P.S. R. ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Sevalpatti (P.O), Sivakasi – 626140

REGULATION 2016

CURRICULUM AND SYLLABI

FOR

B.E., COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT VISION & MISSION

Vision

- To impart holistic education in Computer Science and Engineering to cater the needs in academia, industry and society.

Mission

- Offering under graduate and post graduate programmes by providing effective and balanced curriculum and equip themselves to gear up to the ethical challenges awaiting them.
- To confer continuous activities in technical and research that will enable the students to face the real time challenges in the field of Computer Science and Engineering.
- To provide training for the students in a socially responsible manner with inculcating integrity and human values.

Programme Educational Objectives (PEO's)

- Lead a professional career by acquiring the basic knowledge in the field of specialization and allied Engineering.
- Assess the real life problems and deal with them confidently relevance to the society.
- Engage in lifelong learning by pursuing higher studies and participating in professional organizations.
- Exhibit interpersonal skills and able to work as a team for success.

PROGRAMME OUTCOMES (PO's)

Engineering Graduates will be able to:

1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design / Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSO's)

1. Design, implement, test, and evaluate a computer system, component, or algorithm to meet desired needs and to solve a computational problem.
2. The ability to understand, analyse and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics and networking for efficient design of computer-based systems of varying complexity.
3. The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product.
4. Ability to use knowledge in various domains to identify research gaps and hence to provide solutions, new ideas and innovations.

P.S.R. ENGINEERING COLLEGE, SIVAKASI - 626140
UG REGULATION – 2016
B.E. COMPUTER SCIENCE AND ENGINEERING
CURRICULUM [I - VIII SEMESTER]

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
SEMESTER I					
Theory					
1	161HS11	Essential English	HS	3-0-0	3
2	161MA11	Engineering Mathematics - I	BS	3-1-0	4
3	161PH11	Engineering Physics	BS	3-0-0	3
4	161CY11	Engineering Chemistry	BS	3-0-0	3
5	161CS11	Computer Programming	ES	3-0-0	3
6	161ME11	Engineering Graphics	ES	1-0-3	3
Practical					
7	161PC17	Physics and Chemistry Laboratory - 1	BS	0-0-4	2
8	161CS17	Computer Practices Laboratory	ES	0-0-4	2
9	161EE17	Engineering Practices Laboratory	ES	0-0-4	2
			No. of Credits:		**25**

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
SEMESTER II					
Theory					
1	161HS21	Technical English	HS	3-0-0	3
2	161MA21	Engineering Mathematics-II	BS	3-1-0	4
3	161PH21	Physics of Materials	BS	3-0-0	3
4	161CY21	Environmental Science	BS	3-0-0	3
5	161CS21	Object Oriented Programming	ES	3-0-0	3
6	161CS22	Digital Principles and Systems Design	ES	3-0-0	3
Practical					
7	161PC27	Physics and Chemistry Laboratory - II	BS	0-0-4	2
8	161CS27	Object Oriented Programming Laboratory	ES	0-0-4	2
9	161CS28	Digital Laboratory	ES	0-0-4	2
			No. of Credits:		**25**

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
SEMESTER III					
Theory					
1	161MA31	Transforms and Partial Differential Equations	BS	3-1-0	4
2	161CS31	Data Structures	PC	3-0-0	3
3	161CS32	Computer Organization & Architecture	PC	3-0-0	3
4	161CS33	Microprocessors and Microcontrollers	ES	3-0-2	4
5	161CS34	Operating System	PC	3-0-0	3
6	161CS35	Programming in Python	PC	3-0-2	4
Practical					
7	161CS37	Data Structures Laboratory	PC	0-0-4	2
8	161CS38	Operating system Laboratory	PC	0-0-4	2
9	161HS39	Functional English – I	EEC	0-0-2	MC
			No. of Credits:		**25**

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
SEMESTER IV					
Theory					
1	161MA41	Probability and Random Processes	BS	3-0-0	3
2	161CS41	Computer Networks	PC	3-0-2	4
3	161CS42	Programming with JAVA	PC	3-0-0	3
4	161CS43	Design and Analysis of Algorithms	PC	3-0-0	3
5	161CS44	Database Management Systems	PC	3-0-0	3
6	161CS45	Object Oriented Software Engineering	PC	3-0-2	4
Practical					
7	161CS47	Java Laboratory	PC	0-0-4	2
8	161CS48	Database Management Systems Laboratory	PC	0-0-4	2
9	161HS49	Functional English – II	EEC	0-0-2	MC
				No. of Credits:	**24**

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
SEMESTER V					
Theory					
1	161MA51	Discrete Mathematics	BS	3-0-0	3
2	161CS51	Cryptography & Network Security	PC	3-0-0	3
3	161CS52	Mobile and Pervasive Computing	PC	3-0-0	3
4	161CS53	Theory of Computation	PC	3-0-0	3
5	161CS54	Cloud Computing	PC	3-0-0	3
6	161CS55	C# and .Net Programming	PC	3-0-0	3
Practical					
7	161CS57	C# and .Net Laboratory	PC	0-0-4	2
8	161CS58	Open Source Laboratory	PC	0-0-4	2
9	161HS59	Career English – I	EEC	0-0-2	MC
				No. of Credits:	**22**

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
SEMESTER VI					
Theory					
1	161HS61	Engineering Economics and Management	HS	3-0-0	3
2	161CS61	Mobile Application Development	PC	3-0-0	3
3	161CS62	System Software & Compiler Design	PC	3-0-0	3
4	161CS63	Digital Signal Processing	ES	3-0-0	3
5	161CS**	Elective I*	PE	3-0-0	3
6	161CS**	Elective II*	PE/OE	3-0-0	3
Practical					
7	161CS67	Mobile Application Development Laboratory	PC	0-0-4	2
8	161CS68	System Software & Compiler Laboratory	PC	0-0-4	2
9	161HS69	Career English - II	EEC	0-0-2	MC
				No. of Credits:	**22**

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
SEMESTER VII					
Theory					
1	161CS71	Big data Analytics	PC	3-0-0	3
2	161CS72	Internet of Things	PC	3-0-0	3
3	161CS73	Computer Graphics & Multimedia	PC	3-0-2	4
4	161CS74	Web Technology	PC	3-0-0	3
5	161CS**	Elective III*	PE	3-0-0	3
6	161CS**	Elective IV*	PE/OE	3-0-0	3
Practical					
7	161CS77	Big data analytics Laboratory	PC	0-0-4	2
8	161CS78	Web technology Laboratory	PC	0-0-4	2
				No. of Credits:	**23**

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
SEMESTER VIII					
Theory					
1	161CS**	Elective V*	PE	3-0-0	3
2	161CS**	Elective VI*	PE	3-0-0	3
Practical					
3	161CS81	Project Work	EEC	0-0-12	6
				No. of Credits:	**12**
				Total No. of Credits:	**178**

S. No.	Categories	Total Number of Credits(178)	Weightage	AICTE Weightage
1.	HS - Humanities and Social Science including Management.	09	5.05	12
2.	BS - Basic Science	31	17.41	25
3.	ES - Engineering Sciences	30	16.85	24
4.	PC - Program Core	84	47.19	48
5.	PE - Program Elective	12	06.74	18
6.	OE - Open Elective/PE-Program Elective	06	03.37	18
7.	EEC - Employability Enhancement Courses	06	03.37	15
8.	MC - Mandatory Course	00	00	00

Additional Eligibility requirement for the award of degree

1. The co-curricular activities one or more of the following is/are compulsory for a student in the first three years of his/her study with satisfactory grade to eligible for the award of degree with a satisfactory grade is compulsory to be eligible for the award of degree in the first two years of study
    - National Service Scheme (NSS)
    - Youth Red Cross (YRC)
    - Red Ribbon Club (RRC)
    - Institute of Electrical Electronics Engineering (IEEE)
    - Indian Society for Technical Education (ISTE)
    - Society of Automotive Engineers (SAE)
    - Sports & Games
2. Every student should undergo In-plant Training/Internship/Industrial visit with due approval of HOD & Principal

LIST OF ELECTIVES

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
1	161CSE01	Advanced Database Systems	PE	3-0-0	3
2	161CSE02	Advanced JAVA Programming	PE	3-0-0	3
3	161CSE03	Ad hoc and Sensor Networks	PE	3-0-0	3
4	161CSE04	Network Analysis and Management	PE	3-0-0	3
5	161CSE05	High Speed Networks	PE	3-0-0	3
6	161CSE06	Information Retrieval	PE	3-0-0	3
7	161CSE07	Resource Management Techniques	PE	3-0-0	3
8	161CSE08	Artificial Intelligence and Robotics	PE	3-0-0	3
9	161CSE09	Natural Language Processing	PE	3-0-0	3
10	161CSE10	Human Computer Interaction	PE	3-0-0	3
11	161CSE11	Knowledge Management	PE	3-0-0	3
12	161CSE12	Data Mining Techniques	PE	3-0-0	3
13	161CSE13	Machine learning Techniques	PE	3-0-0	3
14	161CSE14	Digital Image Processing	PE	3-0-0	3
15	161CSE15	Computational Biology	PE	3-0-0	3
16	161CSE16	Software Testing	PE	3-0-0	3
17	161CSE17	Embedded and Real Time Systems	PE	3-0-0	3
18	161CSE18	Game Programming	PE	3-0-0	3
19	161CSE19	Graph Theory and Applications	PE	3-0-0	3
20	161CSE20	Service Oriented Architecture	PE	3-0-0	3
21	161CSE21	Software Project Management	PE	3-0-0	3
22	161CSE22	Software Engineering Practices	PE	3-0-0	3
23	161CSE23	Social Network Analysis	PE	3-0-0	3
24	161CSE24	Nano Computing	PE	3-0-0	3
25	161CSE25	Data Science and Analytics	PE	3-0-0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF CSE

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
1	161OE101	Web development using PHP	OE	3-0-0	3
2	161OE102	Programming in PERL	OE	3-0-0	3
3	161OE103	Multimedia and Animation Tools	OE	3-0-0	3
4	161OE104	Multicore Architecture	OE	3-0-0	3
5	161OE105	Green Computing	OE	3-0-0	3
6	161OE106	Soft Computing	OE	3-0-0	3
7	161OE107	Java Scripts	OE	3-0-0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF ECE

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
1	161OE201	Bio Medical Instrumentation	OE	3-0-0	3
2	161OE202	Digital Image Processing	OE	3-0-0	3
3	161OE203	Consumer Electronics	OE	3-0-0	3
4	161OE204	Multimedia Compression and Communication	OE	3-0-0	3
5	161OE205	High Speed Networks	OE	3-0-0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF EEE

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
1	161OE401	Energy Audit and Conservation	OE	3-0-0	3
2	161OE402	Principles of Virtual Instrumentation	OE	3-0-0	3
3	161OE403	Sensors and Transducers	OE	3-0-0	3
4	161OE404	Aircraft Electronic System	OE	3-0-0	3
5	161OE405	Electrical Safety	OE	3-0-0	3
6	161OE406	Vehicle Electric Power Systems	OE	3-0-0	3
7	161OE407	Domestic and Industrial Electrical Installation	OE	3-0-0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF BIO-TECH

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
1	161OE501	Process Equipment and Plant Design	OE	3-0-0	3
2	161OE502	Biomaterials	OE	3-0-0	3
3	161OE503	Biosensors	OE	3-0-0	3
4	161OE504	Food Science and Technology	OE	3-0-0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF MECHANICAL

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
1	161OE601	Maintenance Engineering	OE	3-0-0	3
2	161OE602	Non Destructive Testing and Materials	OE	3-0-0	3
3	161OE603	Operations Research	OE	3-0-0	3
4	161OE604	Renewable Sources of Energy	OE	3-0-0	3
5	161OE605	Robotics	OE	3-0-0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF CIVIL

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
1	161OE701	Disaster Management System	OE	3-0-0	3
2	161OE702	Fundamentals of Fire Safety Engineering	OE	3-0-0	3
3	161OE703	Optimization in Engineering	OE	3-0-0	3
4	161OE704	Renewable Energy Sources	OE	3-0-0	3
5	161OE705	Environmental Impact and Risk Assessment	OE	3-0-0	3
6	161OE706	Environment and Ecology	OE	3-0-0	3
7	161OE707	Technology Management	OE	3-0-0	3
8	161OE708	Sustainable Management of Urban Ecology	OE	3-0-0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF MBA

S. No.	Course Code	Name of the Course	Category	L-T-P	Credit
1	161OE801	Essentials of Management	OE	3-0-0	3
2	161OE802	Fundamentals of Marketing	OE	3-0-0	3
3	161OE803	Managing Human Resources	OE	3-0-0	3
4	161OE804	Professional Ethics in Engineering	OE	3-0-0	3

161HS11	ESSENTIAL ENGLISH	L	T	P	C
		3	0	0	3

Programme: B.E./B.Tech. Common to all Branches **Sem:** 1 **Category:** HS

Aim: To impart Basic English Language skill to develop the students ability to use English effectively

Course Outcomes: The Students will be able to

CO1: Understand and use different forms of language.
CO2: Write formal letters.
CO3: Speak in English with clarity.
CO4: Listen actively and grasp the contents of the speech.
CO5: Read general texts and comprehend their content.
CO6: Use grammar to make meaning in both speaking and writing.

UNIT –I **9**

Grammar - tense - past simple, present simple, verbal vs non-verbal communication, Vocabulary - Commonly used words - Spelling, Reading - Reading News papers, Writing - Formal Letters - Requisition for leave - Bona fide, Listening - Listening to famous speeches, Speaking- introducing oneself.

UNIT –II **9**

Grammar-tense- past and present simple continuous, Vocabulary - Prefixes, Suffixes - Parts of Speech, Reading - Basic reading comprehension, Writing Formal Letters - Permission letters - In-plant training - Industrial visit, Listening - Listening to Interviews, Speaking - Speaking about interests, one's friends, hobbies, favorite programmes.

UNIT -III **9**

Grammar - tense - past and present perfect, Vocabulary - Forms of Verb - Analogy -Sentences - Types, Reading - Cloze Test, Writing - Paragraph writing - descriptions-Comparing and contrasting-describing pictures, Listening - Listening to News, Speaking- Future plan - Native place, Appropriate body language.

UNIT -IV **9**

Grammar - perfect tenses, Vocabulary – Single - line definitions - Pronoun - Adverbs -Preposition, Reading - Reading for comprehension, Writing - e-mail - basic conventions writing – Instructions - Recommendations, Listening - Listening to Debates, Speaking - Giving opinions.

UNIT -V **9**

Grammar - subject - verb agreement, Vocabulary - commonly confused words - Linkers - Abbreviation - Voice, Reading - Reading for Inferences, Writing - Agenda Note - taking - Editing the text, Listening - Listening to Telephonic Conversation, Speaking - short talks on general topics, short conversations

Total Periods: 45

Text Books:

1. Jack.C.Richards, interchange, Cambridge University Press, New Delhi.(2015) ISBN 9781107570894.

References:

1. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai 2011.
2. www.usingenglish.com
3. www.grammar.org
4. www.audioenglish.com

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1										3		3				
CO2										3		2				
CO3										3		3				
CO4					2					3		3				
CO5										3		3				
CO6										3		2				

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161MA11	ENGINEERING MATHEMATICS - I	L	T	P	C
		3	1	0	4

Programme: B.E./B.Tech. Common to all Branches **Sem: 1 Category: BS**

Aim: The course is aimed at developing the basic mathematical skills of Engineering Student.

Course Outcomes: The Students will be able to

CO1: Find the inverse of given matrix and reduce matrix equation using Cayley- Hamilton Theorem.

CO2: Elaborate given function as a power series using Taylor's series.

CO3: Develop a series solution to an ODE, & recognize special functions defined by series.

CO4: Make use of Calculus in finding the envelope, Evolutes& Involutes.

CO5: Check whether the series is convergent or divergent.

CO6: Evaluate maxima and minima for function of two variables.

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MATRICES

Characteristic equation - Eigen Values and Eigen vectors of a real matrix - Properties of Eigen values - Cayley-Hamilton Theorem (without proof) and its application - Orthogonal Transformation of a Symmetric matrix to diagonal form - Quadratic form - Orthogonal reduction to canonical form.

ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients.

DIFFERENTIAL CALCULUS 12

Curvature - Radius of curvature - Cartesian and Parametric Coordinates - Circle of Curvature - Involutes and Evolutes - Envelope.

FUNCTIONS OF SEVERAL VARIABLES 12

Partial Derivatives - Total Derivative - differentiation of Implicit function - Jacobian - Taylor's Expansion - Maxima/Minima for function of two variables - Method of Lagrange's multipliers.

SEQUENCES AND SERIES 12

Sequences: Definition and examples - Series: Types and Convergence - Series of positive terms - Tests of convergence: Comparison test and D'Alembert's ratio test - Alternating series - Leibnitz's test - Series of positive and negative terms - Absolute and conditional convergence.

Total Periods(Theory 45 + Tutorial 15): 60

Text Books:

1. B.S.Grewal, 'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers, Delhi,200
2. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, John Wiley Sons, 2001.

References:

1. Greenberg, M.D. "Advanced Engineering Mathematics", Second Edition, Pearson Education Inc. (First Indian reprint), 2002.
2. Venkataraman.M.K., "Engineering Mathematics", Volume I and II Revised enlarged Fourth Edition, The National Publishing Company,Chennai,2004.
3. Veerarajan.T "Engineering Mathematics (for first year)", Fourth Edition, Tata McGraw - hill publishing company Ltd, New Delhi, 2005.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3		1								3		2	1	
CO2	2	3		2								2				1
CO3	3	2										1	2			
CO4	1	1													2	
CO5	2	3		1										2		
CO6	2	2		1								3	2			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161PH11	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

Programme: B.E./B.Tech. Common to all Branches **Sem:** 1 **Category:** BS

Aim: To endow the students with the fundamentals of Physics and apply new ideas in the field of Engineering and Technology.

Course Outcomes: The Students will be able to

CO1: Understand the theory and various crystal structures and crystal growth techniques.

CO2: Acquire knowledge about the properties of sound, production of ultrasonic waves and their application in the field of Non-destructive testing and Sonogram.

CO3: Attain the knowledge of ultrasonic waves and their application in the field of Non-destructive testing and Sonogram.

CO4: Gain knowledge about basic equations of Quantum mechanics and its applications.

CO5: Know about the basic configuration of a Laser, types of lasers and the industrial applications of Laser.

CO6: Understand principle behind fiber optic communication and the electronic devices involved in the transmission and reception of data.

CRYSTAL PHYSICS **9**

Lattice - Unit cell - Bravais lattice - Lattice planes - Miller indices - d spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - Packing factor for SC, BCC, FCC and HCP structures - Crystal growth techniques-Solution, melt (Bridgemann and Czochralski).

ACOUSTICS **9**

Classification of sound - Decibel-Weber - Fechner Law- Sabine's formula - Derivation using growth and decay method - absorption coefficient and its determination - Acoustic of building - Factors affecting acoustics of buildings and their remedies.

ULTRASONICS **9**

Production of ultrasonics - Magnetostriction - Piezoelectric methods - Velocity measurement - Acoustic grating - Industrial applications - Non Destructive Testing - Pulse echo system through transmission and reflection modes - SONAR, Medical applications - Sonograms.

QUANTUM PHYSICS **9**

Black body radiation - Planck's theory (derivation) - Photoelectric effect - Matter waves - Schrödinger's wave equation - Time independent and time dependent equations - Physical significance of wave function - Particle in a one dimensional box.

APPLIED OPTICS **9**

LASERS: Introduction - Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B coeffcients - Derivation- Types of lasers - CO_2, Nd-YAG - Industrial Applications - Lasers in welding, cutting - Holography and its applications.

FIBER OPTICS: Optical Fiber-Classification - Principle and propagation of light in optical fibres - Numerical aperture and Acceptance angle - Fibre optical communication system - Sensors (Active and passive) - Displacement and Temperature Sensors.

Total Periods: 45

Text Books:

1. Gaur.R.K., Gupta.S.C., "Engineering Physics" Dhanpat Rai Pub., New Delhi 2003.
2. Avadhanulu M. N., Kshirsagar, P. G., "A Text book of Engineering Physics", S.Chand and company, Ltd., New Delhi, 2005.

References:

1. Serway and Jewett, "Physics for Scientists and Engineers with Modern Physics", 6th Edition, Thomson Brooks/Cole, Indian reprint (2007).
2. Arither Beiser, Concepts of Modern Physics, Tata McGraw-Hill, New Delhi (2010).
3. Palanisamy, P.K., "Engineering Physics" Scitech publications, Chennai, (2007).
4. Rajendran, V & Marikani A, "Engineering Physics" Tata McGraw-Hill Publications Ltd, 3rd Edition, New Delhi, (2004).

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1		2		3					2	1	1		
CO2	3	2	2	2			3					2	1	1		
CO3	2	2					3					1	1	1		
CO4	3	2	2	2			2					2	1	1		
CO5	3	2	2				2					2	1	1		
CO6	3	2	2	2			2					2	1	1		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CY11	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

Programme: B.E./B.Tech. Common to all Branches **Sem:** 1 **Category:** BS

Aim: To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

Course Outcomes: The Students will be able to

CO1: Demonstrate the essential concept of water chemistry with their properties and applications of water technology.

CO2: The treatment of water for potable and industrial purposes.

CO3: Understand the operating principles and the reaction involved in electrochemistry.

CO4: Explain the core concepts of surface chemistry.

CO5: Illustrate the structure, properties and applications of nano materials.

CO6: Learn the principles, importance and application of analytical techniques.

WATER TECHNOLOGY **9**

Hardness - Types and Estimation by EDTA method, alkalinity - Types of alkalinity and determination - Domestic water treatment - disinfection methods (Chlorination, ozonation, UV treatment) - Boiler feed water - requirements - disadvantages of using hard water in boilers - internal conditioning (phosphate, calgon and carbonate conditioning methods) - external conditioning - demineralization process - desalination and reverse osmosis.

ELECTROCHEMISTRY **9**

Electrochemical cells - reversible and irreversible cells - EMF - electrochemical series and its significance - Single electrode potential - Nernst equation (problem) - reference electrodes - Standard Hydrogen electrode - Calomel electrode - Ion selective electrode - glass electrode and measurement of pH - potentiometer titrations (redox - Fe^{2+}vs dichromate) and conductometric titrations (acid-base - HCI vs NaOH) titrations

SURFACE CHEMISTRY **9**

Adsorption - types - adsorption of gases on solids - adsorption isotherms - Frendlich and Langmuir isotherms - adsorption of solutes from solution - role of adsorbents in catalysis, ion-exchange adsorption and pollution abatement.

NANOCHEMISTRY **9**

Nanomaterials - introduction to nanochemistry - synthesis - hydrothermal, solvothermal - Chemical vapour deposition - sol-gel - Electro deposition - ball milling - properties of nanoparticles and applications. Carbon nanotubes - fabrication - arc method - pulsed laser deposition - Chemical vapour deposition - structure, properties & applications.

SPECTROSCOPY & QUANTITATIVE ANALYSIS **9**

Beer-Lambert's law (problem) - UV-visible spectroscopy and IR spectroscopy - principles - instrumentation (problem) (block diagram only) - estimation of iron by colorimetry - Determination of the amount of calcium in milk powder by EDTA Complexometry - Estimation of iodine in iodized common salt by Iodometry - Estimation of phosphoric acid in soft drinks (coca cola) by molybdenum blue method .

Total Periods: 45

Text Books:

1. P. Kannan, A. Ravikrishnan, "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009.
2. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002)

References:

1. S.S.Dara, S.S.Umare, "Engineering Chemistry", S.Chand & Company Ltd., New Delhi 2010.
2. B.K.Sharma, "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
3. B.Sivasankar, "Engineering chemistry" Tata McGraw Hill Publishing Company (P) Ltd., New Delhi, 2006.
4. Pradeep, "Nano the essential" McGraw Hill Publishing Company (P) Ltd., New Delhi,

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2		2	3			2		3	1	3		2
CO2	3	2		2	2	3		1	2		2	2	2	2		3
CO3				2			2					2	3	3		3
CO4	2	1	2	2	1		2					1	2	2		
CO5	3	2	2	1	2	1			2			2	3	3		2
CO6	3	3	3	2		2	3			2		3	2	3		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS11 COMPUTER PROGRAMMING

L	T	P	C
3	0	0	3

Programme: B.E./B.Tech. Common to all Branches **Sem: 1 Category: ES**

Aim: To provide an awareness to Computing and Programming.

Course Outcomes: The Students will be able to

CO1: Able to have fundamental knowledge on basics of computers hardware and number systems.
CO2: Able to understand the basic terminology used in computer programming.
CO3: Able to write, compile and debug programs in C language.
CO4: Able to use different data types in a computer program.
CO5: Able to design programs involving decision structures, loops and functions.
CO6: Able to understand the dynamics of memory by the use of pointers.
CO7: Able to use different data structures and create/update basic data files.

INTRODUCTION **9**

Generation and Classification of Computers - Basic Organization of a Computer - Number System - Binary - Decimal - Conversion - Problems. Software - Types, Development Steps. Algorithm - Pseudo code - Flow Chart. Problem formulation - Problem Solving.

C PROGRAMMING BASICS **9**

Introduction to Unix Operating System - Introduction to ' C' programming - fundamentals - structure of a 'C' program - compilation and linking processes - Constants, Variables - Data Types - Expressions using operators in 'C' - Managing Input and Output operations - Decision Making and Branching - Looping statements - solving simple scientific and statistical problems.

ARRAYS AND STRINGS **9**

Arrays - Initialization - Declaration - One dimensional and Two dimensional arrays. String - String operations - String Arrays. Simple programs - sorting - searching - matrix operations.

FUNCTIONS AND POINTERS **9**

Function - Definition of function - Declaration of function - Pass by value - Pass by reference - Recursion - Pointers - Definition - Initialization - Pointers arithmetic - Pointers and arrays - Example Problems.

STRUCTURES AND UNIONS **9**

Introduction - need for structure data type - structure definition - Structure declaration - Structure within a structure - Union - Programs using structures and Unions - File Manipulation - Storage classes - Pre-processor directives.

Total Periods: 45

Text Books:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", 1/e, Oxford University Press, 2009.
3. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 13/e, 2011.

References:

1. Byron S Gottfried, "Programming with C", Schaum's Outlines, 2nd Edition, Tata McGraw-Hill, 2006.
2. Dromey R.G., "How to Solve it by Computer", Pearson Education, 4th Reprint, 2007.
3. Kernighan.B.W and Ritchie,D.M, "The C Programming language", 2nd Edition, Pearson Education, 2006.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											3			
CO2	3	2											3	3		
CO3	3	3	2	1						1				3		
CO4	3	2	1										2			
CO5	2	2	3	2										2		
CO6	2	2			1									2	2	
CO7	2	2	2	2	1									3		1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161ME11	ENGINEERING GRAPHICS	L	T	P	C
		1	0	3	3

Programme: B.E./B.Tech. Common to all Branches **Sem:** 1 **Category:** ES
Aim: To develop graphics skills in students
Course Outcomes: The Students will be able to
CO1: Follow the conventions used in engineering graphics.
CO2: Practice plane curves and free hand sketching.
CO3: Draw the projections of points, lines and plane.
CO4: Draw the projections of simple solids and their sectional views.
CO5: Describe the applications of development of surfaces.
CO6: Practice isometric and perspective projections

Concepts and conventions (Not for Examination) **1**
Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning.

PLANE CURVES **11**
Curves used in engineering practices:
Conics - Construction of ellipse, Parabola and hyperbola by eccentricity method - Construction of cycloid - Construction of involutes of square and circle - Drawing of tangents and normal to the above curves.

PROJECTION OF POINTS, LINES AND PLANE SURFACES **12**
Projection of straight lines located in the first quadrant - inclined to both planes - Determination of true lengths and true inclinations - Projection of regular polygonal and circular lamina inclined to both reference planes.

PROJECTION OF SOLIDS **12**
Projection of simple solids like Prisms, Pyramids, Cylinder and Cone when the axis is inclined to one reference plane.

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES **12**
Sectioning of above solids in simple vertical position by cutting planes inclined to HP and perpendicular to VP - Obtaining true shape of section. Development of lateral surfaces of truncated solids - Prisms, Pyramids, Cylinder and Cone.

ISOMETRIC AND PERSPECTIVE PROJECTIONS **12**
Principles of isometric projection - isometric scale - isometric projections of truncated Prisms, Pyramids, Cylinder and Cone. Perspective projection of simple prism and pyramid by Visual ray method.

Total Periods: 60

Text Books:
1. K.V.Natrajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai 2015.
2. M.S. Kumar, “Engineering Graphics”, D.D. Publications, 2014.

References:
1. K. Venugopal & V. Prabhu Raja, “Engineering Graphics”, New Age International (P) Ltd 2015.
2. M.B. Shah and B.C. Rana, “Engineering Drawing”, Pearson Education 2014.
3. K.C. John, “Engineering Graphics for degree” PHI Learning Pvt. Ltd., New Delhi, 2013.
4. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2013.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

Special points applicable to end semester examination on Engineering Graphics:

1. There will be five questions, first question is compulsory from Unit-I on engineering curves. Other four questions are either or type from Unit-II to V
2. All questions will carry equal marks of 20 each making a total of 100
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size
4. The end semester examination will be conducted in two sessions (FN and AN on the same day) for 50 percent of student (approx) at a time.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		3		2					3			2		3	
CO2	3		2		2					3			2		2	
CO3	3		2		2					3					2	
CO4	3		3		2					3			2		2	
CO5	3		3		2					3			1		2	
CO6	2		2		2					3			2		2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161PC17 PHYSICS AND CHEMISTRY LABORATORY-I

L	T	P	C
0	0	4	2

Programme: B.E./B.Tech. Common to all Branches **Sem: 1 Category: BS**

Aim: To introduce the basic Physics concepts through experiments and to impart the basic analysis in chemistry.

Course Outcomes: The Students will be able to

CO1: Understand the laser light propagation in optical fibre.
CO2: Learn the principle of interference.
CO3: Gain the knowledge of ultrasonic velocity in a liquid medium.
CO4: Understand the knowledge of their home town water.
CO5: Estimate the amount of substance by potentiometric technique.
CO6: Outline the application of analytical instrument.

LIST OF EXPERIMENTS - PHYSICS PART

(A minimum of five experiments shall be offered)

S. No.	NAME OF THE EXPERIMENT
1.	(a) Determination of Particle Size using Diode LASER. (b) Determination of wavelength of the LASER source. (c) Determination of Acceptance angle and Numerical aperture of an optical fibre.
2.	Determination of thickness of thin wire – Air wedge method.
3.	Determination of Velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
4.	Determination of Dispersive power of a prism using Spectrometer.
5.	Determination of Young's modulus of the material - Non uniform bending.
6.	Determination of thermal conductivity of a bad conductor - Lee's Disc method

LIST OF EXPERIMENTS – CHEMISTRY PART

S. No.	NAME OF THE EXPERIMENT
1.	Estimation of Total Hardness of their home town Water by EDTA method.
2.	Estimation of Copper in brass by EDTA method.
3.	Estimation of Ferrous Ion by Potentiometric Titrations.
4.	Conductometric Titration of strong acid Vs strong base
5.	Estimation of Alkalinity of Water sample
6.	Estimation of iron by spectrophotometer (Demo only)

Total Periods: 60

References:

1. Text book of Quantitative Inorganic Analysis, A.I.Vogel, ELBS, London.
2. "Practical A.Ravikrishnan Engineering Chemistry", Sri Krishna Publications, Chennai 2002.
3. Engineering Physics Laboratory Manual.
4. Engineering Chemistry Laboratory Manual.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1		2		1					1	1	1		
CO2	1	2	2				1					1	1	1		
CO3	2	2	2			2	1					1	1	1		
CO4	2	2	1		1	1	2					1				
CO5	3	2	1	2	2		1					2				
CO6	2	1	3		2		2					2				

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS17 COMPUTER PRACTICES LABORATORY

L	T	P	C
0	0	4	2

Programme: B.E./B.Tech. Common to all Branches **Sem: 1** **Category: ES**

Aim: To provide an awareness to Computing and C Programming.

Course Outcomes: The Students will be

CO1: Able to have fundamental concept on basics commands in Linux.

CO2: Able to write, compile and debug programs in C language.

CO3: Able to formulate problems and implement algorithms in C.

CO4: Able to effectively choose programming components that efficiently solve computing problems in real-world.

CO5: Able to design application oriented programs in C.

CO6: Structures and unions through which derived data types can be formed.

LIST OF EXPERIMENTS:

1. Search, generate, and manipulate data using MS office / Open Office.
2. Presentation and Visualization - graphs, charts, 2D, 3D.
3. C Programming using Simple statements and expressions.
4. Scientific problem solving using decision making and looping.
5. Simple programming for one dimensional and two dimensional arrays.
6. Solving problems using String functions.
7. Programs with user defined functions - Includes Parameter Passing.
8. Program using Recursive Function and conversion from given program to flow chart.
9. Program using structures and unions.
10. Program using files.

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2						2				3	1	1	
CO2	3	2	2						2				3	2	2	
CO3	3	2	3						2				3	3	2	
CO4	2	3	2						2				3	2	2	2
CO5	3		2						2				3	2	1	
CO6	2		2										2	2	1	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161EE17 ENGINEERING PRACTICES LABORATORY

L	T	P	C
0	0	4	2

Programme: B.E./B.Tech. Common to all Branches **Sem: 1 Category: ES**

Aim: To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

Course Outcomes: The Students will be able to

CO1: Express the pipe connections and identify the various components used in plumbing.
CO2: Produce simple wooden joints using wood working tools.
CO3: Create simple lap, butt and tee joints using arc welding equipments.
CO4: Generate the simple components using lathe and drilling machine.
CO5: Identify the fitting usage of square joint, L joint and stepped joints.
CO6: Facilitate the operation of fluorescent lamp, staircase wiring and measuring the consumed electrical energy.
CO7: Express and analyze the fundamentals of Boolean algebra and digital logic gates.
CO8: Generate clock signal and measure the parameters of the signal

LIST OF EXPERIMENTS

GROUP A CIVIL AND MECHANICAL

I .CIVIL ENGINEERING PRACTICE **15**

Buildings:

a. Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

a. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
b. Study of pipe connections requirements for pumps and turbines.
c. Preparation of plumbing line sketches for water supply and sewage works.
d. Hands-on-exercise:
   Basic pipe connections - Mixed pipe material connection - Pipe Connections with different joining components.
e. Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

a. Study of the joints in roofs, doors, windows and furniture.
b. Hands-on-exercise: Wood work, joints by sawing, planing and cutting

II .MECHANICAL ENGINEERING PRACTICE **15**

Welding:

a. Preparation of arc welding of butt joints, lap joints and tee joints.
b. Gas welding practice.

Basic Machining:

a. Simple Turning and Taper turning
b. Drilling Practice

Sheet Metal Work:

a. Forming and Bending:
b. Model making - Trays, funnels, etc.
c. Different type of joints.

Machine assembly practice:

a. Study of centrifugal pump
b. Study of air conditioner

Demonstration on:

a. Smithy operations, upsetting, swaging, setting down and bending.
   Example - Exercise - Production of hexagonal headed bolt.

b. Foundry operations like mould preparation for gear and step cone pulley.
c. Fitting - Exercises - Preparation of square fitting and vee - fitting models.

GROUP B ELECTRICAL and ELECTRONICS

III. ELECTRICAL ENGINEERING PRACTICE 15

a. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
b. Fluorescent lamp wiring.
c. Stair case wiring
d. Measurement of electrical quantities-voltage, current, power & power factor in RLC circuit.
e. Measurement of energy using single phase energy meter.
f. Measurement of resistance to earth of electrical equipment.

IV. ELECTRONICS ENGINEERING PRACTICE 15

a. Study of Electronic components and equipments - Resistor, color coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
b. Study of logic gates AND, OR, EOR and NOT.
c. Generation of Clock Signal.
d. Soldering practice - Components Devices and Circuits - Using general purpose PCB.
e. Measurement of ripple factor of HWR and FWR.

Total Periods: 60

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	3	3				3							
CO2	2	2	3	3	3				3							
CO3	2	2	3	3	3				3							
CO4	2	2	3	3												
CO5	2	2	3	3												
CO6	2	2	3	3	3				3							
CO7	1	2	2	3	3				2							
CO8	1	2	2	2	2				2							

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS21 **TECHNICAL ENGLISH** **L T P C**
3 0 0 3

Programme: B.E./B.Tech. Common to all Branches **Sem: 2 Category: HS**

Aim: To improve confident of the learner to communicate effectively using technical related workplace modules.

Course Outcomes: The Students will be able to

CO1: Remember words and its meaning for the specific purpose
CO2: Apply written communication methodologies at workplace
CO3: Develop listening skill to respond and to gather information
CO4: Interpret the text using comprehending skill
CO5: Describe the topic using appropriate vocabulary
CO6: Summarize the key points.
CO7: Summarize the key points in the audio script

UNIT - I **9**

Language and Grammar – Technical words – Foreign words – Adjective, **Reading** – Reading Technical passages, **Writing** – Formal Letters – Calling for Quotation, placing order, **Listening** – Listening to TED Talks to take notes, **Speaking** – Introducing others.

UNIT - II **9**

Language and Grammar – Interrogative Statements – Acronym – One-word substitution, **Reading** – Note-taking, **Writing** – Essay writing – Preparing Questionnaire, **Listening** – Listening to Group Discussion, **Speaking** – Public Speech practice.

UNIT - III **9**

Language and Grammar – Conditional Clauses – Punctuation – Concord, **Reading** – Reading Book/film/music reviews, **Writing** – Report writing, **Listening** – Listening to Technical Presentation, **Speaking** – Reporting events.

UNIT - IV **9**

Language and Grammar – Words followed by prepositions – Articles – Action verb, **Reading** – Reading Famous speech text, **Writing** – Minutes – Checklist – Memo, **Listening** – Listening for Gist, **Speaking** – discussing about uses of gadgets & machines.

UNIT - V **9**

Language and Grammar Vocabulary, cause and effect, reported speech Reading – Reading for vocabulary, **Writing** – dialogue writing, **Listening** – Listening for Gist, **Speaking** – discussing about uses of gadgets & machines

Total Periods: 45

Text Books

1. Department of English, Anna University, "English for engineers and technologists" (Vol. 1& 2) combined edition, Orient Black swan, Chennai (2012)

References

1. Department of English, Anna University, "Mindscapes: English for Technologists and Engineers", Orient Blackswan, Chennai, (2012)
2. www.usingenglish.com
3. www.grammar.org
4. www.audioenglish.com
5. www.manythings.org

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2		3		1		2	3	3	3	3				
CO2						2		3	3	3	3	3				
CO3		3		2	3	2	3	2	3	3	2	3				
CO4										2		3				
CO5									3	3	2	3				
CO6			2	2								3				

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161MA21	ENGINEERING MATHEMATICS II	L	T	P	C
		3	1	0	4

Programme: B.E./B.Tech. Common to all Branches **Sem: 2 Category: BS**

Aim: To analyze the engineering problems using the techniques and the mathematical skills acquired by studying vector calculus, Laplace transform, complex variables and multiple integral.

Course Outcomes: The Students will be able to

CO1: Apply Laplace transform to solve first and second order differential equations with elementary forcing function.

CO2: Classify Green's theorem to evaluate line integrals along simple closed contours on the plane.

CO3: Construct an analytic function using the properties of analytic function.

CO4: Make use of Cauchy's residue theorem for applications in Engineering.

CO5: Evaluate complicated real integrals using the basics of analytic functions and the complex Integration.

CO6: Apply double integration to find area between two curves.

12

LAPLACE TRANSFORM

Laplace transform - Conditions for existence - Transform of elementary functions - Basic properties - First Shifting Theorem - Transform of derivatives on tf(t) , f(t)/t and periodic functions - Transform of unit step function and impulse functions. Inverse Laplace transform by partial fraction method and Convolution theorem (excluding proof) - Initial and Final value theorems - Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

ANALYTIC FUNCTIONS 12

Functions of a complex variable - Analytic functions - Necessary conditions, Cauchy - Riemann equation and Sufficient conditions (excluding proofs) - Harmonic and orthogonal properties of analytic function(without proof) - Harmonic conjugate - Construction of analytic functions - Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

COMPLEX INTEGRATION 12

Statement and application of Cauchy's theorem and Cauchy's integral formula, Taylor and Laurent expansion, Singularities, Classification, Residues, Cauchy's residue theorem, Contour integration (Type I&II).

MULTIPLE INTEGRALS 12

Double Integration - Cartesian and Polar co-ordinates - Change of order of Integration - Change of variable between Cartesian and polar co-ordinates - Triple integration - Area as a double integral by Cartesian co-ordianates - Volume as a triple integral.

VECTORCALCULUS 12

Gradient, Divergence and Curl - Directional derivative - Irrotational and Solenoidal vector fields - Vector integration - Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) - Simple applications involving cubes and rectangular parallelepipeds.

Total Periods (Theory 45 + Tutorial 15): 60

Text Books:

1. B.S.Grewal, 'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers, Delhi, 2005.
2. T. Veerarajan, "Engineering Mathematics(for first year)", Fourth Edition, Tata McGraw - Hill publishing company Ltd, New Delhi, 2005.

References:

1. Greenberg. M.D. "Advanced Engineering Mathematics, Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Venkataraman.M.K., "Engineering Mathematics", Volume I and II Revised enlarged Fourth Edition, The National Publishing Company, Chennai, 2004.

3. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, John Wiley Sons, 2001.
4. Ravish R Singh, Mukul Bhatt, **"**Engineering Mathematics-I**",** McGraw-Hill Education (India) Private Ltd, New Delhi. Private Ltd, New Delhi.
5. Dr.P.Kandasamy, Dr.K.Thilagavathy, Dr.K.Gunavathy, S.Chand & Company Ltd. Ram Nagar, New Delhi.

Course Outcomes	**Programme Outcomes (POs)**												**Programme Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	2		2								3		2	1	
CO2	2	1		2												1
CO3	2	1		2								1	2			
CO4	1	2		2								2			2	
CO5	2	2												2		
CO6	3	3										3	2			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161PH21 **PHYSICS OF MATERIALS** **L T P C**
3 0 0 3

Programme: B.E. (Circuit Branch only) **Sem: 2 Category: BS**

Aim: To endow the students with the fundamentals of physics, materials and apply new ideas in the field of Engineering and Technology.

Course Outcomes: The Students will be able to

CO1: Understand the theory and processing of conducting, superconducting materials.
CO2: Acquire knowledge of classification of semi conducting materials.
CO3: Gain knowledge about the types of magnetic and dielectric materials and their applications.
CO4: Understand about some exciting properties of modern engineering materials.
CO5: Acquire knowledge about nanomaterials and their properties and applications.
CO6: Attain a clear view of material characterization techniques.

CONDUCTING MATERIALS **9**

Conductors: classical free electron theory of metals - Electrical and thermal conductivity - Wiedemann - Franz law - Lorentz number - Draw backs of classical theory - Fermi distribution function - Effect of temperature on Fermi Function - Density of energy states - carrier concentration in metals.

Super Conductors: properties - Types of super conductors - Applications of superconductors - SQUID, cryotron, magnetic levitation.

SEMICONDUCTING MATERIALS **9**

Intrinsic semiconductor - carrier concentration derivation - Fermi level - Variation of Fermi level with temperature - Extrinsic semiconductors - carrier concentration derivation in n-type and p-type semiconductor - variation of Fermi level with temperature and impurity concentration - Hall effect - Determination of Hall coefficient - Applications.

MAGNETIC AND DIELECTRIC MATERIALS **9**

Magnetic Materials: Origin of magnetic moment - Bohr magneton - Dia and para magnetism - Ferro magnetism - Domain theory - Hysteresis - soft and hard magnetic materials - anti-ferromagnetic materials - Ferrites - applications.

Dielectric Materials: Polarization - electronic, ionic, orientational and space charge polarization - frequency and temperature dependence of polarisation - dielectric loss - dielectric breakdown - uses of dielectric materials (capacitor and transformer) - ferroelectricity and applications.

OPTICAL MATERIALS **9**

Classification of optical materials - properties - Luminescence - Fluorescence and phosphorescence - LED - Polymer Light emitting materials - Plasma light emitting materials - LCD - optical data storage techniques like DVD, Blue ray disc.

NANO MATERIALS AND CHARACTERISATION TECHNIQUES **9**

Nanomaterials: synthesis - chemical vapour deposition - ball milling - properties of nanoparticles and applications.

Characterisation: Principle, Characterization and applications of X- Ray diffraction - Scanning Electron Microscope - Transmission Electron Microscope - Atomic Force Microscope.

Total Periods: 45

Text Books:

1. William D. Callister, Jr., "Material Science and Engineering", John Wiley & Sons Inc., Seventh Edition, New Delhi 2010.
2. Ragavan, V., "Material science and Engineering", Prentice Hall of India 2004.

References:

1. Arumugam M., "Materials Science", Anuradha publications, Kumbakonam 2006.
2. Koch C., "Nanostructured materials: processing, properties and applications", William Andrew Pub (2008).
3. Kasap, S.O., "Principle of Electronic Materials and devices", Tata Mc-Graw Hill 2007.
4. Charles P. Poole and Frank J.Ownen., "Introduction to Nanotechnology", Wiley India (2007)
5. Charles Kittel."Introduction to solid state Physics", John Wiley & Sons, 7th ed, Singapore (2007)

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1	1		1					1	1	1	1	1
CO2	3	1	2	1	1		1					1	1	1	1	1
CO3	3	1	1	2	1		1					1	1	1	1	1
CO4	3	2	2	2	2		2					1	1	1	1	1
CO5	3	2	2	3	2		1					2	1	1	1	2
CO6	3	2	2	1	2		1					2	2	1	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CY21 **ENVIRONMENTAL SCIENCE** **L T P C**
3 0 0 3

Programme: B.E./B.Tech. Common To All Branches **Sem: 2 Category: BS**

Aim: To Impart the social groups and individuals to acquire knowledge of pollution and environmental degradation

Course Outcomes: The Students will be able to

CO1: Understand the basic concepts of environment studies and natural resources.
CO2: Get knowledge about ecosystem and biodiversity.
CO3: Identify and analyze causes, effects and control measures of various types of pollution.
CO4: Get the knowledge about types of disaster and mitigation measures
CO5: Understand the impact of social issues.
CO6: Understand the role of a human being in maintaining a clean environment.

INTRODUCTION TO ENVIRONMENTAL STUDIES & NATURAL RESOURCES 9

Definition, scope and importance - Need for public awareness - Forest resources: Use and over-exploitation, deforestation, case studies. dams and their effects on forests and tribal people - Energy resources: Growing energy needs, renewable (solar energy and wind energy) and non renewable energy sources - Nuclear energy - fission and fusion reactions and light water nuclear reactor for power generation (block diagram only), Petroleum processing and fractions, LPG and Natural gas.

ECOSYSTEM AND BIODIVERSITY 9

ECOSYSTEM : Concept of an ecosystem - Structure and function of an ecosystem: Producers, consumers and decomposers, Energy flow in the ecosystem-Nitrogen cycle, Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the Forest ecosystem and Aquatic ecosystems (lake and rivers) - **BIODIVERSITY**: Introduction to Biodiversity - Definition - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - India as a mega-diversity nation - Hot-spots of biodiversity.

ENVIRONMENTAL POLLUTION 9

Definition - Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution (e) Thermal pollution - Solid waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.

SOCIAL ISSUES AND THE ENVIRONMENT 9

From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, Ozone layer depletion, nuclear accidents - case studies - Goal of Green chemistry.

HUMAN POPULATION AND THE ENVIRONMENT 9

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

Total Periods: 45

Text Books:

1. A. Ravikrishnan, “Environmental Science and Engineering, Sri Krishna Hitech Publishing Company Private Limited, 2010.
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2006.

References:

1. Anubha Kaushik, C.P. Kaushik, “Environmental Science and Engineering”, New Age International Publishers, 2016.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill Publishing Company Ltd, New Delhi, ISBN: 0070601690, 2006.
3. Raman Sivakumar, Introduction to Environmental Science and Engineering, Tata McGraw-Hill Education Private Limited, New Delhi, 2010.
4. P.Meenakshi, Elements of Environmental Science and Engineering, PHI learning (P) Ltd., India.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	1	1			1		2		1	2	2		
CO2		2	1	1			1	1	1	2	1	1	2	2		
CO3	2	1		2				1		1		1	3	3		3
CO4	1	2	1		2							1	1			
CO5	2	3	2		2			2		2	1	2	2			2
CO6	3	2	3		2			2		2	1	3	3	2		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS21 OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science & Engineering **Sem: 2** **Category: ES**

Aim: To introduce the concepts Object Oriented Programming

Course Outcomes: The Students will be able to.

CO1: Differentiate between structures oriented programming and object oriented programming.

CO2: Use object oriented programming language like C++ and associated libraries to develop object oriented programs.

CO3: Understand and apply various object oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve various computing problems using C++ language.

CO4: Apply concepts of operator-overloading, constructors and destructors.

CO5: Apply exception handling and use built -in classes.

CO6: Design problem solutions using Object Oriented Techniques.

OBJECT ORIENTED PROGRAMMING FUNDAMENTALS 9

Procedure Oriented Programming vs. Object Oriented Programming (OOP). Object oriented programming concepts - Classes, reusability, encapsulation, inheritance, polymorphism, dynamic binding, and message passing. C++ Programming features - constructors - static members - constant members - member functions - pointers - references - Role of this pointer - Storage classes - function as arguments.

OBJECTS AND CLASSES 9

Structures and classes: Implementation of class in C++ - C++ Objects as physical object - C++ object as data types constructor. Object as function arguments - default copy constructor - returning object from function - Arrays of object – String - The standard C++ String class. String Handling - Nested classes.

INHERITANCE AND POLYMORPHISM 9

Inheritance - Types, Polymorphism - compile time and run time polymorphisms - function overloading - operator overloading - dynamic memory allocation - Importance of virtual function - function call binding - virtual functions - implementing late binding - need for virtual functions - abstract base classes and pure virtual functions - virtual destructors.

FILES AND POINTERS 9

Components of a file - different operation of the file - communication in files - creation of file streams - stream classes - header files - updating of file - opening and closing a file - file pointers and their manipulations - functions manipulation using file pointers - detecting end of file. **Pointer:** Addresses and pointers - The address of operator and pointer and arrays - Pointer and Faction pointer and C-types string - Memory management - New and Delete - pointers to objects - debugging pointers.

TEMPLATES AND EXCEPTIONS 9

Function templates - Class templates Exceptions - Standard Template Library: Introduction algorithms - sequence containers – iterators - specialized iterators - associative containers - strong user - defined object - function objects.

Total Periods: 45

Text Books:

1. Bjarne Stroustrup, “The C++ Programming Language”, 3/e, Pearson Education, 2007.
2. B. Trivedi, “Programming with ANSI C++”, Oxford University Press, 2012.

References:

1. Robert Lafore, “Object Oriented Programming in C++”, Techmedia Publication, 4/e, 2002.
2. E. Balagurusamy, “Object oriented Programming with C++”, Tata McGraw-Hill, 6/e, 2013.
3. Herbert shield, “The complete reference C++”, McGraw Hill Publication, 4/e, 2003.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2										3	3	1	
CO2	3	2	2										3	3		
CO3	3		2	2									3	3	1	
CO4	2	2	1										2	1		
CO5	1	2	1										2	1		
CO6	3	3	2										3	3		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS22 DIGITAL PRINCIPLES AND SYSTEM DESIGN

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science & Engineering **Sem: 2 Category: ES**

Aim: To provide an understanding of the fundamentals of digital logic and circuit design.

Course Outcomes: The Students will be able to

CO1: Apply the concept of binary number systems.

CO2: Elucidate the minimizing algorithms (Boolean algebra, Karnaugh map & Tabulation Method).

CO3: Analyze and design the Circuits for arithmetic operations and Code conversion.

CO4: Analyze & design the Circuits for Decoders & Encoders and MUXs & DeMUXs.

CO5: Compare types of Memory Devices.

CO6: Design the circuits of Flip-Flops, Counters and Registers.

BOOLEAN ALGEBRA AND LOGIC GATES 9

Review of binary number systems - Binary arithmetic - Binary codes - Boolean algebra and theorems - Boolean functions - Simplifications of Boolean functions using Karnaugh map and tabulation methods - Implementation of Boolean functions using logic gates.

COMBINATIONAL LOGIC 9

Combinational circuits - Analysis and design procedures - Circuits for arithmetic operations - Code conversion - Introduction to Hardware Description Language (HDL).

DESIGN WITH MSI DEVICES 9

Decoders and encoders - Multiplexers and demultiplexers - Memory devices - HDL for combinational circuits.

SYNCHRONOUS SEQUENTIAL LOGIC 9

Sequential circuits - Flip flops - Analysis and design procedures - State reduction and state assignment - Shift registers - Counters - HDL for Sequential Circuits.

ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables - Race-free state assignment - Hazards. ASM Chart.

Total Periods: 45

Text Book:

1. M.Morris Mano, “Digital Design”, 3rd edition, Pearson Education, 2007.

References:

1. Charles H.Roth, Jr. “Fundamentals of Logic Design”, 4th Edition, Jaico Publishing House, Cengage Earning, 5th edition, 2005.
2. Donald D.Givone, “Digital Principles and Design”, Tata McGraw-Hill, 2007.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											`2			
CO2	3	3		2										2		
CO3	3	3	3	2									3	3		
CO4	2	2	2	3									3	3		
CO5	3			2										2		
CO6	2		2	3	2								3	3		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161PC27 PHYSICS AND CHEMISTRY LABORATORY-II

L	T	P	C
0	0	4	2

Programme: B.E./B.Tech. Common to all Branches **Sem: 2 Category: BS**

Aim: To introduce the basic Physics concepts through experiments and to impart knowledge on the application of chemistry in engineering branches.

Course Outcomes: The Students will be able to

CO1: Understand the rigidity modulus of the materials.
CO2: Learn the Young's modulus of the material.
CO3: Study the flow of liquid in capillary tube.
CO4: Determine the quantity of unknown solution by instrumental method.
CO5: Analyze the quality of water.
CO6: Estimate the molecular weight of polymer.

LIST OF EXPERIMENTS - PHYSICS PART
(A minimum of five experiments shall be offered)

S.No. NAME OF THE EXPERIMENT

1. Torsional pendulum – Determination of rigidity modulus.
2. Determination of Young's modulus of the material – Uniform bending.
3. Determination of viscosity of liquid – Poiseuille's method.
4. Determination of wavelength of mercury spectrum- Spectrometer Grating.
5. Determination of Band Gap of a semiconductor material.
6. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.

LIST OF EXPERIMENTS – CHEMISTRY PART

S.No. NAME OF THE EXPERIMENT

1. Esimation of HCl by pH metry
2. Conductometric titration of mixture of acids (HCl& CH_3COOH)
3. Estimation of Chloride ion in water sample by Argentometric method.
4. Determination of molecular weight of a polymer by viscometry method
5. Determination of DO in water (Winkler's method)

Total Periods 60

References

1. Text book of Quantitative Inorganic Analysis, A.I.Vogel, ELBS,London.
2. "Practical A. Ravi krishnan Engineering Chemistry", Sri Krishna Publications, Chennai 2002.
3. Engineering Physics Laboratory Manual.
4. Engineering Chemistry Laboratory Manual.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	1		1					1	1	1		1
CO2	2	2	1	1	1		1					1	1	1		1
CO3	2	2	1	1	1		1					1	1	1		1
CO4	2	2	1	2	2		1					1	2	2		2
CO5	3	2	2	2	2		2					2	1	2		2
CO6	2	2	2	1	1		2						1	1		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS27 OBJECT ORIENTED PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

Programme: B.E. Computer Science & Engineering **Sem: 2 Category: ES**

Aim: To develop and understand the principles of object oriented programming and apply object-based approaches.

Course Outcomes: The Students will be able to.

CO1: Apply an object-oriented approach in programming and identify potential benefits of object-oriented programming over other approaches.

CO2: Reuse the code and write the classes, which work like built-in types.

CO3: Design applications, which are easier to debug, maintain and extend.

CO4: Apply object-oriented concepts in real world applications.

CO5: Understand and apply the in-built functions and customized functions for solving the problems.

CO6: Analyze the complexity of problems, Modularize the problems into small modules and then convert them into programs.

LIST OF EXPERIMENTS:

Write a C++ programming to implement the following topics:

1. Constructors & Destructors, Copy Constructor.
2. Friend Function & Friend Class.
3. Inheritance.
4. Polymorphism & Function Overloading.
5. Virtual Functions.
6. Overload Unary & Binary Operators Both as Member Function & Non Member Function.
7. Class Templates & Function Templates.
8. Exception Handling Mechanism.
9. Standard Template Library concept.
10. File Stream classes.

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C++ compiler 30 Nos.

(or)

Server with C++ compiler supporting 30 terminals or more.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2										3	1	3	
CO2	3	2	2										2	2		2
CO3	3		2										3	2	1	
CO4	2	2	1			2									2	1
CO5	1	2	2											2	2	1
CO6	1	3									2		2	2	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS28 **DIGITAL LABORATORY**

L	T	P	C
0	0	4	2

Programme: B.E. Computer Science & Engineering **Sem: 2 Category: ES**

Aim: To implement the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.

Course Outcomes: The Students will be able to

CO1: Design and implement digital logic gates.
CO2: Implement the adder subtractor and code convertor
CO3: Analyze and design of parity generator / checker using basic gates and MSI device
CO4: Implementation of SISO, SIPO, PISO and PIPO shift registers using flip-flops.
CO5: Construction and verification of 4-bit ripple counter and Mod-10counter. (Asynchronous).
CO6: Simulation of combinational and sequential circuits using HDL

LIST OF EXPERIMENTS:

1. Verification of Boolean theorems using digital logic gates.
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters, etc.
3. Design and implementation of 4-bit binary adder / subtractor using basic gates& MSI devices
4. Design and implementation of parity generator / checker using basic gates and MSI devices
5. Design and implementation of magnitude comparator
6. Design and implementation of application using multiplexers/ Demultiplexers
7. Design and implementation of Shift registers
8. Design and implementation of Synchronous and Asynchronous counters
9. Simulation of combinational circuits using Hardware Description Language (VHDL / Verilog HDL software required)
10. Simulation of sequential circuits using HDL (VHDL / Verilog HDL software required)

Total Periods: 60

List of Equipments and components for A Batch of 30 students

S.No.	Name of equipment /component	Quantity Required	Remarks
1.	Dual power supply/ single mode power supply	15/30	+12/-12V
2.	IC Trainer	15	10 bit
3.	Bread Boards	15	
4.	Multimeter	5	
5.	IC 7400, 7402, 7404, 7408	60	
6.	IC 7486, 7483, 7432, 74150	60	
7.	IC74151, 74147, 74180, 74138	40	
8.	IC7445, 7447	40	
9.	IC7476, 7474, 7473	40	
10.	IC7491, 7494	40	
11.	IC555	40	
12.	IC7485, 7411	40	
13.	Computer with HDL software	30	
14.	Seven segment display	40	
15.	Assembled LED board/LEDs	40/200	
16.	Wires		Single strand

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		2	3					3				3			
CO2	3	2	2	3	2				3				3			
CO3	3		2	3					3				2	3		
CO4	3		1	3	2				3				3			
CO5	3	2	2	3					3							2
CO6	3		2	3	2				3				3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161MA31	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATION	L	T	P	C
		3	1	0	4

Programme: B.E./B.Tech. (Common to all branches) **Sem: 3 Category: BS**

Aim: The Course is aimed at Developing the basic mathematical skills of Engineering student.

Course Outcomes: The Students will be able to

CO1: Classify the Fourier series and half range Fourier sine and cosine series.
CO2: Explain the Fourier transform and with their properties.
CO3: Determine Z-inverse transform using convolution theorem and partial fraction method.
CO4: Solve the partial differential equation by using Lagrange's linear equation.
CO5: Analyze separation of variable to solve linear partial differential equation.
CO6: Discuss the formation of partial differential equation.

FOURIER SERIES **9**

Dirichlet's conditions - General Fourier series - Odd and even functions - Half range sine series - Half range cosine series - Complex form of Fourier Series - Parseval's identify - Harmonic Analysis.

FOURIER TRANSFORMS **9**

Fourier integral theorem (without proof) - Fourier transform pair - Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

PARTIAL DIFFERENTIAL EQUATIONS **9**

Formation of partial differential equations - Lagrange's linear equation - Solutions of standard types of first order partial differential equations (without reducing the standard type) - Linear partial differential equations second and higher order with constant coefficients.

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **9**

Solutions of one dimensional wave equation - One dimensional equation of heat conduction - Steady state solution of two - dimensional equation of heat conduction (Insulated edges excluded) - Fourier series solutions in Cartesian coordinates.

Z-TRANSFORMS AND DIFFERENCE EQUATIONS **9**

Z-transforms - Elementary properties - Inverse Z-transform - Convolution theorem - Formation of difference equations - Solution of difference equations using Z-transform.

(Lecture:45 + Tutorial:15) Total Periods: 60

Text Books:

1. Grewal,B.S, "Higher Engineering Mathematics", 40th Edition, Khanna publishers, Delhi, 2007.
2. Veerarajan.T., "Transforms and Partial Differential Equation", Tata Mc-GrawHill Publishing Company limited, New-Delhi 2011.

References:

1. Bali, N.P and Manish Goyal "A Textbook of Engineering Mathematics", 7thEdition, Laxmi Publications (P) Ltd.2007.
2. RamanaB.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi 2007.
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rdedition-Pearson Education 2007.
4. Erwin Kreyszig "Advanced Engineering Mathematics", 8th edition-Wiley India 2007.
5. Dr.P.Kandasamy,Dr.K.Thilagavathy,Dr.K.Gunavathy, **"Transforms and Partial Differential Equation",** S.Chand & Company Ltd. Ram Nagar,New Delhi.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3		3								3		2	1	
CO2	2	3		3								3				1
CO3	1	2		3								3	2			
CO4	1	1		1										2	2	
CO5	1	1										1				
CO6	2	2											2			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS31 **DATA STRUCTURES** **L T P C**
3 0 0 3

Programme: B.E. Computer Science and Engineering **Sem: 3 Category: PC**
Aim: To make the student easier to study how the operations on data structure and various algorithms are performed.

Course Outcomes: The Students will be able to.

CO1: Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.
CO2: Demonstrate different methods for traversing trees.
CO3: Compare alternative implementations of data structures with respect to performance.
CO4: Compare and contrast the benefits of dynamic and static data structures implementations.
CO5: Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack.
CO6: Design and implement an appropriate hashing function for an application.
CO7: Critically analyze the various algorithms.

LINEAR DATA STRUCTURES - LIST **9**

Abstract Data Types (ADTs) - List ADT - array-based implementation - linked list implementation - singly linked lists - circularly linked lists - doubly-linked lists - applications of lists - Polynomial Manipulation - All operation (Insertion, Deletion, Merge, Traversal).

LINEAR DATA STRUCTURES – STACKS, QUEUES **9**

Stack ADT - Evaluating arithmetic expressions - other applications - Queue ADT - circular queue implementation - Double ended Queues - applications of queues.

SORTING, SEARCHING AND HASH TECHNIQUES **9**

Sorting algorithms: Insertion sort - Selection sort - Bubble Sort - Shell sort - Quick sort - Merge sort - Radix sort. Searching: Linear search - Binary Search. Hashing: Hash Functions - Separate Chaining - Open Addressing - Rehashing - Extendible Hashing.

ADVANCED NON-LINEAR DATA STRUCTURES **9**

AVL trees - Red-Black trees - Splay trees - B-Trees - Binomial Heaps - Fibonacci Heaps - Disjoint Sets - Amortized Analysis - accounting method - potential method - aggregate analysis - Applications of Non-Linear Data Structures.

GRAPHS **9**

Representation of Graphs - Breadth-first search - Depth-first search - Topological sort - Minimum Spanning Trees - Kruskal and Prim algorithm - Shortest path algorithm - Dijkstra's algorithm - Bellman-Ford algorithm - Floyd - Warshall algorithm.

Total Periods: 45

Text Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2/e, Pearson Education, 1997.

References:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", 3/e, Mcgraw Hill, 2002.
2. Reema Thareja, "Data Structures Using C", Oxford University Press, 2/e, 2011.
3. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4. Michael T Goodrich, Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", 7/e, Wiley Publishers, 2004.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3		3								3		3		
CO2	2	3		3								3	1	2	2	
CO3	1	2		3								3		2		
CO4	1	1		1									2		3	3
CO5	1	1										1				2
CO6	2	2											1			3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS32	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

Programme:	B.E. Computer Science and Engineering	Sem:	3	Category:	PC

Aim: To understand the organization of a computer, and the hardware-software interface, and to discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

Course Outcomes: The Students will be able to.

CO1:	Outline the fundamental organization of a computer system.
CO2:	Summarize the concepts of register transfer logic and arithmetic operations.
CO3:	Explain the fundamentals concepts of pipeline processing.
CO4:	Compare the performance of various memory systems and standard I/O interfaces.
CO5:	Interpret the performance issues of multiprocessors and thread level parallelism.
CO6:	Discuss the concepts of multithreading and multi-core Architectures with case studies.

BASIC STRUCTURE OF COMPUTERS — **9**

Functional units - Basic operational concepts - Bus structures - Performance and metrics - Instruction set architecture - Addressing modes - RISC - CISC. Fixed point and floating point operations - Fundamental concepts - Execution of a complete instruction - Multiple bus organization - Hardwired control - Micro programmed control - Nano programming.

PROCESSING & PIPELINING — **9**

Basic concepts - Data hazards - Instruction hazards - Influence on instruction sets - Data path and control considerations - Performance considerations - Exception handling - Instruction -level - parallelism - Parallel processing challenges - Flynn's classification - Hardware processors.

MEMORY AND I/O SYSTEMS — **9**

Basic concepts - Semiconductor RAM - ROM - Speed - Size and cost - Cache Memories - Improving cache performance - Virtual memory - Memory management requirements - Associative memories - Performance Considerations. Accessing I/O devices - Programmed Input/output - Interrupts - Direct Memory Access - Buses - Interface circuits - Standard I/O Interfaces (PCI, SCSI, USB), I/O devices and processors.

MULTIPROCESSORS AND THREAD LEVEL PARALLELISM — **9**

Symmetric and distributed shared memory architectures - Performance issues - Synchronization - Models of memory consistency - Introduction to Multithreading.

MULTI-CORE ARCHITECTURES — **9**

Software and hardware multithreading - SMT and CMP architectures - Design issues - Case studies - Intel Multi-core architecture - SUN CMP architecture - heterogeneous multi-core processors - case study: IBM Cell Processor.

Total Periods: 45

Text Books:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, 6/e, McGraw-Hill Inc, 2012.
2. John L. Hennessey and David A. Patterson, “Computer architecture – A quantitative approach”, Morgan Kaufmann / Elsevier Publishers, 4/e, 2007.

References:

1. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software interface”, Third Edition, Elsevier, 2005.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, 6thEdition, Pearson Education, 2003.
3. John P.Hayes, “Computer Architecture and Organization”, 3rd Edition, Tata McGraw Hill, 1998.
4. V.P. Heuring, H.F. Jordan, “Computer Systems Design and Architecture”, Second Edition, Pearson Education, 2004.
5. David E. Culler, Jaswinder Pal Singh, “Parallel computing architecture: A hardware/software approach”, Morgan Kaufmann /Elsevier Publishers, 1999.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			2								3	3		3
CO2	3			2									2		1	
CO3	3	2												2		
CO4	3												3	1	2	2
CO5	3				2									2		1
CO6	3		2										3		3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS33 MICROPROCESSORS AND MICROCONTROLLERS

L	T	P	C
3	0	2	4

Programme: B.E. Computer Science and Engineering **Sem: 3 Category: ES**

Aim: To learn the architecture, programming, interfacing and rudiments of system design of microprocessors and microcontrollers.

Course Outcomes: The Students will be able to.

CO1: Identify the basic elements and functions of contemporary microprocessors & microcontrollers.

CO2: Design, develop and interface complete microprocessor or microcontroller based systems to peripheral devices and systems at the chip level.

CO3: Impart knowledge on the architecture and software aspects of microprocessor 8086.

CO4: Examine standard architecture and peripheral subsystem of PIC 16F877 and 8051.

CO5: Summarize the special features of 8051 Microcontroller.

CO6: Analyze the data transfer information through serial & parallel ports.

THE 8085 MICROPROCESSOR **9**

8085 Microprocessor architecture - Addressing modes - Instruction set - Programming in 8085 - 8085A Microprocessor architecture - Addressing modes.

PERIPHERALS INTERFACING **9**

Memory interfacing and I/O interfacing with 8085 - Parallel communication interface - Serial communication interface - Timer - keyboard/display controller - Interrupt controller - DMA controller (8237) - Applications - Stepper motor.

8086 MICROPROCESSOR **9**

Intel 8086 microprocessor - Architecture - Signals- Instruction Set-Addressing Modes - Assembly language programming.

8051 MICROCONTROLLERS **9**

Intel 8051 microcontroller - Architecture - Signals - Instruction Set - Addressing Modes - Assembly language programming

SPECIAL FEATURES OF 8051 **9**

Special Function Registers - I/O ports - memory - counters and timers - serial data I/O – interrupts - Interfacing - LCD, ADC and DAC.

Lab Component

List of Experiments:

1. Programming with 8085.
2. Programming with 8086 Microprocessor – Basic experiments including BIOS/DOS calls: Keyboard control, Display, File Manipulation.
3. Interfacing programmable peripheral Interface and Stepper motor with 8085.
4. Interfacing keyboard/display and interrupt controller with 8085.
5. 8051 Microcontroller based experiments for embedded applications.

Total Periods(45+30): 75

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor – Architecture, Programming and Applications with the 8085" Penram International Publisher, 6th Edition., 2013.
2. Yn-cheng Liu, Glenn A.Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", second edition, Prentice Hall of India, 2006.
3. Kenneth J.Ayala, "The 8051 microcontroller Architecture, Programming and applications", second edition, Penram international.

References:

1. Douglas V.Hall, "Microprocessors and Interfacing : Programming and Hardware", 2nd edition , Tata McGraw Hill ,2006
2. A.K.Ray& K.M Bhurchandi, "Advanced Microprocessor and Peripherals - Architecture, Programming and Interfacing", Tata McGraw Hill, 2006.
3. Peter Abel, "IBM PC Assembly language and programming", 5th Edition, Pearson education, Prentice Hall of India Pvt.Ltd, 2007.

4. Mohamed Ali Mazidi, Janice GillispieMazidi," The 8051 microcontroller and embedded systems using Assembly and C", Second Edition, Pearson education /Prentice hall of India, 2007.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	1							1	2	2	1	
CO2	3	2	2	3	1							1	2	2	1	
CO3	2	3	2	3	1							1	2	2	1	
CO4	3	2	3	2	3							2	3	3	2	2
CO5	3	2	2	2	2							2	3	3	1	1
CO6	2	3	1	2	1							2	3	1		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS34 **OPERATING SYSTEM**

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 3** **Category: PC**

Aim: To introduces the basic principles and concepts of operating systems.

Course Outcomes: The Students will be able to.

CO1: Design various Scheduling algorithms.
CO2: Apply the principles of concurrency.
CO3: Design deadlock, prevention and avoidance algorithms.
CO4: Compare and contrast various memory management schemes.
CO5: Design and Implement a prototype file systems.
CO6: Perform administrative tasks on Linux Servers.

OPERATING SYSTEMS OVERVIEW **9**

Operating system overview - objectives and functions, Operating System Structure and Operations - System Calls, System Programs, OS Generation and System Boot. Processes - Process Concept, Process Scheduling, Operations on Processes, Inter Process Communication; Threads - Overview, Multicore Programming, Multithreading Models.

PROCESS SCHEDULING AND SYNCHRONIZATION **9**

CPU Scheduling: Scheduling criteria - Scheduling algorithms - Multiple-processor Scheduling - Real time scheduling - Algorithm Evaluation. Process Synchronization - Critical Section Problem, Mutex Locks, Semaphores, Monitors. Deadlock: System model - Deadlock characterization - Methods for handling deadlocks - Deadlock prevention - Deadlock avoidance - Deadlock detection - Recovery from deadlock.

MEMORY MANAGEMENT **9**

Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 and 64 bit architecture examples. Virtual Memory - Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory - OS Examples.

STORAGE MANAGEMENT **9**

Mass Storage Structure - Overview, Disk Scheduling and Management; File System Storage -File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation - File System Structure, Directory Implementation.

I/O SYSTEM ANDVIRTUALIZATION **9**

I/O Systems: I/O Hardware - Application I/O interface - kernel I/O subsystem - streams - Transforming I/O Requests to Hardware Operations - Performance. Linux System - Basic Concepts; Virtualization- Basic Concepts, Setting Up Xen, VMware on Linux Host and Adding Guest OS.

Total Periods: 45

Text Book:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9/e, John Wiley and Sons Inc., 2012.

References:

1. William Stallings, “Operating Systems – Internals and Design Principles”, 7/e, Prentice Hall, 2011.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, 2/e, Addison Wesley, 2001.
3. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill, 1996.
4. D M Dhamdhere, “Operating Systems: A Concept-Based Approach”, 2/e, Tata McGraw Hill, 2007.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2										3	1	3	
CO2	3	2	3										2	2		2
CO3	3	2	3										3	2		2
CO4	2	2	1										3	2	2	
CO5	1	2	2										2	2		
CO6	1	3	1										2	2	1	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS35 **PROGRAMMING IN PYTHON** **L T P C**
3 0 2 4

Programme: B.E. Computer Science and Engineering **Sem: 3** **Category: PC**

Aim: To provide students with the programming knowledge and to develop python programs.

Course Outcomes: The Students will be able to

CO1: Recall fundamental knowledge in python programming.
CO2: Summarize functions and statement in python programs.
CO3: Illustrate the concepts of strings and lists in python programming.
CO4: Apply file handling and object oriented programming in python.
CO5: Demonstrate tuples, dictionaries, files and exceptions in python.
CO6: Develop problem solving skills and programming capabilities.

INTRODUCTION **9**

Python Overview - Comments - Identifiers - Keywords - Variables - Data types - Operators - Statement and Expressions - String Operations - Boolean Expressions - Control Statements -Iterations - Input from Keyboard.

FUNCTIONS IN PYTHON **9**

Built-in Functions - Composition of Functions - User defined functions - Parameters and Arguments - Function calls - The return statement - Python recursive function - Anonymous Functions.

STRINGS AND LISTS **9**

Strings - Compound Data Types - Len Function - String slices - String Traversal - Escape Characters - String formatting operator, functions - Lists-Traversing a List - Built-in list operators, methods.

CLASSES AND OBJECTS **9**

Class, Objects in python - Built-in Class attributes - Inheritance - Method Overriding - Data Encapsulation - Data hiding.

DICTIONARIES AND FILES **9**

Tubles-Values - Operations - Functions - Dictionaries - Values - Update - Properties Operations - Files - Text Files - Directions - Exceptions - Exception with arguments - User defined Exceptions.

Lab Component:

Write the programs for the following topics using python:

1. Operators
2. Control Statements
3. Built-In and User defined functions
4. String functions
5. List functions.
6. Classes and their attributes.
7. Inheritance and method overriding.
8. Data Encapsulation and hiding.
9. File Operations and Exception handling.

Total Periods(45+30): 75

Text Books:

1. E.Balagurusamy, ”Introduction to Computing And Problem Solving Using Python”, Mc-GrawHill Education (India) Private Ltd., 2016.

References:

1. MarkLutz, ”Programming Python”, Fourth Edition, 2010.
2. John V.Guttag, ”Introduction to Computation and Programming using Python”, Second Edition, 2016.
3. John Paul Mueller, ”Beginning Programming with python For DUMMLES”, 2014.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		3	1	2		2						3			
CO2	3	3		1	2										2	
CO3	3		2	3			3				3	3			3	3
CO4	2	3		2	2									3		
CO5	3	2		3	1				3	3						3
CO6	3	1	2	3	2								2		2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS37 DATA STRUCTURES LABORATORY

L	T	P	C
0	0	4	2

Programme: B.E. Computer Science and Engineering **Sem: 3 Category: PC**

Aim: To develop programming skills in design and implementation of data structures and their applications.

Course Outcomes: The Students will be able to.

CO1: Able to understand the importance of structure and abstract data type, and their basic usability in different applications through different programming languages.

CO2: Able to analyze and differentiate different algorithms based on their time complexity.

CO3: Able to understand the linked implementation, and its uses both in linear and non-linear data structure.

CO4: Able to understand various data structure such as stacks, queues, trees, graphs, etc. to solve various computing problems.

CO5: Able to implement various kinds of searching and sorting techniques, and know when to choose which technique.

CO6: Able to decide a suitable data structure and algorithm to solve a real world problem.

LIST OF EXPERIMENTS:

Implementation in the following topics:

1. Representation of records using Structures in C - Creation of Linked List - Manipulation of records in a Linked List.
2. Operations on a Stack and Queue - infix to postfix - simple expression evaluation using stacks - Linked Stack Implementation - Linked Queue Implementation.
3. Applications of Stack and Queue.
4. Implementation of Sorting algorithm.
5. Implementation of Linear search and Binary Search.
6. Implementation of Hashing Techniques.
7. Implementation of Binary Search Tree.
8. Implementation of Tree traversal Techniques.
9. Implementation of Minimum Spanning Trees.
10. Implementation of Shortest Path Algorithms.

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	1						2				1	2		
CO2	2	2	3	1					3				2	2		
CO3	1	1							2					2		
CO4	2	3							1				1	2		
CO5	1	2	1						1				2	2		
CO6	2	2	3	2					2				2	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS38 OPERATING SYSTEM LABORATORY

L	T	P	C
0	0	4	2

Programme: B.E. Computer Science and Engineering **Sem: 3 Category: PC**

Aim: To develop programming skills in operating systems and their applications.

Course Outcomes: The Students will be able to.

CO1: Have basic knowledge on UNIX Commands.
CO2: Write Shell Programming and apply control structure.
CO3: Programs on process creation and synchronization.
CO4: Implement deadlock avoidance, and Detection Algorithms.
CO5: Compare the performance of various CPU Scheduling Algorithms.
CO6: Critically analyze the performance of the various page replacement algorithms Create processes and implement IPC.

LIST OF EXPERIMENTS:

1. Implement Process Management
2. Implement Shared memory and IPC.
3. Implement Threading Applications.
4. Implement Synchronization Applications using Semaphores.
5. Implement the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority.
6. Implement an Algorithm for Dead Lock Avoidance.
7. Implement an Algorithm for Dead Lock Detection.
8. Implement all page replacement algorithms
   a) FIFO b) LRU c) LFU
9. Implement all file allocation strategies
   a) Sequential b) Indexed c) Linked.
10. Implement Virtualization Concepts.

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C / C++ / Java / Equivalent complier 30 Nos.

(or)

Server with C / C++ / Java / Equivalent complier supporting 30 terminals.

Course Outcomes	Programme Outcomes (POs)												Programmem Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1						2				2	2		
CO2	2	2							2					2	2	2
CO3	3	2	1						1				3	2		2
CO4	3	2	3						2				3	2		
CO5	2	2							2				3	1	3	2
CO6	3	2	3						1				2	1	2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS39 **FUNCTIONAL ENGLISH-I** **L T P C**
0 0 2

Programme: B.E. Computer Science and Engineering **Sem: 3 Category: EEC**
Aim: To create an Environment to improve learner's communication skill.
Course Outcomes: The Students will be able to.
CO1: To impart basics of Language & Grammar relating to Business Communication.
CO2: To develop learners ability to understand Technical communication.
CO3: To widen learners ability to understand any kind of text.
CO4: Learning the nuances of effective writing by using short and crisp sentences.
CO5: Listen and comprehend talks and lectures on technical subjects.
CO6: Describe a process both in speaking and writing.

UNIT I **6**

GRAMMAR: Parts of Speech, Tense- simple present, perfect, continuous, present perfect continuous.
READING: Reading different genres of text (literature, media and technical) for comprehension. Reading for making inferences, reading news bulletins and weather forecast, advertisements.
WRITING: Writing apology letters, Writing e-mail –difference between formal and informal mails, giving information, making an enquiry, answering, announcing a job opportunity, enquiry, confirming terms, informing about a new service.
LISTENING: Telephone etiquette- types of calls, greetings, making and receiving a call, transferring information, making appointments and closing a call. Listening to telephonic conversation, listening to famous personalities' speech.
SPEAKING: Role play- planning a training course, phoning a hotel, enquiring about a new job, launching a new product, negotiating a deal and interviewing someone about a change in job.
Just a minute- describing a business trip, the importance of internal communication of the company, describing a product and how it is advertised.

UNIT II **6**

GRAMMAR: Simple past, perfect, continuous, past perfect continuous.
READING: Reading technical article and making notes, Reading a technical report for gist.
WRITING: Making and taking notes, writing project introduction, Writing for giving assurance and Notice, Agenda, Minutes.
LISTENING: Listening to documentaries, listening to interviews.
SPEAKING: Small talks- introducing one-self, remembering one's childhood, describing one's positive and negative features, making comparisons, describing abilities and skills, making requests and seeking permissions.

UNIT III **6**

GRAMMAR: Simple future, perfect, continuous, future perfect continuous. Voice. Conditional Clause.
READING: Cloze test, Reading and answering questions, reading job advertisements. job interviews,
WRITING: Memos, writing user manuals, product review.
LISTENING: Listening to group discussion.
SPEAKING: Expressing personal opinion about social issues.

Total Periods: 18

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1									3	3	3	3				
CO2									3	3	3	3				
CO3									3	3	3	3				
CO4									3	3	3	3				
CO5									3	3	3	3				
CO6									3	3	3	3				

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161MA41 PROBABILITY AND RANDOM PROCESSES

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 4 Category: BS**

Aim: This course aims at providing the necessary basic concepts in random processes and to acquire skills in analyzing queuing models.

Course Outcomes: The Students will be able to.

CO1: Classify the discrete and continuous random variables.
CO2: Determine strictly stationary, wide–sense stationary and Poisson process.
CO3: Agree central limit theorem.
CO4: Analyze the binomial, Poisson, geometric, uniform, exponential & normal distribution.
CO5: Examine Wiener - khintchine relation.
CO6: Analyze the queueing models.

RANDOM VARIABLES **9**

Discrete and continuous random variables - Moments - Moment generating functions and their properties. Binomial, Poisson, Geometric, Uniform, Exponential, Normal distribution.

TWO DIMENSIONAL RANDOM VARIABLES **9**

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem (for 2d random variables).

CLASSIFICATION OF RANDOM PROCESSES **9**

Definition and examples - First order, second order, strictly stationary, wide-sense stationary and ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process - Random telegraph signal process.

CORRELATION AND SPECTRAL DENSITIES **9**

Auto correlation - Cross correlation - Properties - Power spectral density - Cross spectral density - Properties - Wiener-Khintchine relation - Relationship between cross power spectrum and cross correlation function.

QUEUEING THEORY **9**

Markovian models - Birth and Death Queueing models - Steady state results: Single and multiple server queueing models - queues with finite waiting rooms - Little's Formula.

Total Periods: 45

Text Books:

1. Dr. G. Balaji, 'Probability and Queueing theory' Balaji Publishers 12th Edition November 2016.
2. D. Gross & C.M. Harris, "Fundamentals of Queueing Theory", Wiley Student edition, 2004.

References:

1. Miller,S.L and Childers,S.L, "Probability and Random Processes with applications to Signal Processing and Communications, Elsevier Ine., First Indian Reprint 2007.
2. H. Stark and J.W. Woods, "Probability and Random Processes& Applications to Signal Processing", Pearson Education (Asia), 3rd Edition, 2002.
3. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw-Hill edition, New Delhi, 004.
4. Leon-Garcia,A, "Probability and Random Processes for Electrical Engineering", Pearson Education Asia, Second Edition, 2007.
5. A.O. Allen, "Probability, Statistics and Queueing Theory with Compute Applications", Elsevier, 2nd edition, 2005.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		3								3		2		1
CO2	1	1												1	1	
CO3	1	2		3								1	1		1	
CO4	2	2		3								1		2		1
CO5	1	2		3								2	1		2	
CO6	3	3		2								3	1			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS41 **COMPUTER NETWORKS** **L T P C 3 0 2 4**

Programme: B.E. Computer Science and Engineering **Sem: 4 Category: PC**

Aim: To understand the concepts of data communication and computer networks.

Course Outcomes: The Students will be able to.

CO1: Understand computer network basics, network architecture, TCP/IP and OSI reference models.

CO2: Identify and understand various techniques and modes of transmission.

CO3: Describe data link protocols, multi-channel access protocols & IEEE 802 standards for LAN.

CO4: Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme.

CO5: Discuss the elements and protocols of transport layer.

CO6: Understand network security and define various protocols such as FTP, HTTP, Telnet, DNS.

FUNDAMENTALS & LINK LAYER **9**

Building a network - Requirements - Layering and protocols - Internet Architecture - Network software - Performance; Link layer Services - Framing - Error Detection - Flow control.

MEDIA ACCESS & INTERNETWORKING **9**

Media access control - Ethernet (802.3) - Wireless LANs - 802.11 - Bluetooth - Switching and bridging - Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP).

ROUTING **9**

Routing (RIP, OSPF, metrics) - Switch basics - Global Internet (Areas, BGP, IPv6), Multicast - addresses - multicast routing (DVMRP, PIM).

TRANSPORT LAYER **9**

Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission - TCP Congestion control - Congestion avoidance (DEC bit, RED) - QoS - Application requirements.

APPLICATION LAYER **9**

Traditional applications - Electronic Mail (SMTP, POP3, IMAP, MIME) - HTTP - Web Services - DNS - SNMP.

Lab Component:

Write a program to implement the following topics:

1. Implementation of CRC generator and checker algorithm in C/C++/Java.
2. Implementation of Hamming code algorithm in C / C++ / Java.
3. Implementing client –server program using TCP/ UDP sockets.
4. Implementation of Stop – and – Wait protocol in C / C++ / Java in a client – server environment using sockets.
5. Implementation of Sliding Window protocol in C / C++ / Java in a client –server environment using sockets.
6. Implementation of routing algorithm # 1 in C / C++ / Java.
7. Write a code to simulating ARP /RARP protocols.
8. Write a program to implement RPC (Remote Procedure Call).

Total Periods (45+30): 75

Text Book:

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers, 2011.

References:

1. James F. Kurose, Keith W. Ross, “Computer Networking - A Top-Down Approach Featuring the Internet”, Fifth Edition, Pearson Education, 2009.
2. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.
3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.
4. Behrouz A. Forouzan, “Data communication and Networking”, 4/e, Tata McGraw-Hill, 2011.

Course Outcomes	Programme Outcomes (POs)												Programme Outcomes (POs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3		1	2								3			
CO2	3	3			1									3		
CO3	3	2		2	3									3		
CO4	2	3		2	2									3		
CO5	2	2		2	3				3					3		
CO6	3	2		2	3											3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS42	PROGRAMMING WITH JAVA	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 4 Category: PC**

Aim: To understand object oriented programming concepts, and apply them in problem solving.

Course Outcomes: The Students will be able to

CO1: To learn the basics of java Console and GUI based programming.
CO2: Understanding of OOP concepts and basics of Java programming (Console and GUI based).
CO3: The skills to apply OOP and Java programming in problem solving.
CO4: Apply coding methods and be able to implement event handling mechanisms.
CO5: Basics of exception handling, multi-threaded programming and generic Programming.
CO6: Ability to access data from a DB with Java programs.
CO7: Use of GUI components (Console and GUI based)

INTRODUCTION **9**

OOP concepts - Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, Procedural and object oriented programming paradigms.

Java programming - History of Java - data types - operators - control structures - simple java standalone programs, classes - objects - methods - final classes and methods - arrays - Strings.

INHERITANCE AND PACKAGES **9**

Inheritance - definition - types of inheritance - p**olymorphism -** dynamic binding, method overriding, abstract classes and methods **- interfaces -** implementing interfaces **- inner classes -** uses of inner classes, types of inner classes, examples - p**ackages -** steps to creating and accessing a package - java doc Comments.

EXCEPTION HANDLING AND CONCURRENT PROGRAMMING **9**

Exception handling - exception hierarchy - throwing and catching exceptions built in exceptions, creating own exception sub classes. Multi-threaded programming - interrupting threads - thread states - thread properties - thread synchronization - and procedure consumer pattern - Executors - Synchronizers. Generic programming - generic classes - generic methods - generic code and virtual machine - inheritance and generics - reflection and generics.

GUI PROGRAMMING WITH JAVA **9**

Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Applets - Introduction to Swing - Model-View-Controller design pattern - buttons - layout management - Swing Components-Examples: handling a button click, handling mouse events, Adapter classes.

FILES AND DATABASE CONNECTIVITY **9**

Files - I/O Streams - random access file operations - File classes - **Connecting to Database -** JDBC Type 1 to 4 drives, connecting to a database, querying a database and processing the results, updating data with JDBC - Example program.

Total Periods: 45

Text Book:

1. Java Fundamentals - A comprehensive Introduction, Herbert Schildt, Dale Skrien TMH 2012.

References :

1. Cay S. Horstmann and Gary Cornell, “Core Java: Volume I – Fundamentals”, Eighth Edition, Sun Microsystems Press, 2008.
2. Java for Programmers, P.J. Deitel and H.M. Deitel, Pearson education (OR) Java: How to Program P.J. Deitel and H.M. Deitel, PHI 8th Edition.
3. Object Oriented Programming Through Java. Front Cover. P. Radha Krishna. Universities Press (India) Pvt. Limited, 2007 CRC Press.
4. Thinking In Java 4th Edition, Bruce Eckel, Pearson Education.
5. Programming in Java, S. Malhotra and S. Choudhary, Oxford Univ. 2nd Edition, press, 2014.

Course Outcomes	Programme Outcomes (POs)												Programme Outcomes (POs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3					2				3		3	2	3		
CO2			2							3		2		3		
CO3							2		2	3		3			2	
CO4	2				2					3		3				
CO5		3								3		3		2		1
CO6	1									3		2				
CO7									1	3		2	2		3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS43 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 4 Category: PC**

Aim: To create analytical skills, to enable the students to design algorithms for various application, and to analyze the algorithms.

Course Outcomes: The Students will be able to.

CO1: Relate the correctness of algorithms using inductive proofs and invariants.
CO2: Apply worst-case algorithms using asymptotic analysis.
CO3: Recall greedy algorithms and dynamic-programming paradigm to solve various real world problems
CO4: Illustrate the various graph algorithms to modern engineering problems.
CO5: Critically analyze the different algorithm, design technique for a given problem.
CO6: Design new algorithms to improve the efficiency.

INTRODUCTION **9**

Notion of an Algorithm - Fundamentals of Algorithmic Problem Solving - Important Problem Types - Fundamentals of the Analysis of Algorithm Efficiency - Analysis Framework - Asymptotic Notations and its properties - Mathematical analysis for Recursive and Non -recursive algorithms.

BRUTE FORCE AND DIVIDE-AND-CONQUER **9**

Brute Force - Closest - Pair and Convex - Hull Problems - Exhaustive Search - Traveling Salesman Problem - Knapsack Problem - Assignment problem. Divide and conquer methodology - Merge sort - Quick sort - Binary search - Multiplication of Large Integers - Strassen's Matrix Multiplication - Closest-Pair and Convex-Hull Problems.

DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE **9**

Computing a Binomial Coefficient - Warshall's and Floyd' algorithm - Optimal Binary Search Trees - Knapsack Problem and Memory functions. Greedy Technique - Prim's algorithm - Kruskal's Algorithm - Dijkstra's Algorithm - Huffman Trees.

ITERATIVE IMPROVEMENT **9**

The Simplex Method - The Maximum-Flow Problem - Maximum Matching in Bipartite Graphs - The Stable marriage Problem.

COPING WITH THE LIMITATIONS OF ALGORITHM POWER **9**

Limitations of Algorithm Power - Lower-Bound Arguments - Decision Trees-P, NP and NP-Complete Problems - Coping with the Limitations - Backtracking - n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem - Branch and Bound - Assignment problem - Knapsack Problem - Traveling Salesman Problem - Approximation Algorithms for NP - Hard Problems - Traveling Salesman problem - Knapsack problem.

Total Periods: 45

Text Book:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3/e, Pearson Education, 2012.

References:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3/e, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Edu, 2009.
4. Steven S. Skiena, "The Algorithm Design Manual", 2/e, Springer, 2008.
5. http://nptel.ac.in/

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2							2			2	3			
CO2	2	3							2					3		
CO3	2	3	3		3			2	2			2			3	
CO4	2	3			3			2	2							2
CO5	2	2	3		2			2				2				3
CO6	2	3		1	2								3	2		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS44	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 4 Category: PC**

Aim: To provide a strong foundation in database technology and an introduction to the current trends in this field.

Course Outcomes: The Students will be able to.

CO1: Design Databases using ER diagram for applications.
CO2: Use the Query languages to retrieve the data from the different types of databases
CO3: Analyze the database schema and apply the normalization rules and techniques to optimize the database.
CO4: Apply concurrency control and recovery mechanisms for practical problems.
CO5: Demonstrate a recovered storage mechanism for instantaneous applications
CO6: Understand the different types of Advanced Databases.

INTRODUCTION **9**

Purpose of Database System - Views of data - Data Models - Database Languages - Database System Architecture - Database users and Administrator - Entity - Relationship (E-R) model -E-R Diagrams - Extended E-R Features - Design of E-R database schema - Structure of Relational data model - Fundamentals of relational algebra operations

STRUCTURED QUERY LANGUAGE **9**

SQL: Basic structure - Set operations - Aggregate functions - Null Values - Nested sub queries - Views - Data Definition Language - Data Manipulation Language - Data Control Language - Transaction Control Language - Keys - Referential Integrity - Embedded SQL -Dynamic SQL. Domain Constraints - Assertions - Triggers - Views - Security and Authorization.

DATABASE DESIGN AND QUERY OPTIMIZATION **9**

Functional Dependencies - Non-loss Decomposition - Functional Dependencies - First, Second, Third Normal Forms, Dependency Preservation - Boyce/Code Normal Form - Multi-valued Dependencies and Fourth Normal Form - Join Dependencies and Fifth Normal Form. Query Processing Overview - Catalog Information for Cost Estimation.

TRANSACTIONS PROCESSING AND CONCURRENCY CONTROL **9**

Introduction - Properties of Transaction - Serializability - Concurrency Control - Need for Concurrency - Locking Mechanisms - Two Phase Commit Protocol - Two Phase Locking Protocols - Strict Two Phase Locking - Rigorous Two Phase Locking - Intent Locking -Recovery isolation level - Deadlock-issues

ADVANCED DATABASES **9**

Introduction to Distributed Databases and Client/Server Databases, Object based databases - Multidimensional and Parallel databases - Spatial and multimedia databases - Mobile and web databases - NoSQL - Data Warehouse - Mining - Introduction about Big data Analytics.

Total Periods: 45

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6th Edition, Tata McGraw Hill, 2016.
2. RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", sixth Edition, Pearson Addison wesley, 2008.

References:

1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, "Database Management Systems", 4thEdition, MGH, 2010.
3. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2		2								3			2
CO2	3	2	3	2	2								3	3		2
CO3		2		2	2								1	1	3	
CO4		2	2	2									3			
CO5			3	2		2		2					3		3	3
CO6		2		2									3			3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS45 OBJECT ORIENTED SOFTWARE ENGINEERING

L	T	P	C
3	0	2	4

Programme: B.E. Computer Science & Engineering **Sem: 4 Category: PC**

Aim: To study object oriented analysis and design and the techniques needed to apply them.

Course Outcomes: The Students will be able to.

CO1: Apply the Object oriented concepts & software engineering methodologies to develop the software projects.

CO2: Draw UML diagrams and interrelate the concepts to build the software projects.

CO3: Solve problems in software development activities from requirement specification to testing.

CO4: Choose and utilize suitable testing methods to test the software projects.

CO5: Analyze various modeling techniques for designing UML diagrams.

CO6: Model different kinds of real world problems using OOSE concepts

INTRODUCTION **9**

System Concepts - Software Engineering Concepts - Development Activities - Managing Software Development - Modeling with UML - Modeling concepts - UML Diagrams.

ANALYSIS **9**

Requirements Elicitation - Concepts - Activities - Managing Requirement elicitation - Analysis-concepts - Activities - Managing Analysis - Case Study.

SYSTEM DESIGN **9**

Decomposing the system - Overview of System Design - System Design Concepts - System Design Activities - Addressing Design Goals - Activities - Managing System Design.

OBJECT DESIGN **9**

Reusing Pattern Solutions - Concepts - Activities - Managing reuse - Specifying Interfaces - object design.

IMPLEMENTATION ISSUES AND MANAGING CHANGE **9**

Mapping Models to Code - Overview - concepts - activities - Managing implementation - Testing over-view-Managing Change - Rationale Management - Configuration Management - Project management.

Total Periods(45+30): 75

Text Books:

1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, Pearson Education, 2011.

References:

1. Craig Larman, Applying UML and Patterns, 3rd Edition, Pearson Education, 2005.
2. Roger S Pressman, Software Engineering 6th Edition, Tata McGraw-Hill.
3. Stephen Schach, Software Engineering 7th Edition, McGraw Hill, 2007.

LAB COMPONENTS

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system
5. Online course reservation system

Course Outcomes	Programme Outcomes (POs)												Programmeme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1			3	2				2		2	2	3	3			2
CO2			2								3	2		3	2	
CO3		3		2			2			1			3			2
CO4	3							2						2		
CO5	2	2		2	3		2						3		3	
CO6	2	3		1							2		3		3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS47 **JAVA LABORATORY** **L T P C**
0 0 4 2

Programme: B.E. Common to all Branches **Sem: 4** **Category: PC**

Aim: To introduce java compiler and eclipse platform or netbeans.
To impart hand on experience with java programming.

Course Outcomes: The Students will be able to

CO1: Understanding the basic concepts of Java programming.
CO2: The skills to apply OOP and Java programming in problem solving.
CO3: Apply coding methods and be able to implement event handling mechanisms.
CO4: Apply skills to implement multi-threaded programming.
CO5: Ability to access data from a DB with Java programs.
CO6: Use of GUI components (Console and GUI based).

List of Experiments:

1. Use Eclipse or Netbeans platform and acquaint with the various menus. Create a test project, add a test class and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. a. Develop an applet in Java that displays a simple message.
   b. Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.
4. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 andNum2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.
5. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
6. Write a Java program that connects to a database using JDBC and does add, delete, modify and retrieve operations.
7. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color. Initially there is no message shown.
8. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea () that prints the area of the given shape.
9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
11. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab ( ). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
12. Implement the above program with database instead of a text file.

Total Periods: 30

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3		2			3		3			1		3	
CO2	3									3		3	2	3		
CO3			2	3					3	3		2			3	3
CO4										3		3				
CO5					2				3	3		3	1		3	2
CO6		3						2	3	3		3		2	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS48 DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

Programme: B.E. Computer Science and Engineering **Sem: 4 Category: PC**

Aim: To study and implement DDL, DML commands & basics of PL/SQL functions, cursors, triggers etc.

Course Outcomes: The Students will be able to

CO1: Learn and apply structured query language (SQL) for database definition and database manipulation.

CO2: Understand, analyze, and apply common SQL Statements including DDL, DML and DCL statements to perform different operations.

CO3: Understand, analyze, and apply mechanisms like indexing, views for database tuning.

CO4: Understand, analyze, and apply PL/SQL blocks using Cursors and Triggers.

CO5: Design and implement a database for a given problem according to well-known design principles that balance data retrieval performance with data consistency.

CO6: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

LIST OF EXPERIMENTS:

1. Practice of SQL commands in (DDL,DML,DCL,TCL)
2. Creating an Employee database to set various constraints.
3. Set operators and Join queries and nested queries
4. Practice of NoSQL commands
5. Design an ER diagram for Life insurance database using Erwin tool.
6. Practice of PL/SQL–(Cursors, Stored procedures, stored function, Triggers, Packages).
7. Views and Indexing
8. Front end Connectivity
9. Form / Menu Design
10. Report Generation
11. Accessing Databases from Programs using JDBC and ODBC
12. Mini project (Application Development using Oracle/Mysql)
    a) Inventory Control System.
    b) Hospital Management System.
    c) Railway Reservation System.
    d) Personal Information System.
    e) Web Based User Identification System.
    f) Timetable Management System.
    g) Hotel Management System

Total Periods: 30

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops 30 Nos.

(or)

Server supporting 30 terminals or more.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		3	2								3	3	3	
CO2	2	3	2	2	2									3	3	1
CO3	2	2		2	2									3	3	
CO4	2		2		2									3	3	1
CO5			2	2									3		3	
CO6	3	2		2	2								3			3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS49 **FUNCTIONAL ENGLISH-II** **L T P C**
0 0 2 MC

Programme: B.E. Computer Science and Engineering **Sem: 4 Category: EEC**

Aim: To Create an Environment to experiment communication skills with Intermediate resources.

Course Outcomes: The Students will be able to

CO1: To gain the spirit of accurate and appropriate Basic communication.
CO2: Application of the different forms of advanced grammar.
CO3: Recollect words and their meaning for the specific purpose.
CO4: To develop students' accuracy in Written Communication.
CO5: To improve Communication Skills in formal and informal situations.
CO6: Sum up the key points.

UNIT I **6**

GRAMMAR: Concord, Sentence structure,
READING: Reading a passage and finding an error, reading charts, tables, graphs and making inference.
WRITING: Creative writing-paragraph and essay writing, writing memo
LISTENING: Listening to short conversation, instructions and directions.
SPEAKING: Describing-what I enjoy about my studies, describing about the history of a company, describing various designations in the company, describing a product and how it is advertised, describing the selection process of a company.

UNIT II **6**

GRAMMAR: If clause.
READING: Reading leaflet and pamphlets, reading for gathering information.
WRITING: Writing report, proposals. Writing blogs,
LISTENING: Listening to lectures and ted talks.
SPEAKING: Mini presentation on technical topics- English for presentations- Difference between lecture speech and presentation- what makes a good presentation-planning, purpose, audience, gathering information, using av materials, gestures, and interaction ability.

UNIT III **6**

GRAMMAR: Reported speech.
READING: Reading and interpreting visual material, reading online content and reading technical reports.
WRITING: Writing product review, writing instructions and recommendations.
LISTENING: Listening to technical presentation, speeches and interviews.
SPEAKING: Group discussion, general interaction.

Total Periods: 18

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1									3	3	3	3				
CO2											3	3				
CO3												3				
CO4										3		3				
CO5									3	3	3	3				
CO6									3	3	3	3				

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

16IMA51	DISCRETE MATHEMATICS	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 5 Category: BS**

Aim: To introduce basic mathematical ideas such as reasoning techniques, basic counting techniques and their applications for computer science students.

Course Outcomes: The Students will be able to

CO1: Analyze the mathematical arguments.

CO2: Apply mathematical induction and prove a relation.

CO3: Make use of graph theoretic models to solve basic problems in networks.

CO4: Invent Eulerian and Hamiltonian paths to find shortest paths.

CO5: Summarize the definitions of groups and rings and deduce some consequences of these structures.

CO6: Utilize Boolean algebra concepts to construct logical gates.

LOGIC AND PROOFS **9**

Propositional Logic - Propositional equivalences - Predicates and quantifiers - Nested Quantifiers - Rules of inference - Introduction to Proofs - Proof Methods and strategy.

COMBINATORICS **9**

Mathematical inductions - Strong induction and well ordering -.The basics of counting - The pigeonhole principle - Permutations and combinations - Recurrence relations - Solving Linear recurrence relations - Generating functions -Inclusion and exclusion and application.

GRAPHS **9**

Graphs and graph models - Graph terminology and special types of graphs - Representing graphs and graph isomorphism - connectivity - Euler and Hamilton paths.

ALGEBRAIC STRUCTURES **9**

Algebraic systems - Semi groups and monoids - Groups - Subgroups and homomorphism's - Cosets and Lagrange's theorem - Ring & Fields (Definitions and examples).

LATTICES AND BOOLEAN ALGEBRA **9**

Partial ordering - Posets - Lattices as Posets - Properties of lattices - Lattices as Algebraic systems - Sublattices - direct product and Homomorphism - Some Special lattices - Boolean Algebra.

Total Periods: 45

Text Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Special Indian Edition, Tata McGraw – Hill Pub. Co. Ltd. New Delhi, (2007). (For units 1to3, Sections1.1 to 1.7, 4.1 & 4.2, 5.1 to 5.3, 6.1, 6.2, 6.4 to 6.6, 8.1 to 8.5).
2. Trembly J. P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, New-Delhi, 30th Re-print (2007). (Forunits4&5, Sections 2-3.8 & 2-3.9, 3-1, 3-2 & 3-5, 4-1 & 4-2).

References:

1. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fourth Edition, Pearson Education Asia, Delhi, (2002).
2. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, (2006).
3. Seymour Lipschutz and Mark Lipson, "Discrete Mathematics", Schaum's Outlines, Tata McGraw-Hill Pub.Co.Ltd., New Delhi, Second edition,(2007).
4. Frank Harary forwarded by Krishnamoorthy, "Graph Theory" Narosa Publications, New Delhi.
5. M. O. Albertson, J. P. Hutchinson," **Discrete Mathematics with Algorithms",** Wiley (1988).Newyork.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2		3									1	2		2
CO2	2	2		2											2	
CO3	3	2		3										3	1	1
CO4	3	1											1			
CO5	1	1		3										1	2	2
CO6	2	2											1			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS51	CRYPTOGRAPHY & NETWORK SECURITY	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 5 Category: PC**

Aim: To understand the principles of encryption algorithms; conventional and public key cryptography. To have a detailed knowledge about authentication, hash functions and application level security mechanisms.

Course Outcomes: The Students will be able to

CO1: Identify common network security vulnerabilities/attacks.

CO2: Demonstrate detailed knowledge of the role of encryption to protect data.

CO3: Analyze security issues arising from the use of certain types of technologies.

CO4: Identify the appropriate procedures required for system security testing and procedures of backup and recovery.

CO5: Critically evaluate the risks and threats to networked computers.

CO6: To learn about how to maintain the Confidentiality, Integrity and Availability of a data

INTRODUCTION **9**

OSI Security Architecture - Classical Encryption techniques - Cipher Principles - Data Encryption Standard - Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES - AES Cipher - Triple DES - Placement of Encryption Function - Traffic Confidentiality

PUBLIC KEY CRYPTOGRAPHY **9**

Key Management - Diffie-Hellman key Exchange - Elliptic Curve Architecture and Cryptography - Introduction to Number Theory - Confidentiality using Symmetric Encryption - Public Key Cryptography and RSA.

AUTHENTICATION AND HASH FUNCTION **9**

Authentication requirements - Authentication functions - Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm - RIPEMD - HMAC Digital Signatures - Authentication Protocols - Digital Signature Standard

NETWORK SECURITY **9**

Authentication Applications: Kerberos - X.509 Authentication Service - Electronic Mail Security - PGP - S/MIME - IP Security - Web Security.

SYSTEM LEVEL SECURITY **9**

Intrusion detection - password management - Viruses and related Threats - Virus Counter measures - Firewall Design Principles - Trusted Systems.

Total Periods : 45

Text Books:

1. William Stallings, "Cryptography and Network Security - Principles and Practices", Pearson Education, Third Edition, 2003.
2. Behrouz A. Foruzan, "Cryptography and Network Security", Tata McGraw-Hill, 2007.

References:

1. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.97
2. Charles B.P fleeger, Shari Lawrence P fleeger, "Security in Computing", 3rd Edition, Pearson Edu, 2003
3. Wade Trappe and Lawrence C. Washington, "Introduction to Cryptography with coding theory", Pearson Education, 2007.
4. Wenbo Mao, "Modern Cryptography Theory and Practice", Pearson Education, 2007.
5. Thomas Calabrese, "Information Security Intelligence: Cryptographic Principles and Applications", Thomson Delmar Learning, 2006.
6. AtulKahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	1	1								2			
CO2	3	2		2	2								3			
CO3	3	2	3	1	2									2		3
CO4	2	1	1	1								2	2			
CO5	1	1	2		2									3		
CO6	2	1	3	2	3							3	2	3		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS52 MOBILE AND PERVASIVE COMPUTING

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 5 Category: PC**

Aim: To study the details of lower layers of mobile architectures in the context of pervasive computing and mobile applications.

Course Outcomes: The Students will be able to.

CO1: Recognize basics of wireless voice network and data communication technologies.
CO2: Make use of various GSM, GPRS system.
CO3: Choose suitable wireless network standard for real world applications
CO4: Configure mobile network using various routing algorithms.
CO5: Apply various protocols in transport and application layers.
CO6: Infer the pervasive computing infrastructure and applications.

MOBILE NETWORKS **9**

Cellular Wireless Networks - GSM - Mobile Services - System Architecture - Radio Interface - Protocols - Localization and Calling - Handover - Security - GPRS.

WIRELESS NETWORKS **9**

Wireless LANs and PANs - IEEE 802.11 Standard - Architecture - Physical Layer - Medium access control layer - MAC management - HiperLAN1 - HiperLAN2 - Bluetooth - Wi-Fi - WiMAX.

ROUTING **9**

Mobile IP - DHCP - Mobile ad hoc networks - Routing - DSDV - DSR - Alternative Metrics - Overview of Routing Protocols - Multicast Routing.

TRANSPORT AND APPLICATION LAYERS **9**

Classical TCP improvements - WAP - Architecture - WDP - WTLS - WTP - WSP - WAE - WML - WML Scripts - WTA.

PERVASIVE COMPUTING **9**

Basics and vision - Applications and requirements - Smart devices and services - Smart mobiles, cards and device networks.

Total Periods: 45

1. Jochen Schiller, “Mobile Communications”, PHI, 2/e, 2008.
2. Stefan Poslad, “Ubiquitous Computing Smart Devices, Environments and Interactions”, John Wiley and Sons, 2009.

References:

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi – 2012.
2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
3. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3												3	3		
CO2	3	2												3		3
CO3	3	2			3									2		
CO4	2	3			3									2		3
CO5	2	3	2		3								3	3		
CO6	2	3			3											3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS53 THEORY OF COMPUTATION

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 5 Category: PC**

Aim: To understand all basic concepts in theoretical computer science.

Course Outcomes: The Students will be able to

CO1: Design Finite Automata for different regular Expressions and languages.

CO2: Recall the basic properties of formal languages and grammars.

CO3: Make use of Automata and pumping lemma concepts to prove that the language is not context free.

CO4: Design Turing machines to solve various computational problems.

CO5: Outline the characteristics of P, NP, NP hardness and NP Complete problems.

CO6: Solve computational problems regarding their computability and complexity to prove the basic results of the Theory of Computation.

FINITE AUTOMATA **9**

Introduction - Basic Mathematical Notation and techniques - Finite State systems - Basic Definitions - Finite Automaton - DFA & NDFA - Finite Automaton with €-moves - Regular Languages - Regular Expression - Equivalence of NFA and DFA - Equivalence of NDFA's with and without €-moves - Equivalence of finite Automaton and regular expressions -Minimization of DFA - Pumping Lemma for Regular sets - Problems based on Pumping Lemma.

GRAMMARS **9**

Grammar Introduction - Types of Grammar - Context Free Grammars and Languages - Derivations and Languages - Ambiguity - Relationship between derivation and derivation trees - Simplification of CFG - Elimination of Useless symbols - Unit productions - Null productions - Greiback Normal form - Chomsky normal form - Problems related to CNF and GNF.

PUSHDOWN AUTOMATA **9**

Pushdown Automata- Definitions - Moves - Instantaneous descriptions - Deterministic pushdown automata - Equivalence of Pushdown automata and CFL - pumping lemma for CFL - problems based on pumping Lemma.

TURING MACHINE **9**

Turing Machines- Introduction - Formal definition of Turing machines - Instantaneous descriptions - Turing Machine as Acceptors - Turing Machine as Transducers Computable Languages and functions - Turing Machine constructions - Modifications of Turing Machines.

COMPUTATIONAL COMPLEXITY **9**

Undecidability - Basic definitions - Decidable and undecidable problems - Properties of Recursive and Recursively enumerable languages - Introduction to Computational Complexity: Definitions - Time and Space complexity of TMs - complexity classes - introduction to NP-Hardness and NP-Completeness.

Total Periods: 45

Text Book:

1. Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2008.

References:

1. John.C.Martin, "Introduction to Languages and the Theory of Computation" McGraw-Hill Education, 01-May-2010.
2. Michael Sipser, "Introduction to the Theory of Computation" Cengage Learning, 2012.
3. Peter Linz, "An introduction to formal languages and automata", Jones & Bartlett Learning, 2001.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											3		3	
CO2	3	2		3									2	2		2
CO3	2	3		2	3								3	2		2
CO4	3	2											3		2	
CO5	3	2								2			2	2		
CO6	3	2		3	2					1			3	2		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS54 **CLOUD COMPUTING**

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 5** **Category: PC**

Aim: To provide a means of understanding the model and exploring options available for complementing the technology and infrastructure needs.

Course Outcomes: The Students will be able to

CO1: Ability to review the fundamentals of Distributed Computing, Cluster Computing and Grid Computing.

CO2: Ability to articulate the Virtualization concepts.

CO3: Ability to identify the architecture, service models and deployment models of Cloud.

CO4: Ability to master the programming aspects of Cloud.

CO5: Ability to identify the Cloud Technologies for the Internet of Things.

CO6: Ability to explain the data flow of running a parallel program on a distributed system.

INTRODUCTION **9**

Overview of Distributed Computing, Cluster Computing and Grid Computing - Technologies for Network based systems - System Models for Distributed and Cloud Computing - Software environments for Distributed Systems and Clouds - Overview of Services and Service oriented Architecture.

VIRTUAL MACHINES AND VIRTUALIZATION **9**

Virtual Machines and Virtualization - Implementation levels of Virtualization - Virtualization structures/tools and Mechanisms - Virtualization of CPU, Memory and I/O Devices - Storage Virtualization.

CLOUD COMPUTING LAYERS AND DEPLOYMENT **9**

Cloud Computing - Properties - challenges - Service models - IaaS, PaaS and SaaS Deployment models - Architecture design of Compute and Storage cloud - Public Cloud Platforms - Inter Cloud Resource Management - Cloud Security and Trust Management.

CLOUD PROGRAMMING **9**

Cloud Programming and Software Environments - Parallel and Distributed Programming paradigms - Programming on AWS, Azure and GAE - Cloud software environments Eucalyptus - Open Stack - Open Nebula.

UBIQUITOUS CLOUDS AND THE INTERNET OF THINGS **9**

Ubiquitous Clouds and the Internet of Things - Cloud Trends in Supporting Ubiquitous Computing - Quality of Service in Cloud Computing - Benchmarking MPI, Azure, EC2, MapReduce, and Hadoop - Enabling Technologies for the Internet of Things - Innovative applications of the Internet of Things - Online Social and Professional Networking.

Total Periods: 45

Text Books:

1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier, 2012

References:

1. Barrie Sosinsky, "Cloud Computing Bible" John Wiley & Sons, 2010
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance", O'Reilly 2009
3. Bernard Golden, "Amazon Web Services for Dummies", John Wiley & Sons, 2013.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3										1	3	3			
CO2		3	2		2									3		
CO3	3			3			3				2			3		
CO4	2	3	2	3	3										2	
CO5	2	3			3					2						1
CO6	3	2	2	3			3						3	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS55 **C# & .NET FRAMEWORK** **L T P C 3 0 0 3**

Programme: B.E. Computer Science and Engineering **Sem: 5** **Category: PC**

Aim: To provide an introduction to the .NET framework and make the student to program with C#.

Course Outcomes: The Students will be able to

CO1: Knowledge on object-oriented concepts Design user experience and functional requirements C#.NET application.

CO2: Make use of basic C# constructor, delegates and events.

CO3: Design and analyze the use of language interfaces, inheritance familiar with .NET collections.

CO4: Develop code and test small C# console and GUI applications.

CO5: Building stand-alone applications in the .NET framework using C#.

CO6: Create window based application programming with backend databases.

OOPS CONCEPTS **9**

Review of OOP Concepts - Overview of .NET Framework - Basic Elements of C# - Program Structure and simple Input and Output Operations - Operators and Expressions - Statements - Arrays and Structures.

OVERLOADING **9**

Inheritance - Namespace - Polymorphism - Interface and Overloading - Multiple Inheritance - Property - Indexes - Delegates - Publish/Subscribe Design Patterns - Operator Overloading - Method Overloading

C# CONCEPTS **9**

C# Concepts for creating Data Structures - File Operation - File Management systems - Stream Oriented Operations - Multitasking - Multithreading - Thread Operation - Synchronization.

XML DATA AND CONTROLS **9**

Working with XML - Techniques for Reading and Writing XML Data - Using XPath and Search XML - ADO.NET Architecture - ADO.NET Connected and Disconnected Models - XML and ADO.NET - Simple and Complex Data Binding - Data Grid View Class.

BUILDING WEB SERVICES **9**

Application Domains - Remoting – Leasing and Sponsorship - .NET Coding Design Guidelines – Assemblies – Security – Application Development – Web Services - Building an XML Web Service - Web Service Client – WSDL and SOAP – Web Service with Complex Data Types – Web Service Performance.

Total Periods: 45

Text Books:

1. S. Thamarai Selvi and R. Murugesan "A Textbook on C#", Pearson Education, 2003.
2. Stephen C. Perry, "Core C# and .NET", Pearson Education, 2006.

References:

1. Jesse Liberty, "Programming C#", Second Edition, O"Reilly Press, 2002.
2. Robinson et al, "Professional C#", Fifth Edition, Wrox Press, 2002.
3. Herbert Schildt, "The Complete Reference: C#", Tata McGraw Hill, 2004.
4. Andrew Troelsen, "C# and the .NET Platform", A! Press, 2003.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		2	2								2	2		2
CO2	2	2		1	1								2		1	
CO3		3		3	2									2		1
CO4	3	2		1	2				2						3	2
CO5		2		1	2								2		3	
CO6		2		1									2	2		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS57 **C# .NET LABORATORY** **L T P C**
0 0 4 2

Programme: B.E. Computer Science and Engineering **Sem: 5** **Category: PC**
Aim To provide an awareness to .net tools and applications
Course Outcomes: The Students will be able to
CO1: Articulate the basic syntax and features of the C# programming language.
CO2: Define C# constructs, which implement the three basic control structures.
CO3: Describe object-oriented (OO) concepts related to classes and objects.
CO4: Describe the concepts behind user interface design.
CO5: Define arithmetic, relational, and logical operators.
CO6: Describe the concepts behind variables, constants, and calculations.

LIST OF EXPERIMENTS:

1. Write a console application that obtains four int values from the user and displays the product.
2. Write a console application that places double quotation marks around each word in a string
3. Write an application that uses two command-line arguments to place values into a string and an integer variable, respectively. Then display these values.
4. Write programs using conditional statements and loops: Generate Fibonacci series.
5. Write programs using conditional statements and loops: Test for prime numbers.
6. Write programs using conditional statements and loops: Generate prime numbers.
7. Write programs using conditional statements and loops: Reverse a Number and find sum of digits of a number.
8. Write programs using conditional statements and loops: Test for vowels
9. Write programs using conditional statements and loops: Use of foreach loop with arrays.
10. Write a program using function overloading to swap two integer numbers and swap two float numbers.

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2		2	2				2				2			
CO2	2	2		2	1									2		
CO3		2		2	2				1						2	
CO4		2			3										2	
CO5	2			2					2				2			2
CO6		2			2				2					2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS58 OPEN SOURCE LABORATORY

L	T	P	C
0	0	4	2

Programme: B.E Computer Science and Engineering **Sem: 5** **Category: PC**

Aim: To develop an ability to learn open source / foss environments.

Course Outcomes: The Students will be able to

CO1: Design and implement Kernel configuration, compilation.

CO2: Able to install various software packages like CUPS & samba.

CO3: Learn about the various build systems used like the auto* family, cmake, ant etc.

CO4: Design Version Control System setup and usage using RCS, CVS, SVN.

CO5: Set up the complete network interface using ifconfig command like setting gateway, DNS, IP tables, etc.,

CO6: Simple programs using php, python, perl and GUI.

LIST OF EXPERIMENTS:

1. Kernel configuration, compilation and installation: Download / access the latest kernel source code from kernel.org, compile the kernel and install it in the local system. Try to view the source code of the kernel.
2. Virtualization environment (e.g., xen, kqemu or lguest) to test an applications, new kernels and isolate applications. It could also be used to expose students to other alternate OSs like *BSD
3. Compiling from source: learn about the various build systems used like the auto* family, cmake, ant etc. instead of just running the commands. This could involve the full process like fetching from a cvs and also include autoconf, automake etc.,
4. Introduction to packet management system: Given a set of RPM or DEB, how to build and maintain, serve packages over http or ftp and also how do you configure client systems to access the package repository.
5. Installing various software packages
   Either the package is yet to be installed or an older version is existing. The student can practice installing the latest version. Of course, this might need internet access.
   - Install samba and share files to windows,
   - Install Common Unix Printing System(CUPS)
6. Write user space drivers using fuse -- easier to debug and less dangerous to the system (Writing full-fledged drivers is difficult at student level)
7. GUI programming: a sample programme – using Gambas since the students have VB knowledge. However, one should try using GTK or QT
8. Version Control System setup and usage using RCS, CVS, SVN
9. Text processing with Perl: simple programs, connecting with database e.g., MYSQL
10. Running PHP : simple applications like login forms after setting up a LAMP stack
11. Running Python : some simple exercise – e.g. Connecting with MySql database
12. Set up the complete network interface using ifconfig command like setting gateway, DNS, IP tables, etc.,

Total Periods: 60

References:

1. Scott Hawkins, “Linux Desk Reference (Open Source Technology Series)” Prentice Hall; First Edition.
2. Steve Weber, **“The Success of Open Source”,** Harvard University Press (Nov. 30, 2005).

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2			2				2				2	2	2	
CO2	2	3		2					1				2			1
CO3		2		2	2				2					2		
CO4				2	2										2	
CO5	3	2			2				2					2	2	
CO6	3			2					2				2	2		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS59 **CAREER ENGLISH - I** **L T P C 0 0 2 MC**

Programme: B.E. Computer Science and Engineering **Sem: 5** **Category: EEC**

Aim: To Improve learner's Communication Skills in English

Course Outcomes: The Students will be able to

CO1: To train the students in Language Skills, Soft Skills, Inter Personal Skills, Decision Making and Business Communication.

CO2: To be competent in Presentation skill.

CO3: To imbibe the knowledge of effective classroom speaking and presentation.

CO4: To provide opportunities to learners to practice their communicative skills to become proficient users of English.

CO5: To be a master in time & stress management.

CO6: Write job applications.

UNIT I **10**

Elements of effective presentation - Structure of presentation - Presentation tools - Voice Modulation - Audience analysis - Body language - Video samples

UNIT II **10**

Time management - Articulateness - Assertiveness - Psychometrics - Innovation and Creativity - Stress Management & Poise - Video Samples.

UNIT III **10**

Covering letter- strategies to write, resume and it's various kinds.

Total Periods: 30

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1									3	3	3	3				
CO2										3		2				
CO3									2	3		2				
CO4									2	3		2				
CO5								3		3						
CO6									3	3						

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS61 ENGINEERING ECONOMICS AND MANAGEMENT L-T-P C
3-0-0 3

Programme: B.E. Computer Science and Engineering **Sem: 06 Category: HS**

Course Outcomes: After completion of this course students

CO1: Explain about the fundamentals of economic concepts

CO2: Describe the concept of theory of production and Human resource management.

CO3: Demonstrate the Management Principles, functions of management &organizational structures.

CO4: Adjust inflation and solve different types of replacement problems.

CO5: Prepare internal rate of return, payback period, net present value and cost benefit analysis.

CO6: Prepare feasibility reports and break even analysis.

FUNDAMENTALS OF ECONOMICS 9

Concept and scope of engineering economics - basic concepts of goods, utility, value and wealth - relation between economic decision and technical decision - Law of demand & supply – factors influencing demand - elasticity of demand – demand forecasting - Basic economic problems - causes, types and measures to control Poverty, Un employment and Inflation.

THEORY OF PRODUCTION 9

Theory of production; production function, meaning, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur) - Law of variable proportions & law of returns to scale - Introduction to Human Resource Management; definitions, objectives of manpower planning, process, sources of recruitment, process of selection - Corporate Social Responsibility; meaning, importance - Business Ethics; meaning, importance.

FUNCTIONS OF MANAGEMENT 9

Introduction to Management & administration, skill, types and roles of managers – Management Principles; Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory – Functions of Management – Planning, Organizing, Staffing, Directing, Controlling – Organizational Structures; meaning, principles of organization, types (explanation with merits and demerits), span of control, departmentalization.

DEPRICATION AND REPLACEMENT ANALYSIS 9

Depreciation – various methods of depreciations – inflation adjusted decisions – procedure to adjust inflation – Types of maintenance – types of replacement problem - determination of economic life of an asset – replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender.

COST ANALYSIS 9

Types of costing – traditional costing approach – activity base costing – cost output relationship in the short run and in long run – types of pricing and its practice – appraising project profitability – internal rate of return – payback period – net present value – cost benefit analysis –feasibility reports- break even analysis - managerial uses of break even analysis.

Total Periods: 45

Text Books:

1. Dewett K.K. &Varma J.D., "Elementary Economic Theory", S Chand & Co., 2006.
2. Suma Damodaran, "Managerial economics", Oxford University press 2006.

References:

1. Sharma, K.K , "Principle of Economics", Abishek publications,2002.
2. PanneerSelvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1			3				2				3					2
CO2			3				2	3			3					2
CO3			3				2	2			3					2
CO4			3				2				3					2
CO5			3				2				3					2
CO6			3				2				3					2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS61	MOBILE APPLICATION DEVELOPMENT			L	T	P	C
				3	0	0	3
Programme:	B.E. Computer Science and Engineering	**Sem:**	**6**	**Category :**		**PC**	
Aim:	To provide students with the tools and knowledge necessary to create mobile applications that can run on mobile devices.						

Course Outcomes: The Students will be able to

CO1:	Understand the essentials of android applications and activities.
CO2:	Develop rich User Interfaces for android platform.
CO3:	Build files and databases in android applications.
CO4:	Show the compatibility and support of Android for various multimedia applications.
CO5:	Make use of advanced tools to develop android applications.
CO6:	Demonstrate their ability to deploy software to mobile devices.

ANDROID OVERVIEW — **9**

Introduction - Android SDK features - OHA - Development framework - Getting started -developing for android, mobile devices - ADT - creating an applications and activities -Application manifest - Android Application Life Cycle - Understanding application priority -Externalizing resources - Android application class - Android Activities.

USE INTERFACE TOOLS — **9**

Creating user interface - Views - creating views - Layouts - Drawable resources - resolution and density independence - Menus - Intents - Adapters - Using Internet resources - Dialogs.

FILES, SAVING STATES AND DATABASES — **9**

Saving Simple Application Data - creating and saving preferences - preferences activity -saving activity state - loading files - file management tools - Introducing Android databases -SQLite - Cursors and content Values-Working with SQlite Databases-Creating and Using Content providers - Native Android content Providers.

SMALL COMPUTING TECNOLOGY AND SENSORS — **9**

Audio, Video Using the Camera - Telephony And SMS - Bluetooth Networks - Managing network connectivity - WI-FI - **Sensors**-Sensors and the Sensor Manager - Interpreting sensor values-Using the compass, Accelerometer and Orientation sensor.

ADVANCED ANDROID DEVELOPMENT — **9**

Paranoid Android - Using Wake Locks - Introducing Android Text to Speech - AIDL to Support IPC for Services - Building Rich User Interfaces.

Total Periods: 45

Text Book:

1. Reto Meier, "Professional Android 2 Application Development" , Wiley Inc,2010

References:

1. Michael Juntao Yuan, "Enterprise J2ME: Developing Mobile Java Applications", PearsonEducation, 2004
2. Knudsen J, "Kicking Butt with MIDP and MSA: Creating Great Mobile Applications" First Edition.
3. James Keogh, "J2ME: The Complete Reference", Tata McGraw-Hill, 2003.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		3	1	2		2						3			
CO2	3	3		1	2										2	
CO3	3		2	3			3				3	3			3	3
CO4	2	3		2	2									3		
CO5	3	2		3	1				3	3						3
CO6	3		3	1	2		2						2			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS62 SYSTEM SOFTWARE AND COMPILER DESIGN

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 6 Category: PC**

Aim: To gain the knowledge about system software and to know the design and implementation a simple assembler and compiler.

Course Outcomes: The Students will be able to.

CO1: Analyze the major differentials of SIC & SIC/XE architectural and its programming Characteristics.

CO2: Make use of patterns, tokens & regular expressions for solving a problem.

CO3: Recall the formal attributed grammars for specifying the syntax and semantics of programming languages.

CO4: Outline the algorithms to generate code for a target machine

CO5: Apply simple intermediate code optimization techniques to improve the performance of a program in terms of speed and space.

CO6: Summarize the modern tools and technologies for designing new compiler.

INTRODUCTION **9**

System software and machine architecture - The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming. Basic assembler functions - A simple SIC assembler - Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes - Program relocation - Machine independent assembler features - Literals - Symbol - defining statements - Expressions - One pass assemblers and Multi pass assemblers. basic loader functions - machine dependent loader features .

INTRODUCTION TO COMPILING AND SYNTAX ANALYSIS **9**

Compilers - Phases of a compiler - Cousins of the Compiler - Compiler construction tools - Lexical Analysis - Role of Lexical Analyzer - Specification and recognition of Tokens. Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top down parsing - Bottom-up Parsing - LR parsers - Constructing an SLR(1) parsing table.

INTERMEDIATE CODE GENERATION AND CODE OPTIMIZATION **9**

Intermediate languages - Declarations - Assignment Statements - Boolean Expressions - Case Statements - Back patching - Procedure calls - Introduction to code optimization - Principal Sources of Optimization - Optimization of basic Blocks - loops in flow graphs - Peephole optimization - Introduction to Global Data Flow Analysis.

CODE GENERATION **9**

Issues in the design of a code generator - The target machine - Run-time storage management - Basic blocks and flow graphs - Next-use information - A simple code generator - Register allocation and assignment - The DAG representation of basic blocks - Generating code from DAGs.

PARALLELIZING COMPILER **9**

Basic concepts and examples - Iteration spaces - Affine array indexes - Data reuse - Array data dependence - Finding synchronization free parallelism - Synchronization between parallel loops - Locality optimizations. Case study: Open source parallelizing compilers.

Total Periods: 45

Text Books:

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, “Compilers Principles, Techniques and Tools”, Pearson Education Asia, 2003
2. K. Muneeswaran, “Compiler Design”, Oxford University Press, 2013

References:

1. Allen I. Holub “Compiler Design in C”, Prentice Hall of India, 2003.
2. C.N.Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings, 2003.
3. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, TMGH, 2003.
4. John J. Donovan “System Programming”, Tata McGraw-Hill Edition, 2000.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		3			2							1	3	3		2
CO2	3					2					3		3	3	2	
CO3			3						3			2	3	2		
CO4			3		2				2				2	2		2
CO5	3				3							2	2		3	
CO6	3	3	3		2			2		2				2		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS63 **DIGITAL SIGNAL PROCESSING** **L T P C**
3 0 0 3

Programme: B.E. Computer Science and Engineering **Sem: 6 Category: ES**

Aim: To give an understanding on the study that deals with the representation of signal as ordered sequences of numbers and how to process those ordered sequences.

Course Outcomes:

CO1: Describe the classification of systems with their properties.
CO2: Analyze the discrete time systems using DTFT and Z transform.
CO3: Evaluate the Decimation in time and frequency FFT algorithms for efficient computation of the DFT.
CO4: Design digital IIR Butterworth and Chebyshev filters.
CO5: Design digital FIR filters using the windowing technique.
CO6: Investigate the finite precision effects such as input quantization, coefficient quantization and multiplication round off.

SIGNALS AND SYSTEMS **9**

Basic elements of DSP – concepts of frequency in Analog and Digital Signals – discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, DT signals - periodic and periodic, random signals, DT systems, Basic properties of systems - Linear Time invariant Systems and properties.

ANALYSIS OF DISCRETE TIME SIGNALS **9**

Sampling of CT signals and aliasing, DTFT and properties, Z-transform and properties of Z-transform-Convolution (linear and circular) – Correlation.

FREQUENCY TRANSFORMATIONS **9**

Introduction to DFT – Properties of DFT – Filtering methods based on DFT – FFT Algorithms Decimation – in – time Algorithms, Decimation – in – frequency Algorithms – Use of FFT in Linear Filtering – DCT.

IIR FILTER DESIGN **9**

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (HPF, BPF, BRF) filter design using frequency translation

FIR FILTER DESIGN **9**

Structures of FIR – Linear phase FIR filter – Filter design using windowing techniques, Frequency sampling techniques – Finite word length effects in digital Filters

Total Periods: 45

Text Books:

1. John G Proakis & Dimitris G Manolakis, “Digital Signal Processing – Principles, Algorithms & Applications”, 4/e, Pearson education / Prentice Hall, 2007.
2. Emmanuel C Ifeachor, & Barrie W Jervis, “Digital Signal Processing”, 2/e, Pearson Education / Prentice Hall, 2002.

References:

1. Alan V.Oppenheim, Ronald W. Schafer & Hohn. R.Back, “Discrete Time Signal Processing”, Pearson Education.
2. Andreas Antoniou, “Digital Signal Processing”, Tata McGraw Hill.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		3	3				2				3			
CO2		3	3		1				3			3			2	
CO3			3	3					1						3	2
CO4	3	2		3	2				2					2	3	
CO5		2	3	2	1				2							3
CO6			3	3					1						3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS67 MOBILE APPLICATION DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

Programme: B.E. Computer Science and Engineering **Sem: 6 Category: PC**

Aim: To develop programming skills in design and implementation of mobile applications.

Course Outcomes: The Students will be able to.

CO1: Have basic knowledge an Android application.
CO2: Understand mobile application development programs.
CO3: Design mobile application programs.
CO4: Design and Implement various mobile applications using emulators.
CO5: Deploy applications to hand-held devices.
CO6: Develop an small android applications.

LIST OF EXPERIMENTS:

Implementation in the following topics:

1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop a student data base application.
7. Implement an application that implements Multi threading
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with Windows or Android or iOS or Equivalent Mobile Application Development Tools with appropriate emulators and debuggers

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		3	3				2				3			
CO2		3	3		1				3			3			2	
CO3			3	3					1						3	2
CO4	3	2		3	2				2					2	3	
CO5		2	3	2	1				2							3
CO6	3	2	3		3	2			3			2	3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS68 SYSTEM SOFTWARE AND COMPILER LABORATORY **L T P C**
0 0 4 2

Programme: B.E. Computer Science and Engineering **Sem: 6 Category: PC**
Aim: To know how to implement various system software tools like assemblers, compiler etc.

Course Outcomes: The Students will be able to.
CO1: Able to implement different passes of a compiler
CO2: Able to analyze and implement translation of source code to target code.
CO3: Able to understand and implement various phases of a compiler
CO4: Able to use compiler construction tools.
CO5: Able to understand practical issues in compiler construction.
CO6: Able to understand working principles of compiler programs.

LIST OF EXPERIMENTS:

1. Write a program to implement a symbol table with functions to create, insert, modify, search, and display.
2. Write a program to implement pass one of a two pass assembler.
3. Write a program to implement pass two of a two pass assembler.
4. Write a program to implement a single pass assembler.
5. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.) using LEX.
6. Generate a parser for recognizing assignment statements with operators like +, - , * and / and operands like identifiers and constants using YACC .
7. Construct predictive parsing table for a given grammar.
8. Generate intermediate code for a given source program.
9. Write a program to implement a code generator to generate target code.
10. Construct DAG for a given quadruple.

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	1						2				3	3		
CO2	2	2	3	1					3				2	2		
CO3	2	3			3				2				3	2		1
CO4	2	3			3				1				2	2		3
CO5	3	2	2	1	2				2				3	2		3
CO6	2	3	2	2	2				2				3	3		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161HS69 **CAREER ENGLISH-II** **L T P C**
0 0 2 MC

Programme: B.E. Computer Science and Engineering **Sem: 6 Category: EEC**
Aim: To practice English for Enhancing Employability skills.

Course Outcomes: The Students will be able to

CO1: Enlarge the students aptitude and reasoning skills
CO2: Acquire knowledge about the various principles of communication, understand its various stages and the role of audience and purpose, deal with the barriers that affect communication in a professional set up.
CO3: Practice English for Enhancing Employability skills.
CO4: Develop students job prospects through oral communication.
CO5: Enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.
CO6: Develop interview skills through group discussion and mock interviews.

UNIT I **10**

Verbal analogy, verbal reasoning, error spotting, sentence completion.

UNIT II **10**

Why is GD part of selection process? - Structure of GD - Moderator - led and other GDs - Strategies in GD - Team work - Body Language - Mock GD - Video samples.

UNIT III **10**

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video samples.

1. Resume / Report Preparation
2. Presentation Skills: Students make presentations on given topics.
3. Group Discussion: Students participate in group discussions.
4. Interview Skills: Students participate in Mock Interviews

Total Periods: 30

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2								3	3	3	2				
CO2						2			3	3	3	2				
CO3									2	3	2	2				
CO4										3						
CO5									3	2						
CO6										3						

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS71 **BIGDATA ANALYTICS** **L T P C 3 0 0 3**

Programme: B.E. Computer Science and Engineering **Sem: 7** **Category: PC**

Aim: To highlight and explore the need for big data.

Course Outcomes: The Students will be able to.

CO1: Examine a mixture of structured, semi-structured and unstructured data.
CO2: Evaluate analytics techniques for text, audio, video, and social media data.
CO3: Build a data model for analyzing large data sets.
CO4: Utilizes a variety of statistical, modeling, data mining, & machine learning techniques.
CO5: Model nominal outcome variables using logical regression model.
CO6: Understand how Big Data can be analyzed to extract knowledge.

INTRODUCTION **9**

Big Data - Risk of Big Data - Need to Tame Big Data - Exploring big Data - Mixing with traditional data - Need for Standards.

ANALYTIC PROCESS **9**

Evolution of Analytics Scalability: Parallel Processing System - Cloud Computing - Grid Computing - MapReduce - Evolution of Analytics Processes: The Analytic Sand box - Analytic data set - Enterprise Analytic set - Embedded Scoring - Wrap up.

CLUSTERING AND CLASSIFICATION **9**

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions .- Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes' Theorem - Naïve Bayes Classifier.

ASSOCIATION AND RECOMMENDATION SYSTEM **9**

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association & finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation -Knowledge Based Recommendation- Hybrid Recommendation Approaches.

GRAPH MEMORY AND STREAM MEMORY **9**

Using Graph Analytics for Big Data: What Is Graph Analytics? - The Simplicity of the Graph Model-Representation as Triples - Graphs and Network Organization - Choosing Graph Analytics - Graph Analytics Use Cases - Graph Analytics Algorithms and Solution Approaches - Technical Complexity of Analyzing Graphs- Features of a Graph Analytics Platform - Considerations: Dedicated Appliances for Graph- Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Realtime Analytics Platform(RTAP) applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

Total Periods: 45

Text Books:

1. Bill Franks, "Taming the Big Data Tidal Wave Finding Opportunities in huge data streams with Advanced Analytics", John Wiley & Sons.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
3. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.

References:

1. "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services, Wiley publishers, 2015.
2. Kevin Roebuck, "Big Data: High Impact Strategies" Lightning Source Incorporated, 2011.
3. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
4. Frank J. Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", John Wiley & Sons,

2013.
5. KImH.Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3			3		3						3	3		2
CO2	2	2	1	2			3						3	2	2	
CO3	3	3	2	1	2				2				3		2	
CO4	2	3		2	1								2	2	1	2
CO5	1	2		1	2								2		2	
CO6	3	2		2									2	2		1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS72 **INTERNET OF THINGS** **L T P C 3 0 0 3**

Programme: B.E. Computer Science and Engineering **Sem: 7** **Category: PC**

Aim: To learn the concepts of IoT

Course Outcomes: The Students will be able to.

CO1: Identify the components of IoT.

CO2: Analyze various protocols of IoT.

CO3: Build portable IoT using appropriate boards.

CO4: Design business Intelligence and Information Security for WoT

CO5: Develop schemes for the applications of IOT in real time scenarios

CO6: Summarize the building blocks of Internet of Things and characteristics.

INTRODUCTION **9**

Definition - Foundations - Challenges and Issues - Identification-Security. Components in internet of things: Control Units - Sensors - Communication modules - Power Sources -Communication Technologies - RFID - Bluetooth - Zigbee - Wifi – Rf-links - Mobile Internet - Wired Communication - IoT Platform Overview - Raspberry pi - Arduino boards.

IoT Protocols: **9**

Protocol Standardization for IoTM2M and WSN Protocols - SCADA and RFID Protocols -Issues with Iot Standardization - Protocols - IEEE 802.15.4 - BACNet Protocol - Zigbee Architecture - Network layer - APS Layer - Security.

Resource Management in the Internet of Things: **9**

Clustering - Software Agents - Data Synchronization - Clustering Principles in an Internet of Things Architecture - The Role of Context - Design Guidelines - Software Agents for Object - Data Synchronization - Types of Network Architectures - Fundamental Concepts of Agility and Autonomy - Enabling Autonomy and agility by the Internet of Things - The Evolution from the RFID - based EPC Network to an Agent based Internet of Things - agents for the Behaviour of Objects.

Web of Things: **9**

Web of Things versus Internet of Things-Architecture Standardization for WoT - Platform Middleware for WoT - WoT Portals and Business Intelligence-Cloud of Things: Grid/SOA and Cloud Computing - Cloud Standards - Cloud of Things Architecture - Open Source e-Health sensor platform.

Case Study and IoT Application Development: **9**

IoT applications in home – infrastructures - security - Industries - IoT electronic equipments. Use of Big Data and Visualization in IoT - Industry 4.0 concepts - Sensors and sensor Node -Interfacing using Raspberry Pi/Arduino - Web Enabled Constrained Devices.

Total Periods: 45

Text Books :

1. Honbo Zhou, ”The Internet of Things in the Cloud: A Middleware Perspective” - CRC Press-2012.
2. Dieter Uckelmann, Mark Harrison, “Architecting the Internet of Things”, Springer-2011.
3. Arshdeep Bahga, Vijay Madisetti, “Internet of Things (A Hands-On-Approach)”, VPT, 2014.

References :

1. Luigi Atzori, Antonio Lera, Giacomo Morabito, “The Internet of Things: A Survey”, Journal on Networks, Elsevier Publications, October, 2010.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things –Key applications and Protocols”, Wiley, 2012.
3. http://www.theinternetofthings.eu/what-is-the-internet-of-things.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3			2								3	3		3
CO2	3			2	2									3	3	2
CO3	2		3	2								2	2			2
CO4			3			3					3		3		2	2
CO5			3	2						3			3	2	3	
CO6	3	2	3	1	2								2	2		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS73	COMPUTER GRAPHICS & MULTIMEDIA	L	T	P	C
		3	0	2	4

Programme: B.E. Computer Science and Engineering **Sem: 7 Category: PC**

Aim:
- To introduce students to various two and three dimensional primitives and concepts.
- To provide an opportunity for students to represent, design and implement two dimensional and three dimensional objects.

Course Outcomes: The Students will be able to

CO1: Explain two and three dimensional concepts and their applications.
CO2: Identify all techniques related to modern graphics programming concepts
CO3: Identify the various tools used for manipulating multimedia building blocks
CO4: Study about multimedia building blocks like text and images
CO5: Make animation to work
CO6: Implement computer graphics concepts.

2D PRIMITIVES **9**

output primitives - Line, Circle and Ellipse drawing algorithms - Attributes of output primitives - Two dimensional Geometric transformation - Two dimensional viewing - Line, Polygon, Curve and Text clipping algorithms

3D CONCEPTS **9**

Parallel and Perspective projections - Three dimensional object representation - Polygons, Curved lines, Splines, Quadric Surfaces- Visualization of data sets - 3D transformations - Viewing -Visible surface identification.

GRAPHICS PROGRAMMING **9**

Color Models - RGB, YIQ, CMY, HSV - Animations - General Computer Animation, Raster, Key frame - Graphics programming using OPENGL - Basic graphics primitives - Drawing three dimensional objects - Drawing three dimensional scenes

MULTIMEDIA TOOLS **9**

Introduction to making of multimedia-Macintosh and windows production platforms - 3-d modeling and animation - image-editing tools - sound editing tools - animation - video - and digital movie tools - linking multimedia objects - office suites - word processors - spread sheets - databases - presentation tools. Authoring tools - Card and Page-based authoring tools - Icon Based authoring tools - time based authoring tools - object oriented authoring tools - cross platform-authoring tools.

MULTIMEDIA BUILDING BLOCKS **9**

Text: About fonts and faces - text in multimedia - computers and text - Font editing and design tools- Hypermedia and Hypertext. **Sound:** Multimedia system sounds - MIDI versus digital audio - digital audio - making MIDI audio - audio file format - working with sounds in windows - working with sounds on the Macintosh-NIFF-Adding sounds to multimedia-Towards professional sounds – production **Images:** Making still images - Colors - Image file format. Animation: Principals of animation - Making animation that works. Video: How video works - Broadcast video standards - Integrating computers and television - Shooting and Editing - Video tips - Recoding formats - Digital video.

Implementation of Lab Components

1. Implementation of Bresenhams Algorithm – Line, Circle, Ellipse.
2. Implementation of Line, Circle and ellipse attributes
3. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear.
4. Composite 2D Transformations
5. Cohen Sutherland 2D line clipping and Windowing
6. Sutherland – Hodgeman Polygon clipping Algorithm
7. Three dimensional transformations - Translation, Rotation, Scaling
8. Composite 3D transformations

Total Periods: 45

Text Books :

1. Donald Hearn, Pauline Baker, Computer Graphics – C Version, 2/e, Pearson Education, 2004.
2. Tay Vaughan, Multimedia: Making It Work, 8th edition, McGraw Hill 2011.

References :

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics - Principles and practice, 2/e in C, Pearson Education, 2007.
2. K. Andleigh and K.Thakkrar, Multimedia System Design, PHI
3. Ralf stein Metz and Klara Nahrstedt, Multimedia: Computing, Communication & Application, PHI.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		2										3	3		
CO2	3	3			2								3	3	2	
CO3	3	3			2								3	2		
CO4	3				3								3	2		
CO5	3		3		3								3	2	2	
CO6	3		3	2	3	2	2		1				3	2		1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS74 **WEB TECHNOLOGY** **L T P C 3 0 0 3**

Programme: B.E Computer Science and Engineering **Sem: 7 Category: PC**

Aim: To highlight the features of different technologies involved in Web Technology, Scripting Languages and understanding the web services.

Course Outcomes: The Students will be able to

CO1: Understand basic website communication

CO2: Create a basic website using HTML and Cascading Style Sheets.

CO3: Design and implement dynamic web page with validation using JavaScript objects.

CO4: Design rich server side application using servlet and JSP.

CO5: Design and implement simple web page in PHP, and to present data in XML format.

CO6: Understanding the concept of web services.

Web Basics and Markup Languages **9**

Review of basic Internet Protocols - The World Wide Web-HTTP request message - response message - An Introduction to HTML - Basic XHTML Syntax and Semantics - Fundamental HTML Elements - Introduction to Cascading Style Sheets - Features - Core Syntax-Style Sheets and HTML Style Rule Cascading and Inheritance - Text Properties - Box Model -Normal Flow Box Layout - Beyond the Normal Flow

Client side programming **9**

JavaScript-Syntax - Variables and Data Types - Statements - Operators - Literals - Functions - Objects - Arrays - Built-in objects - JavaScript Debuggers. Introduction to DOM - History-levels-intrinsic event handling - The Document tree - DOM event handling - Introduction to Angular JS - Expressions - Modules - Directives - Model - Data binding - Introduction to JSON.

Server Side Programming **9**

Java Servlet Architecture - Servlets Generating Dynamic Content - Servlet Life Cycle - parameter data - Session Handling - Understanding Cookies - URL rewriting - Other server capabilities - Data storage - Servlet and concurrency - Introduction - JSP and Servlets - Running JSP Applications Basic JSP - JavaBeans Classes and JSP - Tag Libraries and Files - Support for the Model-View-Controller Paradigm - Introduction to Python.

PHP and XML **9**

Introduction-PHP Basics - Strong processing and regular Expressions - form processing and Business logic - Connecting to Database - Using cookies - Dynamic content - Operator precedence chart XML: Basic XML - Document Type Definition - XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

Web Services **9**

Introduction-Java web services basics - Creating, Publishing, Testing and Describing a Web service - Consuming a web service - SOAP - Session tracking in Web services - Consuming Database driven web services from a web application-Passing an object user defined type to web service - REST based web services in ASP.NET.

Total Periods: 45

Text Books :

1. Jeffrey C. Jackson, "Web Technologies-A Computer Science Perspective", Pearson Education, 2012.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", 4/e, Pearson Education, 2006.

References :

1. Robert.W.Sebesta, "Programming the World Wide Web",4/e, Pearson Education, 2007.
2. http://www.W3Schools.com.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											3	2		
CO2	3	2	3										3	3		
CO3			3		2		1						3	3		1
CO4			3										3	3	2	2
CO5			3	2	3								3			2
CO6	3												3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS77 BIG DATA ANALYTICS LABORATORY

L	T	P	C
0	0	4	2

Programme: B.E. Computer Science and Engineering **Sem: 7** **Category: PC**

Aim: To provide an awareness about bigdata tools and databases

Course Outcomes: The Students will be

CO1: Able to apply the knowledge of computing tools and techniques in the field of Big Data for solving real world problems encountered in the Software Industries.

CO2: Able to analyze the various technologies & tools associated with Big Data.

CO3: Able to identify the challenges in Big Data with respect to IT Industry and pursue quality research in this field with social relevance.

CO4: Able to Analyze the local and global impact of computing on individuals, organizations, and society.

CO5: Able to Propose solutions for Big Data Analytics problems by handling the gaps in existing literature.

CO6: Able to create simple regression using R packages.

LIST OF EXPERIMENTS:

1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux.
2. MapReduce application for word counting on Hadoop cluster.
3. K-means clustering using map reduce.
4. Page Rank Computation.
5. Unstructured data into NoSQL data & do all operations such as NoSQL query with API.
6. Installation of R packages
7. Simple Regression using R
8. Mahout machine learning library to facilitate the knowledge build up in big data analysis. Application of Recommendation Systems using Hadoop/mahout libraries.

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		1		2					2				3	1	1	
CO2		2		2					2					2	2	
CO3		2		3					2					3		
CO4		3		2					2					2	2	2
CO5				2					2				3		1	
CO6		1		2					2					3		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS78 WEB TECHNOLOGY LABORATORY

L	T	P	C
0	0	4	2

Programme: B.E Computer Science and Engineering **Sem: 7 Category: PC**

Aim: To design web pages and apply skills on various web technologies.

Course Outcomes: The Students will be able to

CO1: Develop simple web pages using HTML elements.
CO2: Design and implement dynamic websites.
CO3: Develop client side scripting applications.
CO4: Create well formed JSP and servlets documents.
CO5: Model different kinds of real world problems using database connectivity.
CO6: Implement the Web services and Database.

LIST OF EXPERIMENTS

1. Create a static web page using all basic HTML elements (like, list, tables, forms, frames etc.) and embed an image to fix hotspot on that image and show all the related information when the hot spots are clicked.
2. Create a web page using CSS and create client side script to validate web form controls using DHTML.
3. Write programs in Java to create applets incorporating the following features:
   - Set background and foreground of the control text area by selecting a color from color palette.
   - Select Foreground or background colors using sliding bars
4. Create an application using Servlet and Database Connectivity. (Invoke servlets from HTML forms.)
5. Programs using XML Schema and XSLT/XSL
6. Programs using and AJAX.
7. Write programs in Java to create three-tier applications using JSP and Databases
8. Programs using and Angular JS.
9. Implement the developed application using Web Services and Data base.
10. Create a web application with PHP and MySQL.

Total Periods: 60

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3										3	3		
CO2			3										3	3		
CO3			3		3								3	2		
CO4			3	2	3		2		1				3	3		
CO5			3		3								3	2		
CO6			3						3			1	3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CS81 **PROJECT WORK** **L T P C**
0 0 12 6

Programme: B.E Computer Science and Engineering **Sem: 8** **Category: EEC**

Aim: To design web pages and apply skills on various web technologies.

Course Outcomes: The Students will be able to

CO1: Make use of Simulation tools and apply it.
CO2: Create new algorithms and protocols for solving problems.
CO3: Schedule the works under different persons (Project Management skills).
CO4: Develop the skill to communicate effectively and demonstrate the work.
CO5: Develop and analyze solutions for critical real-world Problem.
CO6: Work as an individual and as a team.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	3	1				1			3	2	3	2
CO2	3	3	3	3	2	2						1	2	3	2	3
CO3					2	2	1	2	3	3	3	2	3	3	2	2
CO4	3	2	2	1	1				3	3		2	2	3	3	2
CO5	3	3	2	2					1			2	2	3	3	3
CO6					3	3			2	2	2	2	3	3	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE01 ADVANCED DATABASE SYSTEMS

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim: To provide extensive knowledge on the advanced topics in database technologies.

Course Outcomes: The Students will be able to.

CO1: Select the appropriate high performance database like parallel and distributed database.

CO2: Model and represent the real world data using object oriented database

CO3: Develop in-depth knowledge about intelligent databases like spatial databases, temporal databases.

CO4: Implement the advanced data model.

CO5: Understand the data storage structure in emerging information systems.

CO6: Understand the XML query languages & cloud data models.

PARALLEL AND DISTRIBUTED DATABASES **9**

Parallel Databases: Inter and Intra Query Parallelism - Inter and Intra operation Parallelism - Design of Parallel Systems. Distributed Database Concepts: Homogeneous and Heterogeneous Databases - Distributed Data Storage - Distributed Query Processing - Distributed Transactions - Commit Protocols - Concurrency Control - Recovery.

OBJECT ORIENTED DATABASES **9**

Concepts of Object Oriented Databases - ODMG Model - Object Definition Language - Object Query Language - Conceptual Design - Object Relational features in SQL, Oracle.

INTELLIGENT DATABASES **9**

Active Databases Concepts and Triggers - Deductive Databases - Temporal Database - Spatial Databases - Data Mining: Overview.

ADVANCED DATA MODELS **9**

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data Warehousing- Data Mining- Text Mining

EMERGING DATABASE TECHNOLOGIES AND APPLICATIONS **9**

XML Databases: XML-Related Technologies - XML Schema - XML Query Languages - Storing XML in Databases - XML and SQL - Native XML Databases - Web Databases -Geographic Information Systems. Genome Data Management - Cloud Based Databases: Data Storage Systems on the Cloud - Cloud Storage Architectures - Cloud Data Models -Introduction to Big Data - Storage - Analysis.

Total Periods: 45

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S.Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2011.
2. R.Elmasri, S.B.Navathe, “Fundamentals of Database Systems”, 6th Edition, Pearson Education, Addison Wesley, 2010.

References:

1. Carlo Zaniolo, Stefano Ceri “Advanced Database Systems”, Morgan Kauffmann Publishers. VLDB Journal, 1997.
2. Thomas Connolly and Carlolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, 5th Edition, Pearson Education 2013.
3. Raghu Ramakrishnan and Johannes Gehrke “Database Management System”, Third edition McGraw Hill Publications, 2007.
4. C.J.Date, A.Kannan and S.Swamynathan, ”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2		2								3	2		
CO2	3	2	3	2	2	2							3	3		2
CO3	2	3		2	2								1	3	3	
CO4		2	2	2									3			
CO5		3	3	2		2							3		3	2
CO6		2		2	2								2			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE02 ADVANCED JAVA PROGRAMMING

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim: To enable the students to design and develop enterprise strength distributed and multitier applications – Using Java Technology.

Course Outcomes: The Students will be able to

CO1: Understand the basic concepts of Java.

CO2: Learn advanced Java programming concepts like RMI, Collections etc.

CO3: Develop network programs in Java.

CO4: Understand Concepts needed for distributed and multi-tier applications.

CO5: Understand issues in enterprise applications development.

CO6: Develop recent applications using different tools.

DISTRIBUTED COMPUTING **9**

Collections: Collection Interfaces, Concrete Collections, The Collections Framework.

Networking: Internet Addressing - InetAddress - Factory Methods - Instance Methods - TCP/IP Client Sockets - URL - URL Connection - TCP/IP Server Sockets – Datagrams.

RMI: Defining the Remote Interface, Implementing the Remote Interface, Compiling and Executing the Server and the Client.

DISTRIBUTED APPLICATIONS **9**

Introduction to J2EE - Enterprise Java Bean: Preparing a Class to be a JavaBean, Creating a JavaBean, JavaBean Properties - Types of beans - Stateful Session bean, Stateless Session bean, and Entity bean. **CORBA:** Technical/Architectural Overview,-CORBA Basics, CORBA services.

SERVER SIDE PROGRAMMING **9**

Servlets - Introduction to servlets - Servlets life cycle - Java Server Pages (JSP): Introduction, Java Server Pages Overview, First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries

JAVA DATABASE CONNECTIVITY **9**

Java Database Connectivity (JDBC): Merging Data from Multiple Tables: Joining, Manipulating - Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures C- Example: Retrieve the employee details from the Server through JDBC Driver. Java Naming and Directory Interface - Naming concepts - directory concepts - JNDI Interface - Example.

RECENT JAVA TOOLS **9**

Spring Boot - Deploying a Spring-Boot application running with Java8 - Hibernate: Introduction to Hibernate 3.0 - Hibernate Architecture - First Hibernate Application. Java Server Faces - Installing application - writing - deploying and testing application - Request Process life cycle - managed Bean - Basic JSF Tags - Expression Language.

Total Periods 45

Text Books:

1. Uttam K. Roy, “Advanced Java Programming”, Oxford University press 2015.

References:

1. Elliotte Rusty Harold, “Java Network Programming”, O’Reilly publishers, 2000.
2. Ed Roman, “Mastering Enterprise Java Beans”, John Wiley & Sons Inc., 1999.
3. Hortsmann & Cornell, “Core Java 2 Advanced Features, Vol-II”, Pearson Edu, 2002.
4. Programming in Java, S. Malhotra and S. Choudhary, Oxford University press. 2nd edition, press, 2014.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1		2						2			2	3		
CO2	3					2				3		3	3	3		
CO3			2							3		2		2		
CO4							2		2	3		3		2	2	
CO5	2				2					3		3			3	
CO6		3								3		3				3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE03 ADHOC AND SENSOR NETWORKS

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim:

Course Outcomes: The student should be able to

CO1: Explain 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: Study the architecture of sensor networks and the various MAC protocols of sensor networks.

CO4: Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues.

CO5: Evaluate the QoS related performance measurements of ad hoc and sensor networks

CO6: Classify the design issues and different categories of MAC protocols.

INTRODUCTION **9**

Fundamentals of Wireless Communication Technology - The Electromagnetic Spectrum -Radio propagation Mechanisms - Characteristics of the Wireless Channel - Ad hoc wireless networks: Cellular and Ad Hoc Wireless Networks - Applications of Ad Hoc Wireless Networks - Issues in Ad Hoc Wireless Networks.

MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS **9**

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.

ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS **9**

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.

WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS **9**

Introduction - Sensor Network architecture - Layered Architecture - Clustered Architecture. Sensor node architecture - hardware and software components of a sensor node - Data dissemination - Data gathering - MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC - IEEE 802.15.4.

WSN ROUTING, LOCALIZATION & QUALITY OF SERVICE (QoS) **9**

Issues in WSN routing - Localization - Indoor and Sensor Network Localization - absolute and relative localization, triangulation - QoS in WSN - Energy Efficient Design -Synchronization - Transport Layer issues - Security – Real time communication.

Total Periods: 45

Text book:

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

References:

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
2. Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication - 2002.
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005.
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3						3						2	3		
CO2	2	3		3	2	3								3		2
CO3		2		3	3	3							2	3		
CO4	2		3	2	1									3		2
CO5			3										3	3		2
CO6	3	3	2	1									3	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE04 NETWORK ANALYSIS AND MANAGEMENT

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim: To enable the students to develop network applications and to build knowledge about management.

Course Outcomes: The Students will be able to.

CO1: Do requirement analysis and flow analysis for network design.
CO2: Address the routing and security issues in networks.
CO3: Identify and develop the flow models & specification.
CO4: Work with management lifecycle and management reference models.
CO5: Integrate and assess the impact of network management.
CO6: Develop network management standards like SNMP.

INTRODUCTION **9**

Introduction - Overview of analysis, architecture, ad design process-system methodology -system description - service description - service characteristics - performance characteristics - network supportability - Requirement analysis: Concepts - Background - user, application, device, network, and other requirements.

REQUIREMENT AND FLOW ANALYSIS **9**

Gathering and listing requirements - developing service metrics - characterizing behavior -developing RMA requirements - developing delay requirements - developing capacity requirements - developing supplemental performance requirements- Requirements for Predictable and Guaranteed Performance - Flows - Identifying and developing flows - flow models - flow prioritization - flow specification.

ARCHITECTURE **9**

Network architecture - Components architecture - Reference architecture - Architectural models - Addressing and routing architecture - Addressing and routing mechanisms - Addressing and routing strategies - Architectural consideration.

NETWORK MANAGEMENT BASICS **9**

Introduction - Defining network management - network management mechanisms -architectural considerations - Performance architecture - Performance mechanisms -architectural considerations.

NETWORK MANAGEMENT AND SNMP PROTOCOL MODEL **9**

Network and System management, Network management system platform; Current SNMP Broadband and TMN management, Network management standards. SNMPV1, SNMPV2 system architecture, SNMPV2, structure of management information. SNMPV2 - MIB - SNMPV2 protocol, SNMPV3 - Architecture, Application, MIB, security user based security model, access control RMON.

Total Periods: 45

Text Books:

1. James D McCabe, "Network Analysis, Architecture and Design", Elsevier, 3rd Edition, 2007.
2. Mani Subramanian, "Network Management - Principles & Practice" - 2nd Edition Prentice Hall, 2012.

Reference:

1. Steven T. Karris, "Network Design and Management", Orchard Publications, 2009.
2. Laura Chappell and Gerals combs, "Wireshark Network Analysis", First Edition, 2010.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2	3		3									3		
CO2	3			2				1					2			1
CO3		2		1				2					3			1
CO4			3						3	2			3		1	
CO5				3		2					3		3	2		
CO6			3					1					3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE05 **HIGH SPEED NETWORKS** **L T P C**
3 0 0 3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** **PE**

Aim: The aim of the course is to make the students able to identify the features of different technologies involved in High Speed Networking and their performance.

Course Outcomes: The Students will be able to

CO1: Discuss the current state of the art in the field of networking Technology

CO2: Describe how ATM technologies influence the design and implementation of computer networks.

CO3: Model the single server queues and understand the issues involved in congestion control.

CO4: Examine the TCP flow control mechanism and traffic control techniques in ATM network

CO5: Justify the need for various integrated and differentiated services

CO6: Identify the approaches that support the provision of QoS in Internet

HIGH SPEED NETWORKS **9**

Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel - Wireless LANs: applications, requirements - Architecture of 802.11.

CONGESTION AND TRAFFIC MANAGEMENT **9**

Queuing Analysis - Queuing Models - Single Server Queues - Effects of Congestion -Congestion Control - Traffic Management - Congestion Control in Packet Switching Networks - Frame Relay Congestion Control.

TCP AND ATM CONGESTION CONTROL **9**

TCP Flow control - TCP Congestion Control - Retransmission - Timer Management -Exponential RTO backoff - KARN's Algorithm - Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control.

INTEGRATED AND DIFFERENTIATED SERVICES **9**

Integrated Services Architecture - Approach, Components, Services - Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ - Random Early Detection, Differentiated Services.

PROTOCOLS FOR QOS SUPPORT **9**

RSVP - Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms -Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol Architecture, Data Transfer Protocol, RTCP.

Total Periods: 45

Text Book:

1. William Stallings, "High Speed Networks and Internet", Pearson Education, Second Edition, 2002.

References:

1. Warland, Pravin Varaiya, "High performance communication networks", Second Edition Jean Harcourt Asia Pvt. Ltd., , 2001.
2. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.
3. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1										1			1
CO2	2	2	3	3		2			2				2			1
CO3	2	2	3	2	1	2							1			2
CO4	2	2	2	2	2	3			2				1			1
CO5	2	2	3	2	1	2			1				1			2
CO6	3	3	3	3	2	2			2				1			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE06 **INFORMATION RETRIEVAL** **L T P C**
3 0 0 3

Programme: B.E. Computer Science & Engineering **Sem:** - **Category:** PE

Aim: To understand information retrieval techniques

Course Outcomes: The Students will be able to

CO1: Explain Information retrieval system strategies.
CO2: Explain the metrics for evaluating an Information Retrieval System.
CO3: Apply machine-learning techniques for text classification and clustering.
CO4: Explain about the IR components and Web Search Engine Framework.
CO5: Explain the Web Search Engine architecture and optimization.
CO6: Demonstrate document text mining techniques and clustering Algorithms.

INTRODUCTION **9**

Introduction, Goals and History of IR, The Impact of the Web on IR, The Role of Artificial Intelligence (AI) in IR, Ranked Retrieval, Text Similarity Metrics, TF-IDF (Term Frequency/Inverse Document Frequency) Weighting, Cosine Similarity.

RETRIEVAL STRATEGIES **9**

Boolean Retrieval, Dictionaries and Tolerant Retrieval, Vector Space Model, Indexing, XML Retrieval, Fuzzy Set Retrieval, Probabilistic Information Retrieval, Language Models.

RETRIEVAL UTILITIES **9**

Relevance Feedback, Clustering, Passage-based Retrieval, N-grams, Regression Analysis, Thesauri, Latent Semantic Indexing, Parsing.

CATEGORIZATION AND CLUSTERING **9**

Text Categorization and Clustering, Categorization Algorithms, Decision Trees and Nearest Neighbor, Clustering Algorithms, Agglomerative Clustering, K-Means, Expectation Maximization (EM), Applications to Information Filtering, Organization and Relevance Feedback.

WEB BASED RETRIEVAL **9**

Web Search Basics, Indexing, Query Processing, Crawling, Ranking and Link Analysis: Page rank, Hubs and Authorities (HITS).

Total Periods: 45

Text Books:

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze."Introduction to Information Retrieval" , Cambridge University Press, Cambridge, England, 2009.

References:

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", Second Edition, Pearson Education, 2009.
2. Charles T. Meadow, Bert R. Boyce, Donald H. Kraft, "Text Information Retrieval Systems", Academic Press, Third Edition, 2007.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2										3	3	1	
CO2	3	2	2										3	3		
CO3	3			3	2								3	3	1	
CO4													3	1	1	
CO5		2			2		2						2		1	
CO6	1	2			2								3			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE07 RESOURCE MANAGEMENT TECHNIQUES

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science & Engineering **Sem:** - **Category:** PE

Aim: To shape the attitudes of learners regarding the field of resource management techniques.

Course Outcomes: The Students will be able to

CO1: Usage of Operations Research/Management Science in managerial problem solving.

CO2: To formulate mathematical models of managerial problems/opportunities.

CO3: Ability to formulate the mathematical models for the specific managerial situations.

CO4: Proficiency in applying suitable algorithms for solving the mathematical model.

CO5: Ability to use mathematical model for managerial decision making.

CO6: To impart the skills in the applications of Operations Research techniques o solve the mathematical models of managerial problems.

LINEAR PROGRAMMING MODELS **9**

Mathematical Formulation - Graphical Solution of linear programming models - Simplex method - Artificial variable Techniques - Variants of Simplex method.

TRANSPORTATION AND ASSIGNMENT MODELS **9**

Mathematical formulation of transportation problem - Methods for finding initial basic feasible solution - optimum solution - degeneracy - Mathematical formulation of assignment models - Hungarian Algorithm - Variants of the Assignment problem.

INTEGER PROGRAMMING MODELS **9**

Formulation - Gomory's IPP method - Gomory's mixed integer method - Branch and bound technique.

SCHEDULING BY PERT AND CPM **9**

Network Construction - Critical Path Method - Project Evaluation and Review Technique - Resource Analysis in Network Scheduling.

QUEUEING MODELS **9**

Characteristics of Queuing Models - Poisson Queues - (M/M/1):(FIFO/∞/∞), (M/M/1):(FIFO/N/∞), (M/M/C):(FIFO/∞/∞), (M /M/C):(FIFO/N/∞) models.

Total Periods: 45

Text Books:

1. Taha H.A., "Operations Research An Introduction" Seventh Edition, Pearson Education, 2004.

References:

1. A.M. Natarajan, P.Balasubramani, A.Tamilarasi," Operations Research", Pearson Education, Asia, 2005.
2. Prem Kumar Gupta, D.S.Hira, "Operations Research", S.Chand & Company Ltd, New Delhi, Third Edition, 2003.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2			3				3				3	2		
CO2			1		3		3			1					1	
CO3				2				2				2	3	2		2
CO4	2			2			3							2		2
CO5			2		2					2						
CO6		2				2		3				2	2		2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE08 ARTIFICIAL INTELLIGENCE AND ROBOTICS

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science & Engineering **Sem:** - **Category:** PE

Aim: To expose the students to the fundamentals of AI and expert systems and its application in Robotics

Course Outcomes: The Students will be able to

CO1: Fundamental concept of AI and expert system.
CO2: Basics of problem solving methods.
CO3: Basic of knowledge representation and reasoning.
CO4: Intelligence agents learning and planning.
CO5: Understand terminologies used in robotic systems.
CO6: Understand design and planning in robotics.

INTELLIGENT AGENTS AND PROBLEM SOLVING **9**

Intelligent Agents: Concept of Rational Agent, Structure of Intelligent agents, Agent Environments.
Problem Solving: Solving problems by searching, Problem formulation, Search Strategies, Uninformed Search Techniques-DFS, BFS, Uniform cost search, Iterative Depending. Informed search methods-Best First Search, heuristic Functions, Hill Climbing, A*,IDA*.

KNOWLEDGE AND REASONING **9**

Knowledge and Reasoning: A knowledge Based Agent, WUMPUS WORLD Environment, Propositional Logic, First Order Predicate Logic Syntax and Semantics, Forward and backward chaining.
Uncertain Knowledge and Reasoning: Uncertainty, Representing knowledge in an Uncertain Domain, Belif Networks, Simple Inference in Belief Networks.

LEARNING AND PLANNING **9**

Learning from Observations, General Model of Learning Agents, Inductive learning, Learning Decision Trees, A Simple Planning Agent, Planning in Situation calculus, Basic representation for planning, A Partial Order Planning example, A partial order planning algorithm, Knowledge engineering for planning.

INTRODUCTION OF ROBOTICS **9**

Robotic Paradigms, Overview -A Brief History of Robotics-Teleportation, The Seven Areas of AI, Reactive Paradigm, Designing a Reactive Implementation, Case Study: Unmanned Ground Robotics Competition, Assemblages of Behaviors.

OVERVIEW OF ROBOTICS & PLANNING **9**

Common Sensing Techniques for reactive robots: Overview, Logical sensors, Attributes of a sensor, Proprioceptive Sensors, GPS, Proximity Sensors, Sonar, Infrared, CCD Cameras, Stereo camera pairs, Light stripers, Laser.– Introduction of Path Planning - Study of Simbad 3D Robot Simulator.

Total Periods: 45

Text Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson Publication, 2013.
2. Robin R Murphy, Introduction to AI Robotics, 2015, PHI Publication.

References:

1. Robert J. Schilling, Fundamentals of Robotics: Analysis and Control , 2009, PHI Publication
2. Fu, Gonzales and Lee, Robotics, McGraw Hill.2008
3. Patrick H. Winston, Artificial Intelligence, 3rd Edition, Pearson.1993.
4. Robots, mazes, and subsumption architecture: a useful paper written by Paul Reiners. Introduces a subsumption architecture based on Simbad in the Algernon source forge project.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3					2								3		2
CO2	2	3											1		2	
CO3	2	3									2		2	3		
CO4	2	3				2							3		2	
CO5	3	2				2					2		2	3		1
CO6	2	3				3							3	2	1	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE09 NATURAL LANGUAGE PROCESSING

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim: To design and build computer systems that will help to analyze natural languages and to generate their outputs in a natural language.

Course Outcomes: The Students will be able to

CO1: Analyze the natural language text.

CO2: Generate the natural language

CO3: Understand the concepts of syntactic analysis and word classes.

CO4: Understand the concepts of discourse processing.

CO5: Do machine translation.

CO6: Apply information retrieval techniques.

OVERVIEW AND LANGUAGE MODELING **9**

Overview: Origins and challenges of NLP-Language and Grammar - Processing Indian Languages - NLP Applications - Information Retrieval. Language Modeling: Various Grammar - based Language Models - Statistical Language Model.

WORD LEVEL AND SYNTACTIC ANALYSIS **9**

Word Level Analysis: Regular Expressions - Finite-State Automata - Morphological Parsing - Spelling Error Detection and correction - Words and Word classes - Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar - Constituency - Parsing - Probabilistic Parsing.

SEMANTIC ANALYSIS AND DISCOURSE PROCESSING **9**

Semantic Analysis: Meaning Representation - Lexical Semantics - Ambiguity - Word Sense Disambiguation. Discourse Processing: cohesion - Reference Resolution - Discourse Coherence and Structure.

NATURAL LANGUAGE GENERATION AND MACHINE TRANSLATION **9**

Natural Language Generation: Architecture of NLG Systems - Generation Tasks and Representations - Application of NLG. Machine Translation: Problems in Machine Translation - Characteristics of Indian Languages - Machine Translation Approaches -Translation involving Indian Languages.

INFORMATION RETRIEVAL AND LEXICAL RESOURCES **9**

Information Retrieval: Design features of Information Retrieval Systems - Classical, Non-classical, Alternative Models of Information Retrieval - valuation Lexical Resources: World Net-Frame Net - Stemmers - POS Tagger - Research Corpora.

Total Periods: 45

Text Books:

1. Tanveer Siddiqui, U.S.Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.

References:

1. Daniel Jurafsky and James H Martin, “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, 2nd Edition, Prentice Hall, 2008.
2. James Allen, “Natural Language Understanding”, 2nd edition, Benjamin /Cummings publishing company, 1995.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3												3		
CO2		2	3										3			
CO3	2	1	3										3			
CO4	1		2		2										2	
CO5			3	2									3			
CO6	3				2										3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE10 HUMAN COMPUTER INTERACTION

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim: To understand the basic concept in human computer interaction and analyze the designs to improve decision making.

Course Outcomes: The Students will be able to.

CO1: Understand fundamental design and evaluation methodologies of human computer interaction

CO2: Demonstrate knowledge of human computer interaction design concepts and related methodologies.

CO3: Apply theories and concepts associated with effective work design to real-world application.

CO4: Develop meaningful user interface.

CO5: Identify the basic components and interaction to interact with computers.

CO6: Select the window, device and screen based controls through navigation schemes.

INTRODUCTION **9**

Importance of user Interface - definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface - popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user - Interface popularity, characteristics - Principles of user interface.

DESIGN PROCESS **9**

Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business functions.

SCREEN DESIGNING **9**

Design goals - Screen planning and purpose, organizing screen elements, ordering of screen data and content - screen navigation and flow - Visually pleasing composition - amount of information - focus and emphasis - presentation information simply and meaningfully - information retrieval on web - statistical graphics - Technological consideration in interface design.

DEVELOP SYSTEM MENUS AND WINDOWS **9**

Structure of Menus - functions and contents of menus - Formatting of Menus - selecting menu choices - web site navigation - kinds of graphical menus - Window characteristics -components of window - window presentation styles - types of windows - organizing window functions - The web and browser.

INTERACTION DEVICES AND CONTROLS **9**

Input and Output devices - Operable controls - read-only controls - selection controls - custom controls - words, sentences, messages and text - create meaningful graphics, icons and images - choose the proper colors - organize and layout windows and pages.

Total Periods: 45

Text Book:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Import, 17 Apr 2007.

References:

1. Human–Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education,2004
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech, 2002.
3. User Interface Design, Soren Lauesen, Pearson Education, 2005.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2		3		3								3		2	
CO2		3								1				3		
CO3			3				2			3			3			1
CO4	3					3						2	2	3		
CO5		2	3										1			
CO6		2	3										1			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE11 KNOWLEDGE MANAGEMENT

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim: To learn the techniques in natural language processing. To Understand the information retrieval techniques.

Course Outcomes: The Students will be able to

CO1: Recite the fundamental concepts of knowledge management.

CO2: Depict the knowledge management system life cycle.

CO3: Analyze various knowledge capturing techniques.

CO4: Apply codification tools and testing procedures.

CO5: Elucidate about knowledge transfer and sharing systems.

CO6: Understand about the internet search engines.

KNOWLEDGE MANAGEMENT **9**

KM Myths - KM Life Cycle - Understanding Knowledge - Knowledge, intelligence - Experience - Common Sense - Cognition and KM - Types of Knowledge - Expert Knowledge - Human Thinking and Learning. Ethics for KM

KNOWLEDGE MANAGEMENT SYSTEM LIFE CYCLE **9**

Challenges in Building KM Systems - Conventional vs. KM System Life Cycle (KMSLS) - Knowledge Creation and Knowledge Architecture - Nonaka's Model of Knowledge Creation and Transformation. Knowledge Architecture.

CAPTURING KNOWLEDGE **9**

Evaluating the Expert - Developing a Relationship with Experts - Fuzzy Reasoning and the Quality of Knowledge - Knowledge Capturing Techniques, Brain Storming - Protocol Analysis - Consensus Decision Making - Repertory Grid - Concept Mapping - Black boarding.

KNOWLEDGE CODIFICATION **9**

Modes of Knowledge Conversion - Codification Tools and Procedures - Knowledge Developer's Skill Sets - System Testing and Deployment - Knowledge Testing - Approaches to Logical Testing, User Acceptance Testing - KM System Deployment Issues - User Training - Post implementation.

KNOWLEDGE MANAGEMENT-THE TOOLS & CASE STUDY **9**

Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management - Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval - Information Coding in the Internet Environment - Repackaging Information. A case study on Corporate Memories for supporting various aspects in the process life-cycles of an organization.

Total Periods: 45

Text Books:

1. Elias. M. Award & Hassan M. Ghaziri – "Knowledge Management" Pearson Education 2004.

References:

1. Guus Schreiber, Hans Akkermans, Anjo Anjewierden, Robert de Hoog, Nigel Shadbolt,
2. Walter Van de Velde and Bob Wielinga, "Knowledge Engineering and Management",
3. Universities Press, 2001.
4. C.W. Holsapple, "Handbooks on Knowledge Management", International Handbooks on Information Systems, Vol 1 and 2, 2003.

Course Outcomes	Programme Outcomes (POs)												Programmem Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3													3	2	2
CO2	3	2												3		2
CO3	2	3		2	2								2	3	2	
CO4	3	2			2								3	2	3	2
CO5	3													2	2	
CO6	2	1												2		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE12	DATA MINING TECHNIQUES	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PP

Aim: This course enables us to understand the concepts of Data Mining and its applications.

Course Outcomes: The Students will be able to.

CO1: Identify the issues in data mining applications
CO2: Understand the data preprocessing methods to improve the efficiency of classification
CO3: Apply classification algorithms
CO4: Identify the clustering technique and analyze the data
CO5: Identify the business applications and trends in data mining
CO6: Classification for the retrieval purposes.

INTRODUCTION **9**

Data Mining - Stages of the Data Mining Process - Tasks primitives - KDD vs Data mining - Components of Data Mining Algorithms - Data Mining supporting Techniques - Issues in Mining - knowledge representation-Data Mining query languages-Integration of a Data Mining system with a Data Warehouse.

DATA PREPROCESSING **9**

Data cleaning, Data transformation, Feature selection, Dimensionality reduction, Discretization and generating concept hierarchies - Mining frequent patterns - association -correlation.

CLASSIFICATIONS **9**

Introduction, Decision tree induction, Bayesian classification, Back propagation, Associative Classification, Other classification methods, Prediction, Accuracy measures.

CLUSTER ANALYSIS **9**

Cluster Analysis: Basic concepts and Methods - Cluster Analysis - Partitioning methods Hierarchical methods - Density Based Methods - Grid Based Methods - Evaluation of Clustering - Advanced Cluster Analysis: Probabilistic model based clustering - Clustering High - Dimensional Data - Clustering Graph and Network Data - Clustering with Constraints.

ADVANCED MINING **9**

Text mining, Web mining, Spatial data mining, Social mining, Multimedia and graph mining - Reinforcement learning - Predictive Analytic Techniques - Introduction to reinforcement and wholistic learning, multi-perspective decision making for Big data and multi-perspective learning for big data, Advanced techniques for big data mining. Case Study: WEKA.

Total Periods: 45

Text Books:

1. Margaret H Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education, India 2006.
2. Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition (The Morgan Kaufmann Series in Data Management Systems), 2012.

References:

1. David.J.Hand, Heikki Mannila and Padhraic Smyth “Principles of Data Mining” (Adaptive Computation and Machine Learning), 2005
2. Soman.K.P., Diwakar Shyam and Ajay V. “Insight into Data Mining: Theory and Practice”, PHI, 2009.
3. http://www.data-miners.com/

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2		2								3	3		1
CO2	3	2	3	2	2		3						3	3		3
CO3	3	2			2								1	2		
CO4		3	2	2									3	2	2	3
CO5			3	2		2							3			
CO6	3	2	2		1									2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE13	MACHINE LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

Programme:	B.E. Computer Science and Engineering	Sem:	-	Category:	PE

Aim:

Course Outcomes: The Students will be able to

CO1:	Distinguish between, supervised, unsupervised and semi-supervised learning.
CO2:	Apply the apt machine learning strategy for any given problem.
CO3:	Modify existing machine learning algorithms to improve classification efficiency.
CO4:	Design system that uses the appropriate graph models of machine learning.
CO5:	Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem.
CO6:	Understand wide variety of learning algorithm.

INTRODUCTION **9**

Learning - Types of Machine Learning - Supervised Learning - The Brain and the Neuron - Design a Learning System - Perspectives and Issues in Machine Learning - Concept Learning Task - Concept Learning as Search - Finding a Maximally Specific Hypothesis - Version Spaces and the Candidate Elimination Algorithm - Linear Discriminants - Perceptron - Linear Separability - Linear Regression.

LINEAR MODELS **9**

Multi-layer Perceptron - Going Forwards - Going Backwards: Back Propagation Error - Multi-layer Perceptron in Practice - Examples of using the MLP - Overview - Deriving Back - Propagation - Radial Basis Functions and Splines - Concepts - RBF Network - Curse of Dimensionality - Interpolations and Basis Functions - Support Vector Machines.

TREE AND PROBABILISTIC MODELS **9**

Learning with Trees - Decision Trees - Constructing Decision Trees - Classification and Regression Trees - Ensemble Learning - Boosting - Bagging - Different ways to Combine Classifiers - Probability and Learning - Data into Probabilities - Basic Statistics - Gaussian Mixture Models - Nearest Neighbor Methods - Unsupervised Learning - K means Algorithms - Vector Quantization - Self Organizing Feature Map.

DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS **9**

Dimensionality Reduction - Linear Discriminant Analysis - Principal Component Analysis - Factor Analysis - Independent Component Analysis - Locally Linear Embedding - Isomap - Least Squares Optimization - Evolutionary Learning - Genetic algorithms - Genetic Offspring: - Genetic Operators - Using Genetic Algorithms - Reinforcement Learning - Overview - Getting Lost Example - Markov Decision Process.

GRAPHICAL MODELS **9**

Markov Chain Monte Carlo Methods - Sampling - Proposal Distribution - Markov Chain Monte Carlo - Graphical Models - Bayesian Networks - Markov Random Fields - Hidden Markov Models Tracking Methods.

Total Periods: 45

Text Books:

1. Stephen Marsland, "Machine Learning – An algorithmic perspective", Second Edition, Chapman and Hall/CRC Machine learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, "Machine Learning", First Edition, McGraw Hill Education India Ltd, 2013.

References:

1. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.
2. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", First Edition, Wiley, 2014.
3. Ethem Alpaydin, "Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", Third Edition, MIT Press, 2014.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		3	3		3		2	3		2	2	3	2	
CO2		3		2	2		2		2	2		1		3		
CO3	3			3	3									3	2	
CO4		3		3	3				1	2						2
CO5	1	2		2	2				2	2		2	3		1	
CO6	1				3				1			2		2		1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE14 **DIGITAL IMAGE PROCESSING** **L T P C 3 0 0 3**

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PC

Aim: The aim is to inculcate a basic training in the processing of images for practical applications in the domain of medical, remote sessions and in general.

Course Outcomes: The Students will be able to.

CO1: Illustrate the models and fundamentals of image processing.

CO2: Apply image filtering techniques.

CO3: Develop an application for image segmentation and motion segmentation.

CO4: Infer various compression techniques and standards.

CO5: Make use of video motion analysis.

CO6: Explain the basics of color image processing.

INTRODUCTION **9**

Introduction - Steps in Image Processing Systems - Image Acquisition - Sampling and Quantization - Pixel Relationships - Colour Fundamentals and Models, File Formats, Image operations - Arithmetic, Geometric and Morphological.

IMAGE ENHANCEMENT **9**

Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering - Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain - DFT - Smoothing and Sharpening filters - Homomorphic Filtering.

IMAGE SEGMENTATION AND FEATURE ANALYSIS **9**

Detection of Discontinuities - Edge Operators - Edge Linking and Boundary Detection - Thresholding - Region Based Segmentation - Morphological WaterSheds - Motion Segmentation, Feature Analysis and Extraction.

MULTI RESOLUTION ANALYSIS AND COMPRESSIONS **9**

Multi Resolution Analysis: Image Pyramids - Multi resolution expansion - Wavelet Transforms. Image Compression: Fundamentals - Models - Elements of Information Theory - Error Free Compression - Lossy Compression - Compression Standards.

APPLICATIONS OF IMAGE PROCESSING **9**

Image Classification - Image Recognition - Image Understanding - Video Motion Analysis -Image Fusion - Steganography - Digital Compositing - Mosaics - Color Image Processing.

Total Periods: 45

Text Books:

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing” Second Edition, Pearson Education, 2010.

References:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Second Edition, Thomson Learning, 2001.
2. Anil K.Jain, “Fundamentals of Digital Image Processing”, PHI, 2006.
3. Sanjit K. Mitra, & Giovanni L. Sicuranza, “Non Linear Image Processing”, Elsevier, 2007.
4. Richard O. Duda, Peter E. HOF, David G. Stork, “Pattern Classification” Wiley Student Edition, 2006.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2									2	3	2		
CO2	2	2			2									3		2
CO3	2	2		2									3		2	
CO4	3					3	2						2		2	
CO5	3	3										2	2	2	2	
CO6	2	2										2		2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE15 **COMPUTATIONAL BIOLOGY**

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PC

Aim: To develop the skills of the students in Bioinformatics.

Course Outcomes: The Students will be able to.

CO1: Able to understand the basic concepts of OS, Linux commands, databases and get familiarity with biological databases.

CO2: Able to perform different types of sequence alignments and various kinds of blast search.

CO3: Able to understand the concepts involved in phylogenetic analysis and structure predictions.

CO4: Able to understand the different machine learning techniques and its applications in biotechnology.

CO5: Able to acquire programming skills in Perl.

CO6: Build appropriate clustering techniques for various problems with high dimensional data.

INTRODUCTION **9**

Basic UNIX commands - telnet - ftp - protocols - hardware-topology - search engines - search algorithms - Perl programming.

DATABASES **9**

Data management - data lifecycle - database technology - interfaces and implementation - biological databases and their uses.

PATTERNMATCHING&MACHINELEARNING **9**

Pairwise sequence alignment - locals. global alignment - multiple sequence alignment - dot matrix analysis - substitution matrices - dynamic programming - Bayesian Methods - tools - BLAST - FASTA - machine learning - neural networks - statistical methods - Hidden Markov models - Homology Modeling.

PHYLOGENY **9**

Introduction - mutations - irrelevant mutations - controls mutations as a measure of time - distances - reconstruction - distances between species - estimating time intervals from distances.

ADVANCEDTOPICSINBIOINFORMATICS **9**

Biomolecular and cellular computing - micro array analysis - systems biology.

Total Periods: 45

Text Books:

1. B.Bergeron, Bioinformatics Computing, PHI, 2002.
2. Westhead,D.R., Parish,J.H., Twyman,R.M., Instant Notes In Bioinformatics, BIOS Scientific Publishers, 2000.

References:

1. C.Gibas & P.Jambeck, Developing Bioinformatics Skills, O'Reilly, 1999.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2												3	2	2
CO2	3	2	2	3									2	2	1	1
CO3	3				2									3	2	
CO4	3	2			3									2	3	
CO5	2	2		3										3	2	2
CO6		2	2											3		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE16 **SOFTWARE TESTING** **L T P C**
3 0 0 3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** **PE**

Aim: To make students understand the principles of software testing.

Course Outcomes: The Students will be able to

CO1: Apply software testing principles.
CO2: Apply software testing techniques for various projects.
CO3: Formulate the strategies for generating system test cases.
CO4: Use software metrics to manage and measure the quality of software.
CO5: Automate the testing process by using several testing tools.
CO6: Apply the metrics involved in software development.

INTRODUCTION **9**

Evolution of software testing - Software Testing myths and facts - Goals of Software Testing - Psychology for Software testing - Software Testing Definitions - Model for Software Testing - Effective Vs Exhaustive Software Testing - Software Testing Terminology - Life Cycle.

TESTING TECHNIQUES **9**

Black Box Testing Techniques - Boundary Value Analysis - Equivalence Class testing - State Table based Testing - Decision Table based Testing - Cause Effect Graphing based Testing - White Box Testing Techniques, Need, Logic Coverage Criteria - Basis Path testing - Graph Matrices - Loop Testing - Data Flow Testing - Mutation Testing.

MANAGING THE TESTING PROCESS **9**

Test Organization - structure of Testing Group - Test Planning - Detailed Test Design and Test Specifications - Software Metrics - Need of Software Measurement - Classification of Software Metrics - Entities to be measured - Testing Metrics for Monitoring and Controlling.

QUALITY MANAGEMENT **9**

Software Quality Management - Software Quality , Quality Types , Quality Cost - Benefits of Investment on Quality - Quality Control - Quality Assurance - Quality factors - Methods of Quality Management - Procedural and Quantitative Approach to QM - Software Quality Metrics.

TESTING SPECIALIZED SYSTEMS AND APPLICATIONS **9**

Automation and Testing Tools, Need - Categorization of Testing Tools - Selection of Testing Tools - Testing Object Oriented Software - Object oriented testing - Testing Web based Systems - Web Technology Evolution-Debugging.

Total Periods: 45

Text Books:

1. Naresh Chauhan, “Software Testing Principles and Practices”, Third Edition, Oxford University Press, 2012.

References:

1. SrinivasanDesikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2006.
2. Ron Patton, “Software Testing”, 2nd Edition, Sams Publishing, Pearson Education, 2007.
3. Aditya P. Mathur, “Foundations of Software Testing - Fundamental Algorithms and Techniques”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1		1									3	3	3	
CO2	1	2		2									3	3	2	
CO3		2		2	2								3	2	3	
CO4		1		2	1								3	3	2	2
CO5	1	2		2									2		2	2
CO6	3						3				1				3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE17 EMBEDDED AND REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim: To make students understand the concepts of embedded systems.

Course Outcomes: The Students will be able to

CO1: Describe the architecture and programming of ARM processor.
CO2: Outline the concepts of embedded systems.
CO3: Explain the basic concepts of real time Operating system design.
CO4: Use the system design techniques to develop software for embedded systems.
CO5: Differentiate between the general purpose operating system and the real time operating system.
CO6: Summarize about clock driven scheduling.

INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS 9

Complex systems and microp rocessors - Embedded system design process - Design example: Model train controller - Instruction sets preliminaries - ARM Processor - CPU: programming input and output supervisor mode, exceptions and traps - Co-processors - Memory system mechanisms - CPU performance - C P U power consumption.

EMBEDDED COMPUTING PLATFORM DESIGN 9

The CPU Bus - Memory devices and systems - Designing with computing platforms - consumer electronics architecture - platform-level performance analysis - Components for embedded programs - Models of programs - Assembly, linking and loading - compilation techniques - Program level performance analysis.

PROCESSES AND OPERATINGSYSTEMS 9

Introduction to Multiple tasks and multiple processes - Multirate systems - preemptive realtime operating systems - Priority based scheduling - Interprocess communication mechanisms -Evaluating operating system performance - power optimization strategies for processes –Example Real time operating systems - POSIX - Windows CE.

SYSTEM DESIGN TECHNIQUES AND NETWORKS 9

Design methodologies - Design flows - Requirement Analysis - Specifications - System analysis and architecture design - Quality Assurance techniques - Distributed embedded systems -MPSoCs and shared memory multiprocessors.

CASESTUDY 9

Data compressor - Alarm Clock - Audio player - Software modem - Digital still camera -Telephone answering machine - Engine control unit - Video accelerator.

Total Periods: 45

Text Books:

1. Marilyn Wolf, “Computers as Components Principles of Embedded Computing System Design”, Third Edition “Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

References:

1. Jonathan W.Valvano, “Embedded Microcomputer Systems Real Time Interfacing”, Third Edition Cengage Learning, 2012.
2. David. E. Simon, “An Embedded Software Primer”, 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2		3										2			
CO2	2		3											3		
CO3	1	2		2											2	
CO4	1	2	3	3												3
CO5	1	2		2									2			
CO6	2			1									2		1	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE18 **GAME PROGRAMMING** **L T P C**
3 0 0 3

Programme: B.E Computer Science & Engineering **Sem:** - **Category:** PC

Aim:

Course Outcomes: The Students will be able to.

CO1: Discuss the concepts of Game Programming.
CO2: Design the processes, and use mechanics for game development.
CO3: Create and build games using scripts.
CO4: Explain the Core architectures of Game Programming.
CO5: Use Game programming platforms, frame works.
CO6: Create interactive Games.

GAME PROGRAMMING **9**

Game Architecture, Application layer, Game logic, Game views, Coding Styles, Smart Code Design Practices, Using Memory.

BUILDING YOUR GAME **9**

Creating a Project, Source Code Repositories and Version Control, Building the Game, Creating Build Scripts.

GAME INITIALIZATION AND CONTROL **9**

Game's Application layer, Game Actors and Component Architecture, Controlling the Main Loop, Programming Input Devices, User Interface Programming.

GAMING PLATFORMS AND FRAMEWORKS **9**

2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - DX Studio, Unity.

GAME DEVELOPMENT **9**

Developing 2D and 3D interactive games using DirectX or Python, Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

Total Periods: 45

Text Books:

1. Mike McShaffrfy and David Graham, "Game Coding Complete", Fourth Edition, Cengage Learning, PTR, 2012.

References:

1. Jason Gregory, "Game Engine Architecture", CRC Press / A K Peters, 2009.
2. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3rd Edition, Course Technology PTR, 2011.
3. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" 2nd Editions, Morgan Kaufmann, 2006.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2										3	3	1	
CO2	3	2	2										3	3		
CO3	2	2		1									2	2		
CO4	3		2	2									3	3	1	
CO5	2	2	1										2	1		
CO6	3	2		3									2	1		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE19 GRAPH THEORY AND APPLICATIONS

L	T	P	C
3	0	0	3

Programme: B.E Computer Science & Engineering **Sem:** - **Category:** PC

Aim:

Course Outcomes: The Students will be able to.

CO1: Relate trees and graphs to practical examples.
CO2: Apply algorithmic techniques.
CO3: Develop algorithms for various optimization problems on graphs.
CO4: Identify graph theory techniques to practical problems in networking and communication.
CO5: Make use of DFS algorithm technique.
CO6: Discuss about chromatic characteristics and directed graph.

INTRODUCTION **9**

Graphs - Introduction - Isomorphism - Sub graphs - Walks, Paths, Circuits - Connectedness - Components - Euler Graphs - Hamiltonian Paths and Circuits - Trees - Properties of trees - Distance and Centers in Tree - Rooted and Binary Trees.

TREES, CONNECTIVITY, PLANARITY **9**

Spanning trees - Fundamental Circuits - Spanning Trees in a Weighted Graph - Cut Sets - Properties of Cut Set - All Cut Sets - Fundamental Circuits and Cut Sets - Connectivity and Separability - Network flows - 1-Isomorphism - 2-Isomorphism - Combinational and Geometric Graphs - Planer Graphs - Different Representation of a planer Graph.

MATRICES, COLOURING AND DIRECTED GRAPH **9**

Incidence matrix - Submatrices - Circuit Matrix - Path Matrix - Adjacency Matrix - Chromatic Number - Chromatic partitioning - Chromatic polynomial - Matching - Covering - Four Color Problem - Directed Graphs - Types of Directed Graphs - Digraphs and Binary Relations - Directed Paths and Connectedness - Euler Graphs - Adjacency Matrix of a Digraph.

ALGORITHMS **9**

Algorithms: Connectedness and Components - Spanning tree - Finding all Spanning Trees of a Graph - Set of Fundamental Circuits - Cut Vertices and Separability - Directed Circuits.

ALGORITHMS **9**

Algorithms: Shortest Path Algorithm - DFS - Planarity Testing - Isomorphism.

Total Periods: 45

Text Books:

1. Narsingh Deo, “Graph Theory: With Application to Engineering and Computer Science”, Prentice Hall of India, 2003.

References:

1. R.J. Wilson, “Introduction to Graph Theory”, IV Edition, Pearson Education,2003.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2	2				2	2						3		
CO2	2					2		3		2		2	2		2	3
CO3	2		2	2		2	1				2			3		
CO4									3							1
CO5				1	2			2		1			1	2		
CO6	3	3	2	2										2		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE20 SERVICE ORIENTED ARCHITECTURE

L	T	P	C
3	0	0	3

Programme: B.E Computer Science & Engineering **Sem:** - **Category:** PC

Aim: To understand the concepts needed to have an effective working knowledge of SOA methodologies, and SOA systems design.

Course Outcomes: The Students will be able to.

CO1: Understanding of the basic principles of service orientation.

CO2: Identify service oriented analysis techniques.

CO3: Design new technology underlying the service design.

CO4: Familiar with advanced concepts such as service composition, orchestration and Choreography.

CO5: Implement the web services using J2EE ,JAX,ASP.NET.

CO6: Develop various WS-* specification standards.

INTRODUCTION **9**

Roots of SOA - Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures - Anatomy of SOA - How components in an SOA interrelate - Principles of service orientation.

WEB SERVICES **9**

Web services - Service descriptions - Messaging with SOAP - Message exchange Patterns - Coordination - Atomic Transactions - Business activities - Orchestration - Choreography - Service layer abstraction - Application Service Layer - Business Service Layer - Orchestration Service Layer.

WSDL **9**

Service oriented analysis - Business -centric SOA - Deriving business services - service modeling - Service Oriented Design - WSDL basics - SOAP basics - SOA composition guidelines - Entity - centric business service design - Application service design - Task-centric business service design.

XML BASED WEB SERVICES **9**

SOA platform basics - SOA support in J2EE - Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) - Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC) - Web Services Interoperability Technologies (WSIT) - SOA support in .NET - Common Language Runtime - ASP.NET web forms - ASP.NET web services - Web Services Enhancements (WSE).

WS-BPEL **9**

WS-BPEL basics - WS-Coordination overview - WS-Choreography, WS-Policy, WS-Security

Total Periods: 45

Text Book:

1. Thomas Erl**, "**Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.

References:

1. Thomas Erl, "SOA Principles of Service Design "(The Prentice Hall Service-Oriented Computing Series from Thomas Erl), 2005.
2. Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.
3. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services, An Architect'sGuide", Pearson Education, 2005.
4. Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation" O'REILLY, First Edition, 2006.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		3			2				3		3	2			
CO2			2									2		3		
CO3			2				2	2	2			3			2	
CO4	2				2					3		3		2		
CO5	2			2	2		2					2	1			3
CO6	3	2			2				3		3	1			1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE21 SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim: This course aims at the role of software developers in getting exposure on planning and controlling aspect of software development.

Course Outcomes: The Students will be able to.

CO1: Perceive the importance of structured approach to project management for IT projects.
CO2: Perceive the principles of the project life cycle.
CO3: Compare the various cost benefit evaluation techniques.
CO4: Estimate the project duration using network planning models.
CO5: Analyze the earned value of a software project.
CO6: Organize project team and handle the stress effectively.

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT **9**

Project Definition - Contract Management - Activities Covered By Software Project Management - Plans, Methods and methodologies - Some ways of categorizing software projects - Stack holders - Management control.

PROJECT EVALUATION **9**

Strategic Assessment - Technical Assessment - Cost Benefit Analysis - Cash Flow Forecasting - Cost Benefit Evaluation Techniques - Risk Evaluation.

ACTIVITY PLANNING AND RISK MANAGEMENT **9**

Objectives - Project Schedule - Sequencing and Scheduling Activities - Network Planning Models - Forward Pass - Backward Pass - Activity Float - Shortening Project Duration - Activity on Arrow Networks - Risk Management - Nature of Risk - Types -f Risk - Managing Risk - Hazard Identification - Hazard Analysis - Risk Planning And Control.

MONITORING AND CONTROL **9**

Creating Framework - Collecting the Data - Visualizing Progress - Cost Monitoring - Earned Value - Prioritizing Monitoring - Getting Project Back to Target - Change Control - Managing Contracts - Types of Contract - Stages in Contract Placement - Typical Terms of a Contract - Contract Management - Acceptance.

MANAGING PEOPLE IN SOFTWARE ENVIRONMENTS **9**

Introduction - Understanding Behavior - Organizational Behavior: A Background - Selecting the Right Person for the Job - Instruction in the Best Methods - Motivation - The Oldman - Hackman Job Characteristics Model - Stress - Health and Safety - Some ethical and professional concerns.

Total Periods: 45

Text Books:

1. Bob Hughes, Mike cotterell, “Software Project Management”, fifth Edition, Tata McGraw-Hill, 2009.

References:

1. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
2. Royce, “Software Project Management”, Pearson Education, 1999.
3. Jalote, “Software Project Management in Practice”, Pearson Education, 2002.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3															2
CO2	3	1		2										3		
CO3	3		2	3	2	1										1
CO4	3	1		2	3		2						2			
CO5	2				3		2							3		
CO6	2		1						3	2		2	3		2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE22 SOFTWARE ENGINEERING PRACTICES

L	T	P	C
3	0	0	3

Programme: B.E Computer Science and Engineering **Sem:** - **Category:** PE

Aim: To study and implement the software engineering principles.

Course Outcomes:

CO1: Identify the key activities in managing a software project.
CO2: Compare different process models.
CO3: Concepts of requirements engineering and Analysis Modeling.
CO4: Apply systematic procedure for software design and deployment.
CO5: Compare and contrast the various types of testing.
CO6: Understand the concept of project maintenance.

SOFTWARE PROCESS AND PROJECT MANAGEMENT **9**

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models - Software Project Management: Estimation - LOC and FP Based Estimation, COCOMO Model - Project Scheduling - Scheduling, Earned Value Analysis - Risk Management.

REQUIREMENTS ANALYSIS AND SPECIFICATION **9**

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document - Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management - Classical analysis: Structured system Analysis, Petri Nets - Data Dictionary.

SOFTWARE DESIGN **9**

Design process - Design Concepts - Design Model - Design Heuristic - Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow - User Interface Design: Interface analysis, Interface Design - Component level Design: Designing Class based components, traditional Components

TESTING AND IMPLEMENTATION **9**

Software testing fundamentals - Internal and external views of Testing - white box testing - basis path testing - control structure testing - black box testing - Regression Testing - Unit Testing - Integration Testing - Validation Testing - System Testing And Debugging - Software Implementation Techniques**:** Coding practices - Refactoring.

PROJECT MANAGEMENT **9**

Estimation - FP Based, LOC Based, Make/Buy Decision, COCOMO II - Planning - Project Plan, Planning Process, RFP Risk Management - Identification, Projection, RMMM - Scheduling and Tracking - Relationship between people and effort, Task Set & Network, Scheduling, EVA - Process and Project Metrics.

Total Periods: 45

Text Books :

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Seventh Edition, McGraw-Hill International Edition, 2010.

References :

1. K. Andleigh and K. Thakkrar, Multimedia System Design, PHI.
2. Ralf stein Metz and Klara Nahrstedt, Multimedia: Computing, Communication & Application, PHI.
3. Steve Rimmer, Advanced multimedia programming, McGraw-Hill.
4. Fred T.Hofstetter, Multimedia Literacy, McGraw-Hill.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											3	2		1
CO2		3	2										3		1	
CO3	3	2	1		3								3	2	2	
CO4	3	2	2		3				2				3	2		
CO5	3	2		2	3				2				3		3	
CO6	3	3							2				3		3	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE23 **SOCIAL NETWORK ANALYSIS** **L T P C**
3 0 0 3

Programme: B.E Computer Science and Engineering **Sem:** - **Category:** **PE**
Aim: To provide students with the knowledge about social network analysis.
Course Outcomes: The Students will be able to
CO1: Understand Specialized language on social network analysis.
CO2: Improve skills and communication on social networking on laypersons.
CO3: Understand proficiency of network researches.
CO4: Understand marketing concept on social networks.
CO5: Understand the economy of network effects and goods.
CO6: Understand Clusters and Visualization.

INTRODUCTION **9**

Introduction - Relations and attributes - Analysis and interpretation of network data- Development of social network analysis - Sociometric analysis and graph theory -Interpersonal configurations and cliques - The Harvard back through - Entry of the social physicists.

MARKET AND STRATEGIC INTERACTION IN NETWORK **9**

Matching Market: Bipartite Graphs and Perfect Matching - Prices and Market - Clearing Property - Network Models of Markets with Intermediaries - Price Setting in Market - Social Welfare - Trader Profit - Bargaining and Power in Network - Power in Social Network - Results of Network Exchange Experts - Modeling with Network Exchange - Stable outcomes - Modeling with Network Exchange - Balanced outcomes.

LINES NEIGHBOURHOODS **9**

Analyse, Collection, Selection, Preparation and Organizing relational data - Sociograms and graph theory- Density: Ego-centric, Socio-centric, Digression and community density.

NETWORK DYNAMICS AND AGGREGATE BEHAVIOR **9**

Information Cascade - Networks Effects - The Economy with Network Effects Industries with Network goods - Advanced Materials for Positive Externalities - Power Laws - The Effect of Search Tools and Recommendations- Market and Information: Market with Exogenous Events - Aggregate Beliefs and Wisdom of Asymmetric Information in other Markets. Voting: Group Discussion Making - Voting as an Information Aggregation Property Rights

CLUSTERS AND VISUALIZATION **9**

Centrality - Peripherality - Cores - Cliques - Positions - Clusters - Network structure -Dimensions - Distance space metrics - Components and factors - Network visualization.

Total Periods: 45

Text Books :

1. John Scott, “Social Network analysis”, Third Edition 2013.
2. David Easley, Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning about a Highly

References :

1. Xiaoming Fu, Jar-Der Luo, Margarete Boos,”Social Network Analysis: Interdisciplinary Approaches and Case Studies”,CRC press 2017.
2. John Scott,”Social Network Analysis”, 4th edition Kindle Edition 2017.
3. Brian V.Carolan,”Social Network analysis and Education”,SAGE publication 2014.
4. Jaff French,”Social Marketting and public health Theory and practice”, Second Edition 2017.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		3	1	2		2						3			
CO2	3	3		1	2										2	
CO3	3		2	3			3				3	3			3	3
CO4	2	3		2	2									3		
CO5	2	1	2		2								3			1
CO6	3	2		3	1				3	3						3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE24 **NANO COMPUTING** **L T P C**
3 0 0 3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** **PE**
Aim: To introduces the basic introduction and concepts of nano computing.
Course Outcomes: The Students will be able to
CO1: Discuss nano computing challenges.
CO2: Handle an imperfection.
CO3: Use nano scale quantum computing.
CO4: Analyse software and implementation of nano computing.
CO5: Understand the QCA designer and implementation.
CO6: Analyse molecular and optical computing.

PROSPECTS AND CHALLENGES OF NANO COMPUTING **9**

Introduction - History of Computing - Nanocomputing - Quantum Computers - Nano computing Technologies - Nano Information Processing - Prospects and Challenges - Digital Signals and Gates - Silicon Nanoelectronics - Carbon Nanotube Electronics - Carbon Nano tube Field-effect Transistors - Nanolithography

NANO COMPUTING WITH IMPERFECTIONS AND RELIABILITY **9**

Introduction - Nano computing in the Presence of Defects and Faults - Defect Tolerance - Towards Quadrillion Transistor Logic Systems - Reliability - Markov Random Fields - Reliability Evaluation Strategies - NANOLAB - NANOPRISM - Reliable Manufacturing and Behavior from Law of Large Numbers.

NANOSCALE QUANTUM COMPUTING **9**

Quantum Computers - Hardware Challenges to Large Quantum Computers - Fabrication, Test, and Architectural Challenges - Quantum-dot Cellular Automata (QCA) - Computing with QCA - QCA Clocking - QCA Design Rules.

QCADESIGNER SOFTWARE AND QCA IMPLEMENTATION **9**

Basic QCA Circuits using QCA Designer - QCA Implementation - Molecular and Optical Computing: Molecular Computing - Optimal Computing - Ultrafast Pulse Shaping and Tb/sec Data Speeds.

MOLECULAR AND OPTICAL COMPUTING **9**

Introduction - Molecular computing - Origins of molecular computing - Techniques of molecular computing - challenges of molecular computing - **Optical computing**: Uses of optical computing - Roles of optics - Optical computing paradigms - Ultrafast Pulse Shaping and Tb/sec Data Speeds - conclusions.

Total Periods: 45

Text Books:

1. Sahni V. and Goswami D., Nano Computing, McGraw Hill Education Asia Ltd, ISBN (13): 978007024892 2008.

References:

1. Sandeep K, Shukla and Iris Bahar R, Nano, Quantum and Molecular Computing, Kluwer Academic Publishers ISBN:1402080670, 2004.
2. Time Gregory, ”Nanotechnology”,Springer, 2012.
3. Jean-Baptiste Waldner, Nano computers and Swarm Intelligence, John Wiley & Sons, Inc. ISBN (13): 978-1848210097, 2008.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1									2	2			
CO2	2	3			1								3			
CO3	2		3		3				2							1
CO4	2				3											2
CO5	2	3			2								2			
CO6	2		3		2			2				2				2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161CSE25 DATA SCIENCE AND ANALYTICS

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim: To understand all basic concepts in data science and analytics.

Course Outcomes: The Students will be able to

CO1: Work with big data platform and its analysis techniques.

CO2: Design efficient algorithms for mining the data from large volumes.

CO3: Build a framework for Human Activity Recognition.

CO4: Construct real time application with cloud databases.

CO5: Show a competent understanding of the basic concepts of data science and analytics.

CO6: Understand the concepts of map reduce & social network analysis.

INTRODUCTION TO DATA SCIENCE AND BIG DATA **9**

Introduction to Data Science - Applications - Data Science Process - Exploratory Data analysis - Collection of data - Graphical presentation of data - Classification of data - Storage and retrieval of data - Big data - Challenges of Conventional Systems - Web Data -Evolution Of Analytic Scalability Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Predictionrror

DATA ANALYSIS **9**

Correlation - Regression - Probability - Conditional Probability - Random Variables -Analysis using Mean, Median, Mode, Standard Deviation, Skewness, Kurtosis-Regression Modeling Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks -Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis -Nonlinear Dynamics

DATA MINING TECHNIQUES **9**

Rule Induction - Neural Networks: Learning and Generalization - Competitive Learning -Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods - Neuro-Fuzzy Modelling -Association rule mining - Clustering - Outlier Analysis - Sequential Pattern Mining -Temporal mining Spatial mining - Web mining

MINING DATA STREAMS **9**

Introduction To Streams Concepts - Stream Data Model and Architecture - Stream Computing Sampling Data in a Stream - Filtering Streams - Counting Distinct Elements in a Stream - Estimating Moments - Counting Oneness in a Window - Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions

FRAMEWORKS AND VISUALIZATION **9**

MapReduce - Hadoop, Hive, MapR - Sharding - NoSQL Databases - Cloud databases - S3 -Hadoop Distributed File Systems - Visualizations - Visual Data Analysis Techniques -Interaction Techniques - Social Network Analysis - Collective Inferencing - Egonets -Systems and Applications.

Total Periods: 45

Text Books:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

References:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
2. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.
3. Rachel Schutt, Cathy O'Neil, “Doing Data Science”, O'Reilly Publishers, 2013.
4. Foster Provost, Tom Fawcet “Data Science for Business”, O'Reilly Publishers, 2013.
5. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications“, Wiley Publishers, 2014.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											3		3	
CO2	3	2		3									2	2		2
CO3	2	3		2	3								3	2		2
CO4	3	2											3		2	
CO5	3	2								2			2	2		
CO6	3	2		2									2	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE101 WEB DEVELOPMENT USING PHP

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** OE

Aim: To study the concepts of PHP and develop web page using PHP.

Course Outcomes: The Students will be able to

CO1: Understand basic PHP concepts.
CO2: Study the various programming elements.
CO3: Create web page using PHP.
CO4: Make use of object oriented concepts.
CO5: Make use of files and storing in the Database
CO6: Understand how server-side programming works on the web.

INTRODUCTION **9**

Essential PHP - Getting PHP - Creating and running first PHP page-mixing HTML and PHP-printing text and HTML - commands line PHP code - Working with variables - Operators -Flow controls - PHP using Loop statements - String functions.

ARRAYS AND FUNCTIONS **9**

Handling arrays with loops - PHP array functions - Extracting Sorting arrays - Using PHP's array operator - Handling multidimensional arrays - Using multidimensional arrays - Other array functions. Creating functions in PHP-Passing functions, arrays, reference returning data from functions, arrays, lists, references.

WEB PAGE AND BROWSER HANDLING WITH PHP **9**

Introducing variable scope in PHP - Accessing Global data - Working with static variables -PHP conditional functions - PHP variable functions - Nesting functions - Creating include files - Returning errors from functions - Setting up webpages to communicate with PHP -Handling text fields, text areas, checkboxes, radio buttons, list box, password control, hidden control, image maps, file uploads, buttons.

OBJECT ORIENTED PROGRAMMING WITH PHP **9**

Creating classes and objects - Setting access to properties and Methods - Constructor and destructor - Overloading and overriding methods - Auto loading classes - Static methods -Static members and inheritance - Creating classes and interfaces - comparing object - using final keyword

FILE HANDLING AND DATABASES. **9**

Opening files using fopen-Closing a file-Parsing Files-getting, setting, copying and deleting files - Accessing the Database with PHP - Updating Databases - Inserting new data items into a database - Deleting records - Creating new table and databases - sorting a data.

Total Periods: 45

Text Books:

1. Steven Holzner, The complete reference of PHP', Tata McGraw Hill Edition.

References:

1. Larry Ullman, "PHP for the WEB", 4th edition, Visual Quick start Guide.

Course Outcomes	Programme Outcomes (POs)												Programmeme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											3	2		
CO2	3	2											3			
CO3	3	2	3										3		2	
CO4	3		2										3			
CO5	3		2										3		2	1
CO6	3	2	2						2				2	2	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE102 **PROGRAMMING IN PERL**

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Aim: To make students understand the principles of software testing.

Course Outcomes: The Students will be able to

CO1: Devise Perl programs using scalar data and control structures.
CO2: Develop simple programs in Perl using lists, arrays and hashing.
CO3: Implement Perl Input Output programming.
CO4: Apply and match regular expressions using Perl.
CO5: Validate data using regular expressions.
CO6: Develop perl modules using built-in perl function as a team.

SCALAR DATA **9**

Perl programming introduction - Simple Perl program - Scalar data: Numbers - Strings - Variables - Operators - Output with print - Getting user input - The undefined value - Defined functions control structure - if-elseif - while – unless-until - for control - loop control - conditional operator - logical operator.

LIST, ARRAYS AND HASHES **9**

Array elements - indices - List literals - Assignment - Interpolating arrays into strings - For each control structure - Scalar and list context - Hash - Hash Element Access - Hash Assignment - Hash Functions - Use of Hash - Env Hash.

SUB ROUTINES AND IO **9**

Sub routines definition - invoking sub routines - return variables - arguments - private variables - variable length parameter list - lexical variables - non-scalar return values - persistent private variables - Standard input output - formatted output - opening and using file handle.

REGULAR EXPRESSION **9**

Regular expression definition - using simple patterns - character classes - matching with regular expression - anchors - match variables - precedence.

PROCESSING REGULAR EXPRESSION **9**

Substitution - split operator - join operator - list context - powerful regular expression - Perl Modules - finding modules - installing modules - using modules - strings and sorting.

Total Periods: 45

Text Books:

1. Tom Christiansen, Randal L. Schwartz, Larry Wall, “Learning Perl”, O'Reilly Media, Sixth Edition, 2011.

References:

1. Tom Christiansen, brian d foy, Larry Wall, Jon Orwant “Learning Perl”, O'Reilly Media, Fourth Edition, 2012.

2. Harvey M. Deitel, Paul J. Deitel, Tem R. Nieto, D. C. McPhie, “Perl How to Program”, Prentice Hall, First edition, 2001.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1		3									2			
CO2		2	2											1		
CO3	1	2		3	3										2	
CO4	1			3	3										3	
CO5		1	2	3	3									1		
CO6	2	2												3		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE103 MULTIMEDIA AND ANIMATION TOOL

L	T	P	C
3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** OE

Aim: To develop the students competency in producing dynamic and creative graphic solution for multimedia productions.

Course Outcomes: The Students will be able to

CO1: Grasp the Basic elements of multimedia.

CO2: Understand the importance of web based multimedia usage.

CO3: Use and apply authoring tools for web and e-learning.

CO4: Learn the theory behind data compression both lossless and lossy.

CO5: Implement applications.

CO6: Analyze the anatomy of multimedia information system.

BASIC ELEMENTS **9**

Creation - Editing - Design - Usage - Tools and Hardware - File Formats for Text, Image / Graphics, Audio, Video, Animation. Color Models, Multimedia Data Structures, KD Trees - R Trees.

MULTIMEDIA ON THE WEB **9**

Hypertext - Hypermedia - Hypermedia Structures and Formats - Web Graphics, Web Design Guidelines - HTML5, Plugins, Multimedia Networking.

AUTHORING AND ANIMATION TOOLS **9**

Authoring - Story Boarding, Metaphors - Card / Page, Icon, Timeline, Tools - Adobe Dream Weaver CC, Flash, Edge Animate CC, Camatasia Studio 8, Claro, E-Learning Authoring Tools - Articulate, Elucidat, Hot Lava. Animation Tools like 3D Studio Max, Maya, Blender

DATA COMPRESSION **9**

Text Compression - RLE, Huffman, Arithmetic, Dictionary Based, Image Compression - JPEG, JPEG 2000, JPEG - LS, Audio Compression - PCM, ADPCM, LPC, MPEG Audio, Video Compression - MPEG - 1,2,4.

MULTIMEDIA APPLICATIONS **9**

Multimedia Databases - Content Based Information Retrieval, Multimedia Communications - Multimedia Information Sharing and Retrieval - Applications - Social Media Sharing, Online Social Networking - Virtual Reality - Multimedia for Portable Devices, Collaborative Multimedia Applications.

Total Periods: 45

Text Books:

1. Ze - Nian Li, Mark S Drew and Jiangchuan Liu “Fundamentals of Multimedia”, Second Edition, Springer, 2014.
2. Francis S Hill, Jr. and Stephen M Kelley, “Computer Graphics Using OpenGL” Third Edition, Prentice Hall, 2007.

References:

1. Parag Havaldar and Gerard Medioni, “Multimedia Systems - Algorithms, Standards and Industry Practices”, Course Technology, Cengage Learning, 2010.
2. Nigel Chapman and Jenny Chapman, “Digital Multimedia”, Third Edition, Wiley, 2009.
3. Ralf Steinmetz and Klara Nahrstedt, “Multimedia Computing, Communications and Applications”, First Edition, Pearson, 2005.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		3		3				3			2	3		2	
CO2	2		3		2				2			2		3		
CO3	2		2						2				2		3	
CO4	2		2		2									2		3
CO5	2		1						2			2	2			2
CO6	2				2									3		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE104 **MULTICORE ARCHITECTURE** **L T P C**
3 0 0 3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** OE

Aim: To understand the technology evolution and how to multi-core architecture are being programmed.

Course Outcomes: The Students will be able to

CO1: Understanding of parallel hardware constructs, to include instruction-level parallelism, supercomputer architecture, multi-core processor design.
CO2: Understanding of language design issues related to parallel programming.
CO3: Understand multi-threaded debugging techniques.
CO4: Understand Open MP programming and MPI programming.
CO5: Learn various Multi-core processors.
CO6: Understand the concepts of MPI implementations.

MULTI-CORE PROCESSORS **9**

Single core to Multi-core architectures - SIMD and MIMD systems - Interconnection networks - Symmetric and Distributed Shared Memory Architectures - Cache coherence - Performance Issues - Parallel program design.

PARALLEL PROGRAM CHALLENGES **9**

Performance - Scalability - Synchronization and data sharing - Data races - Synchronization primitives (mutexes, locks, semaphores, barriers) - deadlocks and livelocks - communication between threads (condition variables, signals, message queues and pipes).

SHARED MEMORY PROGRAMMING WITH OpenMP **9**

OpenMP Execution Model - Memory Model - OpenMP Directives - Work-sharing Constructs - Library functions - Handling Data and Functional Parallelism - Handling Loops - Performance Considerations.

DISTRIBUTED MEMORY PROGRAMMING WITH MPI **9**

MPI program execution - MPI constructs - libraries - MPI send and receives - Point- to-point and Collective communication - MPI derived data types - Performance evaluation.

PARALLEL PROGRAM DEVELOPMENT **9**

Case studies - n-Body solvers - Tree Search - OpenMP and MPI implementations and comparison.

Total Periods: 45

Text Books:

1. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan-Kauffman/Elsevier, 2011.
2. Darryl Gove, "Multi-core Application Programming for Windows, Linux, and Oracle Solaris", Pearson, 2011.

References:

1. Richard Y. Kain, "Advanced Computer Architecture a Systems Design Approach", Prentice Hall, 2011.
2. John L. Hennessey and David A. Patterson, "Computer Architecture–A Quantitative Approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.
3. S.S.Jadhav, "Advanced Computer Architecture and Computing", Technical Publications, 2009.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2			3								2	2			2
CO2	2			3								2		2		2
CO3	2			1								1	1			
CO4	2	2		2								2	2		2	
CO5	2	2		2								2				2
CO6	2			3								2				1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE105 **GREEN COMPUTING** **L T P C**
3 0 0 3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** OE
Aim: To understand all basic concepts in Green Computing.
Course Outcomes: The Students will be able to
CO1: Demonstrate advanced knowledge of Green fundamentals.
CO2: Infer knowledge about green assets and modeling.
CO3: Visualizing, telecommunicating, teleconferencing and teleporting of Grid Framework.
CO4: Recognize and comprehend green compliance.
CO5: Show a competent understanding of the basic concepts of green computing.
CO6: Apply the concepts of ERBS.

FUNDAMENTALS **9**

Green IT Fundamentals: Business, IT, and the Environment - Green computing: carbon foot print, scoop on power - Green IT Strategies: Drivers, Dimensions, and Goals - Environmentally Responsible Business: Policies, Practices, and Metrics.

GREEN ASSETS AND MODELING **9**

Green Assets: Buildings, Data Centers, Networks, and Devices - Green Business Process Management: Modeling, Optimization, and Collaboration - Green Enterprise Architecture - Environmental Intelligence - Green Supply Chains - Green Information Systems: Design and Development Models.

GRID FRAMEWORK **9**

Virtualizing of IT systems - Role of electric utilities, Telecommuting, teleconferencing and teleporting - Materials recycling - Best ways for Green PC - Green Data center - Green Grid framework.

GREEN COMPLIANCE **9**

Socio-cultural aspects of Green IT - Green Enterprise Transformation Roadmap - Green Compliance: Protocols, Standards, and Audits - Emergent Carbon Issues: Technologies and Future.

CASE STUDIES **9**

The Environmentally Responsible Business Strategies (ERBS) - Case Study Scenarios for Trial Runs - Case Studies - Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

Total Periods: 45

Text Books:

1. Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009.

References:

1. Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”, Shoff/IBM rebook, 2011.
2. John Lamb, “The Greening of IT”, Pearson Education, 2009.
3. Jason Harris, “Green Computing and Green IT- Best Practices on regulations &industry”, Lulu.com, 2008.
4. Carl speshocky, “Empowering Green Initiatives with IT”, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), “Green computing: Large Scale energy efficiency”, CRC Press, 2012.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2				3							3		3	
CO2	3	2		3									2	2		2
CO3	2	3		2						3			3	2		2
CO4	3	2											3			
CO5	3	2								2			2			
CO6	2	1				2							2			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE106 **SOFT COMPUTING** **L T P C**
3 0 0 3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** OE

Aim: This course provides a way to understand the concepts of ANN, Genetic Algorithms and Fuzzy systems and its applications.

Course Outcomes: The Students will be able to

CO1: Identify basics of ANN and its learning algorithms.
CO2: Develop fuzzy principles and relations
CO3: Design genetic algorithms and its applications
CO4: Develop Hybrid systems and Applications
CO5: Program using MATLAB toolbox
CO6: Understand the ideas about genetic algorithm.

NEURAL NETWORKS **9**

Fundamentals of Neural Networks - History Architectures - Learning methods - XOR problem - Delta rule - derivation - Back propagation - applications - parameters in BPN -Associative memory - Hetero associative - BAM-energy function - problems - applications of associative memories - ART1 - ART2 - applications of adaptive networks

FUZZY LOGIC **9**

Fuzzy set theory - crisp sets - fuzzy sets - crisp relations - Fuzzy relations - Fuzzy systems -Crisp logic - predicate logic - fuzzy logic - fuzzy based systems - Defuzzification methods -applications.

GENETIC ALGORITHMS **9**

Fundamentals of GA - creation of off-springs - encoding - fitness function - reproduction -crossover-insertion& deletion-mutation-bitwise operators–applications.

HYBRID SYSTEMS **9**

Hybrid systems - Neuro Fuzzy - Neuro Genetic - fuzzy Genetic hybrids - GA based Weight determination and applications - fuzzy BPN - simplified fuzzy ARTMAP.

PROGRAMMING USING MATLAB **9**

Using Neural Network toolbox - Using Fuzzy Logic toolbox - Using Genetic Algorithm & directed search toolbox.

Total Periods: 45

Text Books:

1. Rajasekaran.S and VijayalakshmiPai.G.A, “Neural Networks, Fuzzy Logic andGenetic Algorithms”, PHI, 2011.

References:

1. Timothy J.Ross,’’Fuzzy Logic with Engineering applications”, John Wiley and Sons, 2010.
2. Jang.J.S.R, Sun.C.T, Mizutani.E, ”Neuro fuzzy and Soft Computing ”, PHI Learning Pvt. Ltd., 2012.
3. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3										3		2	1		2
CO2	2	3				2							2	1	3	
CO3	2	3									2		3	2		1
CO4	2		3			2							2	1		3
CO5	2				3										2	3
CO6	2	3												3		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

161OE107 **JAVA SCRIPTS** **L T P C**
3 0 0 3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** **OE**

Aim:

Course Outcomes: The Students will be able to.

CO1: Discuss the concepts of Advanced Java Script.
CO2: Design the processes, and use mechanics for game development.
CO3: Create interactive Games.
CO4: Use DOM & JQuery tools and methods to develop game.
CO5: Design & implement animated webpage on the canvas using java scripts.
CO6: Create interactive games.

FUNDAMENTALS **9**

JavaScript, Data types and Variables - Variables, Strings, Booleans, Arrays, Objects, Basics of HTML - Tags and Elements, HTML Hierarchy.

FUNCTIONS AND LOOPS **9**

Anatomy of a Function, Function Creation, Calling Function, Passing Arguments into Functions, Conditionals, Loops, Programming Challenges for Functions and Loops,

ADVANCED JAVASCRIPT **9**

DOM and jQuery, Interactive Programming, Mouse Events, Buried Treasure - Creating the Web Page with HTML, Picking a Random Treasure Location, Click Handler, Object Oriented Programming - Adding Methods to Objects, Creating Objects Using Constructors, Customizing Objects with Prototypes.

CANVAS **9**

Creating a Basic Canvas, Drawing on the Canvas, Changing the Drawing Color, Drawing Lines or Paths, Filling Paths, Drawing Arcs and Circles, Drawing Lots of Circles with Function, Animating the Size of a Square, Bouncing a Ball, Keyboard Events, Moving a Ball with the Keyboard.

GAME DEVELOPMENT **9**

Making a Snake Game - The Structure of the Game, Game Setup, Drawing the Border, Displaying the Score, Ending the Game.

Total Periods: 45

Text Book:

1. Nick Morgan, “Java Script for Kids”, no starch press, San Francisco, 2015.

References:

1. Marijn Haverbeke, Eloquent Java Script, no starch press, San Francisco, 2014.
2. David Sawyer McFarland, “Java Script & JQuery”, Third Edition, USA, 2014.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2		2										3	2		
CO2		2	3	2									2		3	2
CO3	2		3	2											3	2
CO4		2	2	2	3							2	2			3
CO5		2	3	1	2							2	3			1
CO6	2		2		2						1	2	3			3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)