data type, implementation of queues, insert operation, circular queue, implementation and operations.</p> <p>UNIT II</p> <p>Linked lists: Singly Linked Lists and Chains, Representing Chains, linked stacks and queues, polynomials: addition, multiplication, Doubly Linked List, Circularly Linked List, Operations on a Circular Linked</p>												

	<p>List: Insertion, deletion, traversal.</p> <p>UNIT III</p> <p>Trees: Introduction: Terminology, Representation of Trees</p> <p>Binary Trees: Properties of binary trees, binary tree representation, Complete Binary Tree, Expression trees construction and evaluation.</p> <p>Binary Tree Traversals: Inorder, Preorder and Postorder – recursive and non-recursive.</p> <p>Binary Search Trees: Definition, searching a Binary Search Tree (BST), Insertion into a binary search tree, Deletion from a binary search tree.</p> <p>UNIT IV</p> <p>Searching: Sequential search, Binary Search, Comparison and analysis.</p> <p>Sorting: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Merge Sort, Radix Sort.</p> <p>Hashing: Hash Functions, Collision Resolution Strategies.</p>
<p>Text books and Reference books</p>	<p>Text Books:</p> <p>[1] Horowitz Sahni and Anderson-Freed “Fundamentals of Data Structures in C”. 2nd Edition, Universities Press, 2008. (Unit 1, 2, 3)</p> <p>[2] Richard F. Gilberg & B. A. Forouzan “Data Structures A Pseudocode Approach with C”, Second Edition, CENGAGE Learning.(Unit 4)</p> <p>Reference Books:</p> <p>[1] Mark Allen Weiss, ”Data structure and Algorithm Analysis in C”. Addison Wesley Publication. 2006.</p> <p>[2] Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, McGraw Hill, 1984 .</p> <p>[3] Thomas Cormen, C. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms”. 2nd Edition, PHI, 2010.</p>
<p>E-resources and other digital material</p>	<p>[1] Dr.P.P. Chakraborty, IIT Kharagpur, May 19, 2010, Data Structures, NPTEL, Available: www.youtube.com/ watch? v=S47aSEqm_0I</p> <p>[2] Dr. Naveen Garg, IIT Delhi, Sep 24, 2008, Data Structures, NPTEL, Available: http://nptel.iitm.ac.in, http://freevideolectures.com/ Course /2279/Data-Structures-And-Algorithms</p> <p>[3] Shai Simonson, Jun 16, 2014, Data Structures, NPTEL, Available: http://nptel.ac.in/video.php?subjectId=106102064</p>

14HS1304
ENVIRONMENTAL STUDIES

Course Category:	Institutional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-0-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the various natural resources, analyze and explore degradation management											
	CO2	Understand the Ecosystems and need of Biodiversity											
	CO3	Realize and Explore the Problems related to Environmental pollution and its management											
	CO4	Apply the Role of Information Technology and analyze social issues, Acts associated with Environment.											

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2					H		H					
	CO3					H		H					
	CO4							H	H	L	L		

Course Content	<p>UNIT -I</p> <p>The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, Need for public awareness.</p> <p>Natural Resources</p> <p>Renewable and Non-renewable Resources:</p> <p>Natural resources and associated problems.</p> <p>(a) Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people.</p>
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- (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
- (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
- (f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources.

Equitable use of resources for sustainable lifestyles.

UNIT II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem,

Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and function of the following ecosystem:

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

Biodiversity and Its Conservation

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

UNIT III

Environmental Pollution: Definition, Causes, effects and control

measures of

(a) Air pollution	(b) Water pollution
(c) Soil pollution	(d) Marine pollution
(e) Noise pollution	(f) Thermal pollution
(g) Nuclear hazards	

Solid waste management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution; Disasters management: Floods, earthquake, cyclone and landslides

UNIT IV

Social Issues and the Environment: From unsustainable to sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns, Environmental ethics: Issues and possible solutions; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation, Consumerism and waste products.

Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

Human Population and the Environment: Population growth, variation among nations, Population explosion—Family Welfare Programme, Environment and human health, Human rights, Value education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in environment and human health.

Field Work/ Case Studies {NOT TO BE INCLUDED IN SEMESTER END EXAMS}: Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain; Visit to a local polluted site—Urban/Rural/Industrial/Agricultural; Study of common plants, insects, birds; Study of simple ecosystems—pond, river, hill slopes, etc.

<p>Text books and Reference books</p>	<p>Text Book: [1] Erach Bharucha, ENVIRONMENTAL STUDIES for under graduate courses of all branches of higher education, University Grants Commission, University press, First edition 2004, Available at:http://collegesat.du.ac.in/UG/Envinromental% 20Studies_ebook. pdf</p> <p>Reference Book: [1]Anjaneyulu Y, Introduction to Environmental Sciences, B S Publications PVT Ltd, Hyderabad, 2004</p>
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14CS3305

DATACOMMUNICATIONS

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-1-0
Prerequisites:	Basics of Electronics Engineering	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the fundamentals of data communication systems and associated technologies.											
	CO2	Identify the services and features of various layers of TCP/IP model and OSI model.											
	CO3	Examine the transmission media at the physical layer and protocols used at the Data Link Layer.											
	CO4	Analyse MAC schemes at the Data Link Layer and 802.3 standard for LAN.											
	CO5	Analyse the services and addressing in Network layer.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M											
	CO2		H										
	CO3		M							L			
	CO4	M	H							L			
	CO5		H										
Course Content	<p>UNIT I:</p> <p>Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration; Network Models: Protocol Layering, TCP/IP protocol suite, The OSI model</p> <p>Physical Layer: Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance;</p> <p>UNIT II:</p> <p>Digital Transmission: Digital-to-Digital Conversion, Analog-to-Digital Conversion, Transmission Modes;</p>												

	<p>Analog Transmission: Digital-to-Analog Conversion, Analog-to-Analog Conversion; Bandwidth Utilization: Multiplexing, Spread Spectrum</p> <p>Transmission Media: Introduction, Guided Media, Unguided Media;</p> <p>Switching: Introduction, Circuit-Switched Networks, Packet Switching;</p> <p>UNIT III:</p> <p>Data Link Layer: Introduction, Link Layer Addressing; Error Detection and Correction: Introduction, Block Coding, Cyclic Codes, Checksum, Forward Error Correction;</p> <p>Data Link Control: DLC Services, Data Link Layer Protocols, HDLC, Point-to-Point Protocol</p> <p>Media Access Control: Random Access, Controlled Access, Channelization</p> <p>UNIT – IV:</p> <p>Wired LAN: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet;</p> <p>Connecting Devices: Connecting Devices, Virtual LANs</p> <p>Network Layer: Services, Packet Switching, Network Layer Performance, IPv4 Addresses, Forwarding of IP Packets</p>
<p>Textbooks and Reference books</p>	<p>Text Book:</p> <p>[1] Behrouz Forouzan, “Data Communications and Networking”, 5th Edition, McGraw-Hill Education India Pvt. Ltd, 2013</p> <p>Reference Books:</p> <p>[1] W. Stallings, “Data and computer communications”, 8th Edition, Prentice-Hall, Pearson Education, 2007</p> <p>[2] Andrew S Tannenbaum, David J Wetherall, “Computer Networks”, 5th Edition, Pearson Education, 2012</p>
<p>E-resources and other digital material</p>	<p>[1] MIT Open Courseware, MIT, 14th May 2015, Lecture Notes, Available: http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-263j-data-communication-networks-fall-2002/lecture-notes/</p> <p>[2] Prof Hema A Murthy, NPTEL Courses, Lecture Notes, 14th May 2015, Available: http://nptel.ac.in/courses/106106091/1</p>

14CS3306
DIGITAL LOGIC DESIGN

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-1-0
Prerequisites:	14HS1206- Basics of Electronics Engineering	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Apply Boolean laws & theorems to digital Logic functions.											
	CO2	Simplify the Boolean functions to the minimum number of literals.											
	CO3	Design different types of combinational logic circuits.											
	CO4	Design clocked sequential logic circuits using flip flops.											
	CO5	Design different types of Counters, Registers and Programmable Logic Devices											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M											
	CO2	M											
	CO3			H								M	
	CO4			H								M	
	CO5			H								H	
Course Content	<p>UNIT I</p> <p>Boolean algebra And Logic Gates: Digital computers and digital systems, Complements: r's complement, $(r-1)$'s complement. Basic theorems and Properties of Boolean Algebra, Boolean functions, Canonical and Standard Forms, Digital Logic Gates, Universal gates, IC digital logic families.</p> <p>Simplification Of Boolean Functions: The Map Method, Two and three variable Maps, Four-variable Map, Five variable Map, Product of Sums Simplification, Don't care conditions, The Tabulation Method, Determination of Prime Implicants, Selection of Prime-Implicants.</p>												

	<p>UNIT II</p> <p>Combinational Logic: Introduction, Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure. Exclusive-or Gates, Parity Generators and Checkers.</p> <p>Combinational Logic with MSI and LSI: Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, demultiplexers, encoders, Multiplexers.</p> <p>UNIT III</p> <p>Sequential Logic: Sequential circuits, Classification, Latches, Flip Flops, Triggering of Flip-Flops, Master slave flip-flop, Flip-Flop Excitation tables, flip-flop direct inputs.</p> <p>Analysis of Clocked Sequential Circuits: State table, State diagram, state equations, State Reduction and Assignment, Design Procedure, design with unused states, Design of Counters.</p> <p>UNIT IV</p> <p>Registers, Counters: Registers, Shift Registers, Asynchronous Counters, Synchronous Counters, Ring Counter, Johnson Counter, Timing Sequences.</p> <p>Programmable Logic: Read only memory (ROM), Programmable read only memory (PROM), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Introduction to FPGA.</p>
<p>Text books and Reference books</p>	<p>Text Book:</p> <p>[1] M.Morris Mano, Digital Logic & Computer Design 1 e/d reprint, Pearson education, 2013.</p> <p>Reference books:</p> <p>[1] Anand Kumar, Switching Theory and Logic Design, 2nd Edition, PHI,2013</p> <p>[2] Charles H.Roth ,Fundamentals of Logic Design, 6/e, Cengage learning,2010</p> <p>[3] A. P. Malvino, D. P. Leach and G.Saha, Digital Principles and Applications 7/e, McGraw Hill, 2010.</p>
<p>E-resources and other digital material</p>	<p>[1] Prof. S. Srinivasan, IIT Madras, 9th May 2015, Digital Circuits and Systems, NPTEL VIDEO, Available: http://nptel.iitm.ac.in/video.php?subjectId=117106086</p> <p>[2] Prof. N.J. Rao, IISc Bangalore, 9th May 2015, Digital systems, NPTEL WEB Notes , Available at: http://nptel.ac.in/courses/Webcourse-contents/IIScBANG/Digital%20Systems/Digital%20Systems.pdf</p>

14CS3351
DIGITAL LOGIC DESIGN LAB

Course Category:	Programme Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	14EC1206- Basics of Electronics Engineering	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:													
	CO1	Apply Boolean laws & theorems to digital Logic functions.												
	CO2	Simplify the Boolean functions to the minimum number of literals.												
	CO3	Design different types of combinational logic circuits.												
	CO4	Design clocked sequential logic circuits using flip flops.												
	CO5	Design different types of Counters, Registers and Programmable Logic Devices												
Contribution of Course Outcomes towards achievement of Program Outcomes <small>(L – Low, M - Medium, H – High)</small>		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	
	CO1	M												
	CO2	M												
	CO3			H									M	
	CO4			H									M	
	CO5			H									H	
Course Content / Tasks	LAB EXPERIMENTS: <ol style="list-style-type: none"> 1. Realization of All logic gates using universal gates. 2. Design and Implementation of Arithmetic circuits. 3. Design and implement different types of code converters. 4. Design and implementation of magnitude comparators. 5. Implementation of Decoders and encoders. 6. Implementation of Multiplexer and De Multiplexer. 													

	<ol style="list-style-type: none"> 7. Implementation of all types of FLIP-FLOPS using gates. 8. Implementation of Master-Slave JK Flip flop. 9. Design a clocked sequential circuit for the given state diagram/state table. 10. Verification of Shift-Registers using flip flops. 11. Design of Synchronous counters. 12. Design of Asynchronous counters. 13. Design of Ring-counter and Johnson counter. <p>Lab projects:</p> <ol style="list-style-type: none"> 1. Design and Implementation of BCD to Seven Segment Display. 2. Design and Implementation of Digital clock.
<p>Text books and Reference books</p>	<p>Text Book:</p> <p>[1] M.Morris Mano, Digital Logic & Computer Design 1 e/d reprint, Pearson education, 2013.</p> <p>Reference books:</p> <p>[1] Anand Kumar, Switching Theory and Logic Design, 2nd Edition, PHI,2013</p> <p>[2] Charles H.Roth ,Fundamentals of Logic Design, 6/e, Cengage learning,2010</p> <p>[3] A. P. Malvino, D. P. Leach and G.Saha, Digital Principles and Applications 7/e, McGraw Hill, 2010.</p>
<p>E-resources and other digital material</p>	<p>[1] MHRD VIRTUAL LABS, 14/05/2015, DLD Lab, Available: http://cse15-iiith.vlabs.ac.in/</p>

14CS3352

DATA STRUCTURES LAB

Course Category:	Programme Core	Credits:	2
Course Type:	Practical	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	Programming in C	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Apply linear data structures to different applications.											
	CO2	Solve problems using linked list.											
	CO3	Implement operations on binary trees and binary search trees.											
	CO4	Implement different searching and sorting algorithms.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											M
	CO2		M	H								M	M
	CO3		M	H								M	M
	CO4			H								M	M
Course Content / Tasks	LAB EXPERIMENTS: <ol style="list-style-type: none"> Operations on stacks. Stack applications Operations on queues and circular queues. Operations on singly linked list and doubly linked list. Circular linked list operations. Linked List Applications : Polynomial addition, Polynomial Differentiation Binary Search Tree Operations and tree traversal techniques using recursion. Binary Search Tree Operations and tree traversal techniques 												

	<p>using non recursion.</p> <p>9. Searching techniques: Liner Search, Binary Search</p> <p>10. Sorting Techniques: Bubble Sort, Selection Sort, Shell Sort</p> <p>11. Sorting Techniques: Insertion Sort, Quick Sort and Merge Sort</p> <p>12. Hashing Techniques</p> <p>Lab projects:</p> <p>1. Simulation of linear data structures</p> <p>2. Simulation of sorting and searching</p>
<p>Text books and Reference books</p>	<p>Text Books:</p> <p>[1] Horowitz Sahni and Anderson-Freed “Fundamentals of Data Structures in C”. 2nd Edition, Universities Press, 2008. (Unit 1, 2, 3)</p> <p>[3] Richard F. Gilberg & B. A. Forouzan “Data Structures A Pseudocode Approach with C”, Second Edition, CENGAGE Learning.(Unit 4)</p> <p>Reference Books:</p> <p>[1] Mark Allen Weiss, ”Data structure and Algorithm Analysis in C”. Addison Wesley Publication. 2006.</p> <p>[2] Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, McGraw Hill, 1984</p> <p>[3] Thomas Cormen, C. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms”, 2nd Edition, PHI, 2010</p>
<p>E-resources and other digital material</p>	<p>[1] MHRD VIRTUAL LABS, IIT KHARAGPUR, 14.05.2015, Available: http://cse.iitkgp.ac.in/~rkumar/pds-vlab/</p> <p>[2] MHRD VIRTUAL LABS, IIIT HYDERABAD, 14.05.2015, Available: http://cse01-iiith.vlabs.ac.in/</p>

14HS1353

COMMUNICATION SKILLS LAB

Course Category:	Institute Core	Credits:	2
Course Type:	Lab	Lecture-Tutorial-Practice:	0-0-2
Prerequisites:	Technical English & Communication skills -14HS1104	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Be proficient in pronunciation of speech sounds including accentuation.											
	CO2	Enhance the awareness of the elements of listening comprehension.											
	CO3	Develop the abilities of rational argumentation and skills of public speaking.											
	CO4	Be aware of the elements of professional communication											
	CO5	Be exposed to the items of various competitive exams.											

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1				M		H		M		M		
	CO2				H		H		L		M		
	CO3				H		H		M		H		
	CO4				H		H		H		H		
	CO5				M		H		H		L		

Course Content/ Tasks	UNIT I
	Elements of Spoken Expression and processes of Listening comprehension: <ul style="list-style-type: none"> ➤ Speech Mechanism ➤ Articulation of vowels and consonants ➤ Patterns of Accentuation ➤ Types and processes of Listening comprehension

	<p>UNIT II</p> <p>Polemics and Public Speaking:</p> <ul style="list-style-type: none"> ➤ Group Discussion ➤ Pyramid Discussion ➤ PNI ➤ Seminar Talk and Power Point Presentation <hr/> <p>UNIT III</p> <p>Professional Communication:</p> <ul style="list-style-type: none"> ➤ Self Affirmation ➤ Advanced Composition including Official letters and e-mail ➤ Résumé Preparation ➤ Elements of Non-Verbal Communication <hr/> <p>UNIT IV</p> <p>Life Skills and Vocabulary for Competitive Examinations:</p> <ul style="list-style-type: none"> ➤ Select Life Skills(50) ➤ Select Logies, Isms, Phobias and Manias (25 each) ➤ Sentence Completion(50 items) ➤ Fundamentals of Syllogisms
<p>Text books and Reference books</p>	<p>Text Book(s):</p> <p>[1] Martin Cutts, Oxford Guide to Plain English, 7th Impression, OUP, 2011</p> <p>[2] Exercises in Spoken English, Prepared by Department of Phonetics and Spoken English, CIEFL, OUP, 21st Impression, 2003</p> <p>Reference Books:</p> <p>[1] Stephen R Covey, The 7 Habits of Highly Effective people, II edition, (Pocket Books) Simon & Schuster UK Ltd, 2004</p> <p>[2] Martin Cutts, Oxford Guide to Plain English, 7th Impression, OUP, 2011</p> <p>[3] Deborah. J. Bennett, Logic made easy: How to know when Language Deceives you, I edition(Reprint), 2005</p> <p>[4] Eclectic Learning Materials offered by the Department</p>
<p>E-resources and other digital material</p>	<p>[1] ODll Language Learner's Software, 27-6-2012 Orell Techno Systems</p> <p>[2] Visionet Spears Digital Language Lab software Advance Pro, 28-01-2015</p> <p>[3] www.natcorp.ox.ac.uk, British National Corpus, XML edition 2007.</p>

SEMESTER - IV

14MA1401

PROBABILITY AND STATISTICS

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-1-0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand various types of probability distributions and provides knowledge of modeling in the presence of uncertainties.											
	CO2	Apply random phenomena of sample to develop an intuition.											
	CO3	Testing of Hypothesis and Inferences concerning mean, variance and proportions.											
	CO4	Analyze Quality improvement, control charts and reliability to improve Statistical skills.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	L									L	
	CO2		L									L	
	CO3		M									L	
	CO4		L									L	
Course Content	UNIT I Probability Distributions: Random Variables (discrete and continuous) , Expectation, Variance and Standard deviation of discrete random variable, Binomial distribution, Poisson distribution. Probability Densities: Expectations, Variance and standard deviation of continuous random variables, Normal distribution, Normal approximation to the Binomial distribution, Other probability densities - Uniform distribution, Log normal distribution, Gamma distribution, Beta distribution, Weibull distribution. Sampling Distributions: Populations and Samples- Sampling distribution of the mean (SD known and SD unknown) – Sampling distribution of the variance.												

	<p>UNIT II</p> <p>Inference Concerning Means: Point Estimation- Interval Estimation – Bayesian Estimation – Test of Hypothesis – Null Hypothesis and Tests of Hypothesis – Hypothesis concerning one mean – Relation between tests and Confidence intervals –Operating characteristic curves - Inference concerning two means.</p> <hr/> <p>UNIT III</p> <p>Inference Concerning Variances: Estimation of variances- Hypothesis concerning one variance- Hypothesis concerning two variances.</p> <p>Inference Concerning Proportions: Estimation of Proportions- Hypothesis concerning one Proportion- Hypothesis concerning several Proportions – The Analysis of r x c Tables- Goodness of fit.</p> <hr/> <p>UNIT IV</p> <p>The Statistical Content of Quality Improvement Programs: Quality Control- Control Charts for Measurements - Control Charts for Attributes.</p> <p>Applications to Reliability and Life Testing: Reliability - Failure – Time Distributions – The Exponential Model in Reliability.</p>
Text books and Reference books	<p>Text Book(s):</p> <p>[1] Richard A. Johnson ,Probability and Statistics for Engineers Eighth edition, Prentice Hall of India,2011.</p> <p>Reference Books:</p> <p>[1]. R.E. Walpole, R.H.Myers&S.L.Myers. Probability & Statistics for Engineers & Scientist , Sixth Edition, Prentice Hall of India / Pearson Education.</p> <p>[2].Purna Chandra Biswal, Probability and Statistics, Pearson Education Prentice Hall of India, 2007.</p> <p>[3]T.K.V.Iyengar, B.Krishna Gandhi, S.Ranganatham, M.V.S. S.N.Prasad S.Chand.Probability and Statistics.</p>
E-resources and other digital material	<p>[1] Online tutorials and textbooks, 18-05-2015, Available: probweb.berkeley.edu/teaching.html</p> <p>[2] Statistical Science Web, 10-05-2015, http: statsci.org/teaching.html</p> <p>[3] Prof. Somesh kumar, IIT Khargpur, 16-5-2015, Available: videolectures.nptel.iitm.ac.in</p>

14CS3402

WEB TECHNOLOGIES

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-1-0
Prerequisites:		Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the principles of web designing and hosting.											
	CO2	Create static web pages using HTML, CSS and HTML5.											
	CO3	Create attractive web interfaces with client side technologies.											
	CO4	Create, parse and validate XML documents.											
	CO5	Build interactive web applications using PHP											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1		M										
	CO2		M	H						M			L
	CO3		M	H						M			
	CO4		M	H						M			
	CO5		M	H						M			M
Course Content	<p>UNIT I</p> <p>How a website works, Domain Names, Role of DNS, DNS root servers, TLDs, gTLDs and ccTLDs, Types of records in DNS, Internet and Intranet, Evolution: web 1.0,2.0,3.0.</p> <p>Different types of web servers (IIS and Apache), Installing and configuring apache web server on windows, HTTP request and response, Multi-tier application architecture, Client-side versus server-side scripting</p> <p>Website design principles, planning site and navigation, HTML: common tags, color, hyperlink, lists, tables, images, simple HTML</p>												

forms, frames and frame sets

UNIT II

Cascading Style sheets (CSS): Introduction, Inline styles, embedded styles, External styles, Conflicting styles, Linking External Style Sheets, Box Model and Text Flow

XML: XML syntax, Document type definition (DTD), XML schemas, Parsers, SAX parsers, DOM parsers, SAX vs. Dom

Java Script: Introduction to Java Scripts, Client side scripting, Objects in Java Script, User inputs with prompt Dialogs, Control Statements, Functions, Arrays, Dynamic HTML with Java Script, Document Object Model (DOM) - Traversing and Modifying a DOM Tree, AJAX

UNIT III

HTML 5: HTML 5 features – Canvas, video, local storage, web workers, offline applications, geolocation, placeholders, input types–doctype, root, headers, articles, dates and times, navigation and footers– Simple shapes, canvas, Paths, texts, gradients and images – place holders, autofocus fields, email, web addresses, numbers as spinboxes and sliders, date and color pickers, search boxes.

Introduction to PHP, Data types in PHP, Variables, Constants, operators and Expressions, printing data on PHP page, Control statements, Arrays

Functions: Defining and Calling Functions, Passing by Value and passing By references, Inbuilt Functions.

UNIT IV

Working with Forms: Get and Post Methods, Query strings, HTML form controls and PHP, Maintaining User State: Cookies, Sessions, Application State

MYSQL Database: Introduction to MYSQL, Creating database and other operations on database.

PHP Database Connectivity: Connecting to a database, Use a particular database, Sending query to database, parsing the query results Content Management Systems (CMS), Using Wordpress, Drupal and Joomla for creating web sites.

Textbooks and Reference books

Text Book:

[1] H. M. Deitel and P. J. Deitel, 2008, Internet & World Wide Web How to Program, 5th Edition , Prentice Hall

14CS3403

ADVANCED DATA STRUCTURES

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-0-0
Prerequisites:	Data Structures	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO 1	Implement various balanced tree operations.											
	CO 2	Implement graph traversal techniques.											
	CO 3	Analyze the shortest path algorithms.											
	CO 4	Understand different file processing operations.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											M
	CO2		M	H								M	M
	CO3		M	H								M	M
	CO4			H								M	M
Course Content	<p>UNIT I</p> <p>AVL Search Trees: AVL Tree Basic Concepts, AVL Tree Balance Factor, Balancing Trees: Left of Left, Right of Right, right of Left, Left of Left. AVL Tree Implementations, AVL Tree Abstract Data Type.</p> <p>B Trees: B-Trees, B-Tree Implementation, B-tree ADT, Simplified B-Trees.</p> <p>UNIT II</p> <p>Graphs: Basic Concepts, Operations, Graph Storage Structures, Graph Algorithms: DFS, BFS, Graph ADT.</p> <p>Networks: Minimum Spanning Trees, Prim's, Kruskal's Algorithms</p>												

	<p>UNIT III</p> <p>Shortest Path Algorithms: Dijkstra’s Algorithm, Warshall’s algorithm, Floyd’s Algorithm.</p> <p>Heaps: Basic Concepts, Heap Implementation, Heap ADT, Heap Sort, Heap Applications.</p> <p>UNIT IV</p> <p>Fundamental File Processing Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters in Files, The Unix Directory Structure, Physical Devices and Logical Files, File-Related Header Files, Unix File System Commands.</p>
<p>Text books and Reference books</p>	<p>Text Books:</p> <p>[1] Richard F.Gilberg & B.A.Forouzan "Data Structures A Pseudo code Approach with C", 2nd Edition, CENGAGE Learning.2013 (Unit 1, 2)</p> <p>[2] Horowitz Sahni and Anderson-Freed, “Fundamentals of Data Structures in C”,2nd Edition, Universities Press, 2008,(Unit 3).</p> <p>[3]Michael J.Folk, Bill Zoellick,Greg Riccardi, “File Structures: An Object-Oriented approach with C++”, Pearson Education, 2006.(Unit 4).</p> <p>Reference Books:</p> <p>[1].Debasis Samanta, “Classic Data structures”, 2nd Edition, PHI, 2009.</p> <p>[2].Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, McGraw Hill, 1984</p> <p>[3].Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 2006.</p>
<p>E-resources and other digital material</p>	<p>[1] Prof. Naveen Garg, IIT Delhi, August 27, 2011, “AVL Trees” http://nptel.iitm.ac.in [NPTEL]</p> <p>[2] Prof. Pradip K. Das, Jun 9, 2014, www.it4next gen.com/ free-computer-science-lectures-by-nptel.html</p> <p>[3] IIT Delhi, http://nptel.ac.in/courses/106102064/25</p> <p>[4] IIT Guwahati B-Tree Construction, nptel.ac.in/courses/106103069/21</p>

14CS3404

COMPUTER ORGANIZATION

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-1-0
Prerequisites:	Digital Logic Design	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Describe Register transfer and micro operations.											
	CO2	Understand the design of basic computer and micro programming.											
	CO3	Know the Organization of CPU.											
	CO4	Apply algorithms to perform arithmetic operations on fixed point and floating point data.											
	CO5	Understand Memory Hierarchy and I/O Organization.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M											
	CO2		M									L	
	CO3		M										
	CO4	H											M
	CO5		M										
Course Content	UNIT I Register Transfer and Micro-Operations: Register Transfer Language, Register Transfer, Bus and memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit. Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input-Output and Interrupt, Design of Basic Computer, Design of Accumulator Logic.												

	<p>UNIT II Micro Programmed Control: Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit. Central Processing Unit: General register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC)</p> <p>UNIT III Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms – Signed Magnitude Multiplication, Booth Multiplication (Signed 2’s Complement Multiplication), Array Multipliers, Division Algorithm, Floating-point Arithmetic operations. Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.</p> <p>UNIT IV Input Output Organization: Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor.,Serial Communication. Standard I/O Interfaces: PCI Bus, USB</p>
<p>Text books and Reference books</p>	<p>Text Book: [1] Morris M. Mano, <i>Computer Systems Architecture</i>.3 Ed, Pearson/PHI 2006 [2] Carl Hamacher, Zvonko Vranesic, Safwat Zaky: <i>Computer Organization</i>, 5th Edition, Tata McGraw Hill, 2002.</p> <p>Reference Books: [1]John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998</p>
<p>E-resources and other digital material</p>	<p>[1] Prof. S.Raman (14th May 2015), Department of Computer Science & Engineering IIT Madras ,”Introduction to computing”, NPTEL http:// www. nptel. iitm. ac.in /video.php ?subjectId=106106092</p> <p>[2] Prof. S.Raman (14th May 2015), Department of Computer Science & Engineering, IIT Madras , “ Introduction to Digital Computer Organization” NPTEL http://www.nptel.iitm.ac.in/video.php?subjectId=117105078</p>

14CS3405

OBJECT ORIENTED PROGRAMMING USING JAVA

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-1-0
Prerequisites:	Programming in C	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the concepts of object oriented programming.											
	CO2	Implement Exception Handling techniques and multiple inheritance through interfaces.											
	CO3	Apply thread capabilities and Collections framework.											
	CO4	Develop Graphical user interface applications using Swing and Applet Components.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2		M	H									
	CO3			M						H			M
	CO4			M						M			H
Course Content	<p>UNIT I</p> <p>Fundamentals of Object Oriented Programming: Introduction, Object oriented paradigm, Basic concepts of Object Oriented Programming, Benefits of OOP, and Applications of OOP.</p> <p>Introduction to Java: Java history, java features, how java differs from C and C++.</p> <p>Data Types, variables and arrays: Java keywords, Primitive types, Integers, Floating-Point Types, Characters, Booleans, Variables, Type Conversion, casting and Arrays.</p> <p>Classes and objects: Class fundamentals, declaring objects, assigning object reference variables, introducing methods, constructors, this</p>												

keyword, Garbage collection, overloading methods, using objects as parameters, Returning objects, Recursion, static and final keywords, nested and inner classes.

String Handling: The String Constructors, String Buffer Class, String Tokenizer class.

UNIT II

Inheritance: Inheritance basics, using super, multilevel hierarchy, method overriding, dynamic method dispatch, using abstract classes, final with inheritance.

Packages & Interfaces: Defining a package, finding package and CLASSPATH. Access protection, importing packages, Defining an interface, implementing interfaces, nested interfaces, applying interfaces, variables in interfaces.

Exception handling: Exception handling fundamentals, exception types, uncaught exceptions, using try and catch, multiple catch clauses, throw, throws, finally, creating your own exception subclasses.

UNIT III

Stream Classes: Byte Streams- InputStream, OutputStream, FileInputStream, FileOutputStream, Character Streams- Reader, Writer, FileReader, FileWriter.

Multithread Programming: The Java Thread Model, Creating a thread: Implementing Runnable, Extending Thread, creating multiple threads, Thread Priorities, Synchronization: Using Synchronized methods, The synchronized Statement.

The Applet Class: Applet Basics, Applet Architecture, Applet Skeleton, A Simple Banner Applets, Passing Parameters to Applets.

UNIT IV

Event Handling: The delegation event model- Events, Event Sources, Event Listeners. Event Classes, Event Listener Interfaces, Using the delegation Event Model, Adapter Classes.

Swing Components: JLabel and ImageIcon, JTextField, The Swing Buttons: J Button, CheckBoxes, RadioButtons, JTabbedPane, JList, JComboBox, JTable, Menu Bars and Menu in Abstract Window Toolkit.

Collections Framework: Collections overview, Collection interfaces: Collection, List, and Set. Collection Classes: ArrayList, LinkedList, HashSet. Map Classes: HashMap, TreeMap.

Text books and Reference books	<p>Text Books:</p> <p>[1] E Balagurusamy, “Programming with Java: A Primer”, 4th Edition, Tata McGraw Hill Education Pvt Ltd., 2011. [UNIT – I, Chapter - 1]</p> <p>[2] Herbert Schildt, “Java The Complete Reference”, 8th Edition, McGraw-Hill Education, New Delhi, 2011. [UNIT – I (Chapter - 2,3, 4, 5) , UNIT - II , III , IV]</p> <p>Reference Books:</p> <p>[1] Herbert Schildt, Dale Skrien, “Java Fundamentals A Comprehension Introduction”, Special Indian Edition, McGraw-Hill Education India Pvt. Ltd, 2013.</p> <p>[2] Paul J. Dietel and Dr.Harvey M. Deitel, “Java How to Program”, 9th Edition, Prentice-Hall, Pearson Education, 2011.</p> <p>[3] Timothy Budd, “Understanding Object Oriented Programming with Java “, Updated edition, Pearson Education, 2013.</p>
E-resources and other digital material	<p>[1] Prof. I. Sengupta. (14th , May, 2015), Department of Computer Science & Engineering, I.I.T.,Kharagpur, “Internet Technologies”, NPTEL videos. Available: http://nptel.ac.in/video.php?subjectId=106105084</p> <p>[2] Prof. Shane P. (14th , May , 2015), Department of Computer Science & Engineering, NPTEL Videos, Available:http://www.nptelvideos.com/video.php?id=1461&c=15</p>

14CS3406

COMPUTER NETWORKS

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-0-0
Prerequisites:	14CS3305 – Data Communications	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Identify the services and protocols of Network and Transport layer											
	CO2	Implement various routing algorithms											
	CO3	Analyse the features and operations of various application layer protocols and Multimedia protocols											
	CO4	Analyse the issues related to Quality of Service											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M	H										
	CO2		M							M			
	CO3	M	H							M			
	CO4		M										
Course Content	<p>UNIT I</p> <p>Network Layer Protocols: Internet Protocol (IP); Unicast Routing: Introduction, Routing Algorithms, Unicast Routing Protocols; Multicast Routing: Introduction, Multicasting Basics, Intradomain Multicast Protocols, Interdomain Multicast Protocols, IGMP</p> <p>UNIT II</p> <p>Next Generation IP: IPv6 Addressing, The IPv6 Protocol, Transition from IPv4 to IPv6</p> <p>Transport Layer: Introduction, Protocols</p> <p>Transport Layer Protocols: Introduction, UDP, TCP, SCTP</p>												

	<p>UNIT III</p> <p>Application Layer: Standard Client-server Protocols- World Wide Web, HTTP, FTP, Electronic Mail, TELNET, Secure Shell, Domain Name System</p> <p>UNIT IV</p> <p>Quality of Service: Data-Flow Characteristics, Flow Control to improve QOS, Integrated Services, Differentiated Services</p> <p>Multimedia: Multimedia Data, Multimedia in the Internet, Real-Time Interactive Protocols</p>
<p>Textbooks and Reference books</p>	<p>Text Book:</p> <p>[1] Behrouz Forouzan, “Data Communications and Networking”, 5th Edition, McGraw-Hill Education India Pvt. Ltd, 2013</p> <p>Reference Books:</p> <p>[1] Andrew S Tannenbaum, David J Wetherall, “Computer Networks”, 5th editon, Pearson Education, 2012</p> <p>[2] Olifer, “Computer Networks: Principles, Technologies and Protocols for Network Design”, Wiley Publications, 2012</p> <p>[3] Kurose, Ross, “Computer Networking- A Top Down Approach”, 5th editon, Pearson Education, 2010</p>
<p>E-resources and other digital material</p>	<p>[1] Prof Sujoy Ghosh, IIT Kharagpur, NPTEL Lectures, 14th May 2015, Video Lectures, Available: http://nptel.iitm.ac.in/video.php?subjectId =106105081</p> <p>[2] MIT Open Courseware, MIT, , 14th May 2015, Video Lectures, Available:http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system-engineering-spring-2009/video-lectures/</p> <p>[3] Dheeraj, IIT Kharagpur, 14th May 2015, Lecture Notes, Available: http://www.cse.iitk.ac.in/users/dheeraj/cs425/</p>

14CS3451**WEB TECHNOLOGIES LAB**

Course Category:	Program Core	Credits:	2
Course Type:	Practical	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:		Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the principles of web designing and hosting.											
	CO2	Create static web pages using HTML, CSS and HTML5.											
	CO3	Create attractive web interfaces with client side technologies.											
	CO4	Create, parse and validate XML documents.											
	CO5	Build interactive web applications using PHP											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1		M										
	CO2		M	H						M			L
	CO3		M	H						M			
	CO4		M	H						M			
	CO5		M	H						M			M
Course Content/Task	<p>Task 1: Study of backend technologies of working of websites (DNS, Domain Name, Types of domains, Types of DNS records etc.)</p> <p>Task 2: Installing and configuring Apache web server in windows/linux platforms.</p> <p>Task 3: Design static web site with header, footer, menus, images, tables, links and lists by taking an example organization. (Personal information website, Company website, Ecommerce website, Govt. department, Village website etc.). Place suitable information.</p>												

Task 4:

- a. Design a presentation style for your web pages using an external CSS file.
- b. Define text, page and object margins.
- c. Define style, color and background of paragraphs, text, images and other objects.
- d. Create CSS box model.

Task 5:

Create a dice game for two player in javascript and html using two dice.

- a. Each player throws both dice once per turn. You only score if you throw doubles. (that is, both dice have the same number of spots on their top face).
- b. Players score five points for double ones, twos, fours or fives. A double six scores twenty five points, but if you throw a double three your score goes back to zero.
- c. Add your score as you play. The first player to get fifty points wins the game.

Task 6:

Validate html form fields like username, password, email, age, gender etc. for valid conditions.

Task 7:

Create interactive website with AJAX and JQuery. The website should have multiple pages of information and be loaded on single page.

Task 8:

Create a XML file with book/employee/student/inventory data and write a HTML/Javascript program to read and display the data in a table.

Task 9:

Create a valid HTML5 page for the following:

- a. Cache manifest
- b. Audio and video playing
- c. Drawing on the canvas, create a barchart
- d. Drag and drop
- e. Geo location

Task 10:

Write a function `countWords($str)` that takes any string of characters and finds the number of times each word occurs. You should ignore the distinction between capital and lowercase letters, and do not have to worry about dealing with characters that are not letters.

	<p>Task 11:</p> <p>a) Write a PHP program to store current date-time in a COOKIE and display the “Last visited on” date-time on the web page upon reopening of the same page.</p> <p>b) Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.</p> <p>Task 12:</p> <p>Create a register and login web application using PHP. The registration information should be stored in MySql database and during login the credentials have to be verified with database.</p> <p>Task 13:</p> <p>Study the functionalities of wordpress, drupal and joomla Content Management Systems. Install wordpress and create a sample web site.</p>
<p>Textbooks and Reference books</p>	<p>Text Book:</p> <p>[1] H. M. Deitel and P. J. Deitel, 2008, Internet & World Wide Web How to Program, 5th Edition , Prentice Hall</p>

14CS3452**JAVA PROGRAMMING LAB**

Course Category:	Programme Core	Credits:	2
Course Type:	Practical	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	14CS1252- C Programming Lab	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the concepts of object oriented programming.											
	CO2	Implement Exception Handling techniques and multiple inheritance through interfaces.											
	CO3	Apply thread capabilities and Collections framework.											
	CO4	Develop Graphical user interface applications using Swing and Applet Components.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2		M	H									
	CO3			M						H			M
	CO4			M						M			H
Course Content/ Task	<ol style="list-style-type: none"> 1. Create a java application that implements the concept of classes and objects. 2. Develop Java Application using inheritance. 3. Use interfaces and develop a java application. 4. Create a package and access members from a package. 5. Develop Java Application using Method overloading and method overriding. 6. Create a java application to copy content from one file to another using IO streams. 7. Develop Java Application to use String and String Buffer classes 												

	<p>8. Implement Exception handling in a given application. 9. Develop java application using Multithreading. 10. Develop java application using collections. 11. GUI Application using applets. 12. GUI Application using Swing Components.</p> <p>Projects:</p> <ol style="list-style-type: none"> 1. Design and develop an automated ballot vote system. 2. Design and develop a banking application.
<p>Text books and Reference books</p>	<p>Text Book:</p> <p>[1] E Balagurusamy, “Programming with Java: A Primer”, 4th Edition, Tata McGraw Hill Education Pvt Ltd., 2011. [2] Herbert Schildt, “Java The Complete Reference”, 8th Edition, McGraw-Hill Education, New Delhi, 2011.</p> <p>Reference Books:</p> <p>[1] Herbert Schildt, Dale Skrien, “Java Fundamentals A Comprehension Introduction”, Special Indian Edition, McGraw-Hill Education India Pvt. Ltd, 2013. [2] Paul J. Dietel and Dr.Harvey M. Deitel, “Java How to Program”, 9th Edition, Prentice-Hall, Pearson Education, 2011. [3] Timothy Budd, “Understanding Object Oriented Programming with Java “, Updated edition, Pearson Education, 2013.</p>
<p>E-resources and other digital material</p>	<p>[1] LearnJava online virtual training center, 14th May 2015. Available: http://www.learnjavaonline.org/ [2] Internshala Virtual lab, 14th May 2015. http://vtc.internshala.com/signup/course_details2.php?course=java101</p>

SEMESTER - V

14CS3501**DATABASE MANAGEMENT SYSTEMS**

Type of course	Programme Core	
Prerequisites	Object Oriented Programming using Java, Data Structures	
Co-requisites	Programming in C	
Contact hours	Lecture: 4, Tutorial: 1	
Credits	4	
Max. Marks	CE: 30, SE: 70	
Theory/Practical	Theory	
Course Description	<p>Database management system is a core course that is part of 5th semester in the B. Tech program for the Computer Science and Engineering curriculum.</p> <p>The course starts off with modeling real-life applications into entities and attributes and relationships. These are translated to relational tables by using various normal forms. For a relational DBMS, a student has to be able to perform creation of database tables, insertion, modification, deletion of values from the data base and querying of the data base items based on user supplied criteria.</p>	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand different types of Database and Data warehouse concepts
	CO2	Design E-R and Relational model for an application
	CO3	Apply normalization process for data base design
	CO4	Understand Concurrency control and Recovery techniques of DBMS
	CO5	Demonstrate competency in selecting a particular NoSQL database
Contribution of Course	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline. (CO1)

Outcomes to achieve Program Outcomes	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. (CO2,CO3,CO4,CO5)											
	PO c	An ability to design, implement and evaluate a computer based system, process, component or program to meet desired need.(CO2,CO3,CO4,CO5)											
	PO k	An ability to apply mathematical foundations, algorithmic principles and computer science theory in the modeling and design of computer based systems in a way that demonstrates. (CO2,CO3,CO4,CO5)											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2		M	H								L	
	CO3		M	H								L	
	CO4		M	H								L	
	CO5		M	H								L	
Course Content	<p>UNIT I: Databases and Database Users: Characteristics of the Database Approach, Advantages of Using the DBMS Approach, A Brief History of Database Applications. Database System Concepts and Architecture: Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence. Distributed database concepts, Overview of Object Database concepts. Overview of Data Warehousing and OLAP: Introduction, Definitions and Terminology, Characteristics of Data Warehouses, Data Modeling for Data Warehouses, Typical functionality of a Data Warehouse.</p> <p>UNIT II: Data Modeling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams, Naming Conventions, and Design Issues, Relationship Types of Degree Higher than Two.</p>												

Relational Database Design by ER and EER-to-Relational Mapping: Relational Database Design Using ER-to-Relational Mapping.

The Relational Data Model and Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas.

The Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra.

UNIT III:

Basics of Functional Dependencies and Normalization for Relational Databases: Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multi valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

Introduction to Transactions Processing: Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions.

Concurrency Control Techniques and Database Recovery Techniques: Two Phase Locking techniques for Concurrency Control, The ARIES Recovery Algorithm.

UNIT IV:

NOSQL: What It Is And Why You Need It: Definition and Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases.

Interfacing And Interacting With NOSQL: Storing and Accessing Data, Storing Data In and Accessing Data from MongoDB, Querying MongoDB, Storing Data In and Accessing Data from Redis, Querying Redis, Storing Data In and Accessing Data from HBase, Querying HBase.

Understanding The Storage Architecture: Working with Column-Oriented Databases, HBase Distributed Storage Architecture.

Managing Transactions And Data Integrity: RDBMS and ACID, Distributed ACID Systems, Upholding CAP.

Text books and Reference books

Text Books:

[1]Ramez Elmasri, Shamkant B. Navathe, “*Fundamentals of Database Systems*”, 6th edition, Addison-Wesley, 2010. [Unit I,II,III]

	<p>[2].Shashank Tiwari, “ Professional NoSql”, John Wiely & Sons, 2011 [Unit IV]</p> <p>Reference Books:</p> <p>[1]Raghu Ramakrishnan,Johannes Gehrke, “<i>Database Management Systems</i>”, Indian edition, McGraw Hill Education.</p> <p>[2]Abraham Silberschatz, Henry F.Korth, S.Sudarshan, “<i>Database System Concepts</i>”, 6th edition, McGraw-Hill Education.</p> <p>[3]P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012</p>
<p>E-resources and other digital material</p>	<ol style="list-style-type: none"> 1. Dr S.Srinath IIT-Madras “Conceptual design process “ http://nptel.iitm.ac.in/video.php?subjectId=106106093 2. Prof P.Srinivasa Kumar IIT-Madras “ Normalization process” http://nptel.iitm.ac.in/courses/IIT-MADRAS/Intro_to_Database_Systems_Design/ 3. Prof D.Janakiram IIT-Madras “Concurrency Control techniques” http://nptel.iitm.ac.in/video.php?subjectId=106106093 4. Dr Bill Howe University of Washington eScience Institute https://class.coursera.org/datasci-001/lecture/21,99,101,103,107,111,113

14CS3502**MICROPROCESSOR AND MICROCONTROLLER**

Type of course	Programme Core	
Prerequisites	Digital Logic Design	
Co-requisites		
Contact hours	Lecture: 3, Tutorial: 1	
Credits	3	
Max. Marks	CE : 30, SE : 70	
Theory/Practical	Theory	
Course Description	<p>Microprocessor and microcontroller is a core course that is part of 5th semester in the B. Tech program for the Computer Science and Engineering curriculum.</p> <p>The course deals with an overview of 8086 microprocessor family and its architecture, programming language and system connections. The course provides hands-on experience to write effective 8086 assembly language program (flow chart structure, instruction set). The course also aims at how a microprocessor is interfaced with wide variety of low level input and output devices such as keyboard, displays, and relays. This course also deals with internal architecture of 8051 microcontroller.</p>	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand the fundamental concepts of 8086 μ P and its internal Architecture.
	CO2	Apply 8086 μ P Programming Knowledge to solve the problems.
	CO3	Understand the concepts of 8086 microprocessor interrupts
	CO4	Implement programs to interface the 8086 Microprocessor with Analog and Digital devices.
	CO5	Understand the features of peripheral devices and internal architecture of 8051 microcontroller.
Contribution of	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline. (CO1, CO2, CO3, CO5)

Course Outcomes to achieve Program Outcomes	PO c	An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.(CO2,CO4,CO5)											
	PO k	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.(CO2,CO4)											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M											
	CO2	L		M								H	
	CO3	M											
	CO4			H								H	
	CO5	M		M									
Course Content	<p>UNIT I THE 8086 MICROPROCESSOR Overview of microcomputer structure & operation, overview of 8086 microprocessor family, 8086 internal architecture, Machine language Vs assembly language, 8086 addressing modes. 8086 pin diagram, 8086 minimum mode and maximum mode.</p> <p>UNIT II 8086 INSTRUCTION SET & PROGRAMMING Data transfer instructions, arithmetic instructions, bit manipulation instructions, string instructions, program execution transfer instructions, and processor control instructions, Assembler directives. Standard 8086 assembly language program structure, Assembly language program development tools, writing simple programs in 8086 assembly language, Writing and using procedures and assembler macros.</p> <p>UNIT III INTERRUPTS: 8086 interrupts and interrupt responses, 8259A priority interrupt controller INTERFACING WITH 8086 MICROPROCESSOR</p>												

Programmable parallel ports and hand shake input/output, the programmable peripheral interface 8255A: modes of operation and initialization, Basics of D/A and A/D converters. Interfacing of DAC and ADC to 8086 microprocessor.

UNIT IV

PERIPHERAL DEVICES:

Introduction to 8254 programmable timer/counter, 8251 USART, 8257 DMA controller.

THE 8051 MICROCONTROLLER

8051 micro controller hardware, inputs/ outputs pins, ports and circuits, counters and timers, serial data input/output, interrupts. Arithmetic operations, Incrementing, Decrementing, addition, subtraction, multiplication and division.

Text books and Reference books

Text Book:

- [1] Douglas V Hall, “Microprocessor and Interfacing”, 2nd edition, TataMcGraw Hill, 2006.
 [2] Kenneth J. Ayala, “8051 MICRO CONTROLLER ARCHITECTURE” 3rd edition, Thomson Delmar Learning, 2005.

Reference Books:

- [1] K M Bhurchandi, A.K.Ray, “Advanced Microprocessors and Peripherals”, 3rd edition, TataMcgraw Hill, 2014

E-resources and other digital material

- 1] Prof. Krishna Kumar, IISc Bangalore. 14th May 2015” Microprocessors and Microcontrollers” [Web Content]. Available: <http://nptel.ac.in/courses/106108100/>
 [2] Dr. PramodAgarwal, IIT Roorkee, 14th May 2015, “Microprocessor and Peripheral Devices” [Web Content], <http://nptel.ac.in/syllabus/syllabus.php?subjectId=108107082>

14CS3503
OPERATING SYSTEMS

Type of course	Programme Core	
Prerequisites	Computer Organization	
Co-requisites		
Contact hours	Lecture: 4 Tutorial: 1	
Credits	4	
Max. Marks	CE :30, SE :70	
Theory/Practical	Theory	
Course Description	<p>Operating Systems is a core course of 6th semester in the B.Tech program for the Computer Science curriculum. In order to take this course, a student should have a prerequisite knowledge of Computer Fundamentals and Organization as well as data structures. The course investigates in depth what's done in current operating systems ,types and understanding of how they work. This course will start from the introduction of the functions of an operating system, Process Management and scheduling CPU activity and explaining several algorithms. Further discussions will be held on Deadlocks, Main memory management, virtual memory and File system implementation. This course enables the student to understand and appreciate the concept of memory management and implementation of the same while developing programs for embedded systems.</p>	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand the basic principles of operating systems.
	CO2	Analyze CPU Scheduling and disk scheduling algorithms
	CO3	Analyse the mechanisms used for process synchronization, deadlock prevention and deadlock detection
	CO4	Apply different page replacement algorithms
	CO5	Understand the file structure, directory structure and disk structures.

Contribution of Course Outcomes to achieve Program Outcomes	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline. (CO1,CO2,CO5)
	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. (CO2,CO3,CO4)
	PO k	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices (CO2,CO3,CO4)

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H											
	CO2	M	H									M	
	CO3		M									M	
	CO4	M											
	CO5		M										

Course Content	<p>UNIT I: Introduction: What Operating Systems Do Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations. Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls. Processes: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication.</p> <p>UNIT II: CPU Scheduling: Basic Concepts, Scheduling Criteria , Scheduling Algorithms, Thread Scheduling ,Multiple-Processor Scheduling , Real-Time CPU Scheduling. Process Synchronization: Background, The Critical-Section Problem, Peterson’s Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors.</p> <p>UNIT III: Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. Main Memory: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table</p> <p>UNIT – IV: Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing. Implementing File Systems: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery. Mass-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management.</p>
Text books and Reference books	<p>Text Book: [1] Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts.9thed, John Wiley & Sons (Asia) Pvt.Ltd, 2013.</p> <p>Reference Books:</p>

	<p>[1] William Stallings, Operating System: Internals and Design Principles. 6th ed 2009</p> <p>[2] Andrew S.Tanenbaum, Modern Operating Systems. 3 ed, PHI, 2008.</p>
E-resources and other digital material	<p>[1] Prof. P.K. Biswas sir, Ph.D.(IIT Kharagpur),Dated: 21-02-2013 Video Lectures on "Operating Systems"</p> <p>[2]http://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Operating%20Systems/New_index1.html , Dated: June 2004</p> <p>[3] http://www.ics.uci.edu/~ics143/lectures.html,2013</p> <p>[4]http://web.stanford.edu/~ouster/cgi-bin/cs140-winter16/index.php</p>

14CS3504**ADVANCED JAVA PROGRAMMING**

Type of course	Programme Core	
Prerequisites	Object Oriented Programming using Java	
Co-requisites	Programming in C	
Contact hours	Lecture: 3, Tutorial: 1	
Credits	3	
Max. Marks	CE : 30, SE : 70	
Theory/Practical	Theory	
Course Description	<p>Advanced Java Programming is a core course that is part of 5th semester in the B. Tech program for the Computer Science and Engineering curriculum.</p> <p>This course provides an overview of client server architecture and able to develop web and enterprise application using java technologies.</p>	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Perform basic network communication by using sockets
	CO2	Develop web-based solutions using servlets.
	CO3	Create Java Server Pages.
	CO4	Develop EJB Application
Contribution of Course Outcomes to achieve Program Outcomes	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline. (CO1, CO2)
	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. (CO1,CO2,CO3)
	PO c	An ability to design, implement and evaluate a computer based system, process, component or program to meet desired need. (CO2,CO3,CO4)
	PO i	An ability to use the current techniques, skills, and tools necessary for computing practice (CO1,CO2,CO3,CO4)

	PO k	an ability to apply mathematical foundations, algorithmic principles and computer science theory in the modelling and design of computer based systems in a way that demonstrates. (CO1,CO2,CO3,CO4)											
	PO 1	An ability to apply design and development principles in the construction of software systems of varying complexity (CO2,CO3,CO4)											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L								M		M	
	CO2	M	M	M						H		M	H
	CO3		M	M						H		M	H
	CO4		M	M						H		M	H
Course Content	<p>UNIT I Networking: Introduction, Manipulating URLs, Reading a File on a Web Server, Establishing a Simple Server, Establishing a Simple Client, Client/Server Interaction with Stream Socket Connections, Connectionless Client/Server Interaction with Datagrams, Client/Server Tic-Tac-Toe Using a Multithreaded Server, Security and the Network. Java Database Connectivity :JDBC Connectivity, types of JDBC drivers, connecting to the database, JDBC statements, JDBC exceptions, Manipulations on the database, metadata</p> <p>UNIT II Web Servers and Servlets: Tomcat web server, Web Application Basics.Architecture and challenges of Web Application. Introduction to Servelets: Lifecycle of a Serverlet, JSDK, The Servlet API, The javax.servelet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues</p> <p>UNIT III Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC. JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an</p>												

	<p>Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations</p> <p>UNIT – IV Remote Method Invocation:Introduction to RMI, Defining the Remote Interface, Implementing the Remote Interface, Compiling and Executing the Server and the Client. Introduction to EJB: EJB architecture- EJB requirements – design and implementation – EJB session beans- EJB entity bean</p>
<p>Text books and Reference books</p>	<p>Text Books: [3]Harvey M. Deitel,Paul J. Deitel,Sean E. Santry, “Advanced Java 2 Platform HOW TO PROGRAM” Prentice Hall [Unit – I,IV] [4]Herbert Schildt, “Java The Complete Reference”, 8th Edition, McGraw-Hill Education, New Delhi, 2011. [Unit – II] [5]Hans Bergsten, "JavaServer Pages" , II Edition , O'Reilly Media [Unit – III] Reference Books: [4]Paul J. Dietel and Dr.Harvey M. Deitel, “Java How to Program”, 9th Edition, Prentice-Hall, Pearson Education, 2011. [5]David Geary, Cay S. Horstmann “Core JavaServer Faces” Third edition, 2010, Prentice Hall [6]Jim Keogh, “The Complete reference to J2EE”, reprint 2012, Tata McGraw-Hill .</p>
<p>E-resources and other digital material</p>	<p>[1] Prof. I. Sengupta. (14th , May, 2015), Department of Computer Science & Engineering, I.I.T.,Kharagpur, “Internet Technologies”, NPTEL videos. Available: http://nptel.ac.in/video.php?subjectId=106105084 [2] Prof. Shane P. (14th , May , 2015), Department of Computer Science & Engineering,, NPTEL Videos, Available:http://www.nptelvideos.com/video.php?id=1461&c=15</p>

MOOCS
14CS5506A
PROGRAMMING IN PYTHON

Type of course	Independent Learning (MOOCs)	
Prerequisites	Object Oriented Programming using Java	
Co-requisites	Programming in C	
Contact hours	Lecture: 0, Tutorial: 0	
Credits	2	
Max. Marks	CE : 30, SE : 70	
Theory/Practical	Independent Learning (MOOCs)	
Course Description	Programming in Python is a independent Learning (MOOCS) course that is part of 5 th semester in the B. Tech program for the Computer Science and Engineering curriculum. This course will provide a gentle, yet intense, introduction to programming using Python for highly motivated students with little or no prior experience in programming. The course will focus on planning and organizing programs, as well as the grammar of the Python programming language.	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Discover python lexical features and syntax
	CO2	Learn core python structures and flow control
	CO3	Create and run python functions
	CO4	Practice with python execution environment
Contribution of Course Outcomes to achieve Program Outcomes	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline. (CO1, CO2)
	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. (CO1,CO2,CO3)
	PO c	An ability to design, implement and evaluate a computer based system, process, component or program to meet desired need. (CO2,CO3,CO4)
	PO i	An ability to use the current techniques, skills, and tools

		necessary for computing practice (CO3,CO4)											
	PO k	an ability to apply mathematical foundations, algorithmic principles and computer science theory in the modelling and design of computer based systems in a way that demonstrates. (CO3,CO4)											
	PO 1	An ability to apply design and development principles in the construction of software systems of varying complexity (CO2,CO3,CO4)											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2	M	M	M									H
	CO3		M	M						H		M	H
	CO4		M	M						H		M	H
Course Content	<p>UNIT I: Getting started: introducing python, setting up python on windows and other operating systems, introducing IDLE, Types, variables and simple I/O, using quotes with strings, using escape sequences with strings, concatenating and repeating strings, working with numbers, user input, string methods, right types, converting values. Branching, while loops and program planning, using the if, else, elif statements, creating while loops, infinite loops, values as conditions, compound conditions</p> <p>UNIT II: For loops, strings and tuples, using for loops, using sequence operators and functions with strings, indexing strings, string immutability, building a new string, slicing strings, tuples,</p> <p>Lists and dictionaries: using Lists, list methods, understanding when to use tuples and lists, nested sequences, shared references, dictionaries, hangman game. Functions, creating functions, parameters and return values, keyword arguments, default parameters, global variables</p>												

	<p>UNIT III: Files and Exceptions, reading and writing to text files, storing complex data, handling exceptions, trivia challenge game. Software objects, caretaker program, object oriented basics, creating classes, methods and objects, constructors, attributes, class attributes and static methods, object encapsulation, private attributes and methods, attribute access, critter caretaker program.</p> <p>Object Oriented programming: sending and receiving messages, combining objects, inheritance, extending a class through inheritance, altering behavior of inherited methods, understanding polymorphism, creating modules, blackjack game.</p> <p>UNIT – IV</p> <p>GUI development: examining GUI, understanding event driven programming, root window, labels, buttons, creating a GUI using a class, binding widgets and event handlers, text and entry widgets and Grid layout manager, check buttons, radio buttons, mad lib program. Graphics – Pizza panic game, creating a graphics window, setting background image, understanding the graphics coordinate system, displaying sprite, text, message, moving sprites, dealing with screen boundaries, mouse input, collisions.</p>
Text books and Reference books	<p>Text Books: [1]. Python Programming, Michael Dawson, 3rd Edition, Course technology PTR, 2010.</p> <p>Reference Books: [1]James Payne, "Beginning Python: Using Python 2.6 and Python 3.1", Wiley India Pvt Ltd (9 March 2010) , Sample Edition.</p>
E-resources and other digital material	<p>Programming for Everybody(Python) By Prof. Charles Severance, University of Michigan in www.coursera.com URL: https://www.coursera.org/course/pythonlearn Last accessed on Aug 10th 2015 Course Schedule (coursera): Jun 1st to Aug 10th 2015</p> <p>Introduction to Computer Science and Programming Using Python by Prof. Eric Grimson et all, Massachusetts Institute of Technology(MIT) in www.edx.org URL: https://www.edx.org/course/introduction-computer-science-mitx-6-00-1x-0 Last accessed on Aug 10th 2015 Course Schedule (edx): Starts Jun 10th 2015, 9 weeks</p> <p>Learn Python Programming from Scratch in www.udemy.com URL: https://www.udemy.com/learn-python-programming-from-scratch/ Last accessed on Aug 10th 2015 Course Schedule (udemy): Always on</p>

14CS35506B**INTRODUCTION TO LINUX**

Type of course	MOOCS												
Prerequisites	--												
Co-requisites	--												
Contact hours	Lecture: 0, Tutorial: 0												
Credits	2												
Max. Marks	CE : 30, SE : 70												
Theory/Practical	Theory												
Course Description	Linux powers 94% of the world's supercomputers, most of the servers powering the Internet and a billion Android devices. In short, Linux is everywhere. It appears in many different architectures, from mainframes to server to desktop to mobile and on a staggeringly wide variety of hardware. This self-paced course will help to develop a good working knowledge of Linux using both the graphical interface and command line.												
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam												
Course outcomes	CO1	Describe the various fundamental aspects of the linux operating system											
	CO2	Demonstrate an understanding of linux processes, basic process operations and I/O redirection.											
	CO3	Know the general linux house keeping and backup techniques.											
	CO4	Understand linux networking and multimedia concepts.											
Contribution of Course Outcomes to achieve Program Outcomes	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.											
	PO c	An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.											
	PO i	An ability to use current techniques, skills, and tools necessary for computing practice.											
Contribution of Course	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	

<p>Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)</p>	CO1		M										
	CO2		H										
	CO3								L				
	CO4								H				
<p>Course Content</p>	<p>UNIT I: What is Linux: History, The user interface, Properties of Linux, Linux flavors Quickstart: Logging in, activating the user interface, and logging out, Absolute basics, Getting help About files and the file system: General overview of the linux file system, Orientation in the file system, Mnipulating files, file security UNIT II: Processes: Processes inside out, Boot process, init and shutdown, Managing processes, Scheduling processes. I/O redirection: Simple redirections, Advanced redirection features, filters. Text editors: Text editors, Using the Vim editor, Linux in the office. UNIT III: HOME /home: General good house keeping, Your text environment, The graphical environment, Region specific settings, Installing new software Printers and Printing: Printing files, The server side, Print problems Fundamental backup techniques: Introduction, Moving data to a backup device, Using rsync, Encrytion UNIT – IV Networking: Networking overview, Network configuration and information, Internet/intranet applications, Remote execution of applications, Security Sound and Video: Audio basics, Sound and video playing, Internet Telephony</p>												
<p>Text books and Reference books</p>	<p>Text Books: [1]Machtelt Garrels, “Introduction to Linux: A Hands on Guide”, Fultus Corporation, Third edition, 2010</p>												
<p>E-resources and other digital material</p>	<p>[1] http://tille.garrels.be/training/tldp, accessed on 16/03/2016</p>												

MOOCS**14CS5506D****METEOR FRAMEWORK AND MONGODB**

Type of course	Elective	
Prerequisites	Object Oriented Programming using Java	
Co-requisites	Database Management Systems	
Contact hours	Lecture: 0, Tutorial: 0	
Credits	2	
Max. Marks	CE :30, SE :70	
Theory/Practical	Theory	
Course Description	Meteor framework and MongoDB is an independent Learning (MOOCS) course that is part of 5 th semester in the B. Tech program for the Computer Science and Engineering curriculum. This course will go over basic installation of Meteor.js system, working with Meteor.js package and templates, database management operations on MongoDB, authentication functionality to website and security features.	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand the concepts of Meteor.js and MongoDB
	CO2	Apply the MongoDB operators and Schema design to solve the real life problems
	CO3	Apply user authentication functionality to a website
	CO4	Understand basic security features
Contribution of Course Outcomes to achieve Program Outcomes	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline.
	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
	PO c	An ability to design, implement and evaluate a computer based system, process, component or program to meet desired need.

	PO i	An ability to use current techniques, skills, and tools necessary for computing practice.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H											
	CO2	M	L	M						L			
	CO3	L	L	M						L			
	CO4	H								L			
Course Content	<p>UNIT I: Introduction to Meteor.js Development: Introduction to Meteor, Introduction, From one to many users, Install Meteor, Editing a template, Sending data to templates with helpers. Convert to a Bootstrap grid, Responding to user actions.</p> <p>UNIT II: Databases and collections: Introduction, Meteor distributed data model Create a collection of images, Better start up script, removing items from a collection, Add an image rating function: Updating and sorting, Implement image adding with a Bootstrap Modal, Databases and collections summary</p> <p>UNIT III: User authentication: Introduction, User authentication with Meteor.js, Tidying up the design with a navbar, Accessing user information, Customising the user registration form, Attaching users to images, Filtering images by user, Removing the image filter, Infinite scroll.</p> <p>UNIT IV: Security and routing: Introduction, How to organise your code, Hack into your site, Make your site more secure, Tidy up the project, Routing with iron:router, Better routing.</p>												
Text books and Reference books													
E-resources and other digital material	<p>[1] Introduction to Meteor.js Development, University of London & Goldsmiths, University of London, https://www.coursera.org/learn/meteor-development Accessed on 14th February 2016 Course Schedule: 4 Weeks</p>												

14CS3551**DATABASE MANAGEMENT SYSTEMS LAB**

Type of course	Programme Core	
Prerequisites	Object Oriented Programming using Java, Data Structures	
Co-requisites	Programming in C	
Contact hours	Lecture: 0, Tutorial: 0 Practical : 03	
Credits	2	
Max. Marks	CE: 30, SE: 70	
Theory/ Practical	Theory	
Course Description	<p>Database management system is a core course that is part of 5th semester in the B. Tech program for the Computer Science and Engineering curriculum.</p> <p>The course starts off with modeling real-life applications into entities and attributes and relationships. These are translated to relational tables by using various normal forms. For a relational DBMS, a student has to be able to perform creation of database tables, insertion, modification, deletion of values from the data base and querying of the data base items based on user supplied criteria.</p>	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand different types of Database and Data warehouse concepts
	CO2	Design E-R and Relational model for an application
	CO3	Apply normalization process for data base design
	CO4	Understand Concurrency control and Recovery techniques of DBMS
	CO5	Demonstrate competency in selecting a particular NoSQL database

Contribution of Course Outcomes to achieve Program Outcomes	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline. (CO1)
	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. (CO2,CO3,CO4,CO5)
	PO c	An ability to design, implement and evaluate a computer based system, process, component or program to meet desired need.(CO2,CO3,CO4,CO5)
	PO k	An ability to apply mathematical foundations, algorithmic principles and computer science theory in the modeling and design of computer based systems in a way that demonstrates. (CO2,CO3,CO4,CO5)

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2		M	H								L	
	CO3		M	H								L	
	CO4		M	H								L	
	CO5		M	H								L	

Tasks	<p>Task 1: DDL, DML, DCL, TCL commands</p> <p>Task 2: Simple queries: selection, projection, sorting on a simple table Distinct values, Renaming attributes, Arithmetic expressions Simple-complex conditions (AND, OR, NOT)</p> <p>Task 3: Pattern Matching operators (LIKE, %, _) ASC-DESC ordering , checking for Nulls Aliasing tables</p> <p>Task 4: Inner-joins (two or more tables) Inner-recursive-joins (joining to itself) Outer-joins</p> <p>Task 5: Set Operations (Union, Union All, Intersect, Minus)</p> <p>Task 6: Nested queries, Correlated queries (In, Not In, Exists, Not</p>
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	<p>Exists)</p> <p>Task 7: PL/SQL Programs using named and unnamed blocks Cursors, Cursor loops</p> <p>Task 8: Creating stored procedures and functions</p> <p>Task 9: Packages Exception handling</p> <p>Task 10: Triggers</p>
<p>Text books and Reference books</p>	<p>Text Books:</p> <p>[1]Ramez Elmasri, Shamkant B. Navathe, “<i>Fundamentals of Database Systems</i>”, 6th edition, Addison-Wesley, 2010. [Unit I,II,III]</p> <p>[2].Shashank Tiwari, “ Professional NoSql”, John Wiley & Sons, 2011 [Unit IV]</p> <p>Reference Books:</p> <p>[1]Raghu Ramakrishnan,Johannes Gehrke, “<i>Database Management Systems</i>”, Indian edition, McGraw Hill Education.</p> <p>[2]Abraham Silberschatz, Henry F.Korth, S.Sudarshan, “<i>Database System Concepts</i>”, 6th edition, McGraw-Hill Education.</p> <p>[3]P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012</p>
<p>E-resources and other digital material</p>	<p>1. Dr S.Srinath IIT-Madras “Conceptual design process “ http://nptel.iitm.ac.in/video.php?subjectId=106106093</p> <p>2. Prof P.Srinivasa Kumar IIT-Madras “ Normalization process” http://nptel.iitm.ac.in/courses/IIT-MADRAS/Intro_to_Database_Systems_Design/</p> <p>5. Prof D.Janakiram IIT-Madras “Concurrency Control techniques” http://nptel.iitm.ac.in/video.php?subjectId=106106093</p> <p>6. Dr Bill Howe University of Washington eScience Institute https://class.coursera.org/datasci-001/lecture/21,99,101,103,107,111,113</p>

14CS3552**MICROPROCESSOR LAB**

Type of course	Programme Core	
Prerequisites	Digital Logic Design	
Co-requisites		
Contact hours	Lecture: 0, Tutorial: 0 Practical : 03	
Credits	2	
Max. Marks	CE :30, SE :70	
Theory/Practical	Practical	
Course Description	<p>Microprocessor lab is a core course that is part of 5th semester in the B. Tech program for the Computer Science and Engineering curriculum.</p> <p>The course deals with an overview of 8086 microprocessor family and its architecture, programming language and system connections. The course provides hands-on experience to write effective 8086 assembly language program (flow chart structure, instruction set). The course also aims at how a microprocessor is interfaced with wide variety of low level input and output devices such as keyboard, displays, and relays. This course also deals with internal architecture of 8051 microcontroller.</p>	
Course assessment methods	Daily Assessment, Internal Examination & Semester end exam	
Course outcomes	CO1	Understand the fundamental concepts of 8086 μ P and its internal Architecture.
	CO2	Apply 8086 μ P Programming Knowledge to solve the problems.
	CO3	Understand the concepts of 8086 microprocessor interrupts
	CO4	Implement programs to interface the 8086 Microprocessor with Analog and Digital devices.
	CO5	Understand the features of peripheral devices and internal architecture of 8051 microcontroller
Contribution of Course	PO a	An ability to apply knowledge of computing and mathematics appropriate to the

Outcomes to achieve Program Outcomes		discipline.(CO1,CO2,CO3,CO5)											
	PO _c	An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.(CO2,CO4,CO5)											
	PO _k	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.(CO2,CO4)											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO _a	PO _b	PO _c	PO _d	PO _e	PO _f	PO _g	PO _h	PO _i	PO _j	PO _k	PO _l
	CO1	M											
	CO2	L		M								H	
	CO3	M											
	CO4			H									H
	CO5	M		M									
Course Contents/ Tasks	<p>Task 1: Data transfer instructions (With different Address Modes).</p> <p>Task 2: Demonstration on 8086 μP Flag Register with operations.</p> <p>Task 3: Arithmetic instructions (8-bit /16-bit Data Size With different Address Modes)</p> <p>Task 4: Loop/ Jump instructions</p> <p>Task 5: Logical/ rotate instructions</p> <p>Task 6: Shift instructions.</p> <p>Task 7: String instructions.</p> <p>Task 8: Demonstration of subroutines Execution</p> <p>Task 9: ADC interfacing</p> <p>Task 10: DAC interfaces</p> <p>Task 11: Stepper motor interfacing</p> <p>Task 12: 8051 arithmetic instructions</p>												

Text books and Reference books	Text Book: [1] Douglas V Hall, “Microprocessor and Interfacing”, 2 nd edition, Tata Mcgraw Hill, 2006. [2] Kenneth J. Ayala, “8051 MICRO CONTROLLER ARCHITECTURE” 3 rd edition, Thomson Delmar Learning, 2005. Reference Books: [1] K M Bhurchandi, A.K.Ray, “Advanced Microprocessors and Peripherals”, 3rd edition, TataMcgraw Hill, 2014
E-resources and other digital material	1] Prof. Krishna Kumar, IISc Bangalore. 14 th May 2015” Microprocessors and Microcontrollers” [Web Content]. Available: http://nptel.ac.in/courses/106108100/ [2] Dr. Pramod Agarwal, IIT Roorkee, 14 th May 2015, “Microprocessor and Peripheral Devices” [Web Content], http://nptel.ac.in/syllabus/syllabus.php?subjectId=108107082

14CS3553**ADVANCED JAVA PROGRAMMING LAB**

Type of course	Programme Core												
Prerequisites	--												
Co-requisites	--												
Contact hours	Lecture: 0, Tutorial: 0 Practical : 03												
Credits	2												
Max. Marks	CE :30, SE :70												
Theory/Practical	Practical												
Course Description	This lab course is attached to Advanced Java Programming theory course. This course supports the students able to develop web and enterprise application using java technologies.												
Course assessment methods	Continuous evaluation, Semester end examination.												
Course outcomes	CO1	Perform basic network communication by using sockets											
	CO2	Develop web-based solutions using servlets.											
	CO3	Create Java Server Pages.											
	CO4	Develop EJB Application											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L								M		M	H
	CO2	M	M	M						H		M	H
	CO3		M	M						H		M	H
	CO4		M	M						H		M	H
Course Contents/ Tasks	Task 1: Create Application for Datagram server and Client interaction as per given below. i] Datagram server to send a message to client. ii]Datagram client to receive the message sent by the server.												

	<p>Task 2: Create JDBC Application to execute a SQL query for a database and display the results.</p> <p>Task 3: Verify installation and setting of Web container/Web Server/Tomcat and prepare an installation report, which contains setting of class path,server port, starting and shutting down of server. Develop web Application to display a greeting message in the browser by using HttpServlet.</p> <p>Task 4: Design a Login Form Using Html and Displaying the Contents of the Login Form along with Date and Time in Servlet.</p> <p>Task 5: Create Servlet for registering a new user and displaying the number of visits made by the existing user using cookies.</p> <p>Task 6: Create web Application to access a database using Servlet.</p> <p>Task 7: Create JSP to output, "Welcome to JSP world. The time now is: system current time. Use a scriptlet for the complete string, including the HTML tags.</p> <p>Task 8: Create simple shopping cart application using JSP</p> <p>Task 9: Client – Server Communication using RMI</p> <p>Task 10: Develop Enterprise Java Bean of "Session Bean" type and "Entity Session Bean" type.</p> <p>Lab Projects:</p> <ol style="list-style-type: none"> 1. Design and Develop an Online Shopping Application. 2. Design and Develop Online Quiz Application.
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Text books and Reference books

	<p>Text Books:</p> <p>[2]Harvey M. Deitel,Paul J. Deitel,Sean E. Santry, “Advanced Java 2 Platform HOW TO PROGRAM” Prentice Hall [Unit – I,IV]</p> <p>[3]Herbert Schildt, “Java The Complete Reference”, 8th Edition, McGraw-Hill Education, New Delhi, 2011. [Unit – II]</p> <p>[4]Hans Bergsten, "JavaServer Pages" , II Edition , O'Reilly Media [Unit – III]</p>
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	<p>Reference Books:</p> <p>[1]Paul J. Dietel and Dr.Harvey M. Deitel, “Java How to Program”, 9th Edition, Prentice-Hall, Pearson Education, 2011.</p> <p>[2]David Geary, Cay S. Horstmann “Core JavaServer Faces” Third edition, 2010, Prentice Hall.</p> <p>[3]Jim Keogh, “The Complete reference to J2EE”, reprint 2012, Tata McGraw-Hill .</p>
E-resources and other digital material	<p>[1] Prof. I. Sengupta. (14th , May, 2015), Department of Computer Science & Engineering, I.I.T.,Kharagpur, “Internet Technologies”, NPTEL videos. Available: http://nptel.ac.in/video.php?subjectId=106105084</p> <p>[2] Prof. Shane P. (14th , May , 2015), Department of Computer Science & Engineering,, NPTEL Videos, Available:http://www.nptelvideos.com/video.php?id=1461&c=15</p>

SEMESTER – VI

14CS3601**DESIGN AND ANALYSIS OF ALGORITHMS**

Type of course	Programme Core	
Prerequisites	Data Structures	
Co-requisites		
Contact hours	Lecture: 4, Tutorial: 1	
Credits	4	
Max. Marks	CE :30, SE :70	
Theory/ Practical	Theory	
Course Description	Design and Analysis of Algorithms is a core course for the Computer Science Engineering. This course provides an overview of design and analysis of efficient algorithms, emphasizing methods useful in practice so that students and practitioners can learn to devise and analyze new algorithms. Most of the lecture is delivered with the help of black board and PPTs, simultaneously demonstrating with examples and problems at end of each chapter.	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand fundamental concepts of asymptotic notion of an algorithm and Divide and conquer techniques
	CO2	Analyse various design techniques of greedy algorithm and dynamic programming
	CO3	Apply Backtracking, branch and bound techniques for real time problems
	CO4	Understand the concepts of NP-Hard, NP-Complete and Lower bound theory
Contribution of Course	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline. (CO1, CO2)

Outcomes to achieve Program Outcomes	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. (CO3)
	PO c	An ability to function effectively on teams to accomplish a common goal. (CO4)
	PO i	An ability to use current techniques, skills, and tools necessary for computing practice.
	PO k	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M											
	CO2		H	M						L		L	
	CO3		H	M						L		L	
	CO4		M							L			

Course Content	<p>UNIT I:</p> <p>Introduction: Algorithm, Algorithm Specification, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation.</p> <p>Divide and Conquer: General method, Applications-Binary Search, Quick sort, Merge sort, Strassen’s matrix multiplication.</p> <p>UNIT II:</p> <p>Greedy method: General method, Applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, optimal storage on tapes, Optimal merge patterns, Single source shortest path problem.</p>
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Dynamic Programming: General method, applications- Matrix chain multiplication, Multi stage graph problem, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem.

UNIT III:

Backtracking: General method, applications- N-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles, 0/1 knapsack problem.

NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, classes NP Hard and NP Complete, Cook's theorem.

UNIT IV

Branch and Bound: General method, applications - Traveling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.

Lower Bound Theory: Comparison Trees: Ordered Searching, Sorting, Selection. Oracles and Adversary Arguments: Merging, Largest and Second Largest, State Space Method, Selection. Lower Bounds through Reductions: Finding the Convex Hull, Disjoint Sets Problem, Online Median Finding, Multiplying Triangular Matrices, Inverting a Lower Triangular Matrix, Computing the Transitive Closure.

Text books and Reference books

Text Book:

[1] Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia Publications Pvt. Ltd.

Reference Books:

1. Algorithm Design: Foundations, Analysis and Internet examples, M.T. Goodrich and R. Tomassia, John Wiley and sons.
2. Introduction to Algorithms, 2/e, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, PHI Pvt. Ltd. / Pearson Education.
3. Data structures and Algorithm Analysis in C++, Allen Weiss, Second Edition, Pearson Education.
4. Design and Analysis of algorithms, Tulasi.B, Suvarna Vani. K Tulip Publications.

14CS3602
INTERNET OF THINGS

Type of course	Programme Core	
Prerequisites	14CS3502 Microprocessor & Microcontroller	
Contact hours	Lecture: 3, Tutorial: 0	
Credits	3	
Max. Marks	CE:30, SE : 70	
Theory/Practical	Theory	
Course Description	<p>Internet of Things is a core course that is part of 6th semester in the B. Tech program for the Computer Science and Engineering curriculum.</p> <p>This course provides an overview of Embedded systems, 8051 programming and basic principles of IOT, various IOT platforms and application development.</p>	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand the basics of Embedded systems & 8051 Programming.
	CO2	Understand the basic principles of IoT.
	CO3	Differentiate the features of various IoT platforms.
	CO4	Able to Design simple IoT applications using Arduinio.
Contribution of Course Outcomes to achieve Program Outcomes	PO a	An ability to apply knowledge of mathematics, science and engineering appropriate to the discipline.
	PO c	An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.
	PO i	An ability to use current techniques, skills, and tools necessary for computing practice.

	PO k	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade offs involved in design choices.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO L
	CO1	M		H									
	CO2	M		M									
	CO3			M						H			
	CO4			H						M		M	

Topics**UNIT I:****INTRODUCTION TO EMBEDDED SYSTEMS:**

Embedded systems, embedded processors, embedded hardware units, embedded software, Examples of embedded systems, embedded Systems on chip, complex systems design and processors, design process in embedded systems.

8051 PROGRAMMING:

Addressing Modes, External data moves, code memory read only data moves, PUSH and POP op codes, data exchanges, byte level and bit level logical operations rotate and swap operations, jump and call program range, jumps, calls & subroutines Interrupts & returns.

UNIT II:**IoT: OVERVIEW**

Internet of Things (IoT): vision, definition, conceptual framework, architectural view, technology behind IoT, Sources of the IoT, M2M Communication, Examples of IoT.

DESIGN PRINCIPLES FOR CONNECTED DEVICES:

IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability.

UNIT III:**HARDWARE FOR IOT:**

Sensors, digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology.

EMBEDDED PLATFORMS FOR IOT:

Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.

UNITIV:**PROGRAMMING THE ARDUNIO:**

Ardunio platform boards anatomy, arduino IDE, coding, using emulator, using libraries, additions in arduino, programming the arduino for IoT.

IoT APPLICATIONS:

Smart metering, e-health, city automation, automotive applications, home automation, smart cards, Communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.

Text books and Reference books	<p>Text books:</p> <ol style="list-style-type: none"> 1. Raj kamal, <i>Embedded Systems Architecture, Programming and Design</i>. 2 ed, McGraw-Hill,2008 2. <u>Kenneth J. Ayala</u>, “8051 MICRO CONTROLLER ARCHITECTURE” Thomson Delmar Learning, 3RD Edition, 2005 3. Raj Kamal “INTERNET OF THINGS”, McGraw-Hill, 1ST Edition, 2016 <p>Reference books:</p> <ol style="list-style-type: none"> 1. ArshdeepBahga, Vijay Madiseti “ Internet of Things(A hands on approach)” 1ST edition, VPI publications,2014
E-resources and other digital material	<p>“Introduction to Internet of Things” by Prof. Raj Jain, Washington University, https://www.youtube.com/watch?v=oc_qzTj26k&list=PLw5h0DiJ9PCxDZkP8pbgpyiDweF3DJ8c (Accessed on 16 February 2016)</p>

14CS3603
SOFTWARE ENGINEERING

Type of course	Programme Core	
Prerequisites	---	
Co-requisites	---	
Contact hours	Lecture: 3, Tutorial: 1	
Credits	3	
Max. Marks	CE : 30, SE : 70	
Theory/Practical	Theory	
Course Description	<p>Software Engineering is a core course that is part of 6th semester in the B. Tech program for the Computer Science and Engineering curriculum.</p> <p>This course is the Study of the tools and techniques used in the lifecycle of large software systems. Topics include waterfall, iterative and incremental software development practices, agile process models; phases of the software lifecycle (e.g. requirements analysis, specifications, design, coding, testing); Unified Modeling Language and other tools for modeling and designing various aspects of software systems; quality assurance and testing.</p>	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand basic concepts of software engineering.
	CO2	Compare different software engineering process models.
	CO3	Analyze the principles of requirement Engineering.
	CO4	Create architectural design for a given project.
	CO5	Apply different testing techniques
Contribution of Course	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline. (CO1)

Outcomes to achieve Program Outcomes	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. (CO2,CO3)											
	PO c	An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.(CO2,CO4)											
	PO i	An ability to use current techniques, skills, and tools necessary for computing practice.(CO3,CO5)											
	PO k	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.(CO2,CO3,CO4,CO5)											
	PO l	An ability to apply design and development principles in the construction of software systems of varying complexity.(CO2,CO3,CO4)											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2			L						M			L
	CO3		L	L						M		H	L
	CO4		L									H	
	CO5			L									
Course Content	UNIT I: Software and Software engineering: The Nature of Software, Defining Software, Software Application Domains, Legacy Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, The Essence of Practice, General Principles, Software Myths. The Software Process: Process Models, A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified												

Process, Personal and Team Process Models, Process Technology, Product and Process.

Agile Development: What Is Agility? Agility and the Cost of Change, What Is an Agile Process? Extreme Programming (XP) Other Agile Process Models, A Tool Set for the Agile Process.

UNIT II:

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Requirements Modelling: Scenarios, Information and Analysis classes: Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling.

Requirements Modelling: Flow, Behavior, Patterns, And Webapps: Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirements Modeling for WebApps.

UNIT III:

Design Concepts: Design within the Context of Software Engineering, the Design Process, Design Concepts, the Design Model.

Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Assessing Alternative Architectural Designs, Architectural mapping using data flow.

Modeling Component-Level Design: What Is a Component? Designing Class-Based Components, Conducting Component-Level Design, and Component level design for Web Apps.

Performing User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design.

UNIT – IV

Software Testing Strategies: A Strategic Approach to

	<p>Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Validation testing, System testing, the art of debugging.</p> <p>Testing Conventional Applications: Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Model-Based Testing, Testing for Specialized Environments, Architectures, and Applications, Patterns for Software Testing.</p>
Text books and Reference books	<p>Text Book:</p> <p>1. Roger S.Pressman, <i>Software Engineering- A Practitioner's Approach</i>. 7thed, Tata McGraw-Hill International</p> <p>Reference Books:</p> <p>1. Ian Somerville, <i>Software Engineering</i>. 6 ed, Pearson Education.</p> <p>2. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, <i>Fundamentals of Software Engineering</i>. 2 ed, PHI.</p> <p>3. RajibMall, <i>Fundamentals of Software Engineering</i>. 2 ed, PHI.</p>
E-resources and other digital material	<p>http://nptel.ac.in/courses/106101061/2</p> <p>http://nptel.ac.in/courses/106101061/5</p>

14CS3604
THEORY OF COMPUTATION

Type of course	Programme Core	
Prerequisites	Digital logic design	
Co-requisites	Discrete Mathematics	
Contact hours	Lecture: 3, Tutorial: 1	
Credits	3	
Max. Marks	CE :30, SE :70	
Theory/Practical	Theory	
Course Description	<p>Theory of Computation is a core course that is part of 5th semester in the B. Tech program for the Computer Science and Engineering curriculum.</p> <p>This course provides an overview basic of formal languages of finite automata techniques, regular sets, and context free grammar. The course will look at Turing machines and undecidability.</p>	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand the basic concepts of formal languages of finite automata techniques.
	CO2	Solve regular expressions and various problems to minimize FA.
	CO3	Apply various languages to construct context free grammar.
	CO4	Solve various problems of applying normal form techniques, Push down automata and Turing Machines.
Contribution of Course Outcomes to achieve Program Outcomes	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline.
	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
	PO i	An ability to use current techniques, skills, and tools

		necessary for computing practice											
	PO k	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M	H										
	CO2	M	H										
	CO3		H	H								L	
	CO4		H	H						L			
Course Content	<p>UNIT I Finite Automata & Regular Expressions: Finite State Systems-Basic Definitions-Deterministic Finite Automata- Non-Deterministic Finite Automata and their equivalence-Finite Automata with a Moves-Regular Expressions-Finite Automata with output.</p> <p>UNIT II Properties of Regular Sets: The Pumping Lemma for regular sets - Closure Properties of Regular Sets-Decision Algorithms for regular sets. The Myhill – Nerode Theorem and minimization of Finite Automata. Context Free Grammars: Context Free Grammars- Derivation Trees-Simplification of context free grammars.</p> <p>UNIT III Chomsky Normal Form-Greibach Normal Form-Pushdown Automata- Informal Description-Definitions-Pushdown Automata Context Free Languages- Properties of Context Free Languages- The Pumping Lemma for CFL’s. Closure Properties of CFL’s- Decision Algorithms for CFL’s.</p> <p>UNIT – IV</p>												

	<p>Turing Machines: Introduction- Turing Machine Model- Computable Languages and functions-Techniques of Turing Machine Construction.</p> <p>Undecidability: Properties of Recursive and Recursively Enumerable languages- Universal Turing Machines (without any reference to undecidable problems).</p>
<p>Text books and Reference books</p>	<p>Text Book:</p> <ol style="list-style-type: none"> 1. John E Hopcroft, Jeffery D Ullman, Introduction to Automata Theory & Languages and Computation . Narosa Publishing House <p>Reference Books:</p> <ol style="list-style-type: none"> 1 Harry R.Lewis and Christos H.Papadimitriou, Elements of the Theory of Computation. ,2 ed. 2 Cohen, Computer Theory . Pearson Education. 3 K. L. P Mishra and N. Chandrasekharan, Theory of Computation Prentice Hall India
<p>E-resources and other digital material</p>	<p>http://nptel.ac.in/courses/106104028/ http://freevideolectures.com/Course/3045/Theory-of-Computation-I#</p>

14CS3605
DATA ANALYTICS

Type of course	Programme Core	
Prerequisites	DBMS	
Co-requisites	Programming in C	
Contact hours	Lecture: 3, Tutorial: 1	
Credits	3	
Max. Marks	CE:30, SE:70	
Theory/Practical	Theory	
Course Description	Data analytics is a core course in the stream of Computer Science & Engineering taught in 6 th semester. This course presents an analytic project lifecycle designed for the particular characteristics and challenges of hypothesis-driven analysis with Big Data. This course also discusses advanced analytical methods, including clustering, classification, regression analysis, time series and text analysis. Specific technologies and tools that support advanced analytics with Big Data. The MapReduce paradigm and its instantiation in the Hadoop ecosystem are discussed.	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand the concepts of Data mining and Big Data Analytics
	CO2	Apply machine learning algorithms for data analytics
	CO3	Analyze various text categorization algorithms
	CO4	Use Technology and tools to solve the Big Data Analytics problems
Contribution of Course Outcomes to	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline.
	PO b	An ability to analyze a problem, and identify and define

achieve Program Outcomes		the computing requirements appropriate to its solution.											
	PO c	An ability to design, implement and evaluate a computer based system, process, component or program to meet desired need.											
	PO i	An ability to use current techniques, skills, and tools necessary for computing practice.											
	PO k	An ability to apply mathematical foundations, algorithmic principles and computer science theory in the modeling and design of computer based systems in a way that demonstrates.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H											
	CO2		H	L						L		L	
	CO3		M	L						L		L	
	CO4		M	M						H		L	
Course Content	<p>UNIT I Data Mining: Data Mining, Kinds of Patterns Can Be Mined, Applications of data mining Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics Data Analytics Lifecycle:Data Analytics Lifecycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results,Operationalize</p> <p>UNIT II Association Rules: Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules,Transactions in a Grocery Store,Validation and Testing; Regression: Linear Regression, Logistic Regression Advanced Analytical Theory and Methods-Classification: Decision Trees, Naïve Bayes; Classification by Back propagation Advanced Analytical Theory and Methods-Clustering: major categories of clustering methods, k-means, k-nearest neighbor;</p>												

	<p>DBSCAN</p> <p>UNIT III</p> <p>Advanced Analytical Theory and Methods-Time Series Analysis: Overview of Time Series Analysis, ARIMA Model;</p> <p>Advanced Analytical Theory and Methods-Text Analysis: Text Analysis Steps, Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency—Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments</p> <p>UNIT IV</p> <p>Advanced Analytics- Technology and Tools: MapReduce and Hadoop: Analytics for Unstructured Data, The Hadoop Ecosystem,</p> <p>In-Database Analytics: SQL Essentials, In-Database Text Analysis.</p> <p>Putting It All Together: Communicating and operationalizing an Analytics Project, Creating the final deliverables, and Data Visualization basics.</p>
<p>Text books and Reference books</p>	<p>Text books:</p> <ol style="list-style-type: none"> 1. Data Science and Big Data Analytics, EMC² Education Services[Unit II,III,IV] 2. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, 2 ed, Elseiver publishers[Unit I] <p>References:</p> <ol style="list-style-type: none"> 1. VigneshPrajapati, Big Data Analytics with R and Hadoop, packt publishing, 2013 2. Bill Franks, Taming The Big Data Tidal Wave, 1st Edition, Wiley, 2012. 3. Frank J. Ohlhorst, Big Data Analytics, 1st Edition, Wiley, 2012.
<p>E-resources and other digital material</p>	<ol style="list-style-type: none"> 1. DrS.Srinath IIIT Bangalore “Data mining and knowledge discovery” Lecture 34 and 35 http://nptel.iitm.ac.in/video.php?subjectId=106106093 2. Prof Nandansudharsanam and Prof B.Ravindran , IIT Madras, http://nptel.ac.in/courses/110106064/23 Lecture on Regression Last accessed March 1st 2016 3. Prof Nandansudharsanam and Prof B.Ravindran , IIT Madras http://nptel.ac.in/courses/110106064/41 Lecture on Association rule mining and big data Last accessed March 1st 2016

14CS3606
CYBER SECURITY

Type of course	Programme Core	
Prerequisites	Data Communication and Computer Networks	
Co-requisites		
Contact hours	Lecture: 4, Tutorial: 1	
Credits	4	
Max. Marks	CE:30, SE :70	
Theory/Practical	Theory	
Course Description	<p>Cyber Security is a core course that is part of 6th semester in the B. Tech program for the Computer Science and Engineering curriculum.</p> <p>This course provides an overview on cryptographic techniques, Network security and fundamentals on various security issues and policies, Roles and Responsibilities in security management.</p>	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand the basic concepts of cryptography and Network Security.
	CO2	Analyze various security characteristics using cryptographic approaches.
	CO3	Analyze root causes of security issues
	CO4	Comply policies and standards to solve security problems.
Contribution of Course Outcomes to achieve Program Outcomes	PO a	An ability to apply knowledge of mathematics, science and engineering appropriate to the discipline.
	PO b	An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.
	PO e	An understanding of professional, ethical, legal, security and social issues and responsibilities
	PO i	An ability to use current techniques, skills, and tools necessary for computing practice.
	PO	An ability to apply mathematical foundations,

	k	algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade offs involved in design choices.
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Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	H							L			
	CO2	H	H							M			
	CO3	H				M				M			
	CO4										H	M	

Course Content	<p>UNIT I Introduction : Types of Attacks, Services, Controls, A model for network security; Cryptography: introduction, Cryptanalysis, Symmetric Key Cryptography: DES, block cipher modes of operations, AES Asymmetric Key Cryptography: RSA algorithm, Key Management : Diffie Hellman Key Exchange</p> <p>UNIT II Authentication functions and Applications: Message Authentication Code : MD5 algorithm, Hash Functions: Secure Hash Algorithm (SHA), Digital Signature schemes, Applications: Kerberos: Version4, Version 5, X. 509 Email Security : Pretty Good Privacy (PGP), IP Security: Architecture, Authentication header, Encapsulating Security Payload</p> <p>UNIT III Web Security: Secure Socket layer: SSL Architecture, Difference between SSL and Transport layer security. Intruders: Introduction, Intrusion Detection Firewalls: Principles, characteristics, Types, configurations. Information Security management: Information Security Threats and Attack Vectors, Common Vulnerabilities and Exposures (CVE)</p>
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	<p>UNIT IV</p> <p>Data Leakage: Introduction, Organizational data classification, Location and pathways, Content awareness, analysis techniques, Data Protection, DLP limitations, DRM-DLP Conundrum</p> <p>Security policies, procedures and Standards: Information Security Policies, Security Policy key elements, Security Standards, Guidelines & Frameworks: COSO, COBIT, ITIL, Security Standards Organizations, Information Security Laws, Regulations & Guidelines.</p> <p>Security Management-Roles & Responsibilities: Information and data security team structure, Security incident response team.</p>
<p>Text books and Reference books</p>	<p>Text Books:</p> <p>[1]William Stallings, Cryptography and Network Security: Principles and Practice. 5th edition, Pearson Education.</p> <p>[2]“Security Analyst”, Student Hands Book, APSSDC& NASSCOM, 2015</p> <p>Reference Books:</p> <p>[1]Eric Maiwald, Fundamentals of Network Security, Mc Graw Hill, 2010.</p> <p>[2]Nina Godbole, CyberSecurity, 5th Edition, Wiley, 2015</p> <p>Michael E. Whitman et.al, “Management of Information Security”, Cengage, 2014</p>

14CS3651
CASE TOOLS LAB

Type of course	Programme Core	
Prerequisites	--	
Co-requisites	Software Engineering	
Contact hours	Lecture: 0, Tutorial: 0 Practical : 03	
Credits	2	
Max. Marks	CE : 30, SE : 70	
Theory/Practical	Practical	
Course Description	This lab course is attached to Software Engineering theory course. This course supports the application of Unified Modeling Language and other tools for modeling and designing various aspects of software systems.	
Course assessment methods	Continuous evaluation, Semester end examination	
Course outcomes	CO1	Understand basic concepts of software engineering.
	CO2	Compare different software engineering process models.
	CO3	Analyze the principles of requirement Engineering.
	CO4	Create architectural design for a given project.
	CO5	Apply different testing techniques
Tasks	Task 1: Overview of SDLC:A Study Task 2: Studying various phases of waterfall model. Task 3: Estimation of Project Metrics using COCOMO model	

	<p>Task 4: Identifying the Software Requirement from problem statements</p> <p>Task 5: Project Planning</p> <p>Task 6: Capturing use case and modeling use case diagram for the given problem</p> <p>Task 7: System modeling</p> <p>Task 8: OOA: Identifying Domain Classes from the problem statement and State Transition Diagram.</p> <p>Task 9: Interaction diagrams: Sequence and collaboration diagrams and Flow of events and activity diagram</p> <p>Task 10: Software Design: software architecture and object oriented design</p> <p>Task 11: Component and Deployment diagrams</p> <p>Task 12: Estimation of test coverage metrics and Structural Complexity</p> <p>Task 13: Software Testing</p> <p>Task 14: Design Test Suits</p>
<p>Text books and Reference books</p>	<p>Text Book:</p> <ol style="list-style-type: none"> 1. Roger S.Pressman, <i>Software Engineering- A Practitioner's Approach</i>. 7thed, Tata McGraw-Hill International 2. Ian Somerville, <i>Software Engineering</i>. 6 ed, Pearson Education. 3. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, <i>Fundamentals of Software Engineering</i>. 2 ed, PHI. 4. RajibMall, <i>Fundamentals of Software Engineering</i>. 2 ed, PHI.

14CS3652
INTERNET OF THINGS LAB

Type of course	Programme Core	
Prerequisites	Microprocessor LAB	
Co-requisites		
Contact hours	Lecture: 0, Tutorial: 0 Practical : 03	
Credits	2	
Max. Marks	CE:30, SE : 70	
Theory/ Practical	Practical	
Course Description	<p>Internet of Things is a core course that is part of 6th semester in the B. Tech program for the Computer Science and Engineering curriculum.</p> <p>This course provides an overview of 8051 micro controller and basic principles of IOT, various IOT platforms and application development.</p>	
Course assessment methods	Semester end exam	
Course outcomes	CO1	Understand the basics of Embedded systems & 8051 Programming.
	CO2	Understand the basic principles of IoT.
	CO3	Differentiate the features of various IoT platforms.
	CO4	Able to Design simple IoT applications using Arduinio.
Contribution of Course Outcomes to achieve Program Outcomes	PO a	An ability to apply knowledge of mathematics, science and engineering appropriate to the discipline.
	PO c	An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.
	PO i	An ability to use current techniques, skills, and tools necessary for computing practice.
	PO k	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M		H									
	CO2	M		M									
	CO3			M						H			
	CO4			H						M		M	

Topics	<p>PART I: Experiments on 8051 Microcontroller</p> <p>Task 1: Basic Assembly Language programming on 8051 μC (Arithmetic, Data Transfer, Logical, Bit Manipulation and Program control)</p> <p>Task 2: Interfacing LCD controller with 8051 μC</p> <p>Task 3: Interfacing Stepper Motor with 8051 μC</p> <p>Task 4: Program for Seven Segment Display</p> <p>Task 5: Program for A/D and D/A Conversion</p> <p>PART II: Experiments based on Arduino Uno & Raspberry pi</p> <p>Task 6: Interfacing DHT11 Humidity Sensor with Arduino Uno Board.</p> <p>Task 7: Intruder Detection using PIR Motion sensor and Arduino Uno Board.</p> <p>Task 8: Distance Measurement using Ultra Sonic Sensor (HC-SR04) and Arduino Uno Board.</p> <p>Task 9 : ESP8266 WI-FI Module Interface with Arduino and DHT11 data upload to the cloud server.</p> <p>Task 10: Voice – Activated Arduino Bluetooth Android.3</p> <p>Task 11: Configuring Raspberry pi and sensor interfacing</p> <p>Task 12: Installation of NodeJS on Raspberry Pi and simple Hello World Program</p> <p>Task 13: Complete study on ARM Cortex processor.</p>
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Text books and Reference books	Text books: <ol style="list-style-type: none">1. Kenneth J. Ayala, “8051 MICRO CONTROLLER ARCHITECTURE” Thomson Delmar Learning, 3rd Edition, 20052. Raj Kamal “INTERNET OF THINGS”, McGraw-Hill, 1ST Edition, 2016 Reference books: <ol style="list-style-type: none">1. ArshdeepBahga, Vijay Madiseti “ Internet of Things(A hands on approach)” 1ST edition, VPI publications,2014
E-resources and other digital material	“Introduction to Internet of Things” by Prof. Raj Jain, Washington University, https://www.youtube.com/watch?v=oc_qzTj26k&list=PLw5h0DiJ9PCxDZkP8pbgpyiDweF3DJ8c (Accessed on 16 February 2016)

14CS3653**DATA ANALYTICS LAB**

Type of course	Programme Core	
Prerequisites	DBMS	
Co-requisites	Programming in C	
Contact hours	Lecture: 0, Tutorial: 0 Practical : 03	
Credits	2	
Max. Marks	CE : 30, SE : 70	
Theory/Practical	Practical	
Course Description	Data analytics is a core course in the stream of Computer Science & Engineering taught in 6 th semester. This course presents an analytic project lifecycle designed for the particular characteristics and challenges of hypothesis-driven analysis with Big Data. This course also discusses advanced analytical methods, including clustering, classification, regression analysis, time series and text analysis. Specific technologies and tools that support advanced analytics with Big Data. The MapReduce paradigm and its instantiation in the Hadoop ecosystem are discussed.	
Course assessment methods	Assignments, Sessionals, Home assignment, Semester end exam	
Course outcomes	CO1	Understand the concepts of Data mining and Big Data Analytics
	CO2	Apply machine learning algorithms for data analytics
	CO3	Analyze various text categorization algorithms
	CO4	Use Technology and tools to solve the Big Data Analytics problems
Contribution of Course	PO a	An ability to apply knowledge of computing and mathematics appropriate to the discipline. (CO1)

Outcomes to achieve Program Outcomes	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. (CO2,CO3,CO4)										
	PO c	An ability to design, implement and evaluate a computer based system, process, component or program to meet desired need.(CO2,CO3,CO4)										
	PO k	An ability to apply mathematical foundations, algorithmic principles and computer science theory in the modeling and design of computer based systems in a way that demonstrates. (CO2,CO3,CO4)										
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k
	CO1	H										
	CO2		H	L						L		L
	CO3		M	L						L		L
	CO4		M	M						H		L
Tasks	<p>Task 1:</p> <p>Preprocessing: Removal specified attribute, discrimination of a continuous valued attribute, standardization and normalization of data.</p> <p>Task 2:</p> <p>Association Mining: Finding Association Rules using Apriori principle for AllElectronics Transaction Dataset.</p> <p>Task 3:</p> <p>Classification: classify the AllElectronics dataset records using Decision Tree based classification model.</p>											

Task 4:

Classification: classify the AllElectronics dataset records using Multilayer Feed forward Network classification model

Task 5:

Clustering: Use k-means clustering technique to classify the given dataset

Task 6:

Hadoop file management: Adding files and directories ,Retrieving files , Deleting files

Task 7:

Word Count application: MapReduce program to understand MapReduce Paradigm

Task 7:

Pig Latin scripts : To sort, group, join for a given dataset

Task 8:

NO-SQL database –Apache Hbase: To set Hbase shell environment and to create tables, insert rows, display contents

Task 9:

Database manipulation using Hive: To create, alter, drop databases and views

Task 9:

Functions and indexes in Hive

Task 10:

Use Hive to Drop Functions and indexes

Text books and Reference books

Text books:
[1] Data Science and Big Data Analytics, EMC² Education

	<p>Services[Unit II,III,IV]</p> <p>[2] Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, 2 ed, Elseiver publishers[Unit I]</p> <p>References:</p> <p>[1] VigneshPrajapati, Big Data Analytics with R and Hadoop, packt publishing, 2013</p> <p>[2] Bill Franks, Taming The Big Data Tidal Wave, 1st Edition, Wiley, 2012.</p> <p>[3] Frank J. Ohlhorst, Big Data Analytics,1st Edition, Wiley, 2012.</p>
<p>E-resources and other digital material</p>	<p>[1] Dr S.Srinath IIT Bangalore “Data mining and knowledge discovery” Lecture 34 and 35 http://nptel.iitm.ac.in/video.php?subjectId=106106093</p> <p>[2] Prof Nandan sudharsanam and Prof B.Ravindran , IIT Madras, http://nptel.ac.in/courses/110106064/23 Lecture on Regression Last accessed March 1st 2016</p> <p>[3] Prof Nandan sudharsanam and Prof B.Ravindran , IIT Madras http://nptel.ac.in/courses/110106064/41 Lecture on Association rule mining and big data Last accessed March 1st 2016</p>

14CS3654
TERM PAPER

Type of course	Programme Core	
Prerequisites		
Co-requisites		
Contact hours	Lecture: 1	
Credits	2	
Max. Marks	CE:30, SE:70	
Theory/Practical	Theory	
Course Description		
Course assessment methods	Term paper report and Presentation	
Course outcomes	CO1	Formulate a real world problem and develop its requirements (a, b, c, g, l)
	CO2	Design a prototype for a set of requirements (a,b,e,g,l)
	CO3	Express technical and behavioral ideas and thoughts in oral form (f,h)
	CO4	Practice in and possibly moderate discussions that lead to making decisions (h,I,j)
	CO5	Express technical ideas strategies and methodologies in written form (f, i)
	CO6	Prepare and conduct oral presentations (I, f)
	CO7	Understand new tools algorithms and/or techniques contribute to the software solution of the term paper (j,k)
Contribution of Course Outcomes to achieve Program Outcomes	PO a	An ability to apply knowledge of mathematics, science and engineering appropriate to the discipline.
	PO b	An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
	PO c	An ability to design, implement and evaluate a computer-based system, process, component, or program to meet

		desired needs.
	PO d	An ability to function effectively on teams to accomplish a common goal.
	PO e	An understanding of professional, ethical, legal, security, and social issues and responsibilities.
	PO f	An ability to communicate effectively with a range of audiences.
	PO g	An ability to analyze the local and global impact of computing on individuals, organizations and society.
	PO h	Recognition of the need for, and an ability to engage in, continuing professional development.
	PO i	An ability to use current techniques, skills, and tools necessary for computing practice.
	PO j	Demonstrate knowledge and understanding of engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
	PO k	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	M	M				L				M	
	CO2	H	M			L						M	
	CO3						H		L				
	CO4								L	H	M		
	CO5						H			M			
	CO6						H					L	
	CO7										H	M	

SEMESTER VII

14CS3701

COMPILER DESIGN

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practice:	4 - 1 - 0
Prerequisites:	Programming in C Theory of Computation	Continuous Evaluation: Semester end Evaluation:	30 70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the functionality of each phase involved in Compilation process.											
	CO2	Implement the parsing techniques for the given programming construct described in Context Free Grammar.											
	CO3	Identify the suitable intermediate representation based on the storage administration.											
	CO4	Apply different error recovery routines to recover the errors seen at different phases of compilation											
	CO5	Generate the machine code by considering all the functionalities involved in different phases of the compilation process											

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M	M										
	CO2	M	M							M			
	CO3	H											
	CO4	M	M							L			
	CO5		M										M

Course Content	UNIT-I Introduction to compilers: Compilers and translators, why do we need translators?, the structure of a compiler, Lexical Analysis, Syntax analysis, Intermediate Code generation, Optimization, Code generation, Bookkeeping, Error handling, Compiler-writing tools.
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Lexical Analysis: - The role of lexical analyzer, A simple approach to the design of lexical analyzer, Lex tool

UNIT-II

Basic Parsing Techniques: Top Down parsing, Predictive parsers

Automatic Construction of efficient parsers: LR parsers, The canonical collection of LR(0) items, Constructing SLR parsing tables, Constructing canonical LR parsing tables, Constructing LALR parsing tables, Using ambiguous grammars, An automatic parser generator, Implementation of LR parsing tables, Constructing LALR sets of items.

UNIT-III

Syntax – Directed Translation: Syntax – directed translation schemes, Implementation of Syntax-directed translators, Intermediate code, Postfix notation, Parse trees and syntax trees, Three-address code, quadruples, and triples, Translation of assignment statements, Boolean expressions, Statements that alter the flow of control, Postfix translations, Translation with a top-down parser.

More about Translation: Procedure calls & Record Structures

Symbol Tables: The contents of a symbol table, Data structures for symbol tables, Representing scope information.

UNIT-IV

Run – time Storage Administration: – Implementation of simple stack allocation scheme, Implementation of block – structured languages;

Error Detection and Recovery: Errors, Lexical-phase errors, Syntactic-phase errors, Semantic errors.

Code Generation: A simple code generator, Code generation from DAG's.

<p>Text books and Reference books</p>	<p>Text Books:</p> <p>[1]. Alfred V.Aho, Jeffrey D. Ullman, ‘Principles of Compiler Design’, Narosa Publishing, 2002</p> <p>[2]. Aho, Ravi Sethi, JD Ullman, ‘Compilers Principles, Techniques and Tools’, Pearson Education/Prentice Hall of India , 2007</p> <p>Reference Books:</p> <p>[1]. Louden , ‘Compiler Construction : Principle and Practice ‘Cengage Publications, 1997.</p> <p>[2]. Jean-Paul Trembly, Paul G. Sorenson, ‘ The Theory and Practical of Compiler Writing’, BS Publications, 2009</p>
<p>E-resources and other digital material</p>	<p>[1]. Compiler Design by Prof.Y.N.Srikant,Department of Computer Science and Automation, IISC Bangalore. http://nptel.iitm.ac.in/courses/106108052,</p> <p>[2]. NPTEL lectures by Professor Sanjeev K Agarwal, Dept. of CSE IIT Kanpur http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/compiler- desing/ui/TOC.htm</p>

14CS3702

CLOUD COMPUTING

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practice:	4 - 0 - 0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the evolution of cloud computing paradigm and its architecture											
	CO2	Explain and characterize different cloud deployment models and service models											
	CO3	Identify the technological drivers of cloud computing paradigm											
	CO4	Identify the security issues in cloud computing											

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H											
	CO2		M										
	CO3					M							
	CO4										M		

Course Content	<p>UNIT I</p> <p>Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Biocomputing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing, Network Computing</p> <p>Cloud Computing Fundamentals: Motivation for Cloud Computing: The Need for Cloud Computing. Defining Cloud Computing: NIST Definition of Cloud Computing, Cloud</p>
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Computing Is a Service, Cloud Computing Is a Platform 5-4-3
Principles of Cloud computing: Five Essential Characteristics, Four
Cloud Deployment Models, Three Service Offering Models Cloud
Ecosystem, Requirements for Cloud Services, Cloud Application,
Benefits and Drawbacks

Cloud Computing Architecture and Management : Cloud
Architecture, Anatomy of the Cloud, Network Connectivity in Cloud
Computing, Applications on the Cloud, Managing the Cloud,
Migrating Application to Cloud

UNIT II

Cloud Deployment Models : Private Cloud, Public Cloud,
Community Cloud, Hybrid Cloud

Cloud Service Models : Infrastructure as a Service, Platform as a
Service, Software as a Service, Other Cloud Service Models

Technological Drivers for Cloud Computing: SOA and Cloud:
SOA and SOC, Benefits of SOA, Technologies Used by SOA,
Similarities and Differences between SOA and Cloud Computing.
Virtualization: Approaches in Virtualization, Hypervisor and Its
Role, Types of Virtualization Multi-core Technology, Memory and
Storage Technologies, Networking Technologies Web 2.0, Web 3.0

UNIT III

Programming Models in Cloud : BSP Model, MapReduce Model,
SAGA, Transformer, Grid Batch Framework

Operating Systems : Role of OS in Cloud Computing, Features of
Cloud OS, Cloud OS Requirements, Cloud-Based OS Application
Environment

Application Environment : Need for Effective ADE, Application
Development Methodologies, Power of Cloud Computing in

Application Development

Cloud Application Development Platforms: Windows Azure, Google App Engine, Force.com, Manjrasoft Aneka

Cloud Computing APIs: Rackspace, IBM, Intel

Software Development in Cloud : Introduction, Different perspectives on SaaS development, New challenges, Cloud aware software development using PaaS technology

UNIT IV

Networking for Cloud Computing : Introduction, Overview of Data Center Environment, Networking Issues in Data Centers

Cloud Service Providers : Introduction, EMC, Google, Amazon Web Services, Microsoft, IBM, Salesforce, Rackspace

Open Source Support for Cloud

Introduction, Open Source in Cloud Computing: An Overview, Difference between Open Source and Closed Source, Advantages of Having an Open Source

Open Source Tools for IaaS: Eucalyptus, Openstack

Open Source Tools for PaaS: Red Hat OpenShift Origin

Open Source Tools for SaaS: Google Drive, Dropbox

Open Source Tools for Research: CloudSim

Security Aspects

Data Security, Virtualization Security, Network Security Platform-Related Security

Security Issues in Cloud Service Models, Software-as-a-Service Security Issues, Platform-as-a-Service Security Issues, Infrastructure-as-a-Service Security Issues

Advanced Concepts in Cloud Computing

Intercloud, Cloud Management, Mobile Cloud, Media Cloud, Interoperability and Standards, Cloud Governance, Computational Intelligence in Cloud, Green Cloud, Cloud Analytics

**Text books
and
Reference
books****Text Books:**

[1]. K. Chandrasekaran, Essentials of Cloud Computing, CRC Press, 2015

Reference Books:

- [1]. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010
- [2]. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011
- [3]. Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012

14CS4703A

MOBILE COMPUTING

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture -Tutorial - Practice:	3 - 0 - 0
Prerequisites:	Data Communications Computer Networks	Continuous Evaluation: Semester End Evaluation: Total Marks:	30 70 100

Course outcomes	Upon successful completion of the course, the student will be able to:													
	CO1	Understand the concepts and techniques related to Mobile Communications												
	CO2	Analyze the architectures, protocols and features of GSM, GPRS, UMTS, Mobile IP, DHCP and issues related to Mobile Databases and Mobile OS												
	CO3	Analyze the architectures, protocols and features of MANETs and WSN												
	CO4	Examine the implementation aspects of HSPA, LTE, 4G, WiMAX and Mobile Application Development												
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	
	CO1	M	H											
	CO2		H							L				
	CO3	M	H							L				
	CO4	M	H											
Course Content	UNIT I Introduction to Mobile Computing and Wireless Networking: What is Mobile Computing, MC Vs Wireless Networking, MC applications, Characteristics of MC, Structure of MC Application, Cellular Mobile Communication, GSM, GPRS, UMTS MAC Protocols: Properties required of MAC protocols,													

Wireless MAC protocols, Taxonomy, Fixed Assignment Schemes (FDMA, TDMA, CDMA), Random Assignment Schemes, Reservation-based Schemes, The 802.11 Standard, MAC for Ad Hoc Networks

UNIT II

Mobile Internet Protocol: Mobile IP, Packet delivery, Overview, Desirable Features, Key Mechanism, Route Optimization, DHCP

Mobile Transport Layer: Overview and Terminologies of TCP/IP, Improvement in TCP performance

Mobile Databases: Issues in Transaction processing, Transaction processing environment, Data Dissemination, Transaction Processing in Mobile Environment, Data Replication, Mobile Transaction Models, Rollback Process, Two-phase Commit protocol, Query Processing, Recovery

UNIT III

Mobile Adhoc Networks: Characteristics, Applications, MANET design issues, Routing, Essentials of Traditional Routing Protocols, Routing in MANET's, Popular protocols, VANETs, MANET Vs VANET, Security Issues, Attacks and Countermeasures

Wireless Sensor Networks: WSN Vs MANET, Applications, Architecture of a Sensor node, Design Challenges, Characteristics, WSN Routing Protocols, Target Coverage

UNIT – IV

OS for Mobile Computing: OS responsibilities, Mobile O/S, Special Constraints and Requirements of Mobile O/S, Comparative study of Mobile O/S HSPA 3G network, LTE, WiMax, Broadband Wireless Access, 4G Networks – Requirements & Design, Modulation & Multiplexing techniques for 4G, HSOPA, LTE Advanced, WiMax advanced.

Mobile Application Development and Protocols: Mobile Devices as Web Clients, WAP, J2ME, Android Software Development Kit (SDK) – Android SDK,

	Features, Android Application Components, Android Software Stack Structure, Advantages
Textbooks and Reference books	<p>Text Books:</p> <p>[1] Prasant Kumar Pattnaik, “Fundamentals of Mobile Computing”, PHI, 2012</p> <p>[2] Raj Kamal, “<i>Mobile Computing</i>”, Second Edition, Oxford University Press-New Delhi, 2012</p> <p>Reference Books:</p> <p>[1] Dr. Sunil kumar S. Manavi, Mahabaleshwar S. Kakkasageri, “<i>Wireless and Mobile Networks, concepts and protocols</i>”, Wiley India, 2014,</p> <p>[2] William Stallings “Wireless Communications and Networks”, Second Edition, Pearson Education</p> <p>[3] Jochen Schiller, “<i>Mobile Communications</i>”, Addison-Wesley, Second Edition, 2009</p>
E-resources and other digital material	<p>1) https://www.cse.iitb.ac.in/~mythili/teaching/cs653_spring2014/index.html</p> <p>2) http://www.iitg.ernet.in/scifac/qip/public_html/cd_cell/EC632.pdf</p> <p>3) http://people.ee.duke.edu/~romit/courses/s11/ece256-sp11.html</p>

14CS4703B

INFORMATION RETRIEVAL SYSTEMS

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3- 0 -0
Prerequisites:	Database Management Systems Data Mining	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the overview of Information Retrieval Systems											
	CO2	Compute the process of indexing and Information Extraction											
	CO3	Learn the stemming algorithms and implement with various data structures											
	CO4	Understand the concepts of term clustering and Information Visualization											
	CO5	Learn various text search algorithms											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L	L		L	M				L			
	CO2	L	M		M	H				H			
	CO3	L	L		L	M				L			
	CO4	M	M		L	L				L			
	CO5	M	L		L	M				L			
Course Content	<p>UNIT I:</p> <p>Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses.</p> <p>Information Retrieval System Capabilities: Search, Browse</p> <p>UNIT II:</p> <p>Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction.</p> <p>Data Structures: Introduction, Stemming Algorithms, Inverted file</p>												

structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT III:

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages.

Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

UNIT – IV

User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, weighted searches of Boolean systems, Searching the Internet and hypertext.

Information Visualization: Introduction, Cognition and perception, Information visualization technologies.

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems.

Information System Evaluation: Introduction, Measures used in system evaluation, Measurement example – TREC results.

Text books and Reference books

Text Book:

[1]. M. T. M. Gerald J Kowalski, Information Storage and Retrieval Systems: Springer International Edition, 2005.

Reference Books:

[1]. W. B. Frakes, Ricardo Baeza-Yates, Information Retrieval Data Structures and Algorithms: Prentice Hall PTR, 2000.

[2]. R. Baeza-Yates, Modern Information Retrieval: Pearson Education, 2000.

[3]. R. Korfhage, Information Storage & Retrieval: John Wiley & Sons, 2006.

14CS 3703C

BIOINFORMATICS

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Know the biological sequence and structural databases											
	CO2	Understand the genome information and DNA sequence analysis											
	CO3	Describe pair-wise and multiple sequence alignment methods											
	CO4	Analyze secondary structure DNA data.											

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L					M						
	CO2	L					M						
	CO3	L					M						
	CO4	L	M				M						

Course Content	<p>UNIT I</p> <p>Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition and prediction, Folding problem, Sequence Analysis, Homology and Analogy.</p> <p>Protein Information Resources: Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.</p> <p>UNIT II</p> <p>Genome Information Resources: DNA sequence databases, specialized genomic resources</p>
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DNA Sequence analysis: Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases

UNIT III

Pair wise alignment techniques: Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dot plot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

Multiple sequence alignment: Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching.

UNIT IV

Secondary database searching: Importance and need of secondary database searches, secondary database structure and building a sequence search protocol

Analysis packages: Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

Text books and Reference books

Text Books:

[1]. T K Attwood & D J Parry-Smith, Introduction to Bioinformatics, Addison Wesley Longman, New Delhi.

Reference Books:

[1]. Michel Claveriw, CerdricNotredame, "Bioinformatics- A Beginner's Guide", WILEY DreamTech India Pvt. Ltd,2000.

[2]. Scott Markel &Darryl Leon "Sequence Analysis in A Nutshell", O'REILLY,2003.

14CS4703 D

HIGH PERFORMANCE COMPUTING

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:	Data Structures, Computer Organization & Architecture	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:													
	CO1	Understand the parallel programming platforms for parallel computer systems.												
	CO2	Optimize the performance of parallel programs.												
	CO3	Understand the working group communication operations of MPI.												
	CO4	Understand algorithm for multicore processors systems using MPI and thread Techniques												
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	
	CO1	M	H			M								
	CO2		H	L										
	CO3	M	H			M								
	CO4	M	H	L		M								
Course Content	UNIT I Parallel Programming Platforms: Implicit parallelism: Trends in Microprocessor Architectures, Limitations of memory system performance, Dichotomy of parallel computing platforms, physical organization of parallel platforms, Routing mechanisms for interconnection networks. Principles of Parallel Algorithm Design: Preliminaries, decomposition Techniques, Characteristics of tasks and													

interactions, mapping techniques for load balancing, parallel algorithm models.

UNIT II

Basic communication operations: One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather.

Analytical modeling of parallel programs: sources of overhead in parallel programs, performance metrics for parallel systems, The Effect of granularity on performance, scalability of parallel systems.

UNIT III

Programming using the message passing paradigm: Principles of Message passing programming, The building blocks: Send and Receive Operations, MPI: the message passing interface, collective communication and computation Operations.

Programming shared address space platforms: Thread Basics, why Threads, Thread Basics: Creation and Termination, OpenMP: a standard for Directive based Parallel Programming.

UNIT – IV

Dense Matrix Algorithms: Matrix-Vector Multiplication, Matrix – Matrix Multiplication.

Sorting: Issues in Sorting on Parallel Computers, Sorting Networks, Bubble sort and its variants.

Graph Algorithms: Minimum Spanning Tree: Prim's Algorithm, Single-Source shortest paths: Dijkstra's Algorithm.

Textbooks and

Text Book:

[1] Ananth Grama, Anshul Gupta, George Karypis, Vipin

Reference books

Kumar: Introduction to Parallel Computing, Second Edition
Pearson Education, 2007

Reference Books:

[1] Michael J. Quinn, Parallel Programming in C with MPI and OpenMP McGraw-Hill International Editions, Computer Science Series, 2004.

14CS4703E

DATA VISUALIZATION

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:	Software Engineering Design and Analysis of Algorithms	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand Visualization stages for different types of data											
	CO2	Apply Visualization algorithms for good visualization											
	CO3	Analyse various visualization and modelling techniques											
	CO4	Use Visualization relationships for correlation, distribution and to Identify Outliers											

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2		M									M	
	CO3		M									M	
	CO4									M			

Course Content	<p>UNIT I</p> <p>Foundations for an applied science of data visualization:</p> <p>Visualization stages – Experimental Semiotics based on Perception – Gibson’s Affordance theory – A Model of Perceptual Processing – stage 1. Parallel processing to extract low level properties of the visual scene, Stage 2: Pattern perception, stage 3: Visual working memory, Costs and Benefits of Visualization – Types of Data: entities, relationships, attributes of</p>
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entities or relationships, data dimensions, types of numbers, uncertainty, and operations considered as data.

UNIT II

The Visualization Pipeline: Conceptual Perspective, Implementation Perspective. Algorithm Classification, Scalar Visualization: Color Mapping, Designing Effective Colormaps, Contouring, Height Plots, Vector Visualization: Vector Glyphs, Vector Color Coding, Displacement Plots, Texture-Based Vector Visualization

UNIT III

Domain- Modeling Techniques: Cutting, Selection, Grid Construction from Scattered Points, Image Visualization: Image Data Representation, Image Processing and Visualization, Information Visualization: What Is Infovis?, Table Visualization, Visualization of Relations, Multivariate Data Visualization, Text Visualization

UNIT – IV

Visualizing Proportions: what to look for in proportions, parts of a whole, proportions over a time, **Visualizing relationships:** what relationships to look for, correlation, distribution, comparison, **Spotting Differences:** comparing across multiple variables, reducing dimensions, searching for outliers, **Visualising spatial relationships:** specific locations, regions, over space and time

Text books and Reference books

Text Book:

- [1].Colin Ware “Information Visualization Perception for Design”, 3rd edition, Morgan Kaufman 2012. (UNIT 1)
- [2].Alexandru C. Telea, “Data Visualization: Principles and Practice,” A. K. Peters Ltd, 2008.(Unit 2,3)
- [3].Nathan Yau’s Visualize This: The FlowingData Guide to Design,

	<p>Visualization, and Statistics 2011wiley Publisher(Unit 4)</p> <p>Reference Books:</p> <p>[1]. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.</p> <p>[2]. Edward R. Tufte, "The visual display of quantitative information", Second Edition, Graphics Press, 2001.</p>
E-resources and other digital material	<p>[1] Professor Sophie Engle, University of San Francisco, California Data Visualization Course Available: http://datavis.cs.usfca.edu/ Last Accessed November 30, 2015</p>

14HS1704

ENGINEERING ECONOMICS AND FINANCE

Course Category:	Institutional Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand various forms of organizations and principles of management											
	CO2	Understand the various aspects of economics related to the firm											
	CO3	Acquire knowledge on Human resources and Marketing functions											
	CO4	Understand best alternatives for various investment decisions and different depreciation methods											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1				M			M	M	L			
	CO2			H	H	H							
	CO3				M		M	L		L			
	CO4			H	H	H							
Course Content	UNIT I Forms of Business Organization: Salient Features of Sole Proprietorship, Partnership, Joint Stock Company: Private Limited and Public Limited Companies, Co-operative Society and Public Sector. Management: Introduction to Management, Management an Art												

or Science, Functions of Management, Principles of Scientific Management, Henri Fayol's Principles of Management.

UNIT II

Economics: Introduction to Basic Economic Concepts, Utility Analysis: Marginal Utility and Total Utility, Law of Diminishing Marginal Utility, Law of Equi Marginal Utility, Demand Analysis: Theory of Demand: Demand Function, Factors Influencing Demand, Demand Schedule and Demand Curve, Shift in Demand, Elasticity of Demand: Elastic and Inelastic Demand, Types of Elasticity, Factors of Production, Production Function, Production with one variable input, Isoquants, Returns to Scale, Cost Function: Cost - Output Relationship in short run and long run, Relationship between AC and MC. Supply Analysis: Supply Schedule and Supply Curve, Factors Influencing Supply, Supply Function, Theory of firm: Price determination under equilibrium of firm, Perfect competition.

UNIT III

Human Resource Management: Meaning and difference between Personnel Management and Human Resource Management, Functions of Human Resource Management, Recruitment and Selection Process.

Marketing Management: Concept of Selling And Marketing – Differences, Functions of Marketing, Product Life Cycle, Concept of Advertising, Sales Promotion, Types of Distribution Channels, Marketing Research, Break-Even Analysis - Problems.

UNIT IV

Financial Management: Functions of Financial Management, Time value of money with cash flow diagrams, Calculation of

Simple and Compound Interest -Present worth, Future worth, Annual Equivalent, Methods of Evaluating Alternatives under Present worth method, Future worth method, Annual Equivalent method for choice of decision making among alternative projects.

Depreciation: Causes of depreciation, Factors influencing depreciation, common methods of Depreciation: Straight Line Method, Declining Balance Method, Sum of Year's Digits Method –Problems.

Production Management: An Overview and significance of Production Management, Objectives, Scope of production management, Production cycle.

**Text books and
Reference books**

Text Book:

- [1]. P.Premchand Babu and M.Madan Mohan” *Managerial Economics and Financial Analysis*” Himalaya publishing house 2011 edition
- [2] M. Mahajan”*Industrial Engineering and Production Management*” 2nd Edition Dhanpat Rai Publications.

Reference Books:

- [1]. NaGerald J. Thuesen , W.J. Fabrycky, *Engineering Economy* 9th Edition
- [2]. Philip Kotler & Gary Armstrong “*Principles of Marketing*” ,pearson prentice Hall,New Delhi,2012 Edition.
- [3]. B.B Mahapatro, “*Human Resource Management*”, New Age International , 2011
- [4] IM Pandey, “*Financial Management*” Vikas Publications 11th Edition
- [5] R.Panneer selvam, “*Production and operations management*”, PHI Learning pvt Ltd, New Delhi, 2012

14CS4705A

IMAGE PROCESSING

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture- Tutorial- Practice:	3- 0 - 0
Prerequisites:	Linear Algebra and Differential Equations	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Explain the fundamental concepts and basic relationship among the pixels.											
	CO2	Differentiate the Spatial and Frequency domain concepts in image enhancement.											
	CO3	Identify the image restoration filter for degraded image.											
	CO4	Compare the lossy and lossless image compression techniques											
	CO5	Explain the image segmentation techniques											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2	M		L								L	
	CO3	L											
	CO4	M	M	L									L
	CO5	L		L						L			L
Course Content	<p>UNIT I</p> <p>Introduction: Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System</p> <p>Digital Image Fundamentals: Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels</p> <p>UNIT II</p> <p>Intensity transformations and Spatial filtering: Some Basic intensity transformation functions, Histogram Processing,</p>												

	<p>fundamentals of Spatial Filtering, Smoothing spatial Filters, Sharpening spatial Filters</p> <p>Filtering in Frequency Domain: The basics of filtering in the frequency domain, Image Smoothing frequency-domain Filters, Image Sharpening Frequency-domain Filters</p> <p>UNIT III</p> <p>Image restoration: A model of the image degradation/restoration process, noise models, restoration in the presence of noise—only spatial filtering, Wiener filtering, constrained least squares filtering</p> <p>Color image processing: Fundamentals, color models</p> <p>UNIT IV</p> <p>Image Compression: Fundamentals, image compression models, some basic compression methods</p> <p>Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region-Based Segmentation</p>
<p>Text books and Reference books</p>	<p>Text Book:</p> <p>[1] Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, 3rd edition, PHI/Pearson Education, 2007</p> <p>Reference Books:</p> <p>[1]. A.K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall India, 4th edition, 1989.</p> <p>[2]. Madhuri. A. Joshi, “Digital Image Processing”, PHI, 3rd edition, 2006</p>
<p>E-resources and other digital material</p>	<p>[1]. Prof. P.K. Biswas. (16th may, 2015), Digital Image Processing Available: http://www.nptel.ac.in/courses/117105079/</p> <p>[2]. Aggelos K. Katsaggelos, Northwestern University. “Fundamentals of Digital Image and Video Processing”, Started on March 30th - June 19th 2015, Available at: https://www.coursera.org/course/digital</p>

14CS4705B**SEMANTIC WEB AND SOCIAL NETWORKS**

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture- Tutorial- Practice:	3- 0 - 0
Prerequisites:	Data Structures Database Management Systems	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	CO1	Understand the key differences among generations of the web and social networks
	CO2	Use Ontology based knowledge representation techniques for aggregating and reasoning with social network data.
	CO3	Develop semantic based web applications
	CO4	Analyze the data generated by social network for social structures

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M											
	CO2		M										
	CO3									M			
	CO4											L	

Course Content	<p>UNIT I</p> <p>The Semantic web: Limitations of the current Web, The semantic solution, Development of the Semantic Web, The emergence of the social web.</p> <p>Social Network Analysis: What is network analysis?, Development of Social Network Analysis, Key concepts and measures in network analysis.</p> <p>UNIT II</p> <p>Knowledge Representation on the Semantic Web: Ontologies and their role in the Semantic Web, Ontology languages for the semantic</p>
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	<p>Web.</p> <p>Modeling and Aggregating Social Network Data: State of the art in network data representation, Ontological representation of Social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data.</p> <p>UNIT III</p> <p>Developing social semantic applications: Building Semantic Web applications with social network features, Flink- the social networks of the Semantic Web community, Open academia: distributed, semantic-based publication management. (programming tools – developer toolkit Elmo)</p> <p>UNIT – IV</p> <p>Evaluation of Web-Based Social Network Extraction: Differences between survey methods and electronic data extraction, context of the empirical study, Data collection, Preparing the data, Optimizing goodness of fit, Comparison across methods and networks, Predicting the goodness of fit, Evaluation through analysis</p>
<p>Text books and Reference books</p>	<p>Text Books:</p> <p>[1] Peter Mika ,” Social Networks and the Semantic Web”, Springer publication ,2007</p> <p>Reference Books:</p> <p>[1] J. Davies,Rudi Studer,Paul Warren ,”Semantic Web Technologies ,Trends and Research in Ontology Based Systems”, ,John Wiley&Sons.2006</p> <p>[2] Liyang Yu,”Semantic Web and Semantic Web Services”, Chapman and Hall/CRC Taylor & Francis Group Publisher 2007</p>
<p>E-resources and other digital material</p>	<p>[1] Prof. Anupam Basu IIT Kharagpur Lecture 18: Semantic Net Available: http://freevideolectures.com/Course/2272/Artificial-Intelligence/18</p>

14CS4705C

ARTIFICIAL INTELLIGENCE

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3- 0 - 0
Prerequisites:	Discrete Mathematical Structures Probability and Statistics	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the basic principles and applications of Artificial Intelligence											
	CO2	Represent knowledge by using different techniques											
	CO3	Apply various filler structures for various sentences and know the basic concepts of Natural Language Processing											
	CO4	List the key Aspects of Expert systems											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L	M										
	CO2	L	M	H									
	CO3		L	H						M			
	CO4		L	M									
Course Content	<p>UNIT I</p> <p>Problems, Problem Spaces and Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs.</p> <p>Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.</p>												

UNIT II

Knowledge Representation Using Predicate Logic: Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution.

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge.

UNIT III

Weak Slot-And-Fillers Structures: Semantic Nets, Frames.

Strong Slot-and- Filter Structures: Conceptual dependency, Scripts.

Natural Language Processing – Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking.

UNIT IV

Hopfield Networks, Perceptrons, Back propagation networks, generalization, Applications of Neural networks, Expert systems- Representing and using Domain Knowledge, Expert System shells.

Text books and Reference books**TEXT BOOKS**

- [1] Elaine Rich and Kevin Knight, *Artificial Intelligence*. 3 ed, Tata McGraw Hill Edition.

REFERENCE BOOKS

- [1] Patrick Henry Winston, *Artificial Intelligence*. Pearson Education/Prentice Hall of India.
 [2] Russel and Norvig, *Artificial Intelligence*. Prentice Hall of India/Pearson Education.
 [3] Giarratano, *Expert Systems : Principles and Programming*. Cengage Publications.

E-resources and other digital material

- [1] <http://nptel.ac.in/video.php?subjectId=106105079>
 (Accessed on 08/03/2016)

14CS4705D
SOFTWARE PROJECT MANAGEMENT

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3- 0 - 0
Prerequisites:	Software	Continuous Evaluation:	30
	Engineering	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	CO1	Understand project management activities and steps in project planning
	CO2	Identify the appropriate process model for a software project
	CO3	Asses various kinds of risks associated with software projects
	CO4	Perform planning and tracking activities
	CO5	Understand how to manage people and organize teams

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L	M										
	CO2		L									H	
	CO3		L										
	CO4	L										M	
	CO5	L									H		

Topics	<p>UNIT I</p> <p>Project Evaluation And Project Planning, Project Life Cycle :</p> <p>Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning</p> <p>Software process and Process Models – Choice of Process models – mental delivery– Rapid Application development – Agile methods –</p>
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Extreme Programming – SCRUM – Managing interactive processes

UNIT II

Effort Estimation, Activity Planning And Risk Management

Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II A Parametric Productivity Model – Staffing Pattern

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical patterns – Cost schedules

UNIT III

Project Management And Control : Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control- Software Configuration Management – Managing contracts – Contract Management.

UNIT – IV

Staffing In Software Projects : Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plan

Text books and Reference books

Text Book:

[1]. Bob Hughes, Mikecatterell, *Software Project Management*, Tata McGraw Hill, 2008

Reference Books:

	<p>[1]. Watts S.Humphrey <i>Managing the Software Process</i>, Pearson Education,2011.</p> <p>[2]. Ramesh, Gopaldaswamy, <i>Managing Global Projects</i>, Tata McGraw Hill, 2006.</p> <p>[3]. Jalote, <i>Software Project Management in Practice</i>, Pearson Education, 2002.</p>
E-resources and other digital material	<p>[1]. https://www.thoughtworks.com/mingle/</p> <p>[2]. https://www.udemy.com/software-project-management-for-start-ups/</p> <p>[3]. https://www.glasscubes.com/project-management/</p>

14CS4705E**INFORMATION SECURITY ASSESSMENT AND AUDIT**

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3- 0 - 0
Prerequisites:	Cyber Security	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	CO1	Understand the information security performance metrics.
	CO2	Analyze various security audit tasks and reports.
	CO3	Asses different vulnerabilities on various systems
	CO4	Understand various types of Risks in information Security

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H								M			
	CO2	H				H				M			
	CO3					H				H			
	CO4	H				L							

Topics	<p>UNIT I</p> <p>Introduction to security Metrics, Characteristics of good metrics, Categories/Classification of Security Metrics: Classifications by different organizations, A sample list of metrics, Using Security Metrics, Development Process of the Metrics, Metrics and Reporting, Designing information security measurement Systems. Case studies: Indicators of Compromise, NIST sample security metrics.</p> <p>UNIT II</p> <p>Introduction to Security Audit: Definition and Need for security audit, Scope of an audit, Audit Types & Phases, Audit methodology, Audit Tasks, post auditing actions and reporting, case studies: Firewall Security Auditing, IDS Security Auditing and Social Engineering</p>
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	<p>Auditing.</p> <p>UNIT – III:</p> <p>Vulnerability Management: Introduction to vulnerability management, Threats and Vulnerabilities, Vulnerability Scanning, Information Security Assessments, Vulnerability Assessment Methodology, Patch Management, reporting, case studies: Vulnerability Scanning & Assessment</p> <p>UNIT –IV: Configuration Reviews: Configuration Management, Organizational Security Configuration management Policy, Identify Security configuration management Tools, Implementing secure configurations, Unauthorized Access to Configuration Stores</p>
<p>Text books and Reference books</p>	<p>Text Book:</p> <p>[1]. “Security Analyst”, Student Hands Book, APSSDC&NASSCOM, 2015</p> <p>[2]. Michael E. Whitman et.al, “Management of Information Security”, Cengage, 2014</p> <p>[3]. Andrew Vladimirov , Konstantin Gavrilenko, “Assessing Information Security: Strategies, Tactics, Logic and Framework”, IT Governance Publishing, 2010</p>
<p>E-resources and other digital material</p>	<p>[1]. http://www.iso.org/iso/home/standards/management-standards/iso27001.html</p> <p>[2]. http://csrc.nist.gov/publications/nistubs/800-55-Rev1/SP800-55-rev1.pdf</p>

14CS3751
CLOUD COMPUTING LAB

Course Category:	Programme Core	Credits:	2
Course Type:	Practical	Lecture - Tutorial - Practice:	0-0-3
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:													
	CO1	Understand the evolution of cloud computing paradigm and its architecture												
	CO2	Explain and characterize different cloud deployment models and service models												
	CO3	Identify the technological drivers of cloud computing paradigm												
	CO4	Identify the security issues in cloud computing												
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	
	CO1	H												
	CO2		M											
	CO3					M								
	CO4										M			
Course Content	<p>Task 1: Study about Amazon AWS, Google Apps and Microsoft Azure</p> <p>Task 2: Building a simple cloud application using Google App Engine or Microsoft Azure</p> <p>Task 3: Hosting cloud application using Google App Engine or Microsoft Azure</p> <p>Task 4:</p>													

Implement Virtual OS using virtual box.

Task 5:

Simulate VM allocation algorithm using CloudSim.

Task 6:

Simulate Task scheduling algorithm using CloudSim.

Task 7:

Simulate Energy-conscious mode using CloudSim.

Task 8:

Setup a Private Cloud Using Open Stack or Eucalyptus.

Task 9:

Install and configure Open Stack Object Storage - Swift in Ubuntu.

Task 10:

Implement Open Stack Nova-Compute.

Task 11:

Implement Open Stack Image services – Glance

* Experiments are subject to change based on the course coordinators meeting every semester.

Text books and Reference books

Text Books:

[1]. K. Chandrasekaran, Essentials of Cloud Computing, CRC Press, 2015

Reference Books:

[1]. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010

[2]. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011

[3]. Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012

14CS5752
MINI PROJECT

Course Category:	Programme Core	Credits:	1
Course Type:	Project	Lecture - Tutorial - Practice:	0-0-3
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

1. Formulate Domain Analysis, Elaboration through Modeling and Implementation through state of the art technology available.
2. Develop generic and modular programs that includes Handling exceptional cases in providing reliable solutions
3. Testing and verification of programs for different scenarios
4. Conclude findings through oral presentations
5. Prepare proper documentation consisting of Software Requirements Specification (SRS), Modeling Techniques, Development Strategies, Implementation and Testing Strategies. Student may use any Design Methodologies such as SSAD, OOAD and UML
6. Builds the spirit of team work in design process.
7. Become proficient in the programming languages

14CS5753/14CS5754**INTERNSHIPS/ INDUSTRY OFFERED COURSE**

Course Category:	Programme Core	Credits:	2
Course Type:	Internships/ Industry offered course	Lecture - Tutorial - Practice:	
Prerequisites:		Continuous Evaluation:	00
		Semester end Evaluation:	100
		Total Marks:	100

The students may register for one of the following:

(a) Internships: The students are expected to do internship of minimum 3 weeks duration in the industry approved by respective Head of the Department. It carries two credits. The candidate shall submit the comprehensive report to the department. The report will be evaluated for 100 marks by the project review committee.

(b) Industry offered courses: The courses under this category shall be offered by the Industry experts. The courses under this category carry two credits. The semester end examination for courses under this category is evaluated for 100 marks and it shall be conducted and evaluated by the industry expert who has delivered the lecture or by faculty nominated by the head of the department in consultation with the industry expert. There will not be continuous evaluation for the courses under this category

It is mandatory to acquire minimum two credits for the award of degree.



SEMESTER VIII

14CS3801

SOFTWARE TESTING AND QUALITY ASSURANCE

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practice:	4 - 0 - 0
Prerequisites:	Software Engineering	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	CO1	Understand types of testing and bugs											
	CO2	Understand flow graphs and apply path testing.											
	CO3	Apply data flow and path reduction techniques											
	CO4	Perform logic and state testing for any given application											
	CO5	Perform quality assurance for a given software project											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	L										
	CO2	H	L	L									
	CO3			L						L			
	CO4		L										M
CO5	L											L	
Course Content	<p>UNIT I</p> <p>Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.</p> <p>Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.</p> <p>UNIT II</p> <p>Dataflow testing: Basics of dataflow testing, strategies in dataflow</p>												

testing, application of dataflow testing.

Paths, Path products and Regular expressions: path products and path expression, reduction procedure, applications, regular expressions and flow anomaly detection.

UNIT III

Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

State, State Graphs and Transition testing: state graphs, good and bad state graphs, state testing, Transition testing.

UNIT – IV

Software Quality: What Is Quality, Software Quality- ISO 9126 Quality Factors, McCall's Quality Factors,

Software Quality Assurance :Background Issues , Elements of Software Quality Assurance SQA Tasks, Goals, and Metrics, SQA Tasks, Goals, Attributes, and Metrics ,Formal Approaches to SQA, Statistical Software Quality Assurance, A Generic Example, Six Sigma for Software Engineering ,Software Reliability, Measures of Reliability and Availability, Software Safety , The ISO 9000 Quality Standards ,The SQA Plan .

Text books and Reference books

Text Book:

- [1]. Boris Beizer, *Software Testing Techniques*, 2 ed, Dreamtech
 [2]. Roger S.Pressman, *Software Engineering- A Practitioner's Approach*. 7thed, Tata McGraw-Hill International

Reference Books:

- [1]. Perry, *Effective Methods of Software Testing*, John Wiley
 [2]. Edward Kit, *Software Testing in the Real World*. Pearson.
 [3]. RajibMall, *Fundamentals of Software Engineering*. 2 ed, PHI.

E-resources and other digital material

- [1] <http://nptel.ac.in/video.php?subjectId=106101061>
 [2] <http://nptel.ac.in/video.php?subjectId=106101061>
 [3] <http://nptel.ac.in/video.php?subjectId=106101061>

14CS4802A**TCP/IP PROTOCOL SUITE**

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:	14CS3305 -Data Communications 14CS3406 - Computer Networks	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	Upon successful completion of the course, the student will be able to:													
	CO1	Understand different applications of TCP/IP												
	CO2	Identify the services and protocols of IP												
	CO3	Identify the services and protocols of TCP/UDP												
	CO4	Understand the features and services of Application layer												
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	
	CO1	M												
	CO2		H							M		M		
	CO3		H							M		M		
	CO4		H							M		M		
Course Content	UNIT I Introduction And Underlying Technologies: Internet Standards, OSI model, TCP / IP protocol suite, addressing, IP versions, IPv4 and IPv6 Addressing, ICMPV6 protocol, underlying technologies.													

UNIT II

IP Addresses, Routing, ARP AND RARP: Introduction, Classful addressing, classless addressing , Delivery and Routing of IP Packets, ARP and RARP –

Internet Protocols: IP datagram, Fragmentation, options, checksum, IP Package Delivery & forwarding of packets - ICMP –IGMP

UNIT III

UDP: Introduction to Transport Layer, Services, Protocols, UDP, user datagram UDP services, UDP package, UDP applications.

TCP: segment, flow control, error control, congestion control, state transition diagram, TCP package, SCTP– services, features.

UNIT IV

Unicast And Multicast Routing Protocols: Unicast routing, intra and inter domain routing, distance vector routing (RIP), link state routing (OSPF), path vector routing (BGP) Multicasting and Multicast routing protocols.

Application Layer: Introduction - DHCP - TELNET --- TFTP – SMTP - POP – IMAP – MIME – SNMP.

Text books and Reference books**Text Books:**

[1] Behrouz A. Forouzan, “TCP/IP Protocol Suite”, 4th Edition, Tata McGraw Hill,2010.

Reference Books:

[2] Douglas E. Comer, "Internetworking with TCP/IP Vol. I: Principles, Protocols, and Architecture" Prentice Hall of India , 2010.

[3] Gary R. Wright, W. Richard Steven, "TCP/IP Illustrated Vol. II." Pearson Education, 2011.

	<p>[4] Douglas E. Comer and David L. Stevens," Internetworking with TCP/IP Vol. II: ANSI C Version: Design, Implementation, and Internals.", Third Edition ,Prentice Hall of India.</p>
E-resources and other digital material	<p>[1] Prof. Robert Morris ,Department of Computer Science & Engineering, UC Berkeley USA, "Networks", MIT videos. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system-engineering-spring-2009/video-lectures/</p> <p>[2] Prof.Prof. Hema A Murthy ,Department of Computer Science & Engineering, IIT Madras, NPTEL Videos http://nptel.iitm.ac.in/courses/IIT-MADRAS/Computer_Netw orks /index.php</p>

14CS4802B**NATURAL LANGUAGE PROCESSING**

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	CO1	Understand the basic Notation in natural language processing.											
	CO2	Solve NLP sub problems using tokenizing and tagging											
	CO3	Apply various Parsing Techniques in NLP.											
	CO4	Analyze the semantic of sentences											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	L										
	CO2	H		L								L	
	CO3		L	M									
	CO4		H	M								L	
Course Content	UNIT I Introduction – Models and Algorithms, Regular Expressions and Automata - Regular Expression - Basic Regular Expression Patterns, Disjunction, grouping, and precedence, Finite State Automata – using an FSA to recognize sheeptalk, formal languages, Non-Deterministic FSAs, Using an NFAs to accept strings, Recognition as search, Relating Deterministic and Non Deterministic Automata. Regular Languages and FSAs, Morphology and Finite-State Transducers survey of English Morphology -Inflectional Morphology, Derivational Morphology, Finite-State Morphological Parsing – The lexicon and Morphotactics, Morphological parsing												

with finite state transducers, orthographic rules and finite state transducers, Combining an FST Lexicon and Rules, the Porter Stemmer, Human Morphological Processing.

UNIT II

N-grams- Counting Words in Corpora, Unsmoothed N-grams, Smoothing – Add-One smoothing, witten-Bell Discounting, Good-Turing Discounting, Backoff, Deleted Interpolation, N-Grams for spelling and Pronunciation, context-sensitive spelling error correction, N-grams for pronunciation Modelling, Entropy- Cross entropy for comparing models, the entropy of English. **Word Classes and Part-of-Speech Tagging-** English Word Classes, Tagsets for English, Part of Speech Tagging, Rule-Based Part of Speech Tagging, Stochastic Part of Speech Tagging, Transformation-Based Tagging – How TBL rules are applied, How TBL rules are Learned.

UNIT III

Context Free Grammars - Constituency, Context-Free Rules and Trees, Sentence- Level Constructions, the Noun Phrase, Coordination, Agreement, The Verb phrase and Sub Categorization, Auxiliaries, spoken language syntax, grammar equivalence and normal form, finite state and context free grammars, grammars and human processing. **Parsing with Context Free Grammars –** Parsing as Search – top-down parsing, bottom-up parsing, comparing top-down and bottom-up parsing, A Basic Top-Down Parser, problems with the basic top down parser, left recursion, ambiguity, repeated parsing of subtrees, The Earley Algorithm, Finite State Parsing Methods.

	<p>UNIT – IV</p> <p>Representing Meaning - Meaning Structure of Language, First Order Predicate Calculus, Representing Linguistically Relevant Concepts, Semantic Analysis –Syntax, Driven Semantic Analysis - Semantic Attachments for a fragment of English.</p>
<p>Text books and Reference books</p>	<p>TEXT BOOKS</p> <p>[1] D. Jurafsky and J. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition” Pearson Education, 2005.</p> <p>REFERENCE BOOKS</p> <p>[1] C. Manning and H. Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press,1999.</p> <p>[2] James Allen. “Natural Language Understanding”, Addison Wesley, 1995.</p>
<p>E-resources and other digital material</p>	<p>[1]. http://nptel.iitm.ac.in/courses/106101007/ (Accessed on 16/02/2016)</p>

14CS4802C

USER INTERFACE DESIGN

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:	14CS1103 – Introduction To Computing	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the key terms of interactive graphical systems.											
	CO2	Use appropriate device and screen based controls for presenting information.											
	CO3	Apply design principles for developing sophisticated HCI.											
	CO4	Identify faults in the interfaces and suggest alternative designs.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M											
	CO2		H							M		M	
	CO3		H							M		M	
	CO4		H							M		M	
Course Content	<p>UNIT I</p> <p>Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design, a brief history of Screen design.</p> <p>Graphical User Interface: Popularity of graphics, the concept of direct manipulation, graphical system, Characteristics</p> <p>Web User Interface: popularity, characteristics- Principles of user interface.</p>												

UNIT II

Design process: Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds.

Screen designing: Interface design goals, screen meaning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, visually pleasing composition, amount of information, focus and emphasis, presenting information simply and meaningfully, technological considerations in interface design.

UNIT III

Windows: Characteristics, components, operations, Selection of devices based and screen based controls.

Components: Icons and images, Multimedia, choosing proper colors

UNIT – IV

Software Tools: Specification methods, interface, Building tools.

Interaction devices: Keyboard and function keys, pointing devices, speech recognition, digitization and generation, image and video displays, drivers.

Text books and Reference books**Text Books:**

[1]Wilbert O Galitz, The Essential Guide to User Interface Design. 2 ed, Wiley DreamaTech [UNIT I, II, III]

[2]Ben Shneidermann, Designing the User Interface. 3 ed, Pearson Education Asia [UNIT V]

Reference Books:

[1]Alan Dix, Janet Fincay, Gre Goryd, Abowd and Russell Bealg, Human Computer Interaction. Pearson Education.

	<p>[7]Prece, Rogers, Sharps Interaction Design. Wiley Dreamatech Soren Lauesen, User Interface Design. Pearson Education.</p>
E-resources and other digital material	<p>[1] Dr.Samit Bhattacharya (14th , May, 2015),Department of Computer Science & Engineering, IIT Guwahati, "Human Computer Interaction", NPTEL videos. Available: http://nptel.ac.in/syllabus/106103115/</p> <p>[2] Pradeep P Yammiyavar IIT Guwahati(14th , May , 2015), Department of Computer Science & Engineering,, NPTEL Videos, Available:http://www.nptelvideos.com/video.php?id=1461 &c=15</p>

14CS4802D

GEOGRAPHIC INFORMATION SYSTEM

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand the basic concepts of spatial and non spatial data.											
	CO2	Know about data base issues in GIS.											
	CO3	Create to design principles for developing DEM and TIN											
	CO4	Apply different real time problems in GIS											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M											
	CO2		H							M		M	
	CO3		H							M		M	
	CO4		H							M		M	
Course Content	<p>UNIT I</p> <p>GIS: Definitions and Development – Computer Components of GIS (Hardware and Software) – General Data Base concepts of Spatial and Non Spatial data - Elements of Spatial data - Sources of Spatial data – Data quality for GIS – Errors and Error variations in GIS</p> <p>UNIT II</p> <p>GIS Data Management: Data Base Management Systems</p>												

(DBMS) Data Base Models. Data input methods – Spatial Data structures: Raster data and Vector data – Structures – GIS Data Analysis: Spatial measurement methods Reclassification – Buffering – Overlay Analysis.

UNIT III

Modeling Surfaces: Generation of DEM, DTM and TIN models – Spatial Interpolation – GIS output generation – Integration of Remote Sensing and GIS Principles of Global Positioning System (GPS).

UNIT IV

GIS applications: GIS as a Decision Support System – GIS as a Land Information System – GIS as a Disaster Management and Emergency Response System - Resource management applications - Facility Management application – Urban Management application.

Text books and Reference books

Text Books:

- [1]. Aronoff S. Geographic Information System: A Management Perspective, DDL Publication, Ottawa. 1989.
- [2]. Burrough P.A. Principles of Geographic Information Systems for Land Resource Assessment. Oxford University Press, New York, 1986.

Reference Books:

- [1]. Fraser Taylor D.R. Geographic Information System. Pergamon Press, Oxford, 1991.
- [2]. Maquire D. J.M.F. Goodchild and D.W. Rhind (eds.) Geographic Information Systems : Principles and Application. Taylor & Francis, Washington, 1991.
- [3]. Mark S. Monmonier. Computer – assisted Cartography. Prentice – Hall, Englewood Cliff, New Jersey, 1982.

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| | <p>[4]. Peuquet D.J. and D.F. Marble, Introductory Reading in Geographic Information Systems. Taylor & Francis, Washington, 1990.</p> <p>[5]. Star J. and J. Estes. Geographic Information Systems : An Introduction. Prentice Hall, Englewood, Cliff, New Jersey, 1994.</p> |
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14CS4802E**ENTREPRENEURSHIP AND NEW VENTURES**

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Understand Entrepreneurship.											
	CO2	Analyze Business Models and Planning for Business.											
	CO3	Understand Operations and Management in business											
	CO4	Perform Finance operations for the venture											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1				L			M	M	M			
	CO2				L			H		M			
	CO3							H		M			
	CO4									L	M		
Course Content	<p>UNIT I</p> <p>Entrepreneurship: Concept, knowledge and skills requirement; characteristic of successful entrepreneurs; role of entrepreneurship in economic development; entrepreneurship process; factors impacting emergence of entrepreneurship; managerial vs. entrepreneurial approach and emergence of entrepreneurship.</p> <p>UNIT II</p> <p>Starting the venture: generating business idea – sources of new</p>												

ideas, methods of generating ideas, creative problem solving, opportunity recognition; environmental scanning, competitor and industry analysis; feasibility study: market feasibility, technical/operational feasibility, financial feasibility; drawing business plan; preparing project report; presenting business plan to investors.

UNIT III

Functional plans: marketing plan – marketing research for the new venture, steps in preparing marketing plan, contingency planning; organizational plan: form of ownership, designing organization structure, job design, manpower planning; Financial plan: cash budget, working capital, Performa income statement Performa cash flow, perform balance sheet, break even analysis

UNIT IV

Sources of finance: debt or equity financing, commercial banks, venture capital; financial institutions supporting entrepreneurs; legal issues: intellectual property rights patents, trademarks, copy rights, trade secrets, licensing; franching

Text books and Reference books

- [1] Entrepreneurship, Hisrich, Robert D., Michael Peters and Dean Shepherded, , Tata McGraw Hill, ND
- [2] Entrepreneurship, , Brace R., and R., Duane Ireland, , Pearson Prentice Hall, New Jersey (USA).
- [3] Entrepreneurship, Lall, Madhurima, and Shikha Sahai, , Excel Book, New Delhi.
- [4] Entrepreneurship Development and Small Business Enterprises, Charantimath, Poornima, Pearson Education, New Delhi.

14CS4803A**PATTERN RECOGNITION**

Course Category:	Program Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:	Probability and Statistics	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Explain the basic concepts and importance of pattern recognition											
	CO2	Compare the supervised, unsupervised and semi-supervised learning											
	CO3	Discuss the Bayesian decision theory for continuous and discrete features											
	CO4	Explain the Maximum likelihood and Bayesian parameter estimation											
	CO5	Identify the major issues in clustering											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2											L	
	CO3	M	L										
	CO4	H	L							L			
	CO5	M		L						L		L	
Course Content	UNIT I Introduction: Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation, Bayesian Decision Theory: Introduction, continuous features – two categories classifications, minimum error-rate classification- zero-one												

loss function, classifiers, discriminant functions, and decision surfaces.

UNIT II

Normal density: Univariate and multivariate density, discriminant functions for the normal density different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context.

UNIT III

Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case, Component analysis and Discriminants: Principal Component Analysis, Fisher Linear Discriminant, Multiple Discriminant Analysis

UNIT – IV

Un-supervised learning and clustering: Introduction, mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Data description and clustering – similarity measures, criteria function for clustering.

Text books and Reference books

Text Book:

[1] Richard O. Duda, Peter E. Hart and David G. Stroke, “Pattern Classifications”, 2nd Edition, Wiley Student Edition, 2011.

Reference Books:

[1] Earl Gose, Richard John Baugh and Steve Jost, “Pattern Recognition and Image Analysis”, PHI, 2004.

E-resources and other digital material

[1] Prof. P.K. Biswas. (June 2014). Pattern Recognition and Applications [NPTEL, Video lecture]. Available: <http://www.nptel.ac.in/courses/117105101/>

14CS4803B

AD HOC AND SENSOR NETWORKS

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:	Computer Networks	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Know the concepts, network architectures and applications of ad hoc and wireless sensor networks.											
	CO2	Analyze the protocol design issues of ad hoc and sensor networks.											
	CO3	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues.											
	CO4	Evaluate the QoS related performance measurements of Ad Hoc and Sensor Networks.											

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H											
	CO2		M										
	CO3			H									
	CO4												M

Topics	<p>UNIT I</p> <p>INTRODUCTION: Fundamentals of wireless communication technology- the electromagnetic spectrum – radio propagation mechanisms- characteristics of the wireless channel – mobile ad hoc networks(MANETs) and wireless sensor networks(WSNs): concepts and architectures, Applications of ad hoc and sensor networks, design challenges in ad hoc and sensor networks.</p> <p>UNIT II</p>
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MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS: Issues in designing a MAC Protocol- Classification of MAC Protocols-Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11.

UNIT III

ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS: Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT – IV

WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS: Single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures-data relaying and aggregation strategies - MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

WSN ROUTING, LOCALIZATION & QOS: Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization- Transport Layer issues..

Text books and Reference books

Text Book:
 [1]. C. Siva Ram Murthy, and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols “, Prentice Hall Professional Technical Reference, 2008.

	Reference Books: [1]. Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006. [2]. Feng Zhao and Leonides Guibas, “Wireless Sensor Networks”, Elsevier Publication – 2002. [3]. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005.
E-resources and other digital material	[1]. http://nptel.ac.in/courses/108102045/27

14CS4803C

MACHINE LEARNING

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:	Probability and Statistics, Artificial Intelligence	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	CO1	Understand a wide variety of learning algorithms.											
	CO2	Understand how to evaluate models generated from data.											
	CO3	Apply the algorithms to a real problem.											
	CO4	Analyze various learning techniques of Machine Learning.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L	M										
	CO2	M	H										
	CO3	M	H	L								L	
	CO4	L	H										
Topics	<p>UNIT – I</p> <p>Introduction to machine learning</p> <p>Concept Learning and the General to Specific Ordering: Concept learning task, concept learning as search, Find-S: finding a Maximally Specific hypothesis, Version Spaces and the Candidate-Elimination algorithm, remarks on Version Spaces and Candidate-Elimination and inductive bias.</p> <p>Decision Tree Learning: Decision Tree representation, appropriate problems for Decision Tree learning, hypothesis space search in Decision Tree learning, inductive bias in Decision Tree learning and issues in Decision Tree learning.</p> <p>UNIT – II</p> <p>Evaluating Hypotheses: Estimating hypothesis accuracy, basics of</p>												

sampling theory, general approach for deriving confidence intervals, difference in error of two hypotheses and comparing learning algorithms.

UNIT – III

Bayesian Learning: Bayes theorem and concept learning, maximum likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Bayesian belief networks and EM algorithm.

UNIT – IV

Computational learning theory: Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis spaces, and sample complexity for infinite hypothesis spaces and mistake bound model of learning.

Text books and Reference books

TEXT BOOK:

[1]. Tom M. Mitchell, “Machine Learning”, Mc. Graw Hill Publishing 1997.

REFERENCE BOOKS:

[1]. Ethem Alpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press 2004.

[2]. T. Hastie, R. Tibshirani, J. H. Friedman, “The Elements of Statistical Learning”, Springer; 1 edition, 2001

E-resources and other digital material

<http://nptel.ac.in/courses/110106064/16> (Accessed on 05/03/2016)

14CS4803D

INFORMATION SECURITY RISK MANAGEMENT

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:	Cyber Security, Information Security Risk Assessment and Audit	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	CO1	Analyze the information security incidents.											
	CO2	Troubleshoot information security devices.											
	CO3	Understand various Logs associations.											
	CO4	Understand strategies of back up											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H								M			
	CO2	H				H				M			
	CO3	M								L			
	CO4	M				H							
Topics	<p>UNIT I Information Security Incidents: Incident response overview, Incident Response – Roles and Responsibilities, Incident Response Process, Handling Malicious Code Incidents, Handling Network Security Incidents.</p> <p>UNIT II Troubleshoot information security devices: Configuring Network Devices, Configuring Secure Content Management, Configuring Firewall, Troubleshooting Cisco IOS Firewall Configurations, Cisco IOS Firewall IDS, IPS Configuration, Anti-</p>												

virus and Antispam Software, Web Application Security Configuration, Patch Management.

UNIT – III

Log Correlation: Computer Security Logs, Configuring & Analyzing windows Logs, Log management – Functions & challenges, Centralized Logging and architecture, Time Synchronization – NTP/NIST

UNIT –IV

Data Backup: Data backup Introduction, types of data back up and its techniques, developing an effective data backup strategy and plan, Security policy for Back Procedures.

Text books and Reference books

- [1] “Security Analyst”, Student Hands Book, APSSDC & NASSCOM, 2015.
- [2] William Stallings, “Cryptography and Network Security”, 4th Edition.

E-resources and other digital material

- [1] <http://www.iso.org/iso/home/standards/management-standards/iso27001.html>
- [2] <http://csrc.nist.gov/publications/nistubs/800-55-Rev1/SP800-55-rev1.pdf>

14CS 4803E**M-COMMERCE**

Course Category:	Programme Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Prerequisites:	Web Technologies & Computer Network	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes Upon successful completion of the course, the student will be able to:

CO1	Identify the infrastructure required for building a M-commerce application
CO2	Understand the M-Commerce Technology framework
CO3	Identify the applications of M-Commerce
CO4	Identify the goals of B 2 B Mobile Commerce

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1							M					
	CO2	H											
	CO3		H			M							
	CO4					M		L					

Course Content **UNIT I**
ELECTRONIC COMMERCE Traditional commerce and E-commerce – Internet and WWW – Role of WWW – Value Chains – Strategic Business And Industry Value Chains – Role of E-commerce. Packet Switched Networks – TCP/IP Protocol Script – Internet Utility Programmes – SGML, HTML And XML – Web Client And Servers – Web Client/Server Architecture – Intranet And Extranets – Web Based Tools For E-commerce – Security.
MOBILE COMMERCE Introduction – Infrastructure of M-

Commerce – Types Of Mobile Commerce Services – Technologies Of Wireless Business – Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non– Internet Applications In M–Commerce – Wireless/Wired Commerce Comparisons.

UNIT II

MOBILE COMMERCE: TECHNOLOGY A Framework For The Study Of Mobile Commerce – NTT Docomo’s I-Mode – Wireless Devices For Mobile Commerce – Towards A Classification Framework For Mobile Location Based Services – Wireless Personal And Local Area Networks –The Impact Of Technology Advances On Strategy Formulation In Mobile Communications Networks.

UNIT III

MOBILE COMMERCE: THEORY AND APPLICATIONS

The Ecology Of Mobile Commerce – The Wireless Application Protocol – Mobile Business Services – Mobile Portal – Factors Influencing The Adoption of Mobile Gaming Services – Mobile Data Technologies And Small Business Adoption And Diffusion – E-commerce in The Automotive Industry – Location– Based Services: Criteria For Adoption And Solution Deployment – The Role of Mobile Advertising In Building A Brand – M-commerce Business Models

UNIT IV

BUSINESS– TO– BUSINESS MOBILE E– COMMERCE

Enterprise Enablement – Email and Messaging – Field Force Automation (Insurance, Real Estate, Maintenance, Healthcare) – Field Sales Support (Content Access, Inventory) – Asset Tracking and Maintenance/Management – Remote IT Support – Customer

	Retention (B2C Services, Financial, Special Deals) – Warehouse Automation – Security.
Text books and Reference books	<p>Text Books:</p> <p>[1]. E.Brian Mennecke, J.Troy Strader, “Mobile Commerce: Technology, Theory and Applications”, Idea Group Inc., IRM press, 2003.</p> <p>[2]. Ravi Kalakota, Andrew B.Whinston, “Frontiers of Electronic Commerce” Pearson Education Ninth edition 2009</p> <p>Reference Books:</p> <p>[1]. Hendry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, “E-Commerce fundamentals and applications”, John Wiley.</p> <p>[2]. Paul May, “Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business” Cambridge University Press March 2001.</p>
E-resources and other digital material	<p>[1].Lecture Series on Internet Technologies by Prof.I.Sengupta, Department of Computer Science & Engineering ,IIT Kharagpur http://www.youtube.com/watch?v=xKJjyn8DaAw</p> <p>[2] http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/System%20Analysis%20and%20Design/pdf/Lecture_Notes/LNm13.pdf</p>

14CS3851

SOFTWARE TESTING LAB

Course Category:	Programme Core	Credits:	2
Course Type:	Practical	Lecture - Tutorial - Practice:	0 - 0 - 3
Prerequisites:	Software Engineering	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	CO1	Understand types of testing and bugs											
	CO2	Understand flow graphs and apply path testing.											
	CO3	Apply data flow and path reduction techniques											
	CO4	Perform logic and state testing for any given application											
	CO5	Perform quality assurance for a given software project											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	L										
	CO2	H	L	L									
	CO3			L					L				
	CO4		L									M	
	CO5	L										L	
Tasks	<p>Task 1: Design test cases for a given application</p> <p>Task 2: Implementation of Path Testing</p> <p>Task 3: Testing programs for arithmetic operations</p>												

	<p>Task 4: Testing programs for loop control statements</p> <p>Task 5: Testing a basic triangle program</p> <p>Task 6: Testing User Interface for VB application</p> <p>Task 7: Introduction to QTP</p> <p>Task 8: Testing a VB/.Net application</p> <p>Task 9: Debugging and error handling</p> <p>Task 10: Test a program to login a specific webpage</p> <p>Task 11: Test a program to update n number of employee records into an EXCEL file.</p> <p>Task 12: Test a program to find number of objects present in the web page</p>
<p>Text books and Reference books</p>	<p>Text Book:</p> <p>[1]. Boris Beizer, <i>Software Testing Techniques</i>, 2 ed, Dreamtech</p> <p>[2]. Roger S.Pressman, <i>Software Engineering- A Practitioner's Approach</i>. 7thed, Tata McGraw-Hill International</p> <p>Reference Books:</p> <p>[1]. Perry, <i>Effective Methods of Software Testing</i>, John</p>

	<p>Wiley</p> <p>[2]. Edward Kit, <i>Software Testing in the Real World</i>. Pearson.</p> <p>[3]. RajibMall, <i>Fundamentals of Software Engineering</i>. 2 ed, PHI.</p>
E-resources and other digital material	<p>[1] http://nunit.org/</p> <p>[2] http://www.codeproject.com/Articles/178635/Unit-Testing-Using-NUnit</p> <p>[3] http://docs.seleniumhq.org/</p>

14CS5852**MAJOR PROJECT**

Course Category:	Programme Core	Credits:	10
Course Type:	Project	Lecture - Tutorial - Practice:	0-6-6
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

1. Formulate a real world problem and develop its requirements
2. Develop and design solution for a set of requirements
3. Test and validate the conformance of the developed prototype against the original requirements of the problem
4. Work as a responsible member and possibly a leader of a team in developing software solutions
5. Express technical and behavioral ideas and thought in oral settings
6. Participate in and possibly moderate, discussions that lead to making decisions
7. Express technical ideas, strategies and methodologies in written form
8. Prepare and conduct oral presentations
9. Self learn new tools, algorithms, and/or techniques that contribute to the software solution of the project
10. Generate alternative solutions, compare them and select the optimum one