w.e.f. 2017-18

VR17

B. Tech.

COMPUTER SCIENCE AND ENGINEERING

(B.Tech Syllabus)

Department of Computer Science and Engineering

(B. Tech. CSE Programme Accredited by NBA)

VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE

(An Autonomous, ISO 9001:2015 Certified Institution)

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

(Sponsored by Siddhartha Academy of General & Technical Education)

Kanuru, Vijayawada

Andhra Pradesh - 520007, INDIA.

www.vrsiddhartha.ac.in

INSTITUTE VISION

To nurture excellence in various fields of engineering by imparting timeless core values to the learners and to mould the institution into a centre of academic excellence and advanced research.

INSTITUTE MISSION

To impart high quality technical education in order to mould the learners into globally competitive technocrats who are professionally deft, intellectually adept and socially responsible. The institution strives to make the learners inculcate and imbibe pragmatic perception and pro-active nature so as to enable them to acquire a vision for exploration and an insight for advanced enquiry.

DEPARTMENT VISION

The department vision is clearly defined and is in line with the college's vision. The vision of the department is:

"To evolve as a centre of academic excellence and advanced research in Computer Science and Engineering discipline."

DEPARTMENT MISSION

This mission of the Department is concise and supports the College's mission. The mission of the Computer Science and Engineering Department is:

"To inculcate students with profound understanding of fundamentals related to discipline, attitudes, skills, and their application in solving real world problems, with an inclination towards societal issues and research."

Program Educational Objectives(UG)

We have program educational objectives for our Computer Science and Engineering Program. Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

Our Computer Science and Engineering program objectives are:

I. The graduates of the Program will have solid foundation in the principles and practices of computer science, including mathematics, science and basic engineering.

II. The graduates of the Program will have skills to function as members of multi-disciplinary teams and to communicate effectively using modern tools.

III. The graduates of the Program will be prepared for their careers in the software industry or pursue higher studies and continue to develop their professional knowledge.

IV. The graduates of the program will practice the profession with ethics, integrity, leadership and social responsibility.

PROGRAM OUTCOMES

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

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

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural,societal, and environmental considerations.

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

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

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal andcultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

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

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society atlarge, such as, being able to comprehend and write effective reports and design

documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and managementprinciples and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinaryenvironments.

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

PROGRAM SPECIFIC OUTCOMES

PSO1: Develop software applications/solutions as per the needs of Industry and society

PSO2: Adopt new and fast emerging technologies in computer science and engineering.

VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE

B.Tech. COMPUTER SCIENCE AND ENGINEERING

SCHEME OF INSTRUCTION [VR17]

SEMESTER I **Contact Hours: 26**

S.No	Course Code	Title of the Course	L	T	P	C	CE	SE	T
1.	17MA1101	Matrices And Differential Calculus	3	1	0	**4**	30	70	100
2.	17PH1102B	Applied Physics	3	0	0	**3**	30	70	100
3.	17CS1103	Problem Solving Methods	2	1	0	**3**	30	70	100
4.	17EE1104	Basics of Electrical Engineering	3	0	0	**3**	30	70	100
5.	17HS1105	Technical English and Communication Skills	2	0	2	**3**	30	70	100
6.	17PH1151B	Engineering Physics Laboratory	0	0	3	**1.5**	30	70	100
7.	17CS1152	Computing and Peripherals Laboratory	0	0	2	**1**	30	70	100
8.	17ME1153	Basic Workshop	0	0	3	**1.5**	30	70	100
		Total	**13**	**2**	**10**	**20**	**240**	**560**	**800**
9.	17MC1106A	Technology and Society	1	0	0	**-**	**100**	**0**	**100**
10.	17MC1107	Induction Program				**-**			

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

SEMESTER II **Contact Hours: 27**

S.No	Course Code	Course	L	T	P	C	CE	SE	T
1.	17MA1201	Laplace Transforms And Integral Calculus	3	1	0	**4**	30	70	100
2.	17CH1202A	Engineering Chemistry	3	0	0	**3**	30	70	100
3.	17CS1203	Programming in C	3	0	0	**3**	30	70	100
4.	17EC1204A	Basic Electronic Engineering	3	0	0	**3**	30	70	100
5.	17ME1205	Engineering Graphics	2	0	4	**4**	30	70	100
6.	17CH1251	Engineering Chemistry Laboratory	0	0	3	**1.5**	30	70	100
7.	17CS1252	Computer Programming Laboratory	0	0	3	**1.5**	30	70	100
		Total	**14**	**1**	**10**	**20**	**210**	**490**	**700**
8.	17MC1206B	Professional Ethics& Human Values	2	0	0	**-**	**100**	**0**	**100**

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

Semester III **Contact Hours: 27**

S.No	Course Code	Course	L	T	P	C	CE	SE	T
1.	17MA1301B	Probability and Statistics	3	1	0	**4**	30	70	100
2.	17CS3302	Object Oriented Programming using Java	3	0	0	**3**	30	70	100
3.	17CS3303	Data Structures	3	1	0	**4**	30	70	100
4.	17CS3304	Digital Logic Design	3	0	0	**3**	30	70	100
5.	17HS2305	Humanities Elective	1	0	0	**1**	100	0	100
6.	17TP1306	Logic & Reasoning	0	0	2	**1**	100	0	100
7.	17CS3351	Object Oriented Programming Laboratory	0	0	2	**1**	30	70	100
8.	17CS3352	Data Structures Laboratory	0	0	2	**1**	30	70	100
9.	17HS1353	Communication Skills Laboratory	0	0	2	**1**	30	70	100
10.	17CS3354	Digital Logic Design Laboratory	0	0	2	**1**	30	70	100
Total			**13**	**2**	**10**	**20**	**440**	**560**	**1000**
11.	17MC1307A	Environmental Studies	2	0	0	**-**	**100**	**0**	**100**

List of Humanities Electives

A.	Yoga & Meditation	G	Film Appreciation
B.	Music	H	Sanskrit Bhasa
C.	Human Rights and Legislative Procedures	I1	Foreign Languages (French)
D.	Philosophy	I2	Foreign Languages (German)
E.	Development of societies	J	Psychology
F.	Visual Communication		

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

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

Semester IV **Contact Hours: 28**

S.No	Course Code	Course	L	T	P	C	CE	SE	T
1.	17CS3401	Discrete Mathematical Structures	3	0	0	**3**	30	70	100
2.	17CS3402	Web Technologies	3	0	0	**3**	30	70	100
3.	17CS3403	Advanced Data Structures	3	0	0	**3**	30	70	100
4.	17CS3404	Computer Organization	3	0	0	**3**	30	70	100
5.	17TP1405	English for Professionals	0	0	2	**1**	100	0	100
6.	17CS3406	Operating Systems	3	0	0	**3**	30	70	100
7.	17CS3408	Python Programming	3	0	0	**3**	30	70	100
8.	17CS3451	Web Technologies Laboratory	0	0	2	**1**	30	70	100
9.	17CS3452	Python Programming Laboratory	0	0	2	**1**	30	70	100
10.	17CS3453	Competitive Coding -I	0	0	2	**1**	30	70	100
		Total	**18**	**0**	**8**	**22**	**370**	**630**	**1000**
11.	17MC1407B	Indian Constitution	2	0	0	-	100	0	100

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

Semester V **Contact Hours: 30**

S.No	Course Code	Course	L	T	P	C	CE	SE	T
1.	17CS3501	Database Management Systems	3	0	0	**3**	30	70	100
2.	17CS3502	Design and Analysis of Algorithms	3	0	0	**3**	30	70	100
3.	17CS3503	Computer Networks	3	0	0	**3**	30	70	100
4.	17CS2504	**Open Elective - I** A. Advanced Programming in JAVA B. Computer Graphics C. Industry Need Based Elective	3	0	0	**3**	30	70	100
5.	17CS2505	**Open Elective – II** **(Inter Disciplinary Elective)** A. Data Structures through C B. Web Designing C. Fundamentals of Operating System	3	0	0	**3**	30	70	100
6.	17CS2506	**Open Elective – III** **(Self Learning Elective)*** A. Introduction to R Programming B. Product Design and Innovation C. Social Networks D. Programming in C++ E. Advanced Computer Architecture F. Any other MOOC Course decided by the department	0	0	0	**2**	30	70	100
7.	17TP1507	Personality Development	0	0	2	**1**	100	0	100
8.	17CS3509	Micro Processors and Micro Controllers	3	0	0	**3**	30	70	100
9.	17CS3551	Database Management Systems Laboratory	0	0	2	**1**	30	70	100
10.	17CS3552	Micro Processor Laboratory	0	0	2	**1**	30	70	100
11.	17CS2553	**Open Elective – I Laboratory** A. Advanced Programming in JAVA B. Computer Graphics C. Industry Need Based Elective	0	0	2	**1**	30	70	100

12.	17CS3554	Competitive Coding - II	0	0	2	**1**	30	70	100
		Total	**18**	**0**	**10**	**25**	**430**	**770**	**1200**
13.	17MC1508	Biology for Engineers	2	0	0	**-**	**100**	**0**	**100**

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

*****Students can opt any one of the self-learning courses prescribed by the department. Students should register and complete the opted course in the approved MOOCS platform on or before the Last Instruction Day of V Semester. They have to submit the certificate before the Last Instruction Day of V Semester.

Semester VI **Contact Hours: 26**

S.No	Course Code	Course	L	T	P	C	CE	SE	T
1.	17CS3601	Theory of Computation	3	0	0	**3**	30	70	100
2.	17CS3602	Software Engineering	3	0	0	**3**	30	70	100
3.	17CS4603	**Programme Elective -I** A. Cloud Computing B. Linux Essentials C. Statistics with R D. Industry need based Elective	3	0	0	**3**	30	70	100
4.	17CS4604	**Programme Elective -II** A. Internet of Things B. Mobile Application Development C. Data Compression	3	0	0	**3**	30	70	100
5.	17CS2605	**Open Elective -IV** A. Artificial Intelligence Techniques, Tools and Applications B. Bioinformatics C. Image Processing D. Fundamentals of Java Programming**	3	0	0	**3**	30	70	100
6.	17TP1606	Quantitative Aptitude	0	0	2	**1**	100	0	100
7.	17CS4651	**Programme Elective –I Laboratory** A Cloud Computing B Linux Essentials C Statistics with R D Industry need based Elective	0	0	2	**1**	30	70	100
8.	17CS4652	**Programme Elective –II Laboratory** A. Internet of Things B. Mobile Application Development C. Data Compression	0	0	2	**1**	30	70	100
9.	17CS5653	Engineering Project for Community Services*	0	1	2	**2**	30	70	100
10.	17CS3654	Competitive Coding -III	0	0	2	**1**	30	70	100
		Total	**15**	**1**	**10**	**21**	**370**	**630**	**1000**

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

*****Students will go to the society(Villages/Hospitals/Towns etc..,) to identify the problem and survey the literature for a feasible solution. The work will be carried out during summer vacation after IV Semester. The students are encouraged to take up the real life problems leading to innovative model building.

**Only students belonging to branches except for CSE and IT are eligible to opt for this course

Semester VII **Contact Hours: 25**

S.No	Course Code	Course	L	T	P	C	CE	SE	T
1.	17CS3701	Compiler Design	3	1	0	**4**	30	70	100
2.	17CS4702	**Programme Elective - III** A. Data Analytics B. High Performance Computing C. Industry Need Based Elective	3	0	0	**3**	30	70	100
3.	17CS4703	**Programme Elective -IV** A. Cryptography and Network Security B. Mobile Computing C. Agile Software Development (TCS)	3	0	0	**3**	30	70	100
4.	17CS4704	**Programme Elective -V** A. Machine Learning B. Software Testing Methodology C. Routing and Switching Essentials (CISCO NetAcad)	3	0	0	**3**	30	70	100
5.	17HS1705	Engineering Economics and Finance	2	0	0	**2**	30	70	100
6.	17CS4751	**Programme Elective – III Laboratory** A. Data Analytics B. High Performance Computing C. Industry Need Based Elective	0	0	3	**1.5**	30	70	100
7.	17CS4752	**Programme Elective – V Laboratory** A. Machine Learning B. Software Testing Methodology C. Routing and Switching Essentials (CISCO NetAcad)	0	0	3	**1.5**	30	70	100
8.	17CS5753	Mini Project*	0	0	4	**2**	30	70	100
9.	17CS6754	A. Internship B. Industry offered Course C. Global Professional Certification	0	0		**2**		100	100
		Total	**14**	**1**	**10**	**22**	**240**	**660**	**900**

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

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

*Could be done in a group of students; involves working under a faculty member and carrying out a detailed feasibility study, literature survey and preparing a work plan for major project.

Semester VIII **Contact Hours: 19**

S.No	Course Code	Course	L	T	P	C	CE	SE	T
1.	17CS4801	**Programme Elective - VI** A. Business Intelligence B. M Commerce C. Information Retrieval Systems D. Data Visualization E. Cyber Security F. Industry Need Based Elective	3	0	0	**3**	30	70	100
2.	17CS2802	**Open Elective – V*** A. Blockchain Technologies B. Cyber Forensics C. Deep Learning D. User Interface and Experience Design E. Pattern Recognition F. Innovation and Entrepreneurship	3	0	0	**3**	30	70	100
3.	17CS5851	Major Project**	0	5	8	**9**	30	70	100
		Total	**6**	**5**	**8**	**15**	**90**	**210**	**300**

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

*Open Elective- V may also opt as self-learning course. Students should register and complete the opted course in approved MOOCS platform on or before Last Instruction Day of VIII Semester. They have to submit the certificate before the last Instruction Day of VIII Semester. Students who have not opted as a self-learning are required to attend for the class work and internal assessment as per the regular theory course.

**Major project involves continuation of Mini Project. The objective is to complete the work as per the prepared work plan and prepare a detailed project report.

SEMESTER - I

17MA1101
MATRICES AND DIFFERENTIAL CALCULUS

Course Category:	Institutional Core	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 1 - 0
Prerequisites:	Fundamentals of Matrices, Fundamentals of Calculus, Integration, Differentiation.	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Determine Eigen values, Eigen vectors of a matrix.
CO2	Estimate Maxima and Minima of Multi Variable Functions.
CO3	Solve the Linear differential equations with constant coefficients.
CO4	Solve the Linear differential equations with variable coefficients.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3								2		1			
CO2	3								2		1			
CO3	3								2		1			
CO4	3								2		1			

COURSE CONTENT

UNIT I

Matrices: Rank of a Matrix, Elementary transformations, Inverse of a Matrix (Gauss Jordan Method), Consistency of Linear System of Equations, Linear Transformations, Vectors, Eigen values, Properties of Eigen values, Finding Inverse and Powers of a Matrix by Cayley-Hamilton Theorem. Reduction to Diagonal form, Reduction of Quadratic form to Canonical form, Nature of a Quadratic form, Complex matrices.

UNIT II

Differential Calculus: Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Taylor's Theorem, Maclaurin's Series.

Application: Curvature, Radius of Curvature**.**

Functions of two or more Variables: Partial Derivatives, Change of Variables, Jacobians, Taylor's Theorem for Function of two Variables, Maxima and Minima of Functions of two Variables, Lagrange's Method of Undetermined Multipliers.

UNIT III

Differential Equations of First Order: Formation of a Differential Equation, Solution of a Differential Equation, Linear Equations, Bernoulli's Equation, Exact Differential Equations, Equations Reducible to Exact Equations.

Applications: Orthogonal Trajectories, Newton's Law of Cooling.

Linear Differential Equations of Higher Order: Definitions, Operator D, Rules for Finding the Complementary Function, Inverse Operator, Rules for finding Particular Integral, Working Procedure to Solve the Equation.

UNIT IV

Linear Dependence of Solutions, Method of Variation of Parameters, Method of Undetermined Coefficients, Equations Reducible to Linear Equations with Constant Coefficients: Cauchy's Homogeneous Linear Equation, Legendre's Linear Equation, Simultaneous Linear Differential Equations with Constant Coefficients.

Applications: L-C-R Circuits.

TEXT BOOKS

[1] B.S.Grewal , "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2014.

REFERENCE BOOKS

[1] Erwin Kreyszig , " Advanced Engineering Mathematics", John Wiley & Sons, 10th Edition,2015

[2] B.V.Ramana, "Higher Engineering Mathematics", Tata MC Graw Hill, 1st Edition ,2007

[3] N.P.Bali, Dr.Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, 9th Edition,2014

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] www.nptel videos.com/mathematics/ (Math Lectures from MIT,Stanford,IIT'S)

[2] nptel.ac.in/courses/122104017

[3] nptel.ac.in/courses/111105035

[4] Engineering Mathematics Open Learning Project.
www.3.ul.ie/~mlc/support/Loughborough%20website/

17PH1102B
APPLIED PHYSICS

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

COURSE OUTCOMES

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

CO1	Understand the importance of quantum mechanics.
CO2	Analyse and understand various types of lasers and their applications.
CO3	Elaborate different types of optical fibers and understand holography.
CO4	Understand the fabrication of nanomaterials and carbon Nanotubes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2												
CO2	3		2											
CO3	3		2											
CO4	3		1											

COURSE CONTENT

UNIT-I

Quantum Mechanics: Dual nature of light, Matter waves and Debroglie's hypothesis, G. P. Thomson experiment, Heisenberg's uncertainty principle and its applications (Non existence of electron in nucleus, Finite width of spectral lines), One dimensional time independent Schrödinger's wave equation, physical significance of wave function, Particle in a box (One dimension).

UNIT-II

Lasers: Introduction, Characteristics of laser, absorption, spontaneous emission, stimulated emission, pumping, population inversion, cavity resonance, Einstein's coefficients, different types of lasers: solid-state lasers (Ruby, Neodymium), gas

lasers (He-Ne, CO_2), dye lasers, applications of lasers in science, engineering and medicine.

UNIT- III

Fibre Optics: Introduction, Fundamental of optic fibre, Propagation of light through optical fiber, Types of optical fibers, Numerical aperture, Fractional Refractive Index change, V- number and cut-off Parameters of fibres, Fibre attenuation (losses), Fiber optics in communication and its advantages.

Holography: Basic Principle of Holography, construction of the hologram, reconstruction of the image, applications of holography.

UNIT-IV

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

TEXT BOOKS

[1] M.N. Avadhanulu & P.G. Kshirsagar, Engineering Physics, S. Chand publications, Revised Edition, 2014

[2] P.K. Palanisamy, "Applied Physics", Scitech Publications(INDIA) Pvt. Ltd., Fifth Print, 2008.

REFERENCE BOOKS

[1] B. K. Pandey and S. Chaturvedi, 'Engineering Physics' Cengage Learning', Delhi, 2012.

[2] O. Svelto, Principles of Lasers, 5th Edition, Springer, London, 2010

[3] M.R. Srinivasan, "Engineering Physics", New age international publishers, First Edition, 2011.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/lecture-videos/

[2] https://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/laser-fundamentals-i/

[3] http://nptel.ac.in/courses/112106198/19

[4] https://www.peterindia.net/NanoTechnologyResources.html

17CS1103
PROBLEM SOLVING METHODS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 -1- 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand the Computer problem solving approaches, efficiency and analysis of algorithms
CO2	Apply the factoring methods to solve the given problem
CO3	Apply the array techniques to find the solution for the given problem
CO4	Solve the problems using MATLAB

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**2**												
CO2	**1**		**3**											
CO3	**1**		**3**											
CO4	**1**	**1**							**3**					

COURSE CONTENT

UNIT - I

Introduction to Computer Problem Solving: Programs and Algorithms, characteristics of an algorithm, Requirements for solving problems by computer; Flowchart, pseudo-code **The Problem – Solving Aspect**: Problem definition phase, Getting started on a problem, Similarities among problems, Working backwards from the solution, General problem-solving strategies; **Top-Down design**: Breaking a problem into sub-problems, Construction of loops,

Establishing initial conditions for loops, Finding the iterative construct, Termination of loops;

The Efficiency of Algorithms: Redundant Computations, Referencing array elements, Inefficiency due to late termination, Early detection of desired output conditions, Trading storage for efficiency gains;

Analysis of Algorithms: Computational complexity, The order notation, Worst and average case behavior.

UNIT - II

Fundamental Algorithms: Problem, Algorithm Development, Algorithm Description - Exchanging values of two variables, Counting, Summation of a set of numbers, Factorial computation, Generation of Fibonacci sequence, Reversing the digits of an Integer. Using pseudo-codes and flowcharts to represent fundamental algorithms.

Factoring Methods: Finding the Square Root of a number: Smallest Divisor of an Integer, GCD of two Integers, Generating Prime numbers, Computing the Prime Factors of an Integer, Raising a Number to a Large Power, Pseudo random number generation, Computing n^{th} Fibonacci number.

UNIT – III

Array Techniques: Introduction, Array Order Reversal, Array counting, Finding the maximum number in a set, Removal of duplicates from an ordered array, Partitioning an array, Finding The K^{th} Smallest Element.

Merging, Sorting and Searching: Sorting By Selection, Sorting By Exchange, Linear Search, Binary search;

UNIT – IV

MATLAB Environment: User Interface, Syntax and Semantics Operators, Variables and constants: Simple arithmetic calculations. Data types, Control Structures: if…then, loops, Functions, Matrices and Vectors: Matrix manipulations and operations

MATLAB Programming: Reading and writing data, file handling, MATLAB Graphic functions.

TEXT BOOKS

[1] R.G. Dromey , "How to Solve it By Computer", Prentice-Hall International Series in Computer Science,1982.

[2] Bansal.R.K, Goel.A.K, Sharma.M.K, "MATLAB and its Applications in Engineering", Pearson Education, 2012.

REFERENCE BOOKS

[1] Michael Schneider, Steven W. Weingart, David M. Perlman, "An Introduction to Programming and Problem Solving With Pascal", John Wiley and Sons Inc ,1984.

[2] David Gries, “The Science of Programming”, Springer Verlag, 1981.
[3] ReemaThareja, “Computer Fundamentals and C Programming”, Oxford, 2012

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] MATLAB Getting Started Guide http://www.mathworks.com/help/pdf_doc/matlab/getstart.pdf

17EE1104
BASICS OF ELECTRICAL ENGINEERING

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

COURSE OUTCOMES

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

CO1	Analyze Electric Circuit fundamentals.
CO2	Understand the basic concepts of Alternating Quantities and Magnetic Circuits
CO3	Analyze the basic concepts of Electric Machines
CO4	Understand Measuring Instruments & Solar Photo Voltaic System concepts

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**1**			**2**									
CO2	**4**	**1**												
CO3	**2**				**2**									
CO4	**2**													

COURSE CONTENT

UNIT I

Introduction to Electrical Engineering: Electric Current, Electromotive force, Electric power and energy, Basic circuit components- Resistors-Inductors-Capacitors. Electromagnetic Phenomenon and Related Laws, Kirchhoff's laws.

Network Analysis: Network sources-Ideal independent voltage source, Ideal

independent current source, Dependent sources, Practical voltage and current sources, Source conversion, Voltage and Current division rule, series and parallel connection of R, L and C, Star-Delta or, Delta- Star transformation. Mesh and Nodal Analysis (with independent sources only).

UNIT II

Alternating Quantities: Introduction; Generation of a.c. voltages, Waveforms and Basic Definitions, Relationship between frequency, speed and number of poles, Root Mean Square and Average values of alternating current and voltages, Form Factor and Peak Factor, Phasor representation of alternating quantities.

Magnetic Circuits: Introduction, Magnetic Circuits, Magnetic Field Strength (H), Magneto motive Force, Permeability, Reluctance, Analogy between Electric and Magnetic Circuits, Magnetic potential drop, Magnetic circuit computations, Self and Mutual Inductance, Energy in Linear Magnetic Systems.

UNIT III

DC Machines: Introduction, Construction of dc machines, Armature Windings, Generation of dc voltage and torque production in a dc machine,Torque production in a dc Machine, Operation of a dc machine as a generator, Operation of dc machine as a motor.

Induction Motors: Introduction, Constructional features of three-phase induction motors, Principle of operation of three-phase induction motor- Slip and rotor frequency, Voltage and current equations and equivalent circuit of an induction motor.

UNIT IV

Measuring Instruments: Introduction, Classification of instruments, Operating Principles, Essential features of measuring instruments, Ammeters and Voltmeters, Measurement of power.

Solar photovoltaic Systems: Solar cell fundamentals, characteristics, classification, module, panel and array construction, Maximizing the solar PV output and load matching, Maximum Power Point Tracker(MPPT), Balance of system components, solar PV systems and solar PV applications.

TEXT BOOKS

[1] T.K. Nagasarkar and M.S. Sukhja, "*Basic Electric Engineering*", 2nd ed., Oxford University press 2011.

REFERENCE BOOKS

[1] B.H.Khan, "Non Conventional Energy Resources", 2nd ed., Mc.Graw Hill Education Pvt Ltd.,New Delhi,2013.

[2] Ashfaq Husain , Haroon Ashfaq, ” Fundamentals of Electrical Engineering”, 4th ed., Dhanpat Rai & Co , 2014.
[3] I.J.Nagrath and Kothari , “Theory and problems of Basic Electrical Engineering”, 2nd ed., Prentice-Hall of India Pvt.Ltd.,2016.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://nptel.ac.in/courses/108108076/

17HS1105
TECHNICAL ENGLISH & COMMUNICATION SKILLS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 2
Prerequisites:	Basic understanding of the language skills ,viz Listening, Speaking, Reading and Writing, including Sentence construction abilities	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Develop administrative and professional compilations including web related(On-line) communication with felicity of expression
CO2	Demonstrate Proficiency in Interpersonal Communication, in addition to standard patterns of Pronunciation
CO3	Apply the elements of functional English with sustained understanding for authentic use of language in any given academic and/or professional environment
CO4	Execute tasks in Technical communication with competence

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1				**3**		**3**	**3**	**3**	**2**	**3**	1	**2**		
CO2				**3**		**3**	**3**	**3**	**3**	**3**		**3**		
CO3	**2**			**3**		**3**	**3**	**3**	**3**	**3**		**2**		
CO4	**2**	**2**		**3**		2	**3**	**3**	**2**	**3**	**1**	**2**		

COURSE CONTENT

UNIT I

Professional Writing Skills:-

- **Professional Letters**:
  Business, Complaint and Transmittal – Purpose, Style and format with special reference to Block Format and Modified Block Format
- **Essay Writing**:
  Descriptive and Analytical with illustrations
- **Administrative and On-line drafting skills**:
  Minutes- Purpose, Scope and Illustrations
  Web notes including Basics of e-mail- Chat-room interaction, Written Response to web-content, Basics of Format and etiquette for e-mail

UNIT II

Phonetics and Interpersonal Communication Skills

- **Transcription** using International Phonetic Alphabet
- **Word Stress** (Primary) and Rhythm with practice
- **Speech/ Conversational acts**- Extending Invitation, Reciprocation, Acceptance, Concurrence, Disagreeing without being disagreeable-
  Written Form: Discourse/dialogue development and identification of inconsistencies in pre-prepared dialogues
  Spoken Form: Role play

UNIT III

Vocabulary and Functional English

- **Root words** (A Representative collection of 50)
- **Vocabulary for Competitive examinations** (A list of 500 High frequency words) Direct meaning,
  Matching and Cloze test
- **Verbal analogies**(Single Unit) – Synonym Relation, Antonym relation, Object-Operator relation, Object-Obstacle/obstruction relation, Sequence Relation, Place-Monument Relation, Science- area of activity relation, Profession- Tool relation, Gender relation, Diminutive relation, etc
- **Confusables**- Homonyms, Homophones and nearer words (A Representative collection of 100)
- **Idiomatic expressions**- Myth-based, Folklore based, life-based- Meanings, along with sentential illustrations
- **Phrasal Collocations**- Representative collection of 50 -Meanings, along with sentential illustrations
- **Exposure through Reading Comprehension**- Skimming, Scanning and tackling different kinds of questions including interpretation of graphs and statistical data
- **Functional Grammar** with special reference to Tense, Concord, Articles,

pronoun-referent, Prepositions, use of Gerund ,Parallelism etc (A Representative collection of 100 sentences)

UNIT IV

Technical Communication skills:

- **Technical Proposal writing**- Characteristics, Proposal Superstructure, Checklist , Formal Proposal
- **Technical Vocabulary**- Basic explanations and Description
- **Introduction to Executive summary** – Purpose and illustration
- **Technical Report writing**- Informational Reports and Feasibility Report- Types, Components, Style and Formats

TEXT BOOKS

[1] Martin Cutts, " Oxford guide to Plain English", Oxford University Press, 7th Impression 2011.
[2] TM Farhathullah, "Communication skills for Technical Students", Orient Longman, I Edition 2002
[3] John Langan, "College Writing Skills", McGraw Hill, IX Edition, 2014.
"Eclectric Learning materials offered by the Department"

REFERENCE BOOKS

[1] Randolph Quirk, "Use of English", Longman, I Edition (1968) Reprinted 2004.
[2] Thomson A.J & A.V, Martinet, "Practical English Grammar", Oxford University Press, III Edition 2001
[3] V.Sethi and P.V. Dhamija, "A Course in Phonetics and Spoken English", PHI, II Edition 2006

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.britishcouncil.org/english Accessed on 15th June 2017
www.natcorp.ox.ac.uk/Wkshops/Materials/specialising.xml?ID=online Accessed on 15th June 2017
[2]https://www.unimarburg.de/sprachenzentrum/selbstlernzentrum/.../apps_for_esl.pdf Accessed on 15th June 2017

17PH1151B
ENGINEERING PHYSICS LABORATORY

Course Category:	Institutional Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Basic knowledge about fundamental measuring instruments	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Use function generator, spectrometer and travelling microscope in various experiments
CO2	Test optical components using principles of interference and diffraction of light
CO3	Determine the V-I characteristics of solar cell and photo cell and appreciate the accuracy in measurements

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**										**2**			
CO2	**3**													
CO3	**3**													

COURSE CONTENT

1. Photo cell-Study of V-I Characteristics, determination of work function
2. Newton's Rings-Radius of curvature of plano convex lens.
3. Compound pendulum-Measurement of 'g'
4. LCR circuit- Study Resonance
5. AC Sonometer –Verification of vibrating laws
6. Solar cell–Determination of Fill Factor
7. Diffraction grating-Wavelength of laser light
8. Optical fiber- Study of attenuation and propagation characteristics
9. Diffraction grating-Measurement of wavelength of mercury source

10. Hall effect –Hall coefficient measurement
11. Figure of merit of a galvanometer
12. Variation of magnetic field along the axis of current-carrying circular coil

TEXT BOOKS

[1] Madhusudhan Rao, "Engineering Physics Lab Manual", Ist ed., Scitech Publications, 2015
[2] Ramarao Sri, Choudary Nityanand and Prasad Daruka, "Lab Manual of Engineering Physics"., Vth ed., Excell Books, 2010

E-RESOURCES

[1] http://plato.stanford.edu/entries/physics-experiment
[2] http://www.physicsclassroom.com/The-Laboratory
[3] http://facstaff.cbu.edu/~jvarrian/physlabs.html

VIRTUAL LAB REFERENCES

[1] http://vlab.amrita.edu/?sub=1&brch=201&sim=366&cnt=1
[2] http://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1
[3] http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1

17CS1152
COMPUTING AND PERIPHERALS LABORATORY

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 – 2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand and Apply MS Office tools
CO2	Configure the components on the motherboard and install different operating systems
CO3	Understand and configure different storage media
CO4	Perform Networking, troubleshooting and system administration tasks

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1								3					
CO2		3	1											
CO3	3		1											
CO4			3						1					

COURSE CONTENT

CYCLE - I:Word Processing, Presentations and Spread Sheets

1. **Word Processing:**
   a) Create personal letter using MS Word.
   b) Create a resume using MS Word.
   c) Creating project abstract**:** Features to be covered:- Table of Content, List of Tables, Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols,

Spell Check,Track Changes.

d) Creating a Newsletter: Features to be covered:- Table of Content, List of figures, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphsand Mail Merge in word.

2. **Spread Sheets:**

a) Create a worksheet containing pay details of the employees.

b) Creating a Scheduler: Features to be covered:- Gridlines, Format Cells, Summation, auto fill,Formatting Text

c) Create a worksheet which contains student results: .Features to be covered:- Cell Referencing, Formulae in excel – average, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

d) Create a worksheet importing data from database and calculate sum of all the columns.

3. Presentations:

a) Create a presentation using themes.

b) Save, edit, print and import images/videos to a presentation.

c) Create a power Point presentation on business by using master layouts, adding animation to a presentation and see the presentation in different views.

4. MS Access:

a) Create simple table in MS Access for results processing.

b) Create a query table for the results processing table.

c) Create a form to update/modify the results processing table.

d) Create a report to print the result sheet and marks card for the result.

CYCLE - II: Hardware Experiments

1. Identification of System Layout: Front panel indicators & switches and Front side & rear side connectors. Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, FDD,HDD, CD, DVD and add on cards. Install Hard Disk. Configure CMOS-Setup. Partition and Format Hard Disk.
2. Install and Configure a DVD Writer or a Blu-ray Disc writer.
3. Install windows operating system and check if all the device (graphics, sound, network etc.) drivers are installed.
4. Install Linux operating system and check the working of all devices (graphics, sound, network etc.) in the computer.
5. Assemble a Pentium IV or Pentium Dual Core Pentium Core2 Duo system with necessary peripherals and check the working condition of the PC.
6. PC system layout: Draw a Computer system layout and Mark the positions

of SMPS, Mother Board, FDD, HDD, and CD-Drive/DVDDrive add on cards in table top / tower model systems.

7. Mother Board Layout: Draw the layout of Pentium IV or Pentium Dual core or Pentium Core2 DUO mother board and mark Processor, Chip set ICs. RAM, Cache, cooling fan, I/O slots and I/O ports and various jumper settings.
8. Configure BIOS setup program to change standard and advanced settings to troubleshoot typical problems.
9. Install and configure Printer/Scanner/Web cam/Cell phone/bio-metric device with system. Troubleshoot the problems

CYCLE – III : Networking

1. Prepare an Ethernet/UTP cable to connect a computer to network switch. Crimp the 4 pair cable with RJ45 connector and with appropriate color code.
2. Manually configure TCP/IP parameters (Host IP, Subnet Mask andDefault Gateway) for a computer and verify them using IPCONFIG command. Test connectivity to a server system using PING command.
3. Creating a shared folder in the computer and connecting to that folder using Universal Naming Convention (UNC) format. (Ex: computername sharename)
4. Connects computers together via Switch/ Hub
5. Connect different devices via Switch/Hub
6. Statically configure IP address and subnet mask for each computer
7. Examine non-existent IP address and subnet conflicts
8. Configure a computer to connect to internet (using college internetsettings) and troubleshoot the problems using PING, TRACERT and NETSTAT commands.
9. Using scan disk, disk cleanup, disk Defragmenter, Virus Detectionand Rectifying Software to troubleshoot typical computer problems.
10. Configure DNS to establish interconnection between systems and describe how a name is mapped to IP Address.
11. Remote desktop connections and file sharing.
12. Installation Antivirus and configure the antivirus.
13. Introducing Ethereal , a packet capture tool.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Numerical Methods and Programing by Prof.P.B.Sunil Kumar,Department of Physics, IIT Madras https://www.youtube.com/ watch?v=zjyR9e-#1D4&list=PLC5DC6AD60D798FB7

[2] Introduction to Coding ConceptsInstructor: Mitchell Peabody View the complete course: http://ocw.mit.edu/6-00SCS11

17ME1153
BASIC WORKSHOP

Course Category:	Engineering Sciences	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Model and develop various basic prototypes in the Carpentry trade.
CO2	Develop various basic prototypes in the trade of Welding.
CO3	Model and develop various basic prototypes in the trade of Tin Smithy.
CO4	Familiarize with various fundamental aspects of house wiring.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3			1										
CO2	2			1										
CO3	2			1										
CO4	1			1										

COURSE CONTENT

UNIT I

Carpentry:

a. Study of tools & operations and various carpentry joints.
b. Practice of open bridle joint, Cross half lap joint, Half LapT Joint, and Dove tail joint
c. Simple group exercise like preparation of single widow frame.

UNIT II

Welding:

a. Study of tools and operations of Gas welding and arc welding.

b. Practice of various joints like weld layer practice, V- Butt Joint, Double parallel fillet joint, T-Joint, and Corner Joint.

UNIT III

Tin Smithy:

a. Study of tools & operations
b. Practice of various joints like Saw Edge, Wired Edge, Lap Seam, and Grooved Seam.
c. Simple exercise like Fabrication of square tray.

UNIT IV

House Wiring:

a. To connect one lamp with one switch.
b. To connect two lamps with one switch.
c. To connect a fluorescent Tube.
d. Stair case wiring.
e. Godown wiring.
f. Study of single phase wiring for a office room.
g. Nomenclature & measurement of wire gauges and cables.
h. Estimation of cost of indoor wiring for a wiring diagram (plan of a building).
i. Test procedure for continuity of wiring in a electric installation.
j. Measurement of electric energy by using meter.

TEXT BOOKS

[1] Kannaiah P. & Narayana K. C., "Manual on Workshop Practice", Scitech Publications, Chennai, 1999.
[2] Venkatachalapathy, V. S., "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

REFERENCE BOOKS

[1] Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice – Theory, Practice and Work Book", Suma Publications, Chennai, 2005.

17MC1106A
TECHNOLOGY AND SOCIETY

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

COURSE OUTCOMES

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

CO1	Understand the origins of technology and its role in the history of human progress.
CO2	Know the Industrial Revolution and its impact on Society
CO3	Interpret the developments in various fields of technology till Twentieth Century.
CO4	Distinguish the impacts of Technology on the Environemnt and achievements of great scientists.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**							**1**						
CO2	**3**				**2**		**1**							
CO3	**3**							**1**						
CO4	**3**				**2**		**1**							

COURSE CONTENT

UNIT – I

Introduction: Origins of technology, The Agriculture revolution, Technological contributions of ancient civilizations- Mesopotamian, Egyptians, Greeks, Romans, Indians and Chinese.

UNIT - II

Industrial revolution: The social and political background, The technical background, Steam: The power behind the Indistrial Revolution, The revolution in Textile Indistry, The Imapact of Indutrial Revolution on Society.

UNIT - III

The Flowering of modern technology: Manufacturing Technologies, Prime Movers, Internal Combustion engines, Production of Metals and Allyos, The Birth of Electrical Technology, Twentieth Century: The Flowering of modern technology

UNIT - IV

Technology, Science and Society: Impact of technology on society, The Impacts of Technology on the environment, Sustainable development.

Achievements of famous scientists:

(**World**): Einestein, Newton, Faraday, Graham Bell, Edison, S.Hawking.

(**India**): CV Raman, S.Chandrasekhar, Aryabhatta, Homi J Bhabha, Vikram Sarabhai, APJ Abdulkalam, S.Ramanujan, M.Visweswarayya.

TEXT BOOKS

[1] Dr. R.V.G Menon, "Technology and Society", Pearson Education, 2011

REFERENCE BOOKS

[1] Quan-Haase, A., " Technology and Society: Inequality, Power, and Social Networks", Oxford University Press, 2013.

SEMESTER - II

17MA1201
LAPLACE TRANSFORMS AND INTEGRAL CALCULUS

Course Category:	Institutional Core	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 1 - 0
Prerequisites:	Vectors, Curve Tracing.	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Solve Linear Differential Equations using Laplace Transforms.
CO2	Examine the nature of the Infinite series.
CO3	Evaluate areas and volumes using Double, Triple Integrals.
CO4	Convert Line Integrals to Area Integrals and Surface Integrals to Volume Integrals.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**1**												
CO2	**3**	**1**												
CO3	**3**	**1**												
CO4	**3**	**1**												

COURSE CONTENT

UNIT I

Laplace Transforms: Introduction, Definition, Conditions for Existence, Transforms of Elementary functions, Properties of Laplace Transforms, Transforms of Periodic functions, Transforms of Derivatives, Transforms of Integrals, Multiplication by t^n, Division by 't', Inverse Transforms, Method of partial fractions, Other methods of finding Inverse Transform, Convolution Theorem, Unit Step and Unit Impulse functions.

Applications: Evaluation of Improper Integrals, Solving Differential equations by Laplace Transform.

UNIT II

Partial Differential Equations: Introduction, Formation of Partial Differential Equations, Solutions of a Partial Differential Equations, Equations Solvable by Direct Integration, Linear Equations of First Order. **Sequence and Series**: Convergence of series, Comparison test, Integral test, D'Alembert's Ratio test, Cauchy's Root Test, Alternating series test, Absolute and Conditional convergence.

UNIT III

Integral Calculus: Double Integrals, Change of Order of Integration, Double Integrals in Polar Coordinates, Triple Integrals, Change of Variables. **Applications:** Area enclosed by Plane Curves, Volumes of Solids.

Special Functions: Beta Function, Gamma Function, Relation between Beta and Gamma Function, Error Function.

UNIT IV

Vector Calculus: Scalar and Vector point functions, Del applied to Scalar point functions, Del applied to Vector point functions, Physical interpretation of Divergence, Del applied twice to point functions, Del applied to products of point functions. Integration of Vectors, Line Integral, Surface Integral, Green's Theorem in a plane, Stokes's Theorem, Volume Integral, Gauss Divergence Theorem, Irrotational Fields.

TEXT BOOKS

[1] B.S.Grewal, "Higher Engineering Mathematics, Khanna Publishers", 43rd Edition, 2014.

REFERENCE BOOKS

[1] Erwin Kreyszig , "Advanced Engineering Mathematics" , John Wiley & Sons, 10th Edition, 2015

[2] B.V.Ramana, "Higher Engineering Mathematics", Tata MC Graw Hill, 1st Edition, 2007

[3] N.P.Bali, Dr.Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, 9th Edition, 2014

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] www.nptel videos.com/mathematics/ (Math Lectures from MIT,Stanford,IIT'S)

[2] nptel.ac.in/courses/122104017

[3] nptel.ac.in/courses/111105035

[4] Engineering Mathematics Open Learning Project. www.3.ul.ie/~mlc/support/Loughborough%20website/

17CH1202A
ENGINEEERING CHEMISTRY

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

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Analyze various water treatment methods and boiler troubles.
CO2	Apply the principles of spectroscopic techniques to analyse different materials and apply the knowledge of conventional fuels for their effective utilisation.
CO3	Apply the knowledge of working principles of conducting polymers, electrodes and batteries for their application in various technological fields.
CO4	Evaluate corrosion processes as well as protection methods.

Contribution of Course Outcomes towards achievement of Program Outcomes (1-Low, 2-Medium, 3- High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1		**3**												
CO2	**2**													
CO3														
CO4			**2**						**3**					

COURSE CONTENT

UNIT I

Water technology-I: WHO standards - Water treatment for drinking purpose - sedimentation, coagulation, filtration, disinfection by chlorination, breakpoint chlorination and its significance - Desalination of brackish water - principle and process of electrodialysis and reverse osmosis, advantages and disadvantages.

Water technology-II: Boiler troubles - scales-formation, disadvantages and internal conditioning methods - phosphate conditioning, calgon conditioning and sodium aluminate, caustic embrittlement- reasons, mechanism and its control,

and boiler corrosion – causes and control.

UNIT II

Spectroscopic Techniques and Applications: Interaction of electromagnetic radiation with matter - Ultraviolet-visible spectroscopy: Frank-Condon principle, types of electronic transitions, Lambert-Beer's law – definition and numerical problems, problems on interpretation of UV-visible spectra of simple molecules of arenes, aldehydes and ketones. Infrared (IR) spectroscopy: Principle, types of vibrations, problems on interpretation of IR spectra of simple molecules of amines, alcohols, aldehydes and ketones.

Fuel Technology: Fuel-definition, calorific value- lower and higher calorific values, analysis of coal – proximate analysis and ultimate analysis, refining of petroleum, flue gas analysis by Orsat's apparatus, numericals based on calculation of air required for combustion

UNIT III

Conducting polymers: Definition, examples, classification-intrinsically conducting polymers and extrinsically conducting polymers- mechanism of conduction of undoped polyacetylene, doping of conducting polymers-mechanism of conduction of p-doped and n-doped polyacetylenes – applications of conducting polymers.

Electrochemistry: Construction and working of Calomel electrode, silver-silver chloride electrode and principle, construction and working of glass electrode, determination of pH using glass electrode - Chemistry of modern batteries - $Li/SOCl_2$ battery and $Li_xC/LiCoO_2$ battery - construction, working and advantages, Chemistry of H_2-O_2 fuel cell-advantages.

UNIT IV

Corrosion principles: Introduction, definition, reason for corrosion, examples – electrochemical theory of corrosion, types of electrochemical corrosion - hydrogen evolution and oxygen absorption – corrosion due to dissimilar metals, galvanic series – differential aeration corrosion – pitting corrosion and concept of passivity.

Corrosion control methods: Cathodic protection- principle and types - impressed current method and sacrificial anode method, anodic protection-principle and method, corrosion inhibitors – types and mechanism of inhibition – principle, process and advantages of electroplating and electroless plating.

TEXT BOOKS

[1] Shikha Agarwal, "Engineering Chemistry – Fundamentals and Applications", Cambridge University Press, New Delhi, 1st edition (2015).

REFERENCE BOOKS:

[1] Sunita Rattan , "A Textbook of Engineering Chemistry", S.K. Kataria & Sons, New Delhi, First edition 2012.

[2] P.C. Jain , "Engineering Chemistry", Dhanpat Rai Publishing Company (P)

Limited, New Delhi, 15th edition.
[3] B.S. Bahl, G. D. Tuli and Arun Bahl, "Essentials of Physical Chemistry", S. Chand and Company Limited, New Delhi.
[4] O. G. Palanna, " Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd., New Delhi.
[5] Y.Anjaneyulu, K. Chandrasekhar and Valli Manickam, Text book of Analytical Chemistry, , Pharma Book Syndicate, Hyderabad.
[6] H. Kaur, Spectroscopy, I Edition, 2001, Pragati Prakashan, Meerut.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://www.cip.ukcentre.com/steam.htm
[2] http://corrosion-doctors.org/Modi;es/mod-basics.htm
[3] http://nopr.niscair.res.in/bitstream/123456789/5475/1/JSIR%2063%289%29%20715-728.pdf
[4] https://chem.libretexts.org/Core/Analytical_Chemistry/Electrochemistry/Basics_of_Electrochemistry
[5] http://www.filtronics.com/blog/tertiary-treatment/stages-in-typical-municipal-water-treatment/
[6] https://www.khanacademy.org/test-prep/mcat/physical-processes/infrared-and-ultraviolet-visible-spectroscopy/e/infrared-and-ultraviolet-visible-spectroscopy-questions
[7] NPTEL online course, "Analytical Chemistry", offered by MHRD and instructed by Prof. Debashis Ray of IIT Kharagpur.
[8] NPTEL online course, "Corrosion Part-I" offered by MHRD and instructed by Prof. Kallol Mondal of IIT Kanpur

17CS1203
PROGRAMMING IN C

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

COURSE OUTCOMES

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

CO1	Understand the fundamentals and structure of a C programming language
CO2	Apply the loops, arrays, functions and string concepts in C to solve the given problem.
CO3	Apply the pointers and text input output files concept to find the solution for the given applications.
CO4	Use the Enumerated, Datatypes,Structures and Unions.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2		1	3											
CO3		1	3											
CO4	3	1												

COURSE CONTENT

UNIT - I

Introduction to the C Language : Background, C Programs, Identifiers, Types, Variables, Constants, Input/Output, Programming Examples.

Structure of a C Program: Expressions, Precedence and Associatively, Evaluating Expressions, Type Conversion, Statements, Sample Programs.

Selection: Storage Class,Logical Data and Operators, Two -Way Selection,

Multiway Selection, More Standard Functions

UNIT - II

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

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

Functions: Functions in C, User Defined Functions, Inter Function Communication, Standard Functions, Scope.

Strings: String Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions, String- Data Conversion.

UNIT - III

Pointers: Introduction, Pointers For Inter Function Communications, Pointers to Pointers, Compatibility, Lvalue and Rvlaue.

Pointer Applications: Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocations Functions, Array of Pointers.

Text Input/output: Files, Streams, Standard Library Input/Output Functions, Formatting Input/output Functions and Character Input/Output Functions, Command-Line Arguments.

UNIT - IV

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

Structures: Structure Type Declaration, Initialization, Accessing Structures, Operations on Structures, Complex Structures, Structures and Functions, Sending the Whole Structure, Passing Structures through Pointers.

Unions: Referencing Unions, Initializers, Unions and Structures, Internet Address, Programming Applications.

TEXT BOOKS

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

REFERENCE BOOKS

[1] Kernighan and Ritchie , "The C programming language" , The (Ansi C Version), PHI, second edition.

[2] Yashwant Kanetkar , "Let us C" , BPB Publications, 2nd Edition 2001.

[3] Paul J. Dietel and Dr. Harvey M. Deitel, "C: How to Program", Prentice Hall, 7th edition (March 4,2012).

[4] Herbert Schildt, "C:The Complete reference", McGraw Hill, 4th Edition, 2002.

[5] K.R.Venugopal, Sundeep R Prasad, "Mastering C", McGraw Hill, 2nd Edition, 2015

17EC1204A
BASIC ELECTRONIC ENGINEERING

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

COURSE OUTCOMES

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

CO1	Gain Knowledge about the Fundamentals of electronic components, devices, transducers
CO2	Understand and apply Principles of digital electronics
CO3	Get familiar to the basic communication systems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3			2									
CO2	3	3												
CO3	2				2									

COURSE CONTENT

UNIT I

Electronic Components: Passive components - resistors, capacitors &inductors (properties, common types, I-V relationship and uses). Semiconductor Devices: Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, Zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor,solar cell, photo couplers).

UNIT II

Transducers: Transducers - Instrumentation - general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers - piezoelectric and thermocouple.

UNIT III

Digital Electronics: Number systems - binary codes - logic gatesBoolean algebra, laws & theorems - simplification of Boolean expression - Implementation of Boolean expressions using logic gates – standard forms of Boolean expression.

UNIT IV

Communication Systems: Block diagram of a basic communication system - frequency spectrum - need for modulation - methods of modulation - principles of AM, FM, pulse, analog and pulse digital modulation - AM / FM transmitters & receivers (block diagram description only).

TEXT BOOKS

[1] Thyagarajan.T, SendurChelvi.K.P, Rangaswamy, "Engineering Basics: Electrical, Electronics and computer Engineering", T.R, New Age International, Third Edition, 2007.

[2] Somanathan Nair.B, Deepa.S.R, "Basic Electronics", I.K. International Pvt. Ltd., 2009.

REFERENCE BOOKS

[1] Thomas L. Floyd, "Electronic Devices", Pearson Education, 9th Edition,2011.

[2] Rajput.R.K, "Basic Electrical and Electronics Engineering", Laxmi Publications, First Edition, 2007.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://www.nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/ BASIC-ELECTRONICS/ home page.html

[2] http://nptel.ac.in/video.php?subjectId=117102059

17ME1205
ENGINEERING GRAPHICS

Course Category:	Institutional Core	**Credits:**	4
Course Type:	Theory & Practice	**Lecture -Tutorial-Practice:**	2-0-4
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES:

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

CO1	Understand the Scales, conics and Cycloidal curves.
CO2	Draw Orthographic projections of points, Lines, Planes and Solids
CO3	Understand Sectional views of Solids, Development of surfaces and their representation
CO4	Construct isometric scale, isometric projections ,isometric views and convert pictorial views to orthographic projections

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3			3							1			
CO2	2			3							2			
CO3	2			2							2			
CO4	1			3							2			

COURSE CONTENT

UNIT -I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance

Scales: Construction of plain and diagonal Scales

Conic Sections: Construction of ellipse, parabola and hyperbola (Treatment is limited to Eccentricity or General method only)

Engineering Curves: Cycloidal curves - Cycloid, Epicycloid and Hypocycloid

UNIT–II

Orthographic Projections: Principles of Orthographic Projections –Projections of Points, Lines (Treatment is limited to First Angle Projection) and Projections of Plane regular geometric figures (Up to Plane Inclined to both of the Reference planes)

UNIT – III

Projections of Solids: Projections of simple solids such as Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions (Limited to Solid Inclined to one of the Reference planes)

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

UNIT – IV

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

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

Conventions Auto CAD: Basic principles only (Internal assessment only)

Text Books

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

[2] Basanth Agrawal & C M Agrawal," Engineering Drawing", McGraw Hill Education Private Limited, New Delhi

Reference Books

[1] K. L. Narayana & P. Kannaiah, "Text Book on Engineering Drawing", Scitech publications (India) Pvt. Ltd.,Chennai, 2nd Edition - fifth reprint 2006

[2] K. Venugopal, "Engineering Drawing and Graphics + Auto CAD", New Age International, New Delhi

[3] D M Kulkarni, AP Rastogi, AK Sarkar, "Engineering Graphics with Auto CAD", PHI Learning Private Limited, Delhi Edition – 2013

E-Resources and other digital material

[1] http://www.youtube.com/watch?v=XCWJ XrkWco, Accessed On 01-06-2017.

[2]http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html is so drawing, Accessed On 01-06-2017.

[3] http://www.slideshare.net, Accessed On 01-06-2017.

[4] http://edpstuff.blogspot.in, Accessed On 01-06-2017.

17CH1251
ENGINEERING CHEMISTRY LABORATORY

Course Category:	Institutional Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Knowledge of chemistry practicals at intermediate level	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Analyze quality parameters of water samples from different sources
CO2	Perform quantitative analysis using instrumental methods.
CO3	Apply the knowledge of mechanism of corrosion inhibition, metallic coatings and photochemical reactions.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1			**3**											
CO2									**2**					
CO3		**2**												

COURSE CONTENT

List of Experiments:

1. Determination of total alkalinity of water sample
2. Determination of chlorides in water sample
3. Determination of hardness of water sample
4. Determination of available chlorine in bleaching powder
5. Determination of copper in a given sample
6. Determination of Mohr's salt – Dichrometry

7. Determination of Mohr's salt – Permanganometry
8. Determination of purity of boric acid sample
9. Conductometric determination of a strong acid using a strong base
10. pH metric titration of a strong acid vs. a strong base
11. Determination of corrosion inhibition efficiency of an inhibitor for mild steel
12. Chemistry of Blue Printings
13. Preparation of Urea-Formaldehyde resin

REFERENCE BOOKS

[1] S.K. Bhasin and Sudha Rani, "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 2nd edition.

[2] Sunitha Rattan, "Experiments in Applied Chemistry", S.K. Kataria & Sons, New Delhi, 2nd edition.

17CS1252
COMPUTER PROGRAMMING LABORATORY

Course Category:	Institutional Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 – 3
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Implement the use of programming constructs in a structured oriented programming language
CO2	Analyze and implement user defined functions to solve real time problems
CO3	Implement the usage of pointers and file operations on data
CO4	Implement the user defined data types via structures and unions to solve real life problems

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1		3											
CO2		1	3											
CO3		1	3											
CO4			3								1			

COURSE CONTENT

CYCLE – I : PROGRAMMING CONSTRUCTS AND CONTROL STRUCTURES

1. Introduction to C Pogramming:
   a) Use of Turbo C IDE
   b) The Structure of C Program with Sample program

2. Data Types and Variables:
   a) Programs to usage of keywords and identifiers in c
   b) Programs on declaration of variables, rules for naming a variable, constants and different type of constants, data types
   c) Programs to perform on various operators in C
3. Branching and Selection:
   a) To specify the conditions under which a statement or group of statements should be executed.
   b) To choose exactly one out of two statements (possibly compound statements) to be executed; specifies the conditions under which the first statement is to be executed and provides an alternative statement to execute if these conditions are not met.
   c) To choose one statement (possibly compound) to be executed from among a group of state- ments (possibly compound); specifies the conditions under which each statement may be executed and may contain a default statement (in an else clause at the end) to be executed if none of these conditions are met. Note that in the absence of a final else clause, it may be the case that none of the statements are executed.
4. Unconditional control Transfer statements in C:
   a) Design and develop programs that use of goto Statement
   b) Design and develop programs that the use of Break Statement
   c) Design and develop programs that use of Continue Statement
5. Looping constructs:
   Design and develop programs based on
   a) Iterative loops using While, Do While, For, Nested For
   b) Selection Statement using the switch-case Statement
   c) Multiple way selections that will branch into different code segments based on the value of a variable or expression
6. Arrays
   a) Design and develop programs which illustrates the implementation of single-dimensional arrays and Multi dimensional arrays
7. Strings
   a) Create programs to initialize strings and usage of them for various input, output operations.
   b) Design and develop programs to handle String functions

CYCLE - II: ADVANCED PROGRAMMING CONSTRUCTS

1.Concept of user defined functions
   a) Design and develop programs depending on functions both user defined and standard library functions in C with different approaches.

2. File handling operations
   a) FILE structure
   b) Opening and closing a file, file open modes
   c) Reading and writing operations performed on a file
   d) File Pointers: stdin, stdout and stderr
   e) FILE handling functions: fgetc(), fputc(), fgets() and fputs() Functions
3. Pointers:
   a) Programs on declaration of pointers and their usage in C
   b) Programs to relate between arrays and pointers and use them efficiently in a program
   c) To pass pointers as an argument to a function, and use it efficiently in program
4. Command Line Arguments
   a) Design and develop programs that accept arguments from command line to perform different kinds of operations
5. Structures and Unions
   a) Programs to define, declare and access structure and union variables
   b) Design and develop programs to work with pointers to access data within a structure

Programs to pass structure as an argument to a function

TEXT BOOKS

[1] Ashok N Kamthane, "C And Data Structures", Pearson Education; First edition, 2008

REFERENCE BOOKS

[1] Brain W Kernighan and Dennis Ritchie, "The C Programming language", Pearson Education India,2015
[2] David Griffiths and Dawn Griffiths, "Head First C":A Brain Friendly Guide, O:Reilly media, 2012

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Introduction to Programming C: http://nptel.ac.in/courses/106104128/ C-Programming - IIT Kharagpur lectures
[2]https://www.youtube.com/watch?v=S47aSEqm_0I&list=PLeCxvb23g7hrw27XlekHtfygUTQ0TmFfP
[3] Numerical Methods and Programing by Prof.P.B.Sunil Kumar, Department of Physics, IIT Madras https://www.youtube.com/watch?v=zjyR9e-N1D4&list=PLC5DC6AD60D798FB7

17MC1206B
PROFESSIONAL ETHICS & HUMAN VALUES

Course Category:	Mandatory Learning	**Credits:**	-
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Know the moral autonomy and uses of ethical theories.
CO2	Understand morals, Honesty and character.
CO3	Understand about safety, risk and professional rights.
CO4	Know the ethics regarding Global issues related to Environment, Computers and weapon's development.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2								2						
CO3					3									
CO4											2			

COURSE CONTENT

UNIT I

Engineering Ethics: Senses of 'Engineering Ethics' - variety of moral issues- types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - theories about right action - Self-interest - customs and religion- uses of ethical theories.

UNIT II

Human Values:Morals, Values and Ethics - Integrity- Work Ethic – Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring – Sharing - Honesty - Courage - Valuing Time - Co-operation - Commitment –Empathy - Self-Confidence - Character - Spirituality .

UNIT III

Engineering as Social Experimentation: Engineering as experimentation – engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study, Safety, Responsibilities and Rights: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the three mile island and chernobyl case studies. Collegiality and loyalty – respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT IV

Global Issues: Multinational corporations- Environmental ethics- computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

TEXT BOOKS

[1] Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York (1996).

[2] Govindarajan M, Natarajan S, Senthil Kumar V. S., "Engineering Ethics", Prentice Hall of India, New Delhi(2004).

REFERENCE BOOKS

[1] Baum, R.J. and Flores, A., "Ethical Problems in Engineering, Center for the studyof the Human Dimensions of Science and Technology", Rensellae Polytechnic Institute,Troy, New York, 335 pp. eds. (1978)

[2] Beabout, G.R., Wennemann, D.J. , "Applied Professional Ethics: A Developmental Approach for Use with Case Studies", University Press of America Lanham, MD, 175 pp (1994).

SEMESTER - III

17MA1301B
PROBABILITY AND STATISTICS

Course Category:	Institutional Core	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 1 - 0
Prerequisites:	Set theory, Basic probability, probability distributions	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand random variables, Probability distributions.
CO2	Apply random phenomena of sample to test the Hypothesis concerning means.
CO3	Test the Hypothesis concerning variance and proportions.
CO4	Analyze Quality improvement, control charts and reliability to improve Statistical skills.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**3**							**3**		**1**			
CO2	**3**	**3**							**3**		**1**			
CO3	**3**	**3**							**3**		**1**			
CO4	**3**	**3**							**3**		**1**			

COURSE CONTENT

UNIT I

Probability Distributions: Random Variables (discrete and continuous) , Expectation, Variance and Standard deviation of discrete random variable, Binomial distribution, Poisson distribution.

Probability Densities: Expectations, Variance and standard deviation of continuous random variables, Normal distribution, Normal approximation to the Binomial distribution, Other probability densities - Uniform distribution, Log normal distribution, Gamma distribution, Beta distribution, Weibull distribution.

UNIT II

Sampling Distributions: Introduction, Populations and Samples

Inferences Concerning Mean: Point Estimation- Interval Estimation

Test of Hypothesis – Null Hypothesis and Tests of Hypothesis – Hypothesis concerning one mean – Relation between tests and Confidence intervals – Operating characteristic curves - Inferences concerning two means.

UNIT III

Inferences Concerning Variances: Estimation of variances- Hypothesis concerning one variance- Hypothesis concerning two variances.

Inference Concerning Proportions: Estimation of Proportions- Hypothesis concerning one Proportion- Hypothesis concerning several Proportions – The Analysis of r x c Tables- Goodness of fit.

UNIT IV

The Statistical Content of Quality Improvement Programs: Quality Control- Control Charts for Measurements - Control Charts for Attributes.

Applications to Reliability and Life Testing: Reliability - Failure – Time Distributions – The Exponential Model in Reliability.

TEXT BOOKS

[1] Richard A. Johnson, Probability and Statistics for Engineers Eighth edition, Prentice Hall of India, 2011

REFERENCE BOOKS

[1] R.E. Walpole, R.H.Myers&S.L.Myers. Probability & Statistics for Engineers & Scientist , Sixth Edition, Prentice Hall of India / Pearson Education.

[2] Purna Chandra Biswal, Probability and Statistics, Pearson Education Prentice Hall of India, 2007.

[3] T.K.V.Iyengar, B.Krishna Gandhi, S.Ranganatham, M.V.S. S.N.Prasad S.Chand.Probability and Statistics.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] probweb.berkeley.edu/teaching.html

[2] statsci.org/teaching.html

[3] video lectures.nptel.iitm.ac.in

17CS3302
OBJECT ORIENTED PROGRAMMING USING JAVA

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

COURSE OUTCOMES

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

CO1	Understand the concepts of object oriented programming.
CO2	Implement multiple inheritance through interfaces.
CO3	Apply exception, thread capabilities and Collections framework.
CO4	Develop Graphical user interface applications using Applet

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3				1									
CO2		2	1		1								1	1
CO3			2		2				1				2	
CO4			2		3				2		2		3	3

COURSE CONTENT

UNIT I

Fundamentals of Object Oriented Programming: Introduction, Object oriented paradigm, Basic concepts of Object Oriented Programming, Benefits of OOP, and Applications of OOP.

Introduction to Java: Java history, java features, how java differs from C and C++.

Data Types, variables and arrays: Java keywords, Primitive types, Integers, Floating-Point Types, Characters, Booleans, Variables, Type Conversion, casting

and Arrays.
Classes and objects: Class fundamentals, declaring objects, assigning object reference variables, introducing methods, constructors, this keyword, Garbage collection, overloading methods, using objects as parameters, returning objects, static and final keywords, nested and inner classes.

UNIT II
String Handling: The String Constructors, String Buffer Class, String Tokenizer class.
Inheritance: Inheritance basics, using super, multilevel hierarchy, method overriding, dynamic method dispatch, using abstract classes, final with inheritance.
Packages & Interfaces: Defining a package, finding package and CLASSPATH. Access protection, importing packages, Defining an interface, implementing interfaces, nested interfaces, applying interfaces, variables in interfaces.

UNIT III
Exception handling: Exception handling fundamentals, exception types, uncaught exceptions, using try and catch, multiple catch clauses, throw, throws, finally, creating your own exception subclasses.
Stream Classes: Byte Streams- InputStream, OutputStream, FileInputStream, FileOutputStream, Character Streams- Reader, Writer, FileReader, FileWriter.
Multithread Programming: The Java Thread Model, Creating a thread: Implementing Runnable, Extending Thread, creating multiple threads, Thread Priorities, Synchronization: Using Synchronized methods, The synchronized Statement.

UNIT – IV
The Applet Class: Applet Basics, Applet Architecture, Applet Skeleton, A Simple Banner Applets, Passing Parameters to Applets.
Event Handling: The delegation event model- Events, Event Sources, Event Listeners. Event Classes, Event Listener Interfaces, Using the delegation Event Model, Adapter Classes.
Collections Framework: Collections overview, Collection interfaces: Collection, List, and Set. Collection Classes: ArrayList, LinkedList, HashSet.Map Classes: HashMap, TreeMap.

TEXT BOOKS

[1] Herbert Schildt, “Java The Complete Reference”, 9th Edition, McGraw-Hill Education, New Delhi, 2011. [UNIT – I (Chapter – 2,3,4) , UNIT – II , III , IV]

[2] E Balagurusamy, “Programming with Java: A Primer”, 4th Edition, Tata McGraw Hill Education Pvt Ltd., 2011. (UNIT – I, Chapter – 1)

REFERENCE BOOKS

[1] Herbert Schildt, Dale Skrien, “Java Fundamentals A Comprehension Introduction”, Special Indian Edition, McGraw-Hill Education India Pvt. Ltd, 2013.
[2] Paul J. Dietel and Dr.Harvey M. Deitel, “Java How to Program”, 9th Edition, Prentice-Hall, Pearson Education, 2011.
[3] Timothy Budd, “Understanding Object Oriented Programming with Java “, Updated edition, Pearson Education, 2013.

E- RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. I. Sengupta. (14th , May, 2015), Department of Computer Science & Engineering, I.I.T.,Kharagpur, “Internet Technologies", NPTEL. http://nptel.ac.in/video.php?subjectId=106105084
[2] Prof. Shane P. (14th , May , 2015), Department of Computer Science & Engineering,, NPTEL Videos, http://www.nptelvideos.com/video.php?id=1461&c=15

17CS3303
DATA STRUCTURES

Course Category:	Programme Core	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 1 - 0
Prerequisites:	Programming in C	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Apply linear data structures to different applications.
CO2	Solve problems using linked list.
CO3	Implement operations on binary trees and binary search trees.
CO4	Implement different searching and sorting algorithms.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	1									2	
CO2	2	1	3	1									3	2
CO3	2	1	3										3	2
CO4	3	2	3										2	1

COURSE CONTENT

UNIT I

Introduction: Basic Concepts, Algorithm Specification, Data Abstraction, Performance Analysis-Time complexity, Space complexity, Asymptotic Notations, **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

Stacks: Definition, Representing stacks, ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms. Recursion, Towers of

Hanoi problem.

Queues: Queue and its Sequential Representation, Queue as an abstract data type, Types of Queue: Simple Queue, Circular Queue, Operations on each types of Queues: Algorithms.

UNIT II

Linked lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Doubly linked list: operations and algorithms; Circular Linked Lists: all operations their algorithms. Polynomials: Addition, Multiplication.

UNIT III

Trees: Introduction: Terminology, Representation of Trees

Binary Trees: Properties of binary trees, binary tree representation, Complete Binary Tree, Applications of Binary Trees, Expression trees construction and evaluation.

Binary Tree Traversals: Inorder, Preorder and Postorder – recursive and non-recursive.

Threaded Binary Tree: Threads, Inorder Traversal of Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree

Binary Search Trees: Definition, searching a Binary Search Tree (BST), Insertion into a binary search tree, Deletion from a binary search tree.

UNIT IV

Sorting: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Merge Sort, Radix Sort.

Hashing

Static Hashing: Hash Tables, Hash Functions, Overflow Handing

Dynamic Hashing: Motivation for Dynamic Hashing, Dynamic Hashing using Directories, Directory less Dynamic Hashing

TEXT BOOKS

[1] Horowitz Sahni and Anderson-Freed “Fundamentals of Data Structures in C”. 2nd Edition, Universities Press, 2008. (Unit 1, 2, 3)

[2] Richard F. Gilberg & B. A. Forouzan “Data Structures A Pseudocode Approcah with C”, Second Edition, CENGAGE Learning.(Unit 4)

REFERENCE BOOKS

[1] Mark Allen Weiss,”Data structure and Algorithm Analysis in C”. Addison Wesley Publication. 2006.

[2] Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, McGraw Hill, 1984 .

[3] Thomas Cormen, C.Leiserson, R. L.Rivest & C.Stein, "Introduction to Algorithms". 2nd Edition, PHI, 2010.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Dr.P.P. Chakraborty, IIT Kharagpur, May 19, 2010, Data Structures, NPTEL,Available:www.youtube.com/ watch? v=S47aSEqm_0I
[2] Dr. Naveen Garg, IIT Delhi, Sep 24, 2008, Data Strucutres, NPTEL, Available:http://nptel.iitm.ac.in, http://freevideolectures.com/ Course /2279/Data-Structures-And-Algorithms
[3] Shai Simonson, Jun 16, 2014, Data Structures, NPTEL, Available: http://nptel.ac.in/video.php? subjectId=106102064

17CS3304
DIGITAL LOGIC DESIGN

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

COURSE OUTCOMES

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

CO1	Apply Boolean laws & theorems to digital Logic functions.
CO2	Simplify the Boolean functions to the minimum number of literals.
CO3	Design different types of combinational logic circuits.
CO4	Design clocked sequential logic circuits using flip flops.
CO5	Design different types of Counters, Registers and Programmable Logic Devices.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	2													
CO3	1	2	2											
CO4	1	2	2											
CO5	1	2	2											

COURSE CONTENT

UNIT I

Boolean algebra And Logic Gates:

Digital computers and digital systems, Complements: r's complement, (r-1)'s

complement. Basic theorems and Properties of Boolean Algebra, Boolean functions, Canonical and Standard Forms, Digital Logic Gates, Universal gates, IC digital logic families.

Simplification Of Boolean Functions:

The Map Method, Two and three variable Maps, Four-variable Map, Five variable Map, Product of Sums Simplification, Don't care conditions, The Tabulation Method, Determination of Prime Implicants, Selection of Prime-Implicants.

UNIT II

Combinational Logic: Introduction, Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure. Exclusive-or Gates, Parity Generators and Checkers.

Combinational Logic with MSI and LSI: Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, demultiplexers, encoders, Multiplexers.

UNIT III

Sequential Logic: Sequential circuits, Classification, Latches, Flip Flops, Triggering of Flip-Flops, Master slave flip-flop, Flip-Flop Excitation tables, flip-flop direct inputs.

Analysis of Clocked Sequential Circuits: State table, State diagram, state equations, State Reduction and Assignment, Design Procedure, design with unused states, Design of Counters.

UNIT IV

Registers, Counters: Registers, Shift Registers, Asynchronous Counters, Synchronous Counters, Ring Counter, Johnson Counter, Timing Sequences.

Programmable Logic: Read only memory (ROM), Programmable read only memory (PROM), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Introduction to FPGA.

TEXT BOOKS

[1] M.Morris Mano, Digital Logic & Computer Design 1 e/d reprint, Pearson education, 2013.

REFERENCE BOOKS

[1] A. Anand Kumar, Switching Theory and Logic Design, 2nd Edition, PHI,2013
[2] Charles H.Roth ,Fundamentals of Logic Design, 6/e, Cengage learning,2010
[3] A. P. Malvino, D. P. Leach and G.Saha, Digital Principles and Applications 7/e, McGraw Hill, 2010.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. S. Srinivasan, IIT Madras, 9th May 2015, Digital Circuits and Systems, NPTEL VIDEO, Available: http://nptel.iitm.ac.in/ video.php? subjectId=117106086

[2] Prof. N.J. Rao, IISc Bangalore, 9th May 2015, Digital systems, NPTEL WEB Notes, Available at: http://nptel.ac.in/courses/Webcourse-contents/IIScBANG/ Digital%20Systems/Digital%20Systems.pdf

17HS2305A
YOGA & MEDITATION

Course Category:	Humanities Elective	**Credits:**	1
Course Type:	Practical	**Lecture -Tutorial-Practice:**	1-0-0
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	-
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Equip better attitude and behaviour.
CO2	Imbibe set of values enabling a balanced life focused on an ethical material life.
CO3	Develop levels of concentration through meditation
CO4	Apply conscience for the missions of life

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1							2	3	3					
CO2								3	2					
CO3									3					
CO4							3		1					

COURSE CONTENT

UNIT I

Understanding Yoga: Orientation, Introduction to Values , The positive impact of yoga , Application of Values in real life , Universal values

(Lec-demo pattern with illustrations representing Yogic Postures and value system related pictorial is followed)

UNIT II

Yogic Practices: Yoga, Self and Ultimate goal of yoga, Introduction to various types of yoga, Integration of values in Yoga.
(Activity based processes with Assasanas and Pranayama are implemented)

UNIT III

Practice of Meditation: Art of Meditation, Observation, Introspection, Contemplation, Meditation and Concentration
(Activity based processes involving Mediation sessions followed by demonstrations are implemented)

UNIT IV

Towards professional excellence through Yoga and meditation: Stress Management, Choices we make, Excellence and Integration
(Lec-demo pattern is followed)

TEXT BOOKS

[1] Common Yoga protocol, Ministry of Ayush, Govt of India
[2] Journey of the Soul- Michael Newton, 2003, Llewellyn

REFERENCE BOOKS

[1] Lectures from Colombo to Almora, Swami Vivekakanada, 2010 Ramakrishna Mission
[2] Essays of Ralph Waldo Emerson, 1982, Eastern press
[3] Eclectic materials Offered by English Dept.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] www.heartfulness.org accessed on 27th April 2018
[2] www. ayush.gov.in accessed on 27th April 2018
[3] www. belurmath.org accessed on 27th April 2018

17HS2305D
PHILOSOPHY

Course Category:	Humanities Elective	**Credits:**	1
Course Type:	Theory	**Lecture -Tutorial-Practice:**	1-0-0
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	-
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand major philosophical issues.
CO2	Appreciate the philosophical doctrines of western thinkers.
CO3	Understand the eminence of Indian classical thought.
CO4	Aappreciate relation between science and values.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						**3**		**2**	**1**					
CO2								**3**						
CO3						**2**	**2**							
CO4							**3**							

COURSE CONTENT

UNIT I

What's Philosophy: Definition, Nature, Scope and Branches

UNIT II

Introduction to Western Philosophy: Ancient Greek and Modern philosophy

UNIT III

Introduction to Indian Thought: Six systems – Modern philosophers

UNIT – IV

Philosophy of Science & Technology: Human values and professional Ethics

TEXT BOOKS

[1] " The story of philosophy ",Will Durant, Simon & Schuster 1926
[2] " An Introduction to philosophy ",O.O.Fletcher, Word Public Library,2010

REFERENCE BOOKS

[1] " Six systems of Indian Philosophy ", DH Dutta ,
[2] " The pleasures of philosophy, Will Duran, Simon & Schuster,1929

17HS2305 I2
FOREIGN LANGUAGE - GERMAN

Course Category:	Humanities Elective	**Credits:**	1
Course Type:	Theory	**Lecture -Tutorial-Practice:**	1-0-0
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	-
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Learn basics of German Language.
CO2	Write German Writing
CO3	Understand German Hearing
CO4	Form sentence in Present , Past and Future tense

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1									**3**					
CO2									**3**					
CO3									**3**					
CO4									**3**					

COURSE CONTENT

UNIT I

Alphabets, Numbers, Exact articles and not exact Articles

UNIT II

Prepositions, Present Tense

UNIT III
Past Tense and about family

UNIT – IV
Future Tenses

TEXT BOOKS

[1] Studio d A1Cornelsen Goyalaas Publications New Delhi

17HS2305J
PSYCHOLOGY

Course Category:	Humanities Elective	**Credits:**	1
Course Type:	Theory	**Lecture -Tutorial-Practice:**	1-0-0
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	-
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Relate biological and socio-cultural factors in understanding human Behaviour.
CO2	Understand the nature of sensory processes, types of attentions.
CO3	Explain different types of learning and procedures, distinguishes between different types of memory
CO4	Demonstrate an understanding of some cognitive processes involved in Problem solving and decision-making.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						**3**		**2**						
CO2						**2**		**3**						
CO3						**1**	**1**	**3**						
CO4											**3**			

COURSE CONTENT

UNIT I

Introduction: Psychology as a scientific study of behaviour. Biological and sociocultural bases of behaviour, fields of psychology

UNIT II

Sensory and perceptual processes: Sensation, attention and perception

UNIT III

Cognition and Affect: Learning and memory. Emotion and motivation

UNIT – IV

Thinking, problem solving and decision making, Personality and intelligence

TEXT BOOKS

[1] Zimbardo, P. G. Psychology and Life (20th Ed.). New York: Pearson Education (2013).

REFERENCE BOOKS

[1] Baron, R. A Psychology (5th Ed.). New Delhi: Pearson Education (2006).
[2] Coon, D., & Mitterer, J. O. Introduction to Psychology: Gateway to mind and behaviour. New Delhi: Cengage (2007).
[3] Feldman, R. S. Psychology and your life (2nd Ed.). New York: McGraw Hill (2013).

17TP1306
LOGIC AND REASONING

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Learning by Doing	**Lecture -Tutorial-Practice:**	0-0-2
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Think reason logically in any critical situation
CO2	Analyze given information to find correct solution
CO3	To reduce the mistakes in day to day activities in practical life
CO4	Develop time-management skills by approaching different shortcut methods
CO5	Use mathematical based reasoning to make decisions
CO6	Apply logical thinking to solve problems and puzzles in qualifying exams in any competitive exam.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	**3**												
CO2	**3**	**3**												
CO3	**3**	**3**			**1**									
CO4	**3**	**3**		**2**										
CO5	**3**	**2**												
CO6	**3**	**3**												

COURSE CONTENT

UNIT I :

1. Series Completion,
2. Coding-Decoding,
3. Blood Relations,
4. Puzzles test

UNIT II:

1. Direction sense test,
2. Logical Venn diagrams,
3. Number test, ranking test,
4. Mathematical operations

UNIT III:

1. Arithmetical Reasoning,
2. Inserting missing character,
3. Syllogism.

UNIT IV: Non – Verbal:

1. Water images,
2. Mirror images,
3. Paper folding,
4. Paper cutting,
5. Embedded Figures,
6. Dot situation,
7. Cubes & Dice

TEXT BOOKS

[1] R. S. Aggarwal, " Verbal and non-verbal reasoning", Revised Edition, S Chand publication, 2017 ISBN:81-219-0551-6

17CS3351
OBJECT ORIENTED PROGRAMMING LABORATORY

Course Category:	Programme Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0-0-2
Prerequisites:	-	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand the concepts of object oriented programming.
CO2	Implement multiple inheritance through interfaces.
CO3	Apply exception, thread capabilities and Collections framework.
CO4	Develop Graphical user interface applications using Applet

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	2
CO2		2	1										2	
CO3			3						3		2	2	2	
CO4			3						2		3	3	2	2

COURSE CONTENT/TASK

Task 1 : Implement the concept of classes and objects.
Task 2 : Implement Arrays to a given application.
Task 3 : Develop Java Application using inheritance.
Task 4: Use String and String Tokenizer classes and develop a java application.
Task 5 : Use interfaces and develop a java application.
Task 6 : Create a package and access members from a package.
Task 7 : Develop Java Application using Method overloading and method overriding.
Task 8 : Create a java application to copy content from one file to another using

IO streams.

Task 9 : Implement Exception handling to a given application.

Task 10 : Develop java application using Multithreading.

Task 11 : Develop java application using collections.

Task 12 : GUI Application using applets.

PROJECTS

1. Design and develop an automated ballot vote system.
2. Design and develop a banking application.

TEXT BOOKS

[1] E Balagurusamy, "Programming with Java: A Primer", 4th Edition, Tata McGraw Hill Education Pvt Ltd., 2011.

[2] Herbert Schildt, "Java The Complete Reference", 8th Edition, McGraw-Hill Education, New Delhi, 2011.

REFERENCE BOOKS

[1] Herbert Schildt, Dale Skrien, "Java Fundamentals A Comprehension Introduction", Special Indian Edition, McGraw-Hill Education India Pvt. Ltd, 2013.

[2] Paul J. Dietel and Dr.Harvey M. Deitel, "Java How to Program", 9th Edition, Prentice-Hall, Pearson Education, 2011.

[3] Timothy Budd, "Understanding Object Oriented Programming with Java ", Updated edition, Pearson Education, 2013.

E- RESOURCES AND OTHER DIGITAL MATERIAL

[1] LearnJava online virtual training center, 14th May 2015. Available: http://www.learnjavaonline.org/

[2] Internshala Virtual lab, 14th May 2015. http://vtc.internshala.com/signup/course_details2.php?course=java101

17CS3352
DATA STRUCTURES LABORATORY

Course Category:	Programme Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 -0- 2
Prerequisites:	Programming in C	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Apply linear data structures to different applications.
CO2	Solve problems using linked list.
CO3	Implement operations on binary trees and binary search trees.
CO4	Implement different searching and sorting algorithms.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	1									2	
CO2	2	1	3	1									3	2
CO3	2	1	3										3	2
CO4	3	2	3										2	1

COURSE CONTENT/TASKS

Task 1
Operations on stacks.
Task 2
Stack applications
Task 3
Operations on queues and circular queues.
Task 4
Operations on singly linked list and doubly linked list.

Task 5
Circular linked list operations.
Task 6
Linked List Applications : Polynomial addition, Polynomial Differentiation
Task 7
Binary Search Tree Operations and tree traversal techniques using recursion.
Binary Search Tree Operations and tree traversal techniques using non recursion.
Task 8
Searching techniques: Liner Search, Binary Search
Sorting Techniques: Bubble Sort, Selection Sort, Shell Sort
Sorting Techniques: Insertion Sort, Quick Sort and Merge Sort
Task 9
Hashing Techniques
Task 10
Lab Projects
Simulation of linear data structures
Simulation of sorting and searching

TEXT BOOKS

[1] Horowitz Sahni and Anderson-Freed "Fundamentals of Data Structures in C". 2nd Edition, Universities Press, 2008.
[2] Richard F. Gilberg & B. A. Forouzan "Data Structures A Pseudocode Approcah with C", Second Edition, CENGAGE Learning.

REFERENCE BOOKS

[1] Mark Allen Weiss, "Data structure and Algorithm Analysis in C". Addison Wesley Publication. 2006.
[2] Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill, 1984
[3] Thomas Cormen, C. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", 2nd Edition, PHI, 2010

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] MHRD VIRTUAL LABS, IIT KHARAGPUR, 14.05.2015, Available: http://cse.iitkgp.ac.in/~rkumar/pds-vlab/
[2] MHRD VIRTUAL LABS, IIIT HYDERABAD, 14.05.2015, Available: http://cse01-iiith.vlabs.ac.in/

17HS1353
COMMUNICATION SKILLS LABORATORY

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0- 0-2
Prerequisites:	Technical English & Communication Skills	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Execute rational pronunciation of speech sounds including accentuation.
CO2	Apply elements of listening comprehension in professional environments.
CO3	Develop the abilities of rational argumentation and skills of public speaking.
CO4	Demonstrate proficiency in the elements of professional communication including the competitive examination

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						3				3				
CO2			2	2	2	3	3	1		3	2			
CO3	3		2	3	2	3	3	2		3	2			
CO4	2	1	2	2	1	3	2	3	2	3	3	2		

COURSE CONTENT/TASK

UNIT:I :Elements of Spoken Expression and processes of Listening Comprehension:

- Speech Mechanism
- Articulation of vowels and consonants
- Patterns of Accentuation

Types and processes of Listening comprehension

UNIT II: : Patterns of Substantiation and Refutation in Public Speaking:

- Group Discussion(Open and Monitored)
- Pyramid Discussion
- PNI

Seminar Talk and Power Point Presentation

UNIT III: Professional Communication:

- Self Affirmation
- Advanced Composition including Memo and e-mail
- Résumé Preparation

Corporate ethic of Non-Verbal Communication

UNIT IV: Life Skills and Vocabulary for Competitive Examinations:

- Select Life Skills(50)
- Select Logies, Isms, Phobias and Manias (25 each)
- Sentence Completion and Double Unit Verbal Analogies (50 items)

Fundamentals of Syllogisms(Descriptive and Pictorial)

TEXT BOOKS

[1] Martin Cutts, Oxford Guide to Plain English, 7th Impression, OUP, 2011
[2] Exercises in Spoken English, Prepared by Department of Phonetics and Spoken English, CIEFL, OUP, 21st Impression, 2003

REFERENCE BOOKS

[1] Stephen R Covey, The 7 Habits of Highly Effective people, II edition, (Pocket Books) Simon & Schuster UK Ltd, 2004
[2] Eclectic Learning Materials offered by the Department

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] ODll Language Learner's Software, 27-6-2012 Orell Techno Systems
[2] Visionet Spears Digital Language Lab software Advance Pro, 28-01-2015
[3] www.natcorp.ox.ac.uk, British National Corpus accessed on 28-11-2017

17CS3354
DIGITAL LOGIC DESIGN LABORATORY

Course Category:	Programme Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0- 0-2
Prerequisites:	Basics of Electronic Engineering	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Apply Boolean laws & theorems to digital Logic functions.
CO2	Simplify the Boolean functions to the minimum number of literals.
CO3	Design different types of combinational logic circuits.
CO4	Design clocked sequential logic circuits using flip flops.
CO5	Design different types of Counters, Registers and Programmable Logic Devices.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**													
CO2	**2**													
CO3	**1**	**2**	**3**											
CO4	**1**	**2**	**3**											
CO5	**1**	**2**	**3**											

COURSE CONTENT/TASK

Task 1

Verify the Behavior of Logic Gates using Truth Table and Realization of All logic gates using universal gates.

Task 2

Design and test various adders and subtractor circuits(Arithmetic circuits).

Task 3

Design and build different types of code converters.

Task 4

Design and implementation of magnitude comparators.

Task 5

Implementation of Decoders and encoders.
Implementation of Multiplexer and De Multiplexer.
Design a combinational circuit and implement it with multiplexers.
Use a demultiplexer to implement a multiple output combinational circuit from the same input variables.

Task 6

Construct an SR latch using NAND and NOR gates. Verify its operation and demonstrate the circuit.
Implement all types of FLIP-FLOPS using gates.
Construct and study the operation of Master-Slave JK Flip flop.

Task 7

Design a clocked sequential circuit for the given state diagram for a four state counter with one input where the counter counts up in binary when the input is low and counts in reverse when the input is high.

Task 8

Verification of Shift-Registers using flip flops.

Task 9

Design of Synchronous counters.
Design of Asynchronous counter.
Design of Ring-counter and Johnson counter.

Task 10

Design and Implementation of BCD to Seven Segment Display.
Design and Implementation of Digital clock.

TEXT BOOKS

[1] M.Morris Mano, Digital Logic & Computer Design 1 e/d reprint 2013, Pearson education.

REFERENCE BOOKS

[1] A. Anand Kumar, Switching Theory and Logic Design, 2nd Edition. PHI
[2] Charles H.Roth ,Fundamentals of Logic Design, 6/e, , Cengage learning
[3] A. P. Malvino, D. P. Leach and G.Saha ,Digital Principles and Applications 7/e, McGraw Hill

17MC1307A
ENVIRONMENTAL STUDIES

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

COURSE OUTCOMES

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

CO1	Understand the various natural resources, analyze and explore degradation management
CO2	Understand the Ecosystems and need of Biodiversity
CO3	Realize and Explore the Problems related to Environmental pollution and its management
CO4	Apply the Role of Information Technology and analyze social issues, Acts associated with Environment.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1										1			
CO2					3		3							
CO3					3		3							
CO4							3	3	1	1				

COURSE CONTENT

UNIT -I

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, Need for public awareness.

Natural Resources

Renewable and Non-renewable Resources:

Natural resources and associated problems.

(a) Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people.
(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
(e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources.
Equitable use of resources for sustainable lifestyles.

UNIT II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.

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

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

Biodiversity and Its Conservation

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

UNIT III

Environmental Pollution: Definition, Causes, effects and control measures of

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

Solid waste management: Causes, effects and control measures of urban and

industrial wastes, Role of an individual in prevention of pollution; Disasters management: Floods, earthquake, cyclone and landslides

UNIT IV

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

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

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

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

TEXT BOOKS

[1] Erach Bharucha, ENVIRONMENTAL STUDIES for under graduate courses of all branches of higher education, University Grants Commission, University press, First edition 2004, Available at: http://collegesat.du.ac.in/UG/Envinromental%20Studies_ebook.pdf

REFERENCE BOOKS

[1] Anjaneyulu Y, Introduction to Environmental Sciences, B S Publications PVT Ltd, Hyderabad, 2004

SEMESTER - IV

17CS3401
DISCRETE MATHEMATICAL STRUCTURES

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Truth tables, Sets and Relations, Permutations& combinations	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Analyzation of propositional calculus and first order logic.
CO2	Examining the basic and advanced counting techniques.
CO3	Classification of relations and digraphs and their applications.
CO4	Classification of graphs and their applications.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3							3		1		2	2
CO2	3	3							3		1		2	2
CO3	3	3							3		1		2	2
CO4	3	3							3		1		2	2

COURSE CONTENT

UNIT I: PROPOSITIONAL CALCULUS

Fundamentals Of Logic: Propositions, Connectives, Propositional functions, Truth Tables, Tautology,
Contradiction, Logical equivalences, Normal forms, Logical inferences, Methods of proof of an implication.

First Order Logic: Predicate, Quantifiers, and Rules of inference for Quantified propositions.

UNIT II: COUNTING TECHNIQUES

Basics of Counting: Sum and product rules, Indirect counting, One to One Correspondence, Combinations and permutations, Enumerating Combinations and Permutations with and without repetitions.

Advanced Counting Techniques: Generating function of sequences, Recurences relations, Solving recurrences relations – substitution- Generating functions-The method of characteristic roots, Solution of Inhomogeneous recurrences relations.

UNIT III: RELATIONS AND DIGRAPHS

Relations and basic graphs, Special properties of binary relations, Equivalence relation, Partially ordered sets, Hasse diagrams, Lattices, Operations on relations, Paths and closures, Directed graphs and Adjacency matrices, Transitive closure, Warshall's algorithm.

UNIT IV: GRAPH THEORY

Introduction(graphs,subgraphs,circuits, trees) Sum of degrees theorem, Isomorphism and sub graphs, planar graphs, Euler's formula, Multi graphs and Euler's circuits, Hamiltonian graphs, Grin-berg's theorem, Graph coloring, Chromatic numbers.

TEXT BOOKS

[1] J.L.Mott,Kandel,Baker,Discrete Mathematics for Computer Scientists & Mathematicians

REFERENCE BOOKS

[1] Trembly& Manohar, Discrete Mathematical structures with applications to Computer Science
[2] Rosen, TMH, Discrete Mathematics and its Applications
[3] Malik & Sen Thomson, Discrete Mathematical Structures: Theory and applicatons

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] discretemathsweb.berkeley.edu/teaching.html
[2] Discrete Mathematical Structures Dr. Kamala Krithivasan Department of Computer Science and Engineering Indian Institute of Technology, Madras https://nptel.ac.in/courses/106106094

17CS3402
WEB TECHNOLOGIES

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-0-0
Prerequisites:	Programming in C and OOP's using JAVA	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Design and Create static web pages using HTML5 and CSS.
CO2	Create interactive web interfaces with client side technologies.
CO3	Create and validate XML documents.
CO4	Understand Server Side Scripting.
CO5	Design and Create Interactive Server side Scripting for an application

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		**2**	**3**						**2**				**2**	
CO2		**2**	**3**						**2**				**2**	
CO3		**2**	**3**						**2**					
CO4		**2**	**3**						**2**				**3**	
CO5		**2**	**3**						**2**				**3**	

COURSE CONTENT

UNIT I

Introduction to Web: DNS, Role of DNS, DNS root servers, Internet and Intranet, Evolution: web 1.0, 2.0, 3.0, HTTP Request and HTTP Response, Website design principles, Planning.

HTML 5: New Features of HTML5, Structures of HTML Document, Creating and Saving HTML Document, Hosting Web Pages. Fundamentals of HTML, Working with text, links, Images, Colors, Canvas and multimedia, URLs, Creating tables, Organizing text in HTML, Working with forms and frames.

UNIT II

Cascading Style Sheets: Inline Style Sheet, Internal Style Sheet and External Style Sheet and CSS Selectors, Creating Boxes and Columns using CSS.

DHTML: Overview of Java Script, Java Script Functions, Java Script Objects, working with window and Document Object properties and Methods, DOM Tree Traversing.

XML: Compare XML and HTML, Advantages and Disadvantages of XML, Describing the structure of an XML Document, XML Entity References, Describing DTD, Need of Namespaces, Namespace Syntax and scope of Namespace declaration, Describing an XML Schema.

UNIT III

Overview of AJAX: AJAX Web Application Model, How AJAX works? Creating a Simple AJAX Application, creating the XMLHttpRequest Object-Properties and Methods.

PHP: Installing a WAMP on Windows, The Structure of PHP, Using Comments, Basic Syntax, Understanding Variables, Variable Scope, Operators, Constants, Expressions and Control Flow in PHP, PHP Functions- Defining a function, returning a value, returning an array, pass by reference, Returning Global variables, PHP Arrays, Date and Time functions.

UNIT IV

File Operations: including and requiring Files, File Handling – Reading from file, Copying Files, Deleting a File, Updating a File and Uploading Files.

My SQL: Creating Database, Data Types, Basic Operations on tables (Create, Select, Delete and Update)

Working with Database & Forms: Querying a My SQL Database with PHP, Get and Post Methods, Query strings, HTML form handling.

Maintaining User State: Cookies and Sessions

TEXT BOOKS

[1] "HTML 5 Black Book" Covers CSS3, Javasvript, XML, XHTML, AJAX, PHP and jQuery , Dreamtech Press (2011).

[2] Robin Nixon, "Learning PHP, My SQL, Java Script & CSS", 2nd Edition, O'REILLY (2012).

REFERENCE BOOKS

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

E-RESOURCES AND OTHER DIGITAL MATERIAL

1] http://dns-record-viewer.online-domain-tools.com/
2] http://php.net/manual/en/book.mysql.php

17CS3403
ADVANCED DATA STRUCTURES

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

COURSE OUTCOMES

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

CO1	Implement various balanced tree operations.
CO2	Implement Multiway search trees
CO3	Implement graph traversal techniques and shortest path algorithms
CO4	Understand different file processing operations.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1		3										2	
CO2		2	3										3	2
CO3		2	3										3	2
CO4			3										1	1

COURSE CONTENT

UNIT I
EFFICIENT BINARY SEARCH TREES

AVL Trees: AVL Tree Basic Concepts, AVL Tree Balance Factor, Balancing Trees: Left of Left, Right of Right, right of Left, Left of right.

Splay Trees: Introduction, Bottom Up Splay Trees

UNIT II

MULTIWAY SEARCH TREES

m-Way Search Trees: Definition and Properties, Searching an m-Way Search Tree.

B Trees: Definition and Properties, Number of elements in a B-Tree, Insertion into a B-Tree and Deletion from a B-Tree

Heaps: Priority Queues, Definition of Min Heap & Max Heap, Insertion into a Min Heap & Max Heap, Deletion from a Min Heap & Max Heap, Applications of Heap.

UNIT III

Graphs: Basic Concepts, Graph Storage Structures, Graph Abstract Data Type, Elementary Graph Operations: Depth First Search, Breadth First Search, Spanning Trees, Minimum Spanning Trees: Prim's Algorithm and Kruskal's Algorithms

Shortest Paths and Transitive Closure: Dijkstra's Algorithm, Warshall's algorithm, Floyd's Algorithm.

Activity Networks : Activity on Vertex Networks**,** Definition, Topological Order

UNIT IV

Fundamental File Processing Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters in Files, The Unix Directory Structure, Physical Devices and Logical Files, File-Related Header Files, Unix File System Commands.

Fundamental File Structure Concepts: Field and Record Organization, Managing Files of Records: Record Access, File Access and File Organization

TEXT BOOKS

[1] Horowitz Sahni and Anderson-Freed, "Fundamentals of Data Structures in C",2nd Edition, Universities Press, 2008

[2] Michael J.Folk, Bill Zoellick,Greg Riccardi, "File Structures: An Object-Oriented approach with C++", Pearson Education, 2006.(Unit 4)

[3] Richard F.Gilberg & B.A.Forouzan "Data Structures A Pseudo code Approach with C", 2nd Edition, CENGAGE Learning, 2013

REFERENCE BOOKS

[1] Debasis Samanta, "Classic Data structures", 2nd Edition, PHI, 2009.

[2] Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill, 1984

[3] Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2006.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Naveen Garg, IIT Delhi, August 27, 2011, "AVL Trees" http://nptel.iitm.ac.in [NPTEL]
[2] Prof. Pradip K. Das, Jun 9, 2014, www.it4next gen.com/ free-computer-science-lectures-by-nptel.html
[3] IIT Delhi, http://nptel.ac.in/courses/106102064/25
[4] IIT Guwahati B-Tree Construction, nptel.ac.in/courses/ 106103069/21

17CS3404
COMPUTER ORGANIZATION

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

COURSE OUTCOMES

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

CO1	Describe Register transfer and micro operations.
CO2	Understand the basic computer designing and micro programming.
CO3	Know the Organization of CPU.
CO4	Apply algorithms to perform arithmetic operations on fixed point and floating point data.
CO5	Understand Memory Hierarchy and I/O Organization.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**													
CO2		**2**	**1**											
CO3														**2**
CO4	**1**	**2**												
CO5	**1**	**2**												

COURSE CONTENT

UNIT – I

Register Transfer and Micro-Operations: Register Transfer Language, Register Transfer, Bus and memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input-Output and Interrupt, Design of Basic Computer, Design of Accumulator Logic.

UNIT - II

Micro Programmed Control: Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit.

Central Processing Unit: General register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC)

UNIT - III

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms – Signed Magnitude Multiplication, Booth Multiplication(Signed 2's Complement Multiplication), Array Multipliers, Division Algorithm, Floating-point Arithmetic operations.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

UNIT - IV

Input Output Organization: Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor.,Serial Communication.

Standard I/O Interfaces: PCI Bus, USB

TEXT BOOKS

[1] Morris M. Mano, Computer Systems Architecture.3 Ed, Pearson/PHI, 2013
[2] Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002.

REFERENCE BOOKS

[1] John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. S.Raman Department of Computer Science & Engineering , IIT Madras , "Introduction to computing", (14,May,2015).
NPTEL http://www.nptel.iitm.ac.in/video.php?subjectId=106106092

[2] Prof. S.Raman Department of Computer Science & Engineering, IIT Madras , " Introduction to Digital Computer Organization" (14,May,2015), NPTEL http://www.nptel.iitm.ac.in/video.php?subjectId=117105078

17TP1405
ENGLISH FOR PROFESSIONALS

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Learning by Doing	**Lecture -Tutorial-Practice:**	0 – 0 – 2
Prerequisites:	-	**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Present themselves effectively in the professional world
CO2	Introduce themselves as well as others appropriately.
CO3	Use vocabulary to form sentences and narrate stories by using creative thinking skills
CO4	Involve in practical activity oriented sessions.
CO5	Learn about various expressions to be used in different situations.
CO6	Respond positively by developing their analytical thinking skills.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1										**3**	**3**			
CO2									**3**	**3**	**3**			
CO3										**3**	**3**			
CO4								**2**		**3**	**3**			
CO5										**3**	**3**			
CO6										**3**				

COURSE CONTENT

UNIT-I

- Beginners, Functional, Situational Conversations

- Practicing on Functional Conversations.

UNIT-II

- Errors in usage of Parts of Speech with a thrust on Verbs, Adjectives and Conjunctions, Idioms/Phrases.
- Introducing Basic Grammar
- Practicing on Functional Conversations.

UNIT-III

- Introducing Self & Others
- Structures and Forming Sentences
- Telephonic Etiquette, Social Etiquette and Table Manners
- Practicing on Functional Conversations.

UNIT-IV

- Direct, Indirect/Reporting Speech
- Public Speaking Basics
- Versant Test Preparation
- Practicing on Situational Conversations.

METHODOLOGY

Audio—Visuals / Hand Outs (Compiled/Created by Training Division, T&P Cell, VR Siddhartha Engineering College), Board & Chalk and Interactive Sessions.

17CS3406
OPERATING SYSTEMS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Co - requisites:	Data Structures	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand the basic principles of operating systems.
CO2	Analyze CPU Scheduling and disk scheduling algorithms
CO3	Analyse the mechanisms used for process synchronization, deadlock prevention and deadlock detection
CO4	Apply different page replacement algorithms
CO5	Understand the file structure, directory structure and disk structures.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	
CO2	2	3										2	2	
CO3		2										2	2	
CO4	2												2	
CO5		2												

COURSE CONTENT

UNIT I

Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls.

Processes: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication.

UNIT II

Process Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors

CPU Scheduling: Basic Concepts, Scheduling Criteria , Scheduling Algorithms, Thread Scheduling ,Multiple-Processor Scheduling , Real-Time CPU Scheduling.

UNIT III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Main Memory: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table

UNIT – IV

Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing.

Mass Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management

File System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery.

TEXT BOOKS

[1] Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts.9thed, John Wiley & Sons (Asia) Pvt.Ltd, 2018.

REFERENCE BOOKS

[1] William Stallings, Operating System: Internals and Design Principles. 6th ed 2009

[2] Andrew S.Tanenbaum, Modern Operating Systems. 3 ed, PHI, 2008.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. P.K. Biswas sir, Ph.D.(IIT Kharagpur),Dated: 21-02-2013 Video Lectures on "Operating Systems"
[2] http://nptel.ac.in/courses/Webcourse-contents/IISc- BANG/ Operating % 20 Systems/New_index1.html , Dated: June 2004
[3] http://www.ics.uci.edu/~ics143/lectures.html,2013
[4] http://web.stanford.edu/~ouster/cgi-bin/cs140-winter16/index.php

17CS3408
PYTHON PROGRAMMING

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Co - requisites:	Problem Solving Methods Programming in C Object Oriented Programming using Java	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the basic concepts of Python
CO2	Implement basic data structures in python
CO3	Implement handling exceptions and files.
CO4	Develop GUI using python.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3				1									
CO2		2	1		1								1	1
CO3			2		2				1				2	
CO4			2		3				2		2		3	3

COURSE CONTENT

UNIT I

Getting started: Introducing python, Need of Python Programming, python features, basic applications of python.

Variables, expressions and statements: Values and types, variables, operators,

expressions, statements, simple I/O, interactive mode and script mode.

Conditionals and Loops: Conditional statements: using the- if, else, elif statements, creating while loops, avoiding infinite loops, using compound conditions. using for loops.

Strings: Declaring a String, using quotes with strings, using escape sequences with strings, concatenating and repeating a strings, slicing strings, string methods.

UNIT II

Arrays: Creating an array, importing the array module, indexing and slicing on arrays, processing an array, types of arrays, working with arrays.

Functions: Creating functions, Parameters and return values, Keyword arguments, global and local variables.

Lists: Introducing Lists, Naming and defining a list, Traversing a list, List operations, List slices, list methods.

Tuples: Introducing Tuples, creating tuples, using tuples operations.

UNIT III

Dictionaries: Introduction to dictionaries, creating and accessing dictionaries.

Modules: Importing a module, packages and creating a module.

Exceptions and Assertions: Difference between an error and Exception, Handling Exceptions, Built-in exceptions, and Assertions.

Files: reading and writing to text files, storing complex data in files.

Regular Expressions: Regular expressions in python.

UNIT – IV

Object oriented programming: object oriented basics, creating classes, methods and objects, constructors, attributes, class attributes and static methods, object encapsulation, private attributes and methods, attribute access, sending and receiving messages, combining objects, inheritance, extending a class through inheritance, altering behavior of inherited methods, understanding polymorphism.

GUI Development: examining GUI, understanding event driven programming, root window, labels, buttons, creating a GUI using a class, binding widgets and event handlers, text and entry widgets and Grid layout manager, check buttons, radio buttons.

Graphics and Plotting with Pylab – creating a graphics window, setting background image, understanding the graphics coordinate system, displaying a sprite, text, message, moving sprites, dealing with screen boundaries, handling a mouse input, a basic plot, Plotting several plots on the same graph, and Animations

TEXT BOOKS

[1] Michael Dawson, “Python Programming for absolute beginners”, 3rd Edition, CENGAGE Learning Publications, 2018. (Unit I – Chapters: 1,3, Unit II – Chapters: 2, Unit III – Chapters: 1,3 and Unit IV – Chapters: 1,2,3)
[2] Martin C. Brown, “The Complete Reference Python”, 4th Edition, McGraw Hill,2018. (Unit III – Chapters: 2 and 3)
[3] Allen B. Downey, “Think Python”, Second Edition, O'Reilly Media, 2017. (Unit I – Chapters: 2, Unit II – Chapters: 3,4)
[4] Web Link : https://www.tutorialspoint.com/python/python_arrays.htm (Unit II – Chapters: 1)
[5] Web Link for : https://www.python-course.eu/re.php. (Unit III – Chapters: 4)

REFERENCE BOOKS

[1] Charles Dierbach, “ Introduction to Comupter Science using Python, A Computational Problem- Solving Focus”, Wiley India , 2017.
[2] John V. Guttag, “ Introduction to Computation and Programming using Python”, 2nd Edition, PHI Publications, MIT Press , 2015.
[3] Michael T. Goodrich, Roberto Tamassia , Michael H. Goldwasser, “Data Structures and Algorithms in Python”, Wiley publications, 2017.
[4] Vamsi Kurama "Python Programming: A Modern Approach", 2017, Pearson Publications.
[5] TanejaSheetal , Kumar Naveen "Python Programming: A modular approach" , Pearson Publications, 2017.
[6] Mark Lutz, “ Learning Python”, 5th Edition , O’Rielly Media, 2017.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Madhavan Mukund , IIT Madras , "Programming, Data Structures And Algorithms Using Python",
Available: https://onlinecourses.nptel.ac.in/noc18_cs21/preview. Last accessed on August 2018.
[2] Prof. JoydipGhosh, "Python - A to Z Full course for beginners"Available:https://www.udemy.com/python-django-programming-beginner-to-advance-tutorial-step-by-step/ Last accessed on August 2018.
[3] Programming for Everybody(Python) By Prof. Charles Severance, University of Michigan in www.coursera.com URL:
https://www.coursera.org/course/pythonlearn Last accessed on Aug 2018.

17CS3451
WEB TECHNOLOGIES LABORATORY

Course Category:	Programme Core	**Credits:**	1
Course Type:	Practical	**Lecture -Tutorial-Practice:**	0-0-2
Prerequisites:	-	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Design and Create static web pages using HTML5 and CSS.
CO2	Create interactive web interfaces with client side technologies.
CO3	Create and validate XML documents.
CO4	Understand Server Side Scripting.
CO5	Design and Create Interactive Server side Scripting for an application

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		2	3						2			1	2	
CO2		2	3						2				2	
CO3		2	3						2					
CO4		2	3						2				2	
CO5		2	3						2			2	2	

COURSE CONTENT

TASK-1: Study of Network commands. (like ipconfig, tracert, ping, netstat, nslookup, getmac)

TASK-2: Practice on Basic HTML5 elements

1. List and tables
2. Images and links

3. Form Element (<input />)
4. Bar Chart using Canvas

TASK-3: Design static web site with header, footer, menus, images, tables, links and lists by taking an example organization. (Pesonal informationwebsite, Company website, Ecommerce website, Govt. department, etc.,). Place suitable information.

TASK-4:

1. Design your web pages using different type of CSS.(Inline/Internal/External)
2. Change the appearance of the Buttons, Vertical Menu and Horizontal Menu
3. Create CSS box model.

TASK-5:

1. Client side login form validation using Java Script.
2. Create a dice game in java script and html using two dice.
3. Write a JavaScript to find the latitude and longitude of the user's position using HTML5 Geo Location.

TASK-6:

Create an XML file for student/employee/book data and validate against DTD and XML Schema.

TASK-7:

1. Create an array and perform different operations on arrays using pre defined functions in PHP.
2. Create user defined functions and access in your program.

TASK-8:

1. Different File Operations using PHP.
2. Establish the connection between My SQL and PHP.

TASK-9:

1. Design a registration form for a website and save the information in the data base.
2. Design a Login form for a website and validate the user.

TASK-10:

Design an application using sessions and Cookies in PHP.

TEXT BOOKS

[1] **HTML 5 Black Book**: Covers CSS3, Javasvript, XML, XHTML, AJAX, PHP and jQuery , Dreamtech Press (2011)

[2] Robin Nixon, Learning PHP, My SQL, Java Script & CSS, 2nd Edition, O'REILLY (2012).

REFERENCE BOOKS

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

17CS3452
PYTHON PROGRAMMING LABORATORY

Course Category:	Programme Core	**Credits:**	1
Course Type:	Practical	**Lecture -Tutorial-Practice:**	0-0-2
Prerequisites:	C Programming Laboratory and Java Programming Laboratory	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Implement the basic concepts of Python
CO2	Implement basic data structures in python
CO3	Implement handling exceptions and files.
CO4	Develop GUI using python.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3				1									
CO2		2	1		1								1	1
CO3			2		2				1				2	
CO4			2		3				2		2		3	3

COURSE CONTENT

TASK-1: Implement basic concepts of loops, value types, statements and variables.

TASK-2: Use Strings and develop a python application and analyse various string patterns.

TASK-3: Implement Arrays to a given application

TASK-4: Create a List and apply list operations in python.

TASK-5: Develop a dictionary and Implement dictionary operations in python.

TASK-6: Create a module and access members from a module.

TASK-7: Create an application to copy content from one file to another file

TASK-8: Implement the concept of classes and objects.

TASK-9: Develop a python application using inheritance

TASK-10: Develop a python application using polymorphism.

TASK-11: Implement Exception handling to a given application.

TASK-12: Develop a GUI Application using python graphics system.

TASK-13: Create a GUI application plot a graph with given coordinates.

Projects:

1. Design and develop an automated ballot vote system.

2. Design and develop a banking application.

TEXT BOOKS & REFERENCE BOOKS

[1] Michael Dawson, "Python Programming for absolute beginners", 3rd Edition, CENGAGE Learning Publications, 2018. [Unit I – Chapters: 1,3,
[2] Martin C. Brown, "The Complete Reference Python", 4th Edition, McGraw Hill,2018.
[3] Allen B. Downey, "Think Python", Second Edition, O'Reilly Media, 2017.
[4] Web Link : https://www.tutorialspoint.com/python/python_arrays.htm
[5] Web Link for : https://www.python-course.eu/re.php. [Unit III – Chapters: 4.3]
[6] Web Link for : http://jakevdp.github.io/mpl_tutorial/tutorial_pages/tut1.html

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Madhavan Mukund , IIT Madras, "Programming, Data Structures And Algorithms Using Python",
Available: https://onlinecourses.nptel.ac.in/noc18_cs21/preview. Last accessed on August 2018.

[2] Prof. JoydipGhosh, "Python - A to Z Full course for beginners"
Available:https://www.udemy.com/python-django-programming-beginner-to-advance-tutorial-step-by-step/ Last accessed on August 2018.

[3] Programming for Everybody(Python) By Prof. Charles Severance, University of Michigan in www.coursera.com
URL: https://www.coursera.org/course/pythonlearn Last accessed on Aug 2018.

17CS3453
COMPETITIVE CODING – I

Course Category:	Programme Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0-0-2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE CONTENT

Solving the programs under "Easy / Medium" category in CodeChef & HackerRank, etc. Students must solve at least 100 problems in CodeChef / HackerRank, etc. The category may be under Easy / Medium. Students shall participate at least two contests per month, hosted in online judges. Problems to be solved in C.

A minimum of 15 problems shall be solved per week in either CodeChef / HarckerRank, etc.

Monthly contests hosted in CodeChef / HackerRank, etc,. may be taken as day to day assessment of laboratory. Monthly one such evaluation

The work will be carried out in the laboratory slot allotted as well as at the home.

TEXT BOOKS

[1] Halim, Steven and Halim, Felix, Competitive Programming 3, 2013.
[2] Ahmed Shamsul Arefin, Art of Programming Contest, ACMSolver, Second Edition, 2012

REFERENCE BOOKS

[1] Programming Challenges: The Programming Contest Training Manual By Steven S Skiena, Miguel A. Revilla
[2] Guide to Competitive Programming: Learning and Improving Algorithms Through Contests By Antti Laaksonen

E- RESOURCES AND OTHER DIGITAL MATERIAL

[1] Topcoder tutorials - https://www.topcoder.com/community/data-science/data-science-tutorials/
[2] Nite Nimajneb's site - http://comscigate.com/Books/contests/icpc.pdf
[3] Slides from a Stanford Course - http://web.stanford.edu/class/cs97si/
[4] Halim, Steven and Halim, Felix, Competitive Programming 3, 2013. Ebook available at lulu.com. Site associate with with the book is http://cpbook.net

17MC1407B
INDIAN CONSTITUTION

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

COURSE OUTCOMES

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

CO1	Know the fundamental law of the land
CO2	Understand how fundamental rights are protected
CO3	Perceive the structure and formation of the Indian Government System
CO4	Explain when and how an emergency can be imposed and what are the consequences.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						**3**	**2**							
CO2						**2**	**3**							
CO3						**1**								
CO4						**2**	**1**							

COURSE CONTENT

UNIT I

Introduction to Constitution of India: Meaning of the Constitution Law and Constitutionalism, Historical perspective of constitution of India, Salient features of Constitution of India.

UNIT II

Fundamental Rights: Scheme of the fundamental rights, scheme of the fundamental right to equality, scheme of the fundamental right to certain freedoms under Article 19, scope of the right of life and personal liberty under Article 21, writs jurisdiction

UNIT III

Nature of the Indian Constitution: Federal structure and distribution of legislative and financial powers between the Union and states

Parliamentary form of Government in India: The Constitution powers and status of the President of India, Amendment of the Constitutional powers and Procedure, Historical Perspectives of the constitutional amendments in India

Local Self Government: Constitutional Scheme in India

UNIT – IV

Emergency Provisions: National Emergency, President rule, Financial Emergency

TEXT BOOKS

[1] Dr. J.N. Pandey, Constitutional Law of India published by Central law Agency, Allahabad, Edition 2018

REFERENCE BOOKS

[1] V.N Shukla's, Constitution of India Eastern Book Company, Lucknow.
[2] M.P. jain, Indian Constitution Law, Wadhwa and Company, Nagpur.
[3] D.D. basu, Constitution of India, Wadhwa and Company, Nagpur

SEMESTER - V

17CS3501
DATABASE MANAGEMENT SYSTEMS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Data Structures Discrete Mathematical Structures	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand different types of Database and Data warehouse concepts
CO2	Design E-R and Relational model for an application
CO3	Apply normalization process for data base design
CO4	Understand Concurrency control and Recovery techniques of DBMS
CO5	Demonstrate competency in selecting a particular NoSQL database

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1												1	1
CO2		2	3								1		1	1
CO3		2	3								1		2	2
CO4		2	3								1		1	1
CO5		2	3								1		2	2

COURSE CONTENT

UNIT I

Databases and Database Users: Characteristics of the Database Approach, Advantages of Using the DBMS Approach, A Brief History of Database

Applications.

Database System Concepts and Architecture: Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Distributed database concepts, Overview of Object Database concepts.

Overview of Data Warehousing and OLAP: Introduction, Definitions and Terminology, Characteristics of Data Warehouses, Data Modeling for Data Warehouses, Typical functionality of a Data Warehouse.

UNIT II

Data Modeling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams, Naming Conventions, and Design Issues, Relationship Types of Degree Higher than Two.

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

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

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

UNIT III

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

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

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

UNIT IV

Emerging Database Technology: SQLite overview- Salient characteristics, applications, Architecture. Limitations

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

Databases.

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

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

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

TEXT BOOKS

[1] Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems",7th edition, Pearson Education Ltd, 2016. [Unit I,II,III]

[2] Shashank Tiwari, " Professional NoSql", John Wiely & Sons, 2011 [Unit IV].

[3] Sibsankar Haldar, SQLite Database System Design and Implementation, 2nd Edition,2015, O'Reilly publisher [Unit IV].

REFERENCE BOOKS

[1] Raghu Rama Krishnan,Johannes Gehrke, "Database Management Systems", 3rd Edition, McGraw Hill Education

[2] Abraham Silberschatz, Henry F.Korth, S.Sudarshan, "Database System Concepts", 6th edition, McGraw-Hill Education.

[3] Luc Perkins, Eric Redmond, Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL movement, Andy Hunt publishing, 2nd Edition, 2018

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Dr S.Srinath IIT-Madras "Conceptual design process http://nptel.iitm.ac.in/video.php?subjectId=106106093

[2] Prof P.Srinivasa Kumar IIT-Madras "Normalizationprocess"http://nptel.iitm.ac.in/courses/IIT MADRAS/Intro_to_Database_Systems_Design/

[3]Prof D.Janakiram IIT-Madras "Concurrency Control techniques" http://nptel.iitm.ac.in/video.php?subjectId=106106093

[4] Dr Bill Howe University of Washington eScience Institute https://class.coursera.org/datasci001/lecture/21,99,101,103,107,111, 113

17CS3502
DESIGN AND ANALYSIS OF ALGORITHMS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Fundamentals of Data Structures, Basic Mathematics	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand fundamental concepts of Asymptotic notation of an algorithm and Divide and Conquer techniques
CO2	Analyze various design techniques of greedy algorithm and dynamic programming
CO3	Apply basic traversal and search techniques, backtracking for real time problems
CO4	Understand the concepts of Branch and Bound techniques, NP-Hard, NP-Complete.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2		3	2						1		1			
CO3		3	2						1		1			
CO4		2							1					

COURSE CONTENT

UNIT-I

Introduction: Algorithm, Algorithm Specification, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Randomized Algorithms

Divide and conquer: General method, Finding the maximum and minimum, Applications-Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication.

UNIT-II

Greedy method: General method, Applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, optimal storage on tapes, Optimal merge patterns, Single source shortest path problem.

Dynamic Programming: General method, applications- Matrix chain multiplication, Multi stage graph problem, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem.

UNIT- III

Basic Traversal and Search Techniques: Techniques for Binary trees, graphs, connected components, biconnected components.

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

UNIT-IV

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

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

TEXT BOOKS

[1] Ellis Horowitz, SatrajSahni and Rajasekharan, "Fundamentals of Computer Algorithms", Galgotia Publications Pvt. Ltd, 2008.

REFERENCE BOOKS

[1] M.T.Goodrich and R.Tomassia, "Algorithm Design: Foundations, Analysis and Internet examples", John Wiley and sons, 2006.
[2] T.H.Cormen,C.E.Leiserson, R.L.Rivest and C.Stein, "Introduction to Algorithms", 2/e, PHI Pvt. Ltd. / Pearson Education, 2009.
[3] Allen Weiss, "Data structures and Algorithm Analysis in C++", Third Edition, Pearson Education, 2007.
[4] Tulasi.B, SuvarnaVani. K Design and Analysis of algorithms, Tulip Publications.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://nptel.ac.in/courses/106101060/
[2] https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/
[3] https://theory.stanford.edu/~tim/videos.html

17CS3503
COMPUTER NETWORKS

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

COURSE OUTCOMES

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

CO1	Understand fundamentals of networks and network reference models
CO2	Analyze error control, flow control and multiple access mechanisms used at Data Link Layer
CO3	Analyze various routing protocols in network design
CO4	Analyze the underlying protocols in transport layer and Application layer.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		**1**												
CO2					**2**									
CO3									**3**					**3**
CO4									**3**					**3**

COURSE CONTENT

UNIT - I

Introduction: Uses of Computer Networks, Network Hardware, LANs, MANs, WANs, Network Software.

Reference Models: The OSI Reference Model, TCP/IP Reference Model, the comparison of the OSI and TCP/IP reference models.

Physical Layer: Guided transmission media: Magnetic Media, Twisted Pair, Coaxial Cable, and Fiber Optics

UNIT - II

Data Link Layer: Data link layer design issues, Error detection and correction, Elementary data link protocols, and Sliding window protocols.

Medium Access Control Sub layer: The channel allocation problem, multiple access protocols:- ALOHA, CSMA protocol, collision-free protocols, limited-contention protocol, ETHERNET.

UNIT – III

Network Layer: Network Layer Design Issues, Routing Algorithms: Shortest Path, Flooding, DVR, and Link State routing algorithm, Congestion Control Algorithms.

Quality of Service: Requirements, Traffic Shaping, Packet Scheduling, Admission Control, Integrated Services, Differentiated Services, IP Protocol, IP addresses, Internet Control Protocols

UNIT – IV

Transport Layer: The Transport Service, Elements of Transport Protocols, and the Internet Transport Protocols TCP and UDP.

Application Layer: The Domain Name System (DNS), and E-Mail.

TEXT BOOKS

[1] Andrew S Tanenbaum, David J Wetherall "Computer Networks", 5th edition, Pearson Education

REFERENCE BOOKS

[1] Kurose and Ross, "Computer Networks – A Top-down Approach Featuring the Internet", Pearson Education.
[2] Behrouz A.Fourozan, "Data Communications and Networking". 4 ed, TATA McGraw Hill.
[3] Nader F.Mir, Computer and Communication Networks. PHI

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof Sujoy Ghosh, IIT Kharagpur, NPTEL Lectures, 14th May 2015, Video Lectures, Available: http://nptel.iitm.ac.in/video.php?subjectId =106105081
[2] MIT Open Courseware, MIT, , 14th May 2015, Video Lectures, Available:http://ocw.mit.edu/courses/electricalengineering-and-computer-science/6-033-computer-systemengineering-spring-2009/video-lectures/
[3] Dheeraj, IIT Kharagpur, 14th May 2015, Lecture Notes, Available: http://www.cse.iitk.ac.in/users/dheeraj/cs425

17CS2504A
ADVANCED PROGRAMMING IN JAVA

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Problem Solving Methods, Programming in C, Java Programming.	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Create GUI application
CO2	Create distributed application
CO3	Develop web application
CO4	Develop enterprise application

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3				1									
CO2		2	1		1								1	1
CO3			2		2				1				2	
CO4			2		3				2		2		3	3

COURSE CONTENT

UNIT I

GUI Programming: Introduction to Swings, JLable and ImageIcon, JTextField, The Swing Buttons: JButton, Checkboxes, RadioButtons, JTabbedPane, JList, JComboBox, JTable, Menu Bars and Menus.

Java Database Connectivity: JDBC Connectivity, Types of JDBC drivers,

Connecting to the database, JDBC Statements, JDBC Exceptions, Manipulations on the database.

Pragmatic Functional Programming using Lambdas: Introduction to Functional programming, Functional Programming concepts and terminology, Functional Interfaces, Working with Lambda Expressions and Method References.

UNIT II

Network Programming: Introduction, InetAddress, Client/Server Interaction with Stream Socket Connections, Client/Server Interaction with Datagrams socket connections, Manipulating URLs.

Remote Method Invocation: Introduction to RMI, RMI Architecture, Defining the Remote Interface, Implementing the Remote Interface, Compiling and Executing the Server and the Client.

UNIT III

Servlets: Web servers, Tomcat web server installation steps, introduction to servlets, Lifecycle of a Servlet, Simple servlet, the Servlet API, Reading Servlet parameters, the javax.servlet.http package, Handling Http Request & Responses, Using Cookies-Session Tracking.

Java Server Pages: Introduction to JSP, The Problem with Servlet, the Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC architecture.

UNIT IV

JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing, Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing data between JSP pages, Requests and Users, Passing Control and Date between Pages, Sharing Session and Application Data.

Introduction to Spring Framework: Introduction to Spring framework, Dependency Injection and Inversion of Control, Spring modules , Spring with MVC.

TEXT BOOKS

[1] Schildt, “Java, The Complete Reference”, Ninth Edition, Oracle Press, 2018. [Unit- I Chapter 1, Unit- II Chapter 1, Unit- III Chapter 1].

[2] H. M. Deitel, P.J. Deitel, S.E. Santry, “ Advanced Java 2 Platform How to Program”, 3rd Edition, 2016, Prentice Hall Publications. [Unit Chapter 2, Unit- II Chapter 2, Unit-IV Chapter 2]

[3] Hans Bergsten, "JavaServer Pages", 3rd Edition 2017, O’Reilly Media. [Unit III Chapter 2 , Unit- IV Chapter 1].

[4] [Web Reference: https://www.javatpoint.com/spring-and-struts2-integration

Unit IV Chapter 3]

REFERENCE BOOKS

[1] Paul J. Dietel and Dr.Harvey M. Deitel, “Java How to Program”, 9th Edition, Prentice-Hall, Pearson Education, 2016.
[2] David Geary, Cay S. Horstmann “Core JavaServer Faces” Third edition, 2016, Prentice Hall.
[3] Jim Keogh, “The Complete reference to J2EE”, reprint 2017, Tata McGraw-Hill .

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]AbhayRedkar, JSF Developer,“Struts 2 Framework for beginners", Udemy.https://www.udemy.com/struts-2-framework-for-beginners/ Available: Last accessed on August 2018.
[2] Prof. I. Sengupta. (14th , May, 2017), Department of Computer Science & Engineering, I.I.T.,Kharagpur, “Internet Technologies", NPTEL videos.

17CS2504B
COMPUTER GRAPHICS

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Basics of Mathematics (Algebra and Matrix Operations)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand working of different display device.
CO2	Apply Different Point Plotting techniques.
CO3	Demonstrate different 2D and 3D Object Transformation and Viewing.
CO4	Illustrate various 3D Projection and 2D Clipping
CO5	Understand computer animation sequence.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**3**												
CO2	**3**	**3**												
CO3	**3**	**3**												
CO4	**3**	**3**												
CO5		**2**											**2**	

COURSE CONTENT

UNIT I

Introduction and overview of Graphics Systems

Applications of Computer graphics, Video Display Devices: Refresh Cathode-Ray Tubes, Raster and Random Scan Displays, Colour CRT Monitors, LCD Liquid Crystal Display, Normalized device coordinates.

Output Primitives

Line-Drawing Algorithms: Simple DDA, Symmetrical DDA and, Bresenham's Line generation Algorithm, Circle generating Algorithms: Properties of circle, Parametric, Midpoint Circle algorithms, Ellipse Generation Algorithms: Properties of ellipse, Midpoint Ellipse algorithm.

UNIT II

Two-Dimensional Geometric Transformations

Basic Transformations: Translation, Rotation and, Scaling; Matrix representation and Homogeneous coordinates, Composite Transformations: Translations, Rotations, Scaling, General Pivot-Point Rotation, General Fixed-Point Scaling, Concatenation Properties; Other Transformations: Reflections and shear.

Two Dimensional Viewing

The viewing Pipeline-Viewing Coordinate Reference Frame- Window to View port transformation.

Polygons

Introduction-Polygons-An Inside-Outside Tests-Scan-Line Polygon Fill Algorithm- Boundary Fill Algorithm- Flood Fill algorithm- Fill Area Functions-Character Generation- Antialiasing

UNIT III

Line Clipping

The Cohen-Sutherland Outcode algorithm and Nicholl-lee-Nicholl Line clipping; Polygon Clipping: The Sutherland Hodgman Algorithm –Weiler Atherton Polygon Clipping - Character and Text Clipping.

Three Dimensional Geometric And Modelling Transformations

Translation-Rotation- General Three Dimensional Rotations – scaling - Other Transformations- Reflections and Shears-Composite Transformations

UNIT IV

Three Dimensional Viewing

Viewing Pipeline- Viewing Coordinates- Projections: Parallel Projection and Perspective projection

Computer Animation

Design of Animation Sequence, General computer Animation functions, Raster animation, Computer animation languages, key frame systems, motion specifications.

TEXT BOOKS

[1] Donald D. Hearn & M. Pauline Baker "Computer Graphics, C version" 2nd Edition, Pearson Education, New Delhi, 2005.

REFERENCE BOOKS

[1] S. Harrington "Computer Graphics- A Programming Approach", McGraw Hill Publication, New Delhi, 1994.

[2] W.M.Newman and RF Sproull "Principle of Interactive Computer Graphics", McGraw Hill Publication, New Delhi, 1995

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Dr. Sukhendu das, "Computer Graphics", IIT Madras
http://nptel.iitm.ac.in/video.php?subjectId=106106090

[2] Prof.Dr.Prem Kalra, "Computer Graphics", IIT Delhi
http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv046-Page1.htm

INTER DISCIPLINARY ELECTIVE
17CS2505A
DATA STRUCTURES THROUGH C

Course Category:	Inter Disciplinary Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Programming in C	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Apply linear data structures to different applications.
CO2	Solve problems using linked list.
CO3	Implement operations on binary trees and binary search trees.
CO4	Implement different searching and sorting algorithms.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	1									2	
CO2	2	1	3	1									3	2
CO3	2	1	3										3	2
CO4	3	2	3										2	1

COURSE CONTENT

UNIT I

Introduction: Basic Concepts, Algorithm Specification, Data Abstraction, Performance Analysis-Time complexity, Space complexity, Asymptotic Notations, **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

Stacks: Definition, Representing stacks, ADT Stack and its operations:

Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms. Recursion, Towers of Hanoi problem.

Queues: Queue and its Sequential Representation, Queue as an abstract data type, Types of Queue: Simple Queue, Circular Queue, Operations on each types of Queues: Algorithms.

UNIT II

Linked lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Doubly linked list: operations and algorithms; Circular Linked Lists: all operations their algorithms. Polynomials: Addition, Multiplication.

UNIT III

Trees: Introduction: Terminology, Representation of Trees

Binary Trees: Properties of binary trees, binary tree representation, Complete Binary Tree, Applications of Binary Trees, Expression trees construction and evaluation.

Binary Tree Traversals: Inorder, Preorder and Postorder – recursive and non-recursive.

Threaded Binary Tree: Threads, Inorder Traversal of Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree

Binary Search Trees: Definition, searching a Binary Search Tree (BST), Insertion into a binary search tree, Deletion from a binary search tree.

UNIT IV

Sorting: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Merge Sort, Radix Sort.

Hashing

Static Hashing: Hash Tables, Hash Functions, Overflow Handing

Dynamic Hashing: Motivation for Dynamic Hashing, Dynamic Hashing using Directories, Directory less Dynamic Hashing

TEXT BOOKS

[1] Horowitz Sahni and Anderson-Freed “Fundamentals of Data Structures in C”. 2nd Edition, Universities Press, 2008. (Unit 1, 2, 3)

[2] Richard F. Gilberg & B. A. Forouzan “Data Structures A Pseudocode Approcah with C”, Second Edition, CENGAGE Learning.(Unit 4)

REFERENCE BOOKS

[1] Mark Allen Weiss,"Data structure and Algorithm Analysis in C". Addison Wesley Publication. 2006.

[2] Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill, 1984 .

[3] Thomas Cormen, C.Leiserson, R. L.Rivest & C.Stein, "Introduction to Algorithms". 2nd Edition, PHI, 2010.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Dr.P.P. Chakraborty, IIT Kharagpur, May 19, 2010, Data Structures, NPTEL,Available:www.youtube.com/ watch? v=S47aSEqm_0I

[2] Dr. Naveen Garg, IIT Delhi, Sep 24, 2008, Data Strucutres, NPTEL, Available:http://nptel.iitm.ac.in, http://freevideolectures.com/ Course /2279/Data-Structures-And-Algorithms

[3] Shai Simonson, Jun 16, 2014, Data Structures, NPTEL, Available: http://nptel.ac.in/video.php? subjectId=106102064

INTER DISCIPLINARY ELECTIVE
17CS2505B
WEB DESIGNING

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

COURSE OUTCOMES

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

CO1	Design and Create static web pages using HTML5 and CSS.
CO2	Create interactive web interfaces with client side technologies.
CO3	Create and validate XML documents.
CO4	Understand Server Side Scripting.
CO5	Design and Create Interactive Server side Scripting for an application

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		**2**	**3**						**2**				**2**	
CO2		**2**	**3**						**2**				**2**	
CO3		**2**	**3**						**2**					
CO4		**2**	**3**						**2**				**3**	
CO5		**2**	**3**						**2**				**3**	

COURSE CONTENT

UNIT I

Introduction to Web: DNS, Role of DNS, DNS root servers, Internet and Intranet, Evolution: web 1.0, 2.0, 3.0, HTTP Request and HTTP Response, Website design principles, Planning.

HTML: Structures of HTML Document, Creating and Saving HTML Document, Hosting Web Pages. Fundamentals of HTML, Working with text, links, Images, Colors, , URLs, Creating tables, Organizing text in HTML, Working with forms and frames.

HTML 5: New Features of HTML5

UNIT II

Cascading Style Sheets: Inline Style Sheet, Internal Style Sheet and External Style Sheet and CSS Selectors, Creating Boxes and Columns using CSS.

DHTML: Overview of Java Script, Java Script Functions, Java Script Objects, working with window and Document Object properties and Methods, DOM Tree Traversing.

XML: Compare XML and HTML, Advantages and Disadvantages of XML, Describing the structure of an XML Document, XML Entity References, Describing DTD, Need of Namespaces, Namespace Syntax and scope of Namespace declaration, Describing an XML Schema.

UNIT III

Overview of AJAX: AJAX Web Application Model, How AJAX works? Creating a Simple AJAX Application, creating the XMLHttpRequest Object-Properties and Methods.

PHP: Installing a WAMP on Windows, The Structure of PHP, Using Comments, Basic Syntax, Understanding Variables, Variable Scope, Operators, Constants, Expressions and Control Flow in PHP, PHP Functions- Defining a function, returning a value, returning an array, pass by reference, Returning Global variables, PHP Arrays, Date and Time functions.

UNIT IV

File Operations: including and requiring Files, File Handling – Reading from file, Copying Files, Deleting a File, Updating a File and Uploading Files.

My SQL: Creating Database, Data Types, Basic Operations on tables (Create, Select, Delete and Update)

Working with Database & Forms: Querying a My SQL Database with PHP, Get and Post Methods, Query strings, HTML form handling

TEXT BOOKS

[1] **HTML 5 Black Book**: Covers CSS3, Javasvript, XML, XHTML, AJAX, PHP and jQuery , Dreamtech Press (2011)

[2] Robin Nixon, **Learning PHP, My SQL, Java Script & CSS**, 2nd Edition, O'REILLY (2012).

REFERENCE BOOKS

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

INTER DISCIPLINARY ELECTIVE
17CS2505C
FUNDAMENTALS OF OPERATING SYSTEMS

Course Category:	Inter Disciplinary Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-0-0
Corequisites	Data Structures	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand the basic principles of operating systems.
CO2	Analyze CPU Scheduling and disk scheduling algorithms
CO3	Analyse the mechanisms used for process synchronization, deadlock prevention and deadlock detection
CO4	Apply different page replacement algorithms

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3												2	
CO2	2	3										2	2	
CO3		2										2	2	
CO4	2												2	

COURSE CONTENT

UNIT I

Introduction: What Operating Systems do, Memory Management, Storage Management

Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls.

Processes: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication.

UNIT II

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling

Process Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors

UNIT III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Main Memory: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging

UNIT – IV

Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing.

Mass Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management

TEXT BOOKS

[1] Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts.9thed, John Wiley & Sons (Asia) Pvt.Ltd, 2018.

REFERENCE BOOKS

[1] William Stallings, Operating System: Internals and Design Principles. 6th ed 2009

[2] Andrew S.Tanenbaum, Modern Operating Systems. 3 ed, PHI, 2008.

E- RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. P.K. Biswas sir, Ph.D.(IIT Kharagpur),Dated: 21-02-2013 Video Lectures on "Operating Systems"

[2] http://nptel.ac.in/courses/Webcourse-contents/IISc- BANG/ Operating % 20 Systems/New_index1.html , Dated: June 2004

[3] http://www.ics.uci.edu/~ics143/lectures.html,2013

[4] http://web.stanford.edu/~ouster/cgi-bin/cs140-winter16/index.php

SELF LEARNING ELECTIVE(MOOCS)
17CS2506A
INTRODUCTION TO R PROGRAMMING

Course Category:	Self Learning Elective	**Credits:**	2
Course Type:	Theory	**Lecture -Tutorial-Practice:**	0-0-0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Learn R language fundamentals and basic syntax
CO2	Perform data analysis using R
CO3	Apply major R data structures
CO4	Create visualizations using R

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	1	3												
CO3		2												
CO4		2			3									

COURSE CONTENT

The Minimum content to be covered

Basic fundamentals, installation and use of software, data editing, use of R as a calculator, functions and assignments.

Use of R as a calculator, functions and matrix operations, missing data and

logical operators.

Conditional executions and loops, data management with sequences. Data management with repeats, sorting, ordering, and lists

Vector indexing, factors, Data management with strings, display and formatting.

Data management with display paste, split, find and replacement, manipulations with alphabets, evaluation of strings, data frames.

Data frames, import of external data in various file formats, statistical functions, compilation of data.

Graphics and plots, statistical functions for central tendency, variation, skewness and kurtosis, handling of bivarite data through graphics, correlations, programming and illustration with examples.

TEXT BOOKS

[1] Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016

REFERENCE BOOKS

[1] The R Software-Fundamentals of Programming and Statistical Analysis - Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit Liquet, Springer 2013

[2] A Beginner's Guide to R (Use R) By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://onlinecourses.nptel.ac.in/noc17_ma17, Accessed on 24Th July, 2017

SELF LEARNING ELECTIVE(MOOCS)
17CS2506B
PRODUCT DESIGN AND INNOVATION

Course Category:	Self Learning Elective	**Credits:**	2
Course Type:	Theory	**Lecture -Tutorial-Practice:**	0-0-0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Identify and analyse the product design and development processes in manufacturing industry.
CO2	Define the components and their functions of product design and development processes and their relationships from concept to customer over whole product lifecycle.
CO3	Analyse, evaluate and apply the methodologies for product design, development and management.
CO4	Undertake a methodical approach to the management of product development to satisfy customer needs

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		**3**	**2**											
CO2					**2**									
CO3		**3**												
CO4		**1**		**2**										

COURSE CONTENT

The minimum content to be covered

Need for Innovation and design,User Innovation,Introduction to product and Product Design,Difference between Product development and product design

Need/Problem Identification, User study by contextual enquiry,Questionnaire study, Interview techniques, Persona and scenario mapping, Product Study And Market study, design brief.

Importance of Human factors in product design, Physical Ergonomics principles and issues,Ergonomic assessment tool, Cognitive issues in product design

Creative techniques and tools for Concept generation, concept evaluation

Product prototyping/ model making work flow, tools and techniques for model making and prototyping, introduction to prototype driven innovation,
Overview of materials and processes

Evaluation tools and techniques for User-Product interaction

TEXT BOOKS

[1] Eppinger, S., & Ulrich, K.(2015). Product design and development. McGraw-Hill Higher Education.
[2] Green, W., & Jordan, P. W. (Eds.).(1999).Human factors in product design: current practice and future trends. CRC Press.
[3] Sanders, M. S., & McCormick, E. J. (1993). Human factors in engineering and design. McGRAW-HILL book company.

REFERENCE BOOKS

[1] Roozenburg, N. F., & Eekels, J. (1995). Product design: fundamentals and methods (Vol. 2). John Wiley & Sons Inc.
[2] Lidwell, W., Holden, K., & Butler, J.(2010). Universal principles of design, revised and updated: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design.

Rockport Pub

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://onlinecourses.nptel.ac.in/noc18_de02/preview, Accessed on 25th July, 2018

SELF LEARNING ELECTIVE(MOOCS)
17CS2506C
SOCIAL NETWORKS

Course Category:	Self Learning Elective	**Credits:**	2
Course Type:	Theory	**Lecture -Tutorial-Practice:**	0-0-0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Study of theories related to social, information networks and their applications on real-world datasets.
CO2	Crunch the online available graph datasets and process them with the help of python networkx package
CO3	Visualize the graph datasets
CO4	Understand real world scenarios

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1			**3**	**2**	**1**									
CO2					**3**									
CO3				**3**	**1**									
CO4					**2**	**3**								

COURSE CONTENT

The minimum content to be covered

Introduction to Graph Theory and Python

Analyzing Online Social Network Datasets

Power Law and Emergent Properties

Strength of Weak Ties

Homophily and Social Influence

Structural Balance

The Structure of the Web

Link Analysis and Web Search

Link Prediction

Information Cascades

Diffusion Behavior in Networks

The Small World Phenomenon

TEXT BOOKS

[1] Networks, Crowds and Markets by David Easley and Jon Kleinberg, Cambridge University Press, 2010

REFERENCE BOOKS

[1] Social and Economic Networks by Matthew O. Jackson, Princeton University Press, 2010

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://nptel.ac.in/courses/106106169/, Accessed on June 24th, 2018

SELF LEARNING ELECTIVE(MOOCS)
17CS2506D
PROGRAMMING IN C++

Course Category:	Self Learning Elective	**Credits:**	2
Course Type:	Theory	**Lecture -Tutorial-Practice:**	0-0-0
Prerequisites:	Programming in C	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand how C++ improves C with object-oriented features
CO2	Write the programs using C++ features such as composition of objects, Operator overloading, inheritance, Polymorphism etc.
CO3	Apply the concepts of object-oriented programming like structures, unions etc.
CO4	Implement how inheritance and virtual functions implement dynamic binding with polymorphism.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**1**	**2**											
CO2			**3**											
CO3			**3**		**1**								**3**	**3**
CO4					**3**									

COURSE CONTENT

The minimum content to be covered

Programming in C++ is Fun: Build and execute a C program in C++, Write

equivalent programs in C++

C++ as Better C : Procedural Extensions of C
Overview of OOP in C++ : Classes and basic Object-Oriented features (encapsulation)

Overview of OOP in C++ : More OO features, overloading, namespace and using struct and union

Inheritance : Generalization / Specialization of Object Modeling in C++

Polymorphism : Static and Dynamic Binding

Type Casting & Exceptions : C++ cast operators; C++ Exceptions & standard exception classes

Templates & STL – Function and Class templates and using STL like containers, algorithms

TEXT BOOKS

[1] The C++ Programming Language by Bjarne Stroustrup, 2013. Or, Programming: Principles and Practice Using C++ by Bjarne Stroustrup, 2014 – These books will be followed in the course

REFERENCE BOOKS

[1] The C Programming Language (Ansi C Version) by Brian W. Kernighan and Dennis M. Ritchie, 1990. Or, The C Programming Language by Brian W. Kernighan and Dennis M. Ritchie, 2015

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://nptel.ac.in/courses/106106169/, Accessed on June 24th, 2018 3. C++ reference (C++98 and C++03). http://en.cppreference.com/w/

SELF LEARNING ELECTIVE(MOOCS)
17CS2506E
ADVANCED COMPUTER ARCHITECTURE

Course Category:	Self Learning Elective	**Credits:**	2
Course Type:	Theory	**Lecture -Tutorial-Practice:**	0-0-0
Prerequisites:	Computer organization	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the Concept of Pipelining and its applications. .
CO2	Explore Instruction Level Parallelism & data Level Parallelism
CO3	Understand the design & optimization techniques of cache memory
CO4	Understand the design Concepts of DRAM.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													1
CO2	1	2	2											1
CO3	1	2												
CO4	1	2												

COURSE CONTENT

The minimum content to be covered

Review of Basic Computer Organization, Performance Evaluation Methods, Introduction to RISC Instruction Pipeline, Instruction Pipeline and Performance. Pipeline Hazards and Analysis, Branch Prediction, MIPS Pipeline for Multi-Cycle Operations.

Compiler Techniques to Explore Instruction Level Parallelism, Dynamic Scheduling with Tomasulo's Algorithm and Speculative Execution. Advanced Pipelining and Superscalar Processors, Exploiting Data Level Parallelism: Vector and GPU Architectures.

Introduction to Cache Memory, Block Replacement Techniques and Write Strategy, Design Concepts in Cache Memory. Basic and Advanced Optimization Techniques in Cache Memory, Cache Optimization using gem5.

Introduction to DRAM System, DRAM Controllers and Address Mapping, Secondary Storage Systems, Design Concepts in DRAM and Hard Disk.

TEXT BOOKS

[1] Computer Architecture - A Quantitative Approach,5th edition, John L. Hennessy, David A. Patterson.
[2] Computer Systems Design and Architecture, 2nd Edition, Vincent P. Heuring

REFERENCE BOOKS

[1] Computer Organization and Architecture, 6th Edition, William Stallings
[2] Advanced Computer Architectures-A Design Space Approach, Dezsosima, Terence Fountain, Peter Kacsuk.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Advanced computer architecture by Prof. John Jose, IIT Guwahati https://swayam.gov.in/nd1_noc19_cs62/preview (Accessed on 10-8-18)

17TP1507
PERSONALITY DEVELOPMENT

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Learning by Doing	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	100 0 100

COURSE OUTCOMES

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

CO1	Perform as good team player.
CO2	Proficient in academic presentations.
CO3	Know the corporate etiquette.
CO4	Develop analytical skill set through case studies.
CO5	Develop competency in personal interviews, group discussions and succeed in professional and personal life.
CO6	Present them-selves with "corporate readiness".

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1										**3**	**3**			
CO2									**3**	**3**	**3**			
CO3										**3**	**3**			
CO4								**2**		**3**	**3**			
CO5										**2**	**3**			
CO6										**3**				

COURSE CONTENT

UNIT – I

- Self-Introduction
- Shaping Young Minds – A Talk by Azim Premji (Listening Activity)
- Self – Analysis, Developing Positive Attitude
- Perception – Importance of analytical thinking

UNIT – II

- Communication Skills – Need and Methods
- Body-Language-I; How to interpret and understand other's body language
- Body Language – II; How to improve one's own Body Language
- Anger Management

UNIT – III

- Stress Management
- Time Management – Methods of using time effectively
- Social , Business & Dining Etiquette
- Telephone and Email Etiquette

UNIT-IV

- Standard Operation Methods - Note Making & Note Taking
- Minutes Preparation
- Email Writing
- Email – Practice Session
- Letter Writing – Formal & Informal

UNIT – V

- Team Building
- Leadership Qualities
- Six Thinking Hats

UNIT – VI

- Vocabulary
- Correction of Sentences
- Sentence Completion – Course of Action
- Sentences Assumptions

UNIT – VII

- Sentence Arguments
- Reading Comprehension-Practice work
- Group Discussion
- Group Discussion – Practice Session

UNIT-VIII

- Resume Preparation
- Interview Skills
- Mock Interviews.

METHODOLOGY

Audio—Visuals / Hand Outs (Compiled/Created by Training Division, T&P Cell, VR Siddhartha Engineering College), Board & Chalk and Interactive Sessions.

17CS3509
MICROPROCESSORS AND MICROCONTROLLERS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Digital logic design, Computer organization	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the fundamental concepts of 8086 μP and its internal Architecture.
CO2	Apply 8086 μP Programming Knowledge to solve the problems.
CO3	Understand the concepts of 8086 microprocessor interrupts
CO4	Implement programs to interface the 8086 Microprocessor with Analog and Digital devices.
CO5	Understand the internal architecture& programming of 8051 microcontroller.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	1	2	3											
CO3	2													
CO4		3	3											
CO5	2	2	2											

COURSE CONTENT

UNIT I

The 8086 Microprocessor:

Overview of microcomputer structure & operation, overview of 8086 microprocessor family, features of advanced Pentium processors, 8086 internal architecture, Machine language Vs assembly language, 8086 addressing modes. 8086 pin diagram, 8086 minimum mode and maximum mode

UNIT II

8086 Instruction Set & Programming:

Data transfer instructions, arithmetic instructions, bit manipulation instructions, string instructions, program execution transfer instructions, and processor control instructions, Assembler directives.

Standard 8086 assembly language program structure, Assembly language program development tools, writing simple programs in 8086 assembly language, Writing and using procedures and assembler macros

UNIT III

Interrupts: 8086 interrupts and interrupt responses, 8259A priority interrupt controller

Interfacing With 8086 Microprocessor

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

UNIT IV

The 8051 Microcontroller: 8051 micro controller hardware, inputs/ outputs pins, ports and circuits, counters and timers, serial data input/output, interrupts.

Programming The 8051:

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

TEXT BOOKS

[1] Douglas V Hall, "Microprocessor and Interfacing", 3rd edition, McGraw Hill, 2016.

[2] Kenneth J. Ayala, "8051 MICRO CONTROLLER ARCHITECTURE" 3rd edition, Thomson Delmar Learning, 2007

REFERENCE BOOKS

[1] K M Bhurchandi, A.K.Ray, "Advanced Microprocessors and Peripherals", 3rd edition, McGraw Hill, 2014

[2] A.Nagoor Kani, "Microprocessors and Microcontrollers", 2nd edition, McGraw Hill, 2015

[3] Microprocessors and Microcomputer-Based System Design , Mohamed Rafiquzzaman , 2nd Edition , CRS press,1995

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Krishna Kumar, IISc Bangalore "Microprocessors and Microcontrollers" [Web Content]. Available: http://nptel.ac.in/courses/106108100/ (Accessed on 10-8-18)

17CS3551
DATABASE MANAGEMENT SYSTEMS LABORATORY

Course Category:	Programme Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:	Object Oriented Programming using Java, Web Technologies	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Design and implement a database schema for a given problem-domain
CO2	Model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
CO3	Apply normalization process for database design
CO4	Implement various OLAP operations
CO5	Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Key-Value Pair NoSQL databases.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1												1	1
CO2		2	3								1		1	1
CO3		2	3								1		2	2
CO4		2	3								1		1	1
CO5	2	3									1		2	2

COURSE CONTENT

PART-A (SQL, PL/SQL)

Task 1:
Defining schemas for applications (Creating tables, Renaming tables, Data constraints (Primary key, Foreign key, Not Null), Data insertion into a table)

Task2:
Execute the aggregate functions like count, sum, avg etc. on the suitable database. Make use of built in functions according to the need of the database chosen. Retrieve the data from the database based on date function. Use group by and having clauses.

Task3:
Implementation of different types of Joins, views, Sub-queries

Task4:
Draw ER diagram for an application with at least 3 entities and relationships between them using a tool. Perform ER to Relational Mapping to derive Relational database

Task5:
Write a PL/SQL block to implement various control structures

Task6:
Write a PL/SQL block to implement all types of cursors.

Task7:
Create simple procedure, procedures with parameters like IN,OUT & INOUT on the given schemas . Differentiate Function & Procedure. Create simple function on the given schema

Task8:
Execute statement level and row level trigger on the given schema

PART-B (No SQL)

Task 9:
Create a NoSQL database for a sample application and perform CURD operations

Task 10:
Create a data warehouse and Implement OLAP operations

Task 11:

Design and Implement Database operations (add, delete, edit etc.) using SQLite.

PART-C (DBMS LAB PROJECT)

Design and Implement the given Database Application using following requirements

- **Database Analysis and Design**
  - ✓ **Build Conceptual schema using tools**
  - ✓ **Apply Normalization process for relational database design**
  - ✓ **Relational Model Database**
- **Implementation:**
  - ✓ Front End: Java/Perl/PHP/Python/Ruby/.net
  - ✓ Backend: SQL/MySQL/SQLite
  - ✓ Database Connectivity: ODBC/JDBC/Servlets
- **Testing: Data Validation**

TEXT BOOKS

[1] Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems",7thedition, Pearson Education Ltd, 2016.

REFERENCE BOOKS

[1] Gordon S Linoff Data Analysis Using SQL and Excel, 2nd Edition Wiley 2016

[2] Joan Casteel, Oracle 12c:SQL, Cengage Learning ,2017

[3] J D Ullman, "Principles of database systems", Computer Science Press, 2001.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof Arnab Bhattacharya IIT Kanpur, SQL Introduction https://nptel.ac.in/courses/106104135/10

[2] Prof Arnab Bhattacharya IIT Kanpur SQL: Updates, Joins, Views and Triggers https://nptel.ac.in/courses/106104135/11

[3] Geoff Allix and Graeme Malcolm: Microsoft , Querying with Transact-SQL (edX) https://www.mooc-list.com/course/querying-transact-sql-edx

17CS3552
MICROPROCESSOR LABORATORY

Course Category:	Programme Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:	Digital logic design, Computer organization	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the fundamental concepts of 8086 μP and its internal Architecture.
CO2	Apply 8086 μP Programming Knowledge to solve the problems.
CO3	Understand the concepts of 8086 microprocessor interrupts
CO4	Implement programs to interface the 8086 Microprocessor with Analog and Digital devices.
CO5	Understand the features of peripheral devices and internal architecture of 8051 microcontroller.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	1	2	3											
CO3	2													
CO4		3	3											
CO5	2		2											

COURSE CONTENT

Task 1: Data transfer instructions (With different Address Modes).

Task 2: Demonstration on 8086 μP Flag Register with operations.

Task 3: Arithmetic instructions (8-bit /16-bit Data Size With different Address Modes)

Task 4: Loop instructions

Task5: Jump instructions

Task 6: Logical/ rotate/ shift instructions

Task 7: String instructions.

Task 8: Demonstration of subroutines Execution

Task 9: ADC interfacing

Task 10: DAC interfaces

Task 11: Stepper motor interfacing

Task12:Complete study of ARM Cortex processor

TEXT BOOKS

[1] Douglas V Hall, "Microprocessor and Interfacing", 3rd edition, McGraw Hill, 2016.

[2] Kenneth J. Ayala, "8051 MICRO CONTROLLER ARCHITECTURE" 3rd edition, Thomson Delmar Learning, 2007

REFERENCE BOOKS

[1] K M Bhurchandi, A.K.Ray, "Advanced Microprocessors and Peripherals", 3rd edition, McGraw Hill, 2014

[2] Microprocessors and Microcomputer-Based System Design , Mohamed Rafiquzzaman , 2nd Edition , CRS press,1995.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Krishna Kumar, IISc Bangalore "Microprocessors and Microcontrollers" [Web Content]. Available: http://nptel.ac.in/courses/106108100/ (Accessed on 10-8-18)

17CS2553A
ADVANCED PROGRAMMING in JAVA LABORATORY

Course Category:	Open Elective	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:	C Programming Laboratory, Java Programming Laboratory	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Create GUI application
CO2	Create distributed application
CO3	Develop web application
CO4	Develop enterprise application

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3				1									
CO2		2	1		1								1	1
CO3			2		2				1				2	
CO4			2		3				2		2		3	3

COURSE CONTENT

Task 1:

Course Outcome: CO1: *Create GUI application*

Topic: *Java Swings.*

Create a GUI application in java using Swing components, which enter the details of an Employee and on the submit display the details of the Employee (Employee details is like contains name, code, address, phone, joining details, blood group etc.)

Task 2:
Course Outcome: CO1: *Create GUI application*
Topic: *Java Swings and JDBC Connectivity.*

Design Employee Database for company or Organization (Employee Personal Details,
Department, Salary (basic, DA, HRA.,) Details) and develop JDBC based java application for following tasks:
1. Insert Records into respective table
2. Select records of particular table of database
3. Delete Records from table.
Connect GUI application to database and perform SQL commands via JDBC API

Task 3:
Course Outcome: CO1: *Create distributed application*
Topic: *Lambda Expressions.*

Create a simple java application for guessing game and keep track about top five scores for each game played by the user with implementation of lambda expressions.

Task 4:
Course Outcome: CO2: *Create distributed application*
Topic: *Network Programming*

Create Application for Datagram server and Client interaction as per given below.
i] Datagram server to send a message to client.
ii]Datagram client to receive the message sent by the server.
Create a simple UDP chat application where client and server can chat with each other. Write a client server program using TCP where client sends 10 numbers to server program and server program responds with the numbers in ascending order to respective client.

Task 5:
Course Outcome: CO2: *Create distributed application*
Topic: *RMI Programming*

Write an RMI client server String operations application. RMI server provides two

remotely accessible methods:
long findStringLength(String s); //returns length of a String parameter
boolean checkPalindrome(String s); //determines whether a String
//parameter is palindrome or not

Task 6:
Course Outcome: CO3: *Create web application*
Topic: *Servlets*

Verify installation and setting of Web container/Web Server/Tomcat and prepare an installation report, which contains setting of class path,server port, starting and shutting down of server.
Develop web Application to display a greeting message in the browser by using Servlet interface.

Task 7:
Course Outcome: CO3: *Create web application*
Topic: *Servlets*
Create a simple Sign in and Signup web application using HTTPServlet class.

Task 8:
Course Outcome: CO3: *Create web application*
Topic: *Servlets*

Create Servlet for registering a new user and displaying the number of visits made by the existing user using cookies.

Task 9:
Course Outcome: CO3: *Create web application*
Topic: *Java Server Pages*
Create JSP to output, "Welcome to JSP world. The time now is: system current time. Use a scriptlet for the complete string, including the HTML tags.

Task 10:
Course Outcome: CO3: *Create web application*
Topic: *Java Server Pages*
Create a simple JSP application for online poll application that prompts the user to answer a question and display the results in bar graph representation.

Task 11:

Course Outcome: CO3: *Create enterprise application*

Topic: *Spring framework*

Create a simple web application for online poll application that prompts the user to answer a question and display the results in bar graph representation and use spring framework in development.

Lab Projects:

1. Apply the concepts of Java Swings, JDBC Connectivity and Networking programming to develop any real-time GUI based application.

   Ex. e-Shopping cart application.

2. Apply the key concepts of Servlets, JSP and EJB to develop web based application.

   Ex. interactive online-based quiz application.

TEXT BOOKS

[1] Herbert Schildt, "Java, The Complete Reference", Ninth Edition, Oracle Press, 2018. [Unit- I Chapter 1, Unit- II Chapter 1, Unit- III Chapter 1].

[2] H. M. Deitel, P.J. Deitel, S.E. Santry, " Advanced Java 2 Platform How to Program", 3rd Edition, 2016, Prentice Hall Publications. [Unit Chapter 2, Unit- II Chapter 2, Unit-IV Chapter 2]

[3] Hans Bergsten, "JavaServer Pages", 3rd Edition 2017, O'Reilly Media. [Unit III Chapter 2 , Unit- IV Chapter 1].

[4] Web Reference: https://www.javatpoint.com/spring-and-struts2-integration [Unit IV Chapter 3]

REFERENCE BOOKS

[1] Paul J. Dietel and Dr.Harvey M. Deitel, "Java How to Program", 9th Edition, Prentice-Hall, Pearson Education, 2016.

[2] David Geary, Cay S. Horstmann "Core JavaServer Faces" Third edition, 2016, Prentice Hall.

[3] Jim Keogh, "The Complete reference to J2EE", reprint 2017, Tata McGraw-Hill .

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Abhay Redkar, JSF Developer,"Struts 2 Framework for beginners", Udemy.https://www.udemy.com/struts-2-framework-for-beginners/ Available: Last accessed on August 2018.

[2] Prof. I. Sengupta. (14th , May, 2017), Department of Computer Science & Engineering, I.I.T.,Kharagpur, "Internet Technologies", NPTEL videos

17CS2553B
COMPUTER GRAPHICS LABORATORY

Course Category:	Open Elective	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:	Basics of Mathematics (Algebra and Matrix Operations)	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand working of different display device.
CO2	Apply Different Point Plotting techniques.
CO3	Demonstrate different 2D and 3D Object Transformation and Viewing.
CO4	Illustrate various 3D Projection and 2D Clipping
CO5	Understand computer animation sequence.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**3**												
CO2	**3**	**3**												
CO3	**3**	**3**												
CO4	**3**	**3**												
CO5		**2**											**2**	

COURSE CONTENT

Task 1: Digital Differential Analyzer Algorithm

Task 2: Bresenham’s Line Drawing Algorithm

Task 3: Midpoint Circle Generation Algorithm

Task 4: Ellipse Generation Algorithm

Task 5: Creating various types of texts and fonts

Task 6: Creating two dimensional objects

Task 7: Two Dimensional Transformations

Task 8: Colouring the Pictures

Task 9: Three Dimensional Transformations

Task 10: Curve Generation

Task 11: Simple Animations using transformations

Task 12: Key Frame Animation

TEXT BOOKS

[1] Donald D. Hearn & M. Pauline Baker "**Computer Graphics, C version**" 2nd Edition, Pearson Education, New Delhi, 2005

REFERENCE BOOKS

[1] S. Harrington "Computer Graphics- A Programming Approach", McGraw Hill Publication, New Delhi, 1994.

[2] W.M.Newman and RF Sproull "Principle of Interactive Computer Graphics", McGraw Hill Publication, New Delhi, 1995

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Dr. Sukhendu das, "Computer Graphics", IIT Madras
http://nptel.iitm.ac.in/video.php?subjectId=106106090

[2] Prof.Dr.Prem Kalra, "Computer Graphics", IIT Delhi
http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv046-Page1.htm

17CS3554
COMPETITIVE CODING – II

Course Category:	Programme Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0-0-2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand the basic concepts such as Stacks, Queues, Linked Lists and Hashing Techniques in the programming language
CO2	Analyse the programs on pointers, dynamic programming concepts
CO3	Solve the problems with given test cases
CO4	Apply programing skills for optimized code and derive the solutions according to the provided constraints

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1											
CO2		3											2	2
CO3		1							2		3		3	3
CO4	2	3									2		2	2

COURSE CONTENT

Solving the programs under “Easy / Medium” category in CodeChef & HackerRank, etc. Students must solve 20 problems related to Data Structures in CodeChef / HackerRank, etc. The category may be under Easy / Medium. Students shall participate at least two contests per month, hosted in online judges. Problems to be solved in C.

A minimum of 15 problems shall be solved per week in either CodeChef /

HarckerRank, etc.

Monthly contests hosted in CodeChef / HackerRank, etc,. may be taken as day to day assessment of laboratory. Monthly one such evaluation

The work will be carried out in the laboratory slot allotted as well as at the home.

TEXT BOOKS

[1] Halim, Steven and Halim, Felix, Competitive Programming 3, 2013.
[2] Ahmed Shamsul Arefin, Art of Programming Contest, ACMSolver, Second Edition, 2012

REFERENCE BOOKS

[1] Programming Challenges: The Programming Contest Training Manual By Steven S Skiena, Miguel A. Revilla
[2] Guide to Competitive Programming: Learning and Improving Algorithms Through Contests By Antti Laaksonen

E- RESOURCES AND OTHER DIGITAL MATERIAL

[1] Topcoder tutorials - https://www.topcoder.com/community/data-science/data-science-tutorials/
[2] Nite Nimajneb's site - http://comscigate.com/Books/contests/icpc.pdf
[3] Slides from a Stanford Course - http://web.stanford.edu/class/cs97si/
[4] Halim, Steven and Halim, Felix, Competitive Programming 3, 2013. Ebook available at lulu.com. Site associate with with the book is http://cpbook.net

17MC1508
BIOLOGY FOR ENGINEERS

Course Category:	Mandatory Learning	**Credits:**	-
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Describe the fundamental Principles and methods of engineering
CO2	Identify the functions of different types in bio-molecules
CO3	Describe mechanisms underlying the working of molecular biological processes including enzyme catalysis, metabolic pathways, gene expression.
CO4	Use Excel, MATLAB and other computational tools to quantitatively analyze biological processes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3												
CO2		3												
CO3		2		3										
CO4		1		2	3									

COURSE CONTENT

Unit-I Introduction and Classification of Living organisms

Introduction:

Fundamental differences between science and engineering by drawing a

comparison between eye and camera, Bird flying and aircraft. Biology as an independent scientific discipline. Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor.

Classification:

Classification of living organisms based on (a) Cellularity- Unicellular or multicellular (b) Ultrastructure- prokaryotes or eukaryotes. (c) Energy and Carbon utilization -Autotrophs, heterotrophs, lithotrophs (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitat- acquatic, terrestrial (e) Molecular taxonomy- three major kingdoms of life.

Unit-II Biomolecules and Enzymes

Biomolecules:

Biomolecules: Structures of sugars(Glucose and Fructose), starch and cellulose. Nucleotides and DNA/RNA. Amino acids and lipids. Proteins- structure and functions- as enzymes, transporters, receptors and structural elements.

Enzymes:

Enzyme classification. Mechanism of enzyme action.

Enzyme kinetics and kinetic parameters.

Unit-III Genetics and Gene information Transfer

Genetics:

"Genetics is to biology what Newton's laws are to Physical Sciences" Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Concepts of recessiveness and dominance. Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring.

Information Transfer:

DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Unit-IV Metabolism and Microbiology

Metabolism:

Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. ATP as an energy currency. Breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions.

Microbiology:

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Growth kinetics. Ecological aspects of single celled organisms. Microscopy.

TEXT BOOKS

[1] Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

[2] Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons

[3] Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

[4] Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher, Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]https://bee.cals.cornell.edu/sites/bee.cals.cornell.edu/files/shared/documents/Career_Bee_Final-for-Web.pdf

[2] https://www.teachengineering.org/subjectareas

SEMESTER - VI

17CS3601
THEORY OF COMPUTATION

ourse Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Discrete Mathematics, Digital Logic Design	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the basic concepts of formal languages of finite automata techniques.
CO2	Solve regular expressions and various problems to minimize FA.
CO3	Apply various languages to construct context free grammar.
CO4	Apply normal form techniques, Push down automata and Turing Machines to solve various problems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**2**	**3**												
CO2	**2**	**3**												
CO3		**3**	**3**								**1**			
CO4		**3**	**3**						**1**					

COURSE CONTENT

UNIT I

Finite Automata & Regular Expressions: Finite State Systems- Basic Definitions-Deterministic Finite Automata- Non-Deterministic Finite Automata and their equivalence-Finite Automata with å Moves-Regular Expressions-Finite Automata with output.

UNIT II

Properties of Regular Sets: The Pumping Lemma for regular sets - Closure Properties of Regular Sets-Decision Algorithms for regular sets.

The Myhill – Nerode Theorem and minimization of Finite Automata.

Context Free Grammars: Context Free Grammars- Derivation Trees- Simplification of context free grammars.

UNIT III

Chomsky Normal Form-Greibach Normal Form-Pushdown Automata-Informal Description: Definitions-Pushdown Automata Context Free Languages-Properties of Context Free Languages- The Pumping Lemma for CFL's. Closure Properties of CFL's- Decision Algorithms for CFL's.

UNIT IV

Turing Machines: Introduction- Turing Machine Model-Computable Languages and functions-Techniques of Turing Machine Construction.

Undecidability: Properties of Recursive and Recursively Enumerable languages-Universal Turing Machines (without any reference to undecidable problems).

TEXT BOOKS

[1] John E Hopcroft, Jeffery D Ullman, Introduction to Automata Theory & Languages and Computation . Narosa Publishing House, 2002

REFERENCE BOOKS

[1] K.L.P Mishra, N. Chandrasekaran, Theory of Computer Science (Automata, Languages and Computation), Prentice Hall India, 3rd Edition, 2007.

[2] John C. Martin, Introduction to Language and Theory of Computation, TMH, 3rd Edition, 2007.

[3] Daniel Cohen, Introduction to Computer Theory, Wiley India,2ed, 2007.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://nptel.ac.in/courses/106104028/

[2] https://freevideolectures.com/course/3045/theory-of-computation-i

17CS3602
SOFTWARE ENGINEERING

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

COURSE OUTCOMES

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

CO1	Understand basic concepts of software engineering.
CO2	Compare different software engineering process models.
CO3	Analyze the principles of requirement Engineering.
CO4	Create architectural design for a given project.
CO5	Apply different testing techniques

Contribution of Course Outcomes towards achievement of Program Outcomes (1-Low, 2-Medium, 3- High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1													
CO2			1							2		1		
CO3		1	1						2		3	1		
CO4		1									3			
CO5			1								1			

COURSE CONTENT

UNIT I

Software and Software Engineering: The Nature of Software, Defining Software, Software Application Domains, Legacy Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software Engineering Practice, The Essence of Practice, General Principles, Software Myths.

The Software Process: Process Models, A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

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

UNIT II

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements. Requirements Modelling: Scenarios, Information and Analysis classes: Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling.

Requirements Modelling: Flow, Behavior, Patterns, And Web apps: Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirements Modeling for Web Apps.

UNIT III

Design Concepts: Design within the Context of Software Engineering, the Design Process, Design Concepts, the Design Model. Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Assessing Alternative Architectural Designs, Architectural mapping using data flow.

Modeling Component-Level Design: What Is a Component? Designing Class-Based Components, Conducting Component Level Design, and Component level design for Web Apps. Performing User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design.

UNIT IV

Software Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Validation testing, System testing, the art of debugging.

Testing Conventional Applications: Software Testing Fundamentals, Internal and External Views of Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Model-Based Testing, Testing for Specialized Environments, Architectures, and Applications, Patterns for Software Testing.

TEXT BOOKS

[1] Roger S.Pressman, "Software Engineering- A Practitioner's Approach". Tata McGraw-Hill International 7th ed, 2010.

REFERENCE BOOKS:

[1] Ian Somerville, "Software Engineering". 9th ed, Pearson Education. 2011.

[2] Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, "Fundamentals of Software Engineering".2 ed, PHI. 2009

[3] RajibMall, Fundamentals of Software Engineering. 3 ed, PHI. 2009.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://nptel.ac.in/courses/106101061/2

[2] https://nptel.ac.in/courses/106101061/5

17CS4603A
CLOUD COMPUTING

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

COURSE OUTCOMES

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

CO1	Understand various basic concepts related to cloud computing technologies
CO2	Understand different cloud programming platforms and tools
CO3	Explain and characterize different cloud deployment models and service models
CO4	Identify the security issues in cloud computing

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3					1		1		3	1	2	2
CO2	3	3					1		1		3	1	2	2
CO3	3	3							1	1	3	1	2	2
CO4	3	3					1		1	1	3	1	2	2

COURSE CONTENT

UNIT I: Introduction & Cloud Computing Architecture

Cloud computing at a glance: The vision of cloud computing, Defining a cloud, A closer look, The cloud computing reference model, Characteristics and benefits

Historical developments: Distributed systems, Virtualization, Web 2.0, Service-

oriented computing, Utility-oriented computing

Building cloud computing environments: Application development, Infrastructure and system development, Computing platforms and technologies

The cloud reference model: Architecture, Infrastructure-and hardware-as-a-service, Platform as a service, Software as a service

Types of clouds: Architecture, Infrastructure-and hardware-as-a-service, Platform as a service, Software as a service,

Open Challenges: Cloud definition, Cloud interoperability and standards, Scalability and fault tolerance, Security, trust, and privacy, Organizational aspects.

UNIT II: Virtualization & SOA

Introduction, Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques - Execution Virtualization, Other types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples – Xen, VMware, Microsoft Hyper-V

Introducing Service Oriented Architecture - Event-driven SOA or SOA 2.0, The Enterprise Service Bus, Service catalogs

Defining SOA Communications - Business Process Execution Language, Business process modeling

Managing and Monitoring SOA - SOA management tools, SOA security, The Open Cloud Consortium, Relating SOA and Cloud Computing

UNIT III: Cloud Platforms, Applications and Cloud Programming and Software Environments

Amazon web services - Compute services, Storage services, Communication services and Additional Services. **Google AppEngine -** Architecture and core concepts, Application life cycle, Cost model, Observations. **Microsoft Azure** – Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance

Scientific Applications – Healthcare, Biology, Geoscience, **Business and Consumer Applications –** CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming

Features of Cloud and Grid Platforms - Cloud Capabilities and Platform Features, Traditional Features Common to Grids and Clouds, Data Features and Databases, Programming and Runtime Support

Programming Support of Google App Engine - Programming the Google App Engine, Google File System (GFS), BigTable, Google's NOSQL System, Chubby, Google's Distributed Lock Service. **Programming on Amazon AWS and Microsoft Azure** - Programming on Amazon EC2, Amazon Simple Storage Service (S3), Amazon Elastic Block Store (EBS) and SimpleDB, Microsoft Azure Programming Support.

UNIT IV: Cloud Security and Mobile Cloud

Securing the Cloud - The security boundary, Security service boundary, Security mapping.

Securing Data - Brokered cloud storage access, Storage location and tenancy, Encryption, Auditing and compliance.

Establishing Identity and Presence - Identity protocol standards, Windows Azure identity standards, Presence.

Working with Mobile Devices - Defining the Mobile Market, Connecting to the cloud, Adopting mobile cloud applications.

TEXT BOOKS

[1] Rajkumar Buyya, Christian Vecchiola, S Tamarai Selvi "Mastering Cloud Computing Foundations And Applications Programming" , McGraw Hill Education, 2016.
[2] Kai Hwang, Geoffrey C Fox, Jack J Dongarra, "Distributed and Cloud Computing - From Parallel Processing to the Internet of Things", Morgan Kaufman Publishing, 2012
[3] Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishers, 2012

REFERENCE BOOKS

[1] Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012
[2] Thomas Erl, "Cloud Computing: Concepts, Technology & Architecture", 1st Edition, Pearson, 2014

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://cs.uwaterloo.ca/~a78khan/courses-offered/cs446/2010_05/lecture-slides/16_CloudComputing.pdf
[2] http://www.cs.iit.edu/~iraicu/teaching/CS553-S12/index.html
[3] https://www.youtube.com/user/arch4cloud/playlists

17CS4603B
LINUX ESSENTIALS

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

COURSE OUTCOMES

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

CO1	Understand and work confidently in Linux Environment
CO2	Apply the security and administration mechanisms for user or group management and permissions
CO3	Write shell scripts for solving problems
CO4	Develop the client/server communication using IPC mechanisms

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		2									2	2	
CO2	3		3									2	2	
CO3	3		3									2	2	
CO4	3		2									2	2	

COURSE CONTENT

UNIT I

Selecting an Operating System: What Is an OS, Investigating User interfaces.

Using Common Linux Programs: Using a Linux Desktop Environment, Working with Productivity Software, Using Server Programs, Managing Programming Languages, Handling Software Packages.

UNIT II

Managing Hardware: Learning about Your CPU, Understanding Disk Issues,

Managing Displays, Handling USB Devices, Managing Drivers.
Getting to Know the Command Line: Starting a Command Line ,Running Programs ,Using Shell Features ,Getting Help Using man Pages ,Getting Help Using info Pages.

UNIT III
Managing Files: Navigating Files and Directories, Manipulating Files, Manipulating Directories.
Searching, Extracting, and Archiving Data: Using Regular Expressions Searching for and Extracting Data, Redirecting Input and Output, Archiving Data.
Exploring Processes and Process Data: Understanding Package Management, Understanding the Process Hierarchy, Identifying Running Processes, Using Log Files.

UNIT IV
Creating Scripts: Beginning a Shell Script, Using Commands, Using Arguments Using Variables, Using Conditional Expressions, Using Loops, Using Functions.
Understanding Basic Security: Understanding Accounts, Using Account Tools, Working as root.
Managing Network Connections: Understanding Network Features, Configuring a Network Connection, Testing Your Network Connection, Protection.

TEXT BOOKS

[1] Christine Bresnahan, Richard Blum," Linux Essentials", 2nd Edition, September 2015

REFERENCE BOOKS

[1] Richard Petersen, "Linux:The Complete Reference", 6th edition, Tata McGraw-Hill, 2007.
[2] Mc Kinnon, Mc Kinnon, "Installing and Administrating Linux", 2nd edition, Wiley, 2004.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] www.linuxhomenetworking.com
[2] http://www.oreillynet.com/linux/cmd/
[3] www.iu.hio.no/~mark/unix/unix.html

17CS4603C
STATISTICS WITH R

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

COURSE OUTCOMES

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

CO1	Apply statistical methods to data for inferences and introduce the concepts of R
CO2	Analyze the libraries for data manipulation and data visualization in R
CO3	Analyze data-sets to create testable hypotheses and identify appropriate statistical tests
CO4	Analyze and summarize data-sets to fit linear and nonlinear models .

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2			2								2	2
CO2	2	1			2								2	2
CO3	3	2		3									1	2
CO4	3	2	3	2	2								1	2

COURSE CONTENT

UNIT I

Introduction: How to run R, R Sessions ,Introduction to Functions, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes.

R Programming Structures: Control Statements, Loops, - Looping Over Non vector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return-

Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quick sort Implementation-Extended Extended Example: A Binary Search Tree.

UNIT-II

Doing Math and Simulation in R: Math Function, Extended Example Calculating Probability Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices. Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files, Simulation Processing in R.

UNIT-III

Graphics: Creating Graphs, The Workhorse of R Base Graphics, the plot () Function – Customizing Graphs, Saving Graphs to Files.

Probability Distributions: Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

UNIT-IV

Linear Models: Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines, Decision Trees, Random Forests.

TEXT BOOKS

[1] Norman Matloff, The Art of R Programming, No Starch Press, San Francisco 2011 [Unit I,II,III]

[2] Jared P. Lander, R for Everyone, Addison Wesley Data & Analytics Series, Pearson, 2014.[Unit III,IV]

REFERENCE BOOKS

[1] Rob Kabacoff and Dale Ogden, R in Action, Manning, Second Edition, 2018

[2] G. Jay Kerns, Introduction to Probability and Statistics using R, First Edition, 2010

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Mine Çetinkaya-Rundel, David Banks, Colin Rundel, Merlise A Clyde, Duke University, (8,08,2019). Statistics with R Specialization.
Available: https://www.coursera.org/specializations/statistics

[2] Rafael Irizarry, Michael Love, Statistics with R, Harvard University (08, 08, 2019) Available: https://www.edx.org/course/statistics-r-harvardx-ph5251x-1

17CS4604A
INTERNET OF THINGS

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

COURSE OUTCOMES

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

CO1	Understand the basic principles and architecture of IoT.
CO2	Determine the components used as smart objects and access technologies.
CO3	Understand network and application layer protocols for IOT
CO4	Relate data analytics and IOT and understand IOT security protocols.
CO5	Apply IOT related technologies for smart cities and transportation.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1											
CO2			2		2								2	
CO3	2				2									
CO4	3				2									
CO5		3	3		3								2	3

COURSE CONTENT

UNIT I

Introduction to IoT: Genesis of IOT, IOT and digitization, IOT impact, Convergence of IT and OT, IOT challenges.

IoT Network Architecture and Design: Drivers behind network architecture. Comparing IOT architectures, a simplified IOT architecture, the core IOT functional stack, IOT data management and compute stack.

UNIT II

Smart Objects: The "Things" in IoT: Sensors, Actuators and Smart Objects, sensor networks

Connecting Smart objects: Communication criteria, IOT access technologies: IEEE 802.15.4, Lora WAN

UNIT III

Protocols For IoT: Optimizing IP for IOT, the transport layer, IOT application transport methods: introduction to SCADA, IOT application layer Protocols: COAP, MQTT.

Data and Analyttics for IoT: Introduction to data analytics for IOT, Edge streaming Analytics, Network Analytics.

UNIT IV

Securing IOT: History of OT security, Common challenges in OT security, IT and OT Security Practices and systems vary.

IOT Applications: SMART and Connected CITIES: IOT Strategy for smarter cities, smart city IOT architecture, Smart city security architecture, smart city –use case examples **TRANSPORTATION:** Transportation challenges, IOT architecture for Transportation, IOT use cases for transportation.

TEXT BOOKS

[1] David Hanes, "IOT FUNDAMENTALS" 1ST edition, CISCO PRESS, 2018

REFERENCE BOOKS

[1] ArshdeepBahga, Vijay Madisetti " Internet of Things(A hands on approach)" 1ST edition, VPI publications,2014
[2] Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2017

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Sudip misra, IIT Kharagpur "Introduction to Internet of things".
Available: http://nptel.ac.in/courses/106105166/ (Accessed on 10-8-18)

17CS4604B
MOBILE APPLICATION DEVELOPMENT

Course Category:	Programme Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-0-0
Prerequisites:	Problem Solving Methods, Programming in C, Java Programming.	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand J2ME technology
CO2	Create user interfaces for mobile application
CO3	Develop databases connection to given mobile application
CO4	Develop and deploy mobile application into an android device.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3				1									
CO2		2	1		1								1	1
CO3			2		2				1				2	
CO4			2		3				2		2		3	3

COURSE CONTENT

UNIT I

Developing for Mobile and Embedded Devices, J2ME Overview: Java 2 Micro Edition and the World of Java, Inside J2ME, J2ME and Wireless Devices

J2ME Architecture and Development Environment: J2ME Architecture, Small Computing Device Requirements, Run-Time Environment, MIDlet Programming, J2ME Software Development Kits, Multiple MlDlet in a MIDlet Suite.

UNIT II

Commands, Items, and Event Processing: J2ME User Interfaces, Display Class, Command Class, Item Class, Exception Handling.

Record Management System: Record Storage, Writing and Reading Records, Record Enumeration, Sorting Records, Searching Records, Record Listener.

UNIT III

Generic Connection Framework: The Connection, Hypertext Transfer Protocol, Communication Management Using HTTP Commands, Session Management, Transmit as a Background Process

Android: An Open Platform for Mobile Development, A Little Background, Native Android Applications, Android SDK Features, Developing for Android, Android Development Tools

UNIT IV

Creating Applications and Activities: Introducing the Application Manifest File, Externalizing Resources, The Android Application Lifecycle, A Closer Look at Android Activities.

Building User Interfaces: Fundamental Android UI Design, Android User Interface Fundamentals, Introducing Layouts.

Databases and Content Providers: Introducing Android Databases, Working with SQLite Databases

TEXT BOOKS

[1] James Keogh, "J2ME: The Complete Reference", Tata McGrawHill, 2017. [Unit I, II, IV]

[2] Reto Meier, "Professional Android Application Development", Wiley India,2012. [Unit – III]

REFERENCE BOOKS

[1] Brian Fling,"Mobile Design and Development", O'Reilly, SPD, 2011.

[2] Wei-Meng Lee, "Beginning Android Application Development", Wiley Publishing, Inc, 2012

[3] Jonathan Knudsen, "Wireless Java: Developing with J2ME",A Press ,Second Edition, 2003

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Gaurav Raina , Mr Tanmai Gopal (14th , May, 2018), Department of Computer Science & Engineering, I.I.T.,Madras, “Introduction to Mobile applications", NPTEL videos

17CS4604C
DATA COMPRESSION

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

COURSE OUTCOMES

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

CO1	Understand the data compression representations and its applications
CO2	Implement the compression techniques to compress the different raw data
CO3	Analyze the concepts associated speech, image and video compression
CO4	Analyze the usage of compression algorithms and compare its performance

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2											2	
CO2	2	3									2		2	
CO3	3	3	3						3		2		2	
CO4	2	2	3						3		3		2	

COURSE CONTENT

UNIT I

Introduction: Compression Techniques, Lossless Compression, Lossy Compression, Measures of Performance, Modeling and Coding

Mathematical Preliminaries for Lossless Compression : Overview - A Brief Introduction to Information Theory , Derivation of Average Information , Models-

Physical Models, Probability Models, Markov Models, Composite Source Model, Coding- Uniquely Decodable Codes, Prefix Codes , The Kraft-McMillan Inequality

Huffman Coding: Overview, The Huffman Coding Algorithm-Minimum Variance Huffman Codes, Optimality of Huffman Codes , Length of Huffman Codes, Extended Huffman Codes , Nonbinary Huffman Codes , Adaptive Huffman Coding- Update Procedure, Encoding Procedure, Decoding Procedure, Applications of Huffman Coding- Lossless Image Compression, Text Compression ,Audio Compression

UNIT II

Arithmetic Coding : Overview ,Introduction ,Coding a Sequence- Generating a Tag, Deciphering the Tag, Generating a Binary Code- Uniqueness and Efficiency of the Arithmetic Code ,Algorithm Implementation ,Integer Implementation, Comparison of Huffman and Arithmetic Coding, Adaptive Arithmetic Coding, Applications.

Dictionary Techniques : Overview ,Introduction, Static Dictionary- Digram Coding, Adaptive Dictionary - The LZ77 Approach, The LZ78 Approach, Applications-File Compression—UNIX compress ,Image Compression—The Graphics Interchange Format (GIF) ,Image Compression—Portable Network Graphics (PNG)

Lossless Image Compression: Overview, Introduction- The Old JPEG Standard, CALIC , JPEG-LS Multi resolution Approaches-Progressive Image Transmission, Facsimile Encoding-Run-Length Coding

UNIT III

Transform Coding : Overview, Introduction ,The Transform, Transforms of Interest- Karhunen-Loeve Transform ,Discrete Cosine Transform, Discrete Sine Transform, Discrete Walsh-Hadamard Transform, Quantization and Coding of Transform Coefficients , Application to Image Compression—JPEG- The Transform, Quantization, Coding ,Application to Audio Compression—the MDCT

Wavelet-Based Compression: Overview, Introduction, Wavelets, Multiresolution Analysis and the Scaling Function ,Implementation Using Filters -Scaling and Wavelet Coefficients ,Families of Wavelets ,Image Compression, Embedded Zerotree Coder ,Set Partitioning in Hierarchical Trees, JPEG 2000

Audio Coding : Overview, Introduction- Spectral Masking, Temporal Masking, Psychoacoustic Model, MPEG Audio Coding, Layer I Coding, Layer II Coding, Layer III Coding—*mp3*, MPEG Advanced Audio Coding - MPEG-2 AAC, MPEG-4 AAC, Dolby AC3 (Dolby Digital), Bit Allocation , Other Standards

UNIT IV

Video Compression: Overview ,Introduction, Motion Compensation, Video Signal Representation, ITU-T Recommendation H.261 - Motion Compensation, The Loop Filter, the Transform, Quantization and Coding, Rate Control, Model-Based Coding, Asymmetric Applications , The MPEG-1 Video Standard, The MPEG-2 Video Standard—H.262 ,The Grand Alliance HDTV Proposal ,ITU-T Recommendation H.263-Unrestricted Motion Vector Mode, Syntax-Based Arithmetic Coding Mode, Advanced Prediction Mode, PB-frames and Improved PB-frames Mode, Advanced Intra Coding Mode, Deblocking Filter Mode, Reference Picture Selection Mode ,Temporal, SNR, and Spatial Scalability Mode, Reference Picture Resampling , Reduced-Resolution Update Mode ,Alternative Inter VLC Mode, Modified Quantization Mode, Enhanced Reference Picture Selection Mode.

TEXT BOOKS

[1] Sayood, Khalid, "Introduction to Data Compression", 5th Edition, Morgan Kaufmann, 2017.

[2] Salomon, David**,"** Data Compression The Complete Reference",3rd Edition,Springer,2007.

REFERENCE BOOKS

[1] Saloman, "Handbook of Data Compression", springer, 2010.

[2] Parekh Ranjan, "Principles of Multimedia", TMH, 2006

17CS2605A
ARTIFICIAL INTELLIGENCE TECHNIQUES, TOOLS AND APPLICATIONS

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 – 0
Prerequisites:	Discrete Mathematics, Probability and statistics	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the basic principles and applications of Artificial Intelligence.
CO2	Represent Knowledge by using various rules.
CO3	Apply filler structures for different sentences and know the concepts of Natural Language Processing.
CO4	List the key aspects of Expert Systems and realize the concepts of Connectionist Models.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2												
CO2	1	2	3											
CO3		2	3						2					
CO4		2	3											

COURSE CONTENT

UNIT I

Problems, Problem Spaces And Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs.

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis

UNIT II

Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation.

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

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

UNIT III

Weak Slot-and-Fillers Structures: Semantic Nets, Frames

Strong Slot-and- Fillers Structures: Conceptual Dependency, Scripts.

Natural Language Processing: Introduction, syntactic processing, Semantic analysis, Discourse and pragmatic processing, Statistical Language processing, Spell checking

UNIT IV

Connectionist Models: Introduction: Hopfield Networks, Learning in Neural Networks, Applications of Neural Networks.

Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition

TEXT BOOKS

[1] Elaine Rich, Kevin Knight, Shivashankar B Nair, *"Artificial Intelligence"*, 3rd Edition, Tata McGraw Hill Edition, 2008

REFERENCE BOOKS

[1] Patrick Henry Winston 'Artificial Intelligence', 3rd Edition, Prentice Hall, 1992.

[2] Stuart Russell and Peter Norvig, 'Artificial Intelligence', 3rd Edition, Prentice Hall of India, 2009.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://nptel.ac.in/courses/106105077/

[2] https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos/

[3] https://web.stanford.edu/class/cs221/

17CS2605B
BIOINFORMATICS

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Biology for Engineers	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Know the biological sequence and structural databases.
CO2	Understand the genome information and DNA sequence analysis
CO3	Describe pair-wise and multiple sequence alignment methods
CO4	Analyze secondary structure DNA data.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1					3							2	
CO2		2				3							3	2
CO3		2				3							3	2
CO4						3							1	1

COURSE CONTENT

UNIT I

Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition an prediction, Folding problem, Sequence Analysis, Homology and Analogy.

Protein Information Resources: Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.

UNIT II

Genome Information Resources: DNA sequence databases, specialized genomic resources.

DNA Sequence Analysis: Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases.

UNIT III

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

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

UNIT IV

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

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

TEXT BOOKS

[1] T. K. Attwood and D. J. Parry-Smith, Addison Wesley Longman, Harlow, "An Introduction to Bioinformatics", 2007.
[2] Zhumur Ghosh and Bibekanand Mallick, "Bioinformatics: Principles and Applications", Oxford University Press, 2008.
[3] Arthur M. Lesk, "Introduction to Bioinformatics", Oxford University Press, Fourth Edition 2014.

REFERENCE BOOKS

[1] Jean-Michel Claverie and Cedric Notredame "Bioinformatics – A Beginners Guide", Wiley , Dreamtech India Pvt. Ltd. 2003

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Todd Mezzulo, June 29, 2003, "Sequence analysis" https://www.bioinformatics.org/
[2] Protein Secondary Structure Databases : http://cybionix.com/bioinformatics/databases/
[3] Dong Xu, , Protein Databases on the Internet https://www.ncbi.nlm.nih.gov/

17CS2605C
IMAGE PROCESSING

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

COURSE OUTCOMES

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

CO1	Explain the fundamental concepts and basic relationship among the pixels.
CO2	Differentiate the Spatial and Frequency domain concepts in image enhancement.
CO3	Identify the image restoration filter for degraded image.
CO4	Compare the lossy and lossless image compression techniques
CO5	Explain the image segmentation techniques

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	2		3								3			
CO3	3													
CO4	2	2	3								3			
CO5	3		3						3		3			

COURSE CONTENT

UNIT I

Introduction: Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System

Digital Image Fundamentals: Elements of Visual Perception, Image Sensing and

Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels

UNIT II

Intensity transformations and Spatial filtering: Some Basic intensity transformation functions, Histogram Processing,
fundamentals of Spatial Filtering, Smoothing spatial Filters, Sharpening spatial Filters

Filtering in Frequency Domain: The basics of filtering in the frequency domain, Image Smoothing frequency-domain Filters, Image Sharpening Frequency-domain Filters

UNIT III

Image restoration: A model of the image degradation/restoration process, noise models, restoration in the presence of noise–only spatial filtering, Weiner filtering, constrained least squares filtering

Color image processing: Fundamentals, color models

UNIT IV

Image Compression: Fundamentals, image compression models, some basic compression methods

Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region-Based Segmentation

TEXT BOOKS

[1] C. Gonzalez, Richard E. Woods, Digital Image Processing, 4th Edition Rafael C. 2018, Pearson

REFERENCE BOOKS

[1] A.K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall India, 4th edition, 1989.
[2] Madhuri. A. Joshi, "Digital Image Processing", PHI, 3rd edition , 2006

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. P.K. Biswas , Digital Image Processing
Available: http://www.nptel.ac.in/courses/117105079/
[2] Aggelos K. Katsaggelos, Northwestern University. "Fundamentals of Digital Image and Video Processing"
Available at: https://www.coursera.org/course/digital

17CS2605D
FUNDAMENTALS OF JAVA PROGRAMMING

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

COURSE OUTCOMES

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

CO1	Understand the concepts of object oriented programming.
CO2	Implement multiple inheritance through interfaces.
CO3	Apply exception, thread capabilities to a given application.
CO4	Apply Collections framework to a given application.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3				1									
CO2		2	1		1								1	1
CO3			2		2				1				2	
CO4			2		3				2		2		3	3

COURSE CONTENT

UNIT I

Fundamentals of Object Oriented Programming: Introduction, Object oriented paradigm, Basic concepts of Object Oriented Programming, Benefits of OOP, and Applications of OOP.

Introduction to Java: Java history, java features, how java differs from C and C++.

Data Types, variables and arrays: Java keywords, Primitive types, Integers, Floating-Point Types, Characters, Booleans, Variables, Type Conversion, casting

and Arrays.

Classes and objects: Class fundamentals, declaring objects, assigning object reference variables, introducing methods, constructors, this keyword, Garbage collection, overloading methods, using objects as parameters, returning objects, static and final keywords, nested and inner classes.

UNIT II

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

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

Packages: Defining a package, finding package and CLASSPATH. Access protection, importing packages.

UNIT III

Interfaces: Defining an interface, implementing interfaces, nested interfaces, applying interfaces, variables in interfaces.

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

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

UNIT – IV

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

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

TEXT BOOKS

[1] Herbert Schildt, "Java The Complete Reference", 9th Edition, McGraw-Hill Education, New Delhi, 2011. [UNIT – I (Chapter – 2,3,4) , UNIT – II , III)

[2] E Balagurusamy, "Programming with Java: A Primer", 4th Edition, Tata McGraw Hill Education Pvt Ltd., 2011. (UNIT – I, Chapter – 1)

REFERENCE BOOKS

[1] Herbert Schildt, Dale Skrien, "Java Fundamentals A Comprehension Introduction", Special Indian Edition, McGraw-Hill Education India Pvt. Ltd, 2013.
[2] Paul J. Dietel and Dr.Harvey M. Deitel, "Java How to Program", 9th Edition, Prentice-Hall, Pearson Education, 2011.
[3] Timothy Budd, "Understanding Object Oriented Programming with Java ", Updated edition, Pearson Education, 2013.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. I. Sengupta. (14th , May, 2015), Department of Computer Science & Engineering, I.I.T.,Kharagpur, "Internet Technologies", NPTEL. http://nptel.ac.in/video.php?subjectId=106105084
[2] Prof. Shane P. (14th , May , 2015), Department of Computer Science & Engineering,, NPTEL Videos, http://www.nptelvideos.com/video.php?id=1461&c=15

17TP1606
QUANTITATIVE APTITUDE

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Learning by doing	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Effectively organize, summarize and present information in quantitative forms including tables,
CO2	Use mathematical based reasoning and to evaluate alternatives and make decisions
CO3	Think and reason logically and critically in any given situation.
CO4	Apply logical thinking to solve problems and puzzles in qualifying exams for companies and in other competitive exams

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1										**3**	**3**			
CO2									**3**	**3**	**3**			
CO3										**3**	**3**			
CO4								**2**		**3**	**3**			

COURSE CONTENT

UNIT I

- Number system
- HCF & LCM,
- Average,

- Percentages,
- Profit & Loss

UNIT II

- Ratio & Proportion,
- Partnership,
- Chain Rule,
- Time & Distance,
- Time & Work

UNIT III

- Pipes & Cistern,
- Problems on Trains,
- Problems on boats &Steams,
- Allegation,
- Simple interest and compound interest.

UNIT IV

- Area, Volume and Surface areas,
- Races & Games of skills,
- Calendar & Clock,
- Stocks & Shares,
- Permutations & Combination, Probability.

METHODOLOGY

Learning Resources: Quantitative Aptitude by R.S..Aggarwal

17CS4651A
CLOUD COMPUTING LABORATORY

Course Category:	Programme Elective	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 -0 - 2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand various basic concepts related to cloud computing technologies
CO2	Understand different cloud programming platforms and tools
CO3	Explain and characterize different cloud deployment models and service models
CO4	Identify the security issues in cloud computing

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3					1		1		3	1	2	2
CO2	3	3					1		1		3	1	2	2
CO3	3	3							1	1	3	1	2	2
CO4	3	3					1		1	1	3	1	2	2

COURSE CONTENT

Task 1: Case Studies
Study about Amazon AWS, Google Apps and Microsoft Azure.

Task 2: Working with Google App Engine
Building and hosting a simple cloud application using Google App Engine.

Task 3:Working with Microsoft Azure
Building and hosting a simple cloud application using Microsoft Azure.

Task 4: Working with Oracle VM Virtual Box Manager
Implement Virtual OS using Oracle VM Virtual Box Manager.

Task 5: Working with Cloud Simulator
Implement Cloud Simulator using Eclipse and create a datacenter with one host and run one cloudlet on it.

Task 6: Working with AWS
To launch a virtual machine using Amazon ec2 Instance in AWS.

Task 7: Working with AWS
Host a Static Personal Website or Marketing Website on AWS.

Task 8: Working with AWS
Deploy and host a production ready WordPress website on AWS.

Task 9: Working with Salesforce Trailhead.
To Build a Battle Station App using Salesforce Trailhead.

Task 10: Working with Salesforce Trailhead.
To work with Apex and Apex Triggers using the Salesforce Trailhead Platform.

Task 11: Working with Yellow Circle
To Create and launch Windows Server virtual machine using Yellow Circle platform.

Task 12: Case Studies
Study about Amazon AWS,Hadoop,Aneka

TEXT BOOKS

[1] Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing: Principles and Paradigms", Wiley Publishers, 2013.
[2] K. Chandrasekaran, “Essentials of Cloud Computing”, CRC Press, 2015

REFERENCE BOOKS

[1] Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010
[2] Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012

[3] Thomas Erl, "Cloud Computing: Concepts, Technology & Architecture", 1st Edition, Pearson, 2014

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://cs.uwaterloo.ca/~a78khan/courses-offered/cs446/2010_05/lecture-slides/16_CloudComputing.pdf

[2] http://www.cs.iit.edu/~iraicu/teaching/CS553-S12/index.html

[3] https://www.youtube.com/user/arch4cloud/playlists

17CS4651B
LINUX ESSENTIALS LABORATORY

Course Category:	Open Elective	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand and work confidently in Linux Environment
CO2	Apply the security and administration mechanisms for user or group management and permissions
CO3	Write shell scripts for solving problems
CO4	Develop the client/server communication using IPC mechanisms

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		2									2	2	
CO2	3		3									2	2	
CO3	3		3									2	2	
CO4	3		2									2	2	

COURSE CONTENT

PART – I:Introduction to Linux/Unix commands (utilities)

Task -1:

a. Implement basic commands such as date, who, who am I, uname, cal, tty, stty, echo, printf, bc, script, passwd, finger
b. Implement directory related commands : pwd, mkdir, cd, rmdir, ls and File related commands: cat, cp, mv, rm, chmod, chown, chgrp, file, find, ln, ulink, ulimit, umask, touch
c. Implement Process Related Commands: ps, kill, nohup, at, batch, crontab, fg, bg, jobs

d. Implement Network Related commands: telnet, ftp, rlogin, arp

Task -2:

a. Implement Process Related Commands: ps, kill, nohup, at, batch, crontab, fg, bg, jobs
b. Implement Network Related commands: telnet, ftp, rlogin, arp

Task -3: Working with grep command

a. Write a grep command that selects the lines from the file1 that have exactly three characters
b. Write a grep command that count the number blank lines in the file1
c. Write a grep command that selects the lines from the file1 that have the string UNIX.
d. Write a grep command that copy the file to the monitor, but delete the blank lines.
e. Write a grep command that selects the lines from the file1 that do not start with A to G

Task -4: Working with sed command

a. Write a sed command that print lines numbers of lines beginning with "O"
b. Write a sed command that delete digits in the given input file.
c. Write a sed command that delete lines that contain both BEGIN and END
d. Write a sed command that deletes the first character in each line in a file
e. Write a sed command to delete character before last character in each line in a file
f. Write a sed command that swaps the first and second character in each line in the file

Task -5: Working with awk command

a. Write an awk command to print the lines and line number in the given input file
b. Write an awk command to print first field and second field only if third field value is >=50 in the given input file.
c. Write an awk program to print the fields 1 and 4 of a file that is passed as command line argument. The file contains lines of information that is separated by "," as delimeter. The awk program must print at the end the average of all 4th field data.
d. Write an awk program to demonstrate user defined functions and system command.
e. Write an awk script to count the number of lines in a file that do not contain vowels.
f. Write an awk script to find the number of characters, words and lines in a file

PART – II: Shell Programming (utilities)

Task – 6: Shell Scripts

a. Write shell script to perform integer arithmetic operations
b. Write a shell script to perform floating point arithmetic operations
c. Write a shell script to check the given file is writable or not

Task – 7: Shell Scripts

a. Write a shell program to find out reverse string of the given string and check the given string is palindrome or not
b. Write a shell program to find out factorial of the given number
c. Write a shell script to find out whether the given number is prime number or not

Task – 8: Shell Scripts

a. Write a shell script that computes the gross salary of a employee according to the following
   1) if basic salary is <1500 then HRA 10% of the basic and DA =90% of the basic
   2) if basic salary is >=1500 then HRA 500 and DA =98% of the basic
b. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
c. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.

Task – 9: C Programs

a. Write C program to implement ls –l command.
b. Write C program to list every file in a directory, inode number and file name

Task – 10: Programs on IPC

Write a C program that illustrates 2 processes communicating using shared memory.

TEXT BOOKS

[1] Christine Bresnahan, Richard Blum," Linux Essentials", 2nd Edition, September 2015

REFERENCE BOOKS

[1] Richard Petersen, "Linux:The Complete Reference", 6th edition, Tata McGraw-Hill, 2007.
[2] Mc Kinnon, Mc Kinnon, "Installing and Administrating Linux", 2nd edition, Wiley, 2004.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] www.linuxhomenetworking.com
[2] http://www.oreillynet.com/linux/cmd/
[3] www.iu.hio.no/~mark/unix/unix.html

17CS4651C
STATISTICS WITH R LABORATORY

Course Category:	Open Elective	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:	Discrete Mathematical Structures	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Apply statistical methods to data for inferences and introduce the concepts of R
CO2	Analyze the libraries for data manipulation and data visualization in R
CO3	Analyze data-sets to create testable hypotheses and identify appropriate statistical tests
CO4	Analyze and summarize data-sets to fit linear and nonlinear models .

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2			2								2	2
CO2	2	1			2								2	2
CO3	3	2		3									1	2
CO4	3	2	3	2	2								1	2

COURSE CONTENT

Task 1

Program to handle vectors and perform simple statistics on the vectors using R**.**

Task 2

Program to create a data frame in R and perform operations on it.

Task 3
(a) Program to read data from files(.csv) and handle the data using functions like plot, hist, summary and mean, mode, median and standard deviation .
(b) Merge the datasets ,transformation of variables and creating subsets of the dataset.

Task 4
a) Program to find the factorial of a number using recursion in R
b) Program to print numbers from 1 to 100 using while loop and for loop in R

Task 5
Program to plot graphs -scatter plot, box plot and bar plot.

Task 6
Program to create a list in R and perform operations on it like list Slicing, sum and mean functions, head and tail functions and finally delete the list using rm() function.

Task 7
a) Program to implement simple and multiple linear regression.
b) Program to implement non- linear regression.

Task 8
Program to implement logistic regression.

Task 9
Program to perform ANOVA test (one-way, two way).

Task 10
Program to perform Principal component analysis (PCA) on the dataset.

Task 11
Program to perform matrix operations (transpose, inverse, least square estimates, eigen values).

Task 12
Program to handle mathematical functions with single argument.

TEXT BOOKS

[1] Norman Matloff, The Art of R Programming, No Starch Press, San Francisco 2011 [Unit I,II,III]

[2] Jared P. Lander, R for Everyone, Addison Wesley Data & Analytics Series, Pearson, 2014. [Unit III,IV]

REFERENCE BOOKS

[1] Rob Kabacoff and Dale Ogden, R in Action, Manning, Second Edition, 2018

[2] G. Jay Kerns, Introduction to Probability and Statistics using R, First Edition, 2010

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Mine Çetinkaya-Rundel, David Banks, Colin Rundel, Merlise A Clyde, Duke University, (08,08,2019). Statistics with R Specialization.
Available: https://www.coursera.org/specializations/statistics

[2] Rafael Irizarry, Michael Love, Statistics with R, Harvard University (08, 08, 2019) Available: https://www.edx.org/course/statistics-r-harvardx-ph5251x-1

17CS4652A
INTERNET OF THINGS LABORATORY

Course Category:	Programme Elective	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 -0 - 2
Prerequisites:	Microprocessor & Microcontrollers	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the basics of Embedded systems & 8051 Programming.
CO2	Understand the basic principles of IoT.
CO3	Differentiate the features of various IoT platforms.
CO4	Design simple IoT applications.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2											
CO2	2													
CO3			2		2								2	
CO4		3	3		3								2	3

COURSE CONTENT

PART I

Experiments on 8051 Microcontroller

Task 1: programmes on arithmetic instructions

Task 2: programmes on data transfer instructions

Task 3: programmes on logical instructions

Task 4 : programmes on jump instructions

Task 5: Programs on interfacing

PART II

Experiments based on Arduino Uno

Task 6: Blinking of LED
Task 7: Temperature & Humidity Measurement
Task 8: Intruder Detection
Task 9: Distance Measurement

PART III

Experiments based on Raspberry pi

Task 10: Configuring Raspberry pi
Task 11: LED Control
Task 12: temperature measurement
Task 13: uploading data on open source cloud

TEXT BOOKS

[1] Raj kamal, Embedded Systems Architecture, Programming and Design. 3rd edition, McGraw-Hill, 2012
[2] Kenneth J. Ayala, "8051 MICRO CONTROLLER ARCHITECTURE" 3rd edition, Thomson Delmar Learning, 2005
[3] Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016

REFERENCE BOOKS

[1] ArshdeepBahga, Vijay Madisetti " Internet of Things(A hands on approach)" 1ST edition, VPI publications,2014

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Sudip misra, IIT Kharagpur "Introduction to Internet of things" [Web Content]. Available: http://nptel.ac.in/courses/106105166/ (Accessed on 10-8-18)

17CS4652B
MOBILE APPLICATION DEVELOPMENT LABORATORY

Course Category:	Programme Elective	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 -0 - 2
Prerequisites:	C Programming Lab, Java Programming Lab	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Implement J2ME technology
CO2	Create user interfaces for mobile application
CO3	Develop databases connection to given mobile application
CO4	Develop and deploy mobile application into an android device.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3				1									
CO2		2	1		1								1	1
CO3			2		2				1				2	
CO4			2		3				2		2		3	3

COURSE CONTENT

Task 1:

Course Outcome: CO1: Implement J2ME technology

Topic: *First application: Creating Android Project, Android Virtual Device Creation, Set up debugging environment, Workspace set up for development, Launching emulator, debugging on mobile devices.*

Create a simple mobile application for login and logout activities that illustrates the GUI components, Colors and Fonts.

Task 2:

Course Outcome: CO2: Create user interfaces for mobile application

Topic: *Basic UI design: Basics about Views, Layouts, Draw able Resources, Input controls, Input Events, Toasts, More UI Components: Layouts - GridView and ListView, Action bar, Adapters, Menus: Option menu, context menu, sub menu, Pickers - Date and Time.*

Develop a mobile application which displays different images dynamically by clicking on button that works with Layout managers and Event handlers.

Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.

Task 3:

Course Outcome: CO2: Create user interfaces for mobile application

Topic: *Basic UI design: Basics about Views, Layouts, Draw able Resources, Input controls, Input Events, Toasts, More UI Components: Layouts - GridView and ListView, Action bar, Adapters, Menus: Option menu, context menu, sub menu, Pickers - Date and Time.*

Create a screen that has input boxes for User Name, Password, and Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use

(a) Linear Layout , (b) Relative Layout and

(c) Grid Layout or Table Layout.

Task 4:

Course Outcome: CO2: Create user interfaces for mobile application

Topic: *UI Components and Layout Managers.*

Design and develop simple calculator application.

Task 5:

Course Outcome: CO2: Create user interfaces for mobile application

Topic: *Graphics primitives*

Create an application that draws basic graphical primitives on the screen. An Application which draws a Pie Graph to the display. Data Values can be given at int[] array. You can enter four data(integer)values to the input text field.

Task 6:

Course Outcome: CO2: Create user interfaces for mobile application

Topic: *UI Components*

Implement an application that implements Multithreading. To design an application that implements Multithreading for multimedia content such as playing audio? Playing video? Capturing a snap shot simultaneously.

Task 7:

Course Outcome: CO3: Create user interfaces for mobile application

Topic: *UI Design*

To implement an application that read & writes data from and to the Internal memory device such as SD card using android Studio.

Task 8:

Course Outcome: CO4: Develop and deploy mobile application into an android device.

Topic: *Navigation Drawer: Panel that displays the app's main navigation screens on the left edge of the screen*

Develop a native application that uses GPS location information.

Task 9:

Course Outcome: CO3: Create user interfaces for mobile application

Topic: *UI Components*

Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

Task 10:

Course Outcome: CO4: Develop and deploy mobile application into an android device.

Topic: *Android Notifications – Toast, Dialogs (TimePicker, DatePicker, Progress, Alert), Notification Manager and Push Notification.*

Implement an application that creates an alert upon receiving a message. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.

Task 11:

Course Outcome: CO3: Develop databases connection to given mobile application

Topic: *Working with SQLite Databases*

Develop database management system to retrieve data for mobile application.

Task 12:

Course Outcome: CO4: Develop and deploy mobile application into an android device.

Topic: *Basic UI design: Basics about Views, Layouts, Draw able Resources, Input controls, Input Events, Toasts, More UI Components: Layouts - GridView and ListView, Action bar, Adapters, Menus: Option menu, context menu, sub menu, Pickers - Date and Time.*

Create an alarm clock application

Lab Projects:

For any given mobile application follow the steps

Ex: Your college mobile application,

1. Understanding the requirement of a given application.

2. Designing the interface and architecture.
3. Best practices regarding application design and development.
4. Writing code and testing it.
5. Preparing application for Publishing.

Publishing to Android Market and Physical device

TEXT BOOKS

[1] James Keogh, "J2ME: The Complete Reference", Tata McGrawHill, 2017. [Unit I, II, IV]

[2] Reto Meier, "Professional Android Application Development", Wiley India,2012. [Unit – III]

REFERENCE BOOKS

[1] Brian Fling,"Mobile Design and Development", O'Reilly, SPD, 2011.

[2] Wei-Meng Lee, "Beginning Android Application Development", Wiley Publishing, Inc, 2012

[3] Jonathan Knudsen, "Wireless Java: Developing with J2ME",A Press, Second Edition, 2003

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Gaurav Raina , Mr Tanmai Gopal (14th , May, 2018), Department of Computer Science & Engineering, I.I.T.,Madras, "Introduction to Mobile applications", NPTEL videos.

17CS4652C
DATA COMPRESSION LABORATORY

Course Category:	Programme Elective	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 -0 - 2
Prerequisites:	Digital Communication, Image Processing	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the data compression as an example of representation and its applications
CO2	Implement the compression techniques to compress the different raw data
CO3	Analyze the concepts associated speech, image and video compression
CO4	Analyze the usage of compression algorithms and compare its performance

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2											2	3
CO2	2	3									2		2	2
CO3	3	3	3						3		2		2	3
CO4	2	2	3						3		3		2	2

COURSE CONTENT

Task1: Write a program which inputs a string of 1s and 0s and compresses the 0s using the Run-length compression technique.

Task2: Write a program to implement Arithmetic coding.

Task3: Write a program to compress file using Huffman coding.

Task4: Write a program to compress and uncompress file using adaptive Huffman coding.

Task5: Write a program to compress image using Lossy DPCM Algorithm and evaluate performance of DPCM Algorithm.

Task6: Write a program to implement Huffman data compression algorithm to generate Prefix codes and encoded text.

a. Count of character frequencies.
b. Construction of prefix code.
c. Encoding the text.

Task7: Write a program to implement Wave let transform technique.

Task8: Write a program to implement transform coding.

Task9: Write a program to implement DTWT compression techniques.

Task10: Write a program for compress the video file using the video compression technique.

TEXT BOOKS

[1] Sayood, Khalid, "Introduction to Data Compression", 5th Edition, Morgan Kaufmann, 2017.
[2] Salomon, David," Data Compression The Complete Reference",3rd Edition,Springer,2007

REFERENCE BOOKS

[1] Saloman, "Handbook of Data Compression", springer, 2010.
[2] Parekh Ranjan, "Principles of Multimedia", TMH, 2006

17CS5653
ENGINEERING PROJECT FOR COMMUNITY SERVICES

Course Category:	Project Work	**Credits:**	2
Course Type:		**Lecture -Tutorial-Practice:**	0 -1 - 2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Identify the Societal problems.
CO2	Solve the problems.
CO3	Design of the problem/work plan.
CO4	Design of the prototype/model.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						**2**	**3**							
CO2						**3**	**1**			**2**				
CO3						**3**			2					
CO4									**1**	**3**				

COURSE CONTENT

Students will go to the society (Villages/ Hospitals / Towns etc,.) to identify the problem and survey the literature for a feasible solution. The work will be carried out during summer vacation after IV Semester. The student is encouraged to take up real life problems leading to innovative model building.

17CS3654
COMPETITIVE CODING – III

Course Category:	Programme Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0-0-2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand the basic concepts such as Divide and Conquer, Greedy and Dynamic programing principles
CO2	Analyse the programs on algorithm analysis concepts.
CO3	Solve the problems with given test cases.
CO4	Apply programing skills for optimized code and derive the solutions according to the provided constraints

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1											
CO2		3											2	2
CO3		1							2		3		3	3
CO4	2	3									2		3	3

COURSE CONTENT

Solving the programs under “Easy / Medium” category in CodeChef & HackerRank, etc. Students must solve 20 problems related to Design and Analysis of Algorithms in CodeChef / HackerRank, etc. The category may be under Easy / Medium. Students shall participate at least two contests per month, hosted in online judges. Problems to be solved in C, Java, Python.

A minimum of 15 problems shall be solved per week in either CodeChef /

HarckerRank, etc.

Monthly contests hosted in CodeChef / HackerRank, etc,. may be taken as day to day assessment of laboratory. Monthly one such evaluation

The work will be carried out in the laboratory slot allotted as well as at the home.

TEXT BOOKS

[1] Halim, Steven and Halim, Felix, Competitive Programming 3, 2013.
[2] Ahmed Shamsul Arefin, Art of Programming Contest, ACMSolver, Second Edition, 2012

REFERENCE BOOKS

[1] Programming Challenges: The Programming Contest Training Manual By Steven S Skiena, Miguel A. Revilla
[2] Guide to Competitive Programming: Learning and Improving Algorithms Through Contests By Antti Laaksonen

E- RESOURCES AND OTHER DIGITAL MATERIAL

[1] Topcoder tutorials - https://www.topcoder.com/community/data-science/data-science-tutorials/
[2] Nite Nimajneb's site - http://comscigate.com/Books/contests/icpc.pdf
[3] Slides from a Stanford Course - http://web.stanford.edu/class/cs97si/
[4] Halim, Steven and Halim, Felix, Competitive Programming 3, 2013. Ebook available at lulu.com. Site associate with with the book is http://cpbook.net

SEMESTER - VII

17CS3701
COMPILER DESIGN

Course Category:	Programme Core	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 1 - 0
Prerequisites:	Programming in C, Theory of Computation	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand the functionality ofeach phase involved in Compilation process.
CO2	Implement the parsing techniques for the given programming construct described in Context Free Grammar.
CO3	Identify the suitable intermediate representation based on the storage administration.
CO4	Generate the machine code by considering all the functionalities involved in different phases of the compilation process

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2												
CO2	2	2							2					
CO3	4								1					
CO4		2									2			

COURSE CONTENT

UNIT-I

Introduction to Compilers: Compilers and translators, why do we need translators?, the structure of a compiler, Lexical Analysis, Syntax analysis, Intermediate Code generation, Code Optimization, Code generation, Bookkeeping, Error handling, Compiler-writing tools.

Lexical Analysis: - The role of lexical analyzer, Input Buffering, specification of tokens, The Lexical Analyzer Generator, Design of a Lexical Analyzer Generator

UNIT-II

Syntax Analysis: The Role of Parser, Context free Grammars, Top Down parsing, Predictive parsing, error recovery in Predictive Parsing

Bottom – Up Parsing: Shift Reduce Parsing, LR parsers, The canonical collection of LR(0) items, Constructing SLR parsing tables, Constructing canonical LR parsing tables, Constructing LALR parsing tables, compaction of LR Parsing tables, Using ambiguous grammar, Error recovery in LR Parsing.

UNIT-III

Syntax – Directed Translation: Syntax – directed definitions, Applications of Syntax Directed Translations, translation schemes, Implementation of Syntax-directed translators, Intermediate code, Postfix notation, Parse trees and syntax trees, Three-address code, quadruples, and triples, Translation of assignment statements, Type checking, Boolean expressions, Statements that alter the flow of control, Postfix translations, Procedure calls & Record Structures

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

UNIT-IV

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

Code Generation: Issues in the design of a Code generator, The Target language, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A simple code generator, Code generation from DAG's.

TEXT BOOKS

[1] Alfred V.Aho, Jeffrey D. Ullman, 'Principles of Compiler Design', Narosa Publishing, 2002
[2] Alfred V.Aho , Monica S Lam, Ravi Sethi, Jeffrey D Ullman, 'Compilers Principles, Techniques and Tools', Second Edition, Pearson Education India , 2014.

REFERENCE BOOKS

[1] Louden, 'Compiler Construction : Principle and Practice 'Cengage Publications, 1997.
[2] Jean-Paul Trembly, Paul G. Sorenson, ' The Theory and Practical of Compiler Writing', BS Publications, 2009

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Compiler Design by Prof.Y.N.Srikant,Department of Computer Science and Automation, IISC Bangalore. http://nptel.iitm.ac.in/courses/106108052
[2] NPTEL lectures by Professor Sanjeev K Agarwal, Dept. of CSE IIT Kanpur http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/compiler-desing/ui/TOC.htm

17CS4702A
DATA ANALYTICS

Course Category:	Programme Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Programming in C, Theory of Computation	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the concepts of Data mining and Big Data Analytics
CO2	Apply machine learning algorithms for data analytics
CO3	Analyze various text categorization algorithms
CO4	Use Technology and tools to solve the Big Data Analytics problems

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2		3	1						1		1			
CO3		2	1						1		1			
CO4		2	2						3		1			

COURSE CONTENT

UNIT I

Data Mining: Data Mining, Kinds of Patterns Can Be Mined, Applications of data mining.

Data pre-processing: Data Cleaning:Missing Values,Noisy Data,Data Cleaning as

a Process; Data Integration: Entity Identification Problem,Redundancy and Correlation Analysis, Tuple Duplication, Data Value Conflict Detection and Resolution; Data Transformation and Data Discretization: Data Transformation Strategies Overview, Data Transformation by Normalization,Discretization by Binning,Discretization by Histogram Analysis.

Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics

Data Analytics Lifecycle: Data Analytics Lifecycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize

UNIT II

Association Rules: Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules, Transactions in a Grocery Store,Validation and Testing;

Regression: Linear Regression, Logistic Regression

Advanced Analytical Theory and Methods-Classification: Decision Trees, Naïve Bayes; Classification by Back propagation

Advanced Analytical Theory and Methods-Clustering: major categories of clustering methods, k-means, k-nearest neighbor; DBSCAN

UNIT III

Advanced Analytical Theory and Methods-Time Series Analysis: Overview of Time Series Analysis, ARIMA Model.

Advanced Analytical Theory and Methods-Text Analysis: Text Analysis Steps, Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency—Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments

UNIT IV

Advanced Analytics- Technology and Tools: MapReduce and Hadoop: Analytics for Unstructured Data, The Hadoop Ecosystem,

In-Database Analytics: SQL Essentials, In-Database Text Analysis.

Putting It All Together: Communicating and operationalizing an Analytics Project,

Creating the final deliverables, and Data Visualization basics.

TEXT BOOKS

[1] Data Science and Big Data Analytics, EMC2 Education Services, John Wiley, 2015 [Unit II,III,IV]

[2] Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, 3 ed, Elsevier Publishers [Unit I]

REFERENCE BOOKS

[1] Simon Walkowiak Big Data Analytics with R: Leverage R Programming to uncover hidden patterns in your Big Data ,Packt publishing, 2016

[2] Nathan Marz, James Warren, "Big Data-Principles and best practices of scalable real-time data systems", DreamTech Press, 2015

[3] Benjamin Bengfort, Jenny Kim, Data Analytics with Hadoop: An Introduction for Data Scientists, OReilly ,1st Edition, 2016

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof.D. Janaki Ram and S. Srinath, III Madras, Data Mining and Knowledge Discovery https://freevideolectures.com/course/2280/database-design/35, Last accessed on 11th August 2018

[2] Prof. Nandansudharsanam and Prof . B.Ravindran , IIT Madras, Introduction to Data Analytics http://nptel.ac.in/courses/110106064/23, Last accessed on 11th August 2018

17CS4702B
HIGH PERFORMANCE COMPUTING

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

COURSE OUTCOMES

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

CO1	Understand the parallel programming platforms for parallel computer systems.
CO2	Optimize the performance of parallel programs.
CO3	Understand the working group communication operations of MPI.
CO4	Understand algorithm for multicore processors systems using MPI and thread Techniques

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3			2									
CO2		3	1											
CO3	2	3			2									
CO4	2	3	1		2									

COURSE CONTENT

UNIT I

Parallel Programming Platforms: Implicit parallelism: Trends in Microprocessor Architectures, Limitations of memory system performance, Dichotomy of parallel

computing platforms, physical organization of parallel platforms, Routing mechanisms for interconnection networks.

Principles of Parallel Algorithm Design: Preliminaries, decomposition Techniques, Characteristics of tasks and interactions, mapping techniques for load balancing, parallel algorithm models.

UNIT II

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

Analytical modeling of parallel programs: sources of overhead in parallel programs, performance metrics for parallel systems.

Introduction to Heterogeneous Computing: Introduction to OPenCL, Platform and Devices, The Execution Environment, Memory Model, Writing Kernels

UNIT III

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

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

UNIT IV

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

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

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

Introduction to General-Purpose GPU programming (CUDA): The age of parallel processing, The Rise of GPU computing, CUDA, Applications of CUDA, Development Environment, Introduction to CUDA C, Parallel Programming in CUDA C.

TEXT BOOKS

[1] Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar: Introduction to Parallel Computing, Second Edition Pearson Education, 2016.(Chapters:1-10)

[2] Jason Sanders, Edward Kandrot, CUDA By Example – An Introduction to General-Purpose GPU Programming, Addison Wesley, 2011. (Chapters:1-4)

[3] Benedict R Gaster, Lee Howes, David R Kaeli Perhaad Mistry Dana Schaa, *Heterogeneous Computing* with OpenCL McGraw-Hill, Inc. Newyork , 2012(Chapters-2)

REFERENCE BOOKS

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

[2] David B. Kirk, Wen-mei W. Hwu, Programming Massively Parallel Processors – A Hands-on Approach, Third Edition, Morgan Kaufmann, 2016.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] nptel.ac.in/courses/106108055/

[2] http://www.nvidia.com/object/cuda_home_new.html

[3] http://www.icrar.org/research/postgraduuate/high-performance-computing-honours-course

[4] http://www.openCL.org

17CS4703A
CRYPTOGRAPHY AND NETWORK SECURITY

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

COURSE OUTCOMES

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

CO1	Understand various security issues related to cryptography and Network Security.
CO2	Analyze the process of cryptographic ciphers.
CO3	Summarizes the Network Security Scenarios.
CO4	Inspect the protection methods against Network security threats.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**				**3**									
CO2	**2**	**3**									**2**			
CO3	**3**													
CO4		**3**			**3**									

COURSE CONTENT

UNIT I

Overview: Security attacks, Services, Mechanisms, A model for network security; Basics of Cryptography, Cryptanalysis. Symmetric cipher model.

Classical encryption techniques: Substitution Techniques: Caeser Cipher, Mono alphabet Cipher, Playfair Cipher Transposition Techniques: Rail Fence.

Block Cipher: Principles, DES, Strength of DES, AES
Block cipher Operations: Triple DES, ECB, CBC, CFM, OFM

UNIT II

Number Theory: Prime Numbers, Fermat's theorem, Euler's Theorem, Chinese remainder Theorem.
Public Key Cryptography: Principles of Public Key Crypto System, RSA algorithm, Diffie-Hellman Key Exchange.
Cryptographic Hash Functions: Applications -Message Authentication, Digital signatures, SHA- Logic, Round Functions
Digital Signatures: Properties, Attacks and Forgeries, Requirements

UNIT III

X. 509 Certificates, Kerberos: Motivation Kerberos Version 4 Kerberos Version 5
Transport Level Security: Web Security Threats, Web Traffic Security Approaches.
Secure Socket Layer and Transport Layer Security : SSL - SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, Cryptographic Computations **TLS-** Version, MAC, Pseudorandom Function, Alert Codes, Cipher suites, Client Certificate Types, Certificate_Verify and Finished Messages Cryptographic Computations Padding
HTTPS: Connection Initiation Connection Closure

UNIT IV

IP Security: Overview: Applications , Benefits , IPsec Documents, IPsec Services, Transport and Tunnel Modes, Encapsulating Security Payload - ESP Format Encryption and Authentication Algorithms Padding Anti-Replay Service Transport and Tunnel Modes,
Email Security : Pretty Good Privacy- Notation, Operational Description
Malicious Softwares: Types –Backdoor, Logic Bomb, Trojan Horses.
Firewalls : The Need for Firewalls, Characteristics, Types of Firewalls - Packet Filtering Firewall, Stateful Inspection Firewalls, Application-Level, Gateway Circuit-Level Gateway

TEXT BOOKS

[1] William Stallings, Cryptography and Network Security: Principles and Practice. 7th ed, Pearson Education, 2017

REFERENCE BOOKS

[1] Cryptography and Network Security: Forouzan, Mukhopadhyay, McGraw Hill, 2nd Edition

[2] Network Security and Cryptography, Bernard Menezes, CENGAGE Learning

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] nptelonlinecourse.com,"Cryptography and network Security", 2018. [Online]. Available: https://onlinecourses.nptel.ac.in/noc19_cs28/preview.

[2] cybrary.com, "Cryptography", 2018, [Online]. Available: https://www.cybrary.it/course/ cryptography/

17CS4703B
MOBILE COMPUTING

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

COURSE OUTCOMES

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

CO1	Understand the concepts and techniques related to Mobile Communications
CO2	Analyze the architectures, protocols and features of GSM, GPRS, UMTS, Mobile IP, DHCP and issues related to Mobile Databases and Mobile OS
CO3	Analyze the architectures, protocols and features of MANETs and WSN
CO4	Examine the implementation aspects of HSPA, LTE, 4G, WiMAX and Mobile Application Development

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**2**	**3**												
CO2		**3**								**1**				
CO3	**2**	**3**								**1**				
CO4	**2**	**3**												

COURSE CONTENT

UNIT I

Introduction to Mobile Computing and Wireless Networking: What is Mobile Computing, MC Vs Wireless Networking, MC applications, Characteristics of MC, Structure of MC Application, Cellular Mobile Communication, GSM, GPRS, UMTS

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

UNIT II

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

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

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

UNIT III

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

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

UNIT – IV

OS for Mobile Computing: OS responsibilities, Mobile O/S, Special Constraints and Requirements of Mobile O/S, Compartive study of Mobile OSs

HSPA 3G network, LTE, WiMax, Broadband Wireless Acess, 4G Networks –

Requiements & Design, Moduation & Multiplexing techniques for 4G, HSOPA, LTE Advanced, WiMax advanced.

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

TEXT BOOKS

[1] Prasant Kumar Pattnaik, "**Fundamentals of Mobile Computing**", PHI, 2015

[2] Raj Kamal, "*Mobile Computing"*, Second Edition, Oxford University Press-New Delhi, 2012

REFERENCE BOOKS

[1] Dr. Sunil kumar S. Manavi, Mahabaleshwar S. Kakkasageri*, "**Wireless and Mobile Networks, concepts and protocols***", Wiley India, 2014,

[2] William Stallings "**Wireless Communications and Networks**", Second Edition, Pearson Education

[3] Jochen Schiller, "***Mobile Communications***", Addison-Wesley, Second Edition, 2009

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.cse.iitb.ac.in/~mythili/teaching/cs653_spring2014/index.html

[2 http://www.iitg.ernet.in/scifac/qip/public_html/cd_cell/EC632.pdf

[3] http://people.ee.duke.edu/~romit/courses/s11/ece256-sp11.html

17CS4703C
AGILE SOFTWARE DEVELOPMENT

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

COURSE OUTCOMES

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

CO1	Compare different traditional software development models.
CO2	Understand Agile concepts and principles
CO3	Analyze the scrum and XP process model
CO4	Apply Agile methodology for any given application

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		1												
CO2	1											2		1
CO3	1	2												
CO4			3	1									1	2

COURSE CONTENT

UNIT I: TRADITIONAL SOFTWARE DEVELOPMENT

The Waterfall approach: Requirements, Design phase Implementation, testing, support, Advantages and dis-advantages.

Modified Waterfall Models: Milestone and Regular Integration, Incremental Development, Rational unified process, Agile Unified process, and Agile model

driven development.

UNIT II: UNDERSTANDING AGILE & AGILE PRINCIPLES

Understanding agile values: What is Agile, A team lead & architect, No silver bullets, Agile manifesto.

The Agile Principles: The 12 principles of Agile software, Delivering the project, communicating and working together, project execution, constantly improving the project and the team.

.

UNIT III: SCRUM

Scrum and self organizing teams: The rules of a scrum, Act-I: can haz scrum, Act-II: Whole team uses scrum daily, Act-III: sprinting into a wall, Act-IV: Dog catches car

Scrum planning and collective commitment: Act-V: Expecting the unexpected, Act-VI: victory Lap.

UNIT IV: EXTEME PROGRAMMING(XP)

XP and Embracing change: Primary practices of XP, XP values help the team change their mind set, understanding XP principles.

XP, Simplicity and Incremental Design: Going into overtime, make code and design decisions at the last responsible moment, Incremental design and holistic practices.

TEXT BOOKS

[1] Thomas Stober, Uwe Hansmann: Agile Software Development –Springer-verlag Berlin Heidelberg, 2010. **Unit-I**

[2] Andrew Stellman & Jennifer Greenie : Learning Agile understanding scrum, XP, Lean and Kanban –First Edition, O.Reiley Media , USA, 2014. **Unit-II, Unit -III, Unit-IV**

REFERENCE BOOKS

[1] Robert C.Martin: Agile principles, patterns &practices- Pearson Edition-2006.

[2]Alistair Cockburn: Agile Software Development: The cooperative Game,

Pearson Education, 2006.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.versionone.com/agile-101/

[2] https://www.codeproject.com/Articles/604417/Agile-software-development-methodologies

17CS4704A
MACHINE LEARNING

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

COURSE OUTCOMES

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

CO1	Identify instance based learning algorithms
CO2	Design neural network to solve classification and function approximation problems
CO3	Build optimal classifiers using genetic algorithms
CO4	Analyze probabilistic methods for learning

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**2**	**2**							**1**				1	1
CO2		**2**							**1**				1	1
CO3		**2**	**1**										1	1
CO4			**1**						**1**				1	1

COURSE CONTENT

UNIT I

INTRODUCTION - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – Concept learning as search, General-to-specific ordering of hypotheses , Find-S: finding a maximally specific hypothesis, List then eliminate algorithm, Candidate elimination learning algorithm

UNIT II

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning

Artificial Neural Networks – Neural network representation, Appropriate problems for neural network learning, Perceptrons- Gradient descent and the Delta rule, Multilayer networks and the back propagation algorithm

Evaluation Hypotheses – Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals

UNIT III

Bayesian learning – Bayes theorem, Bayes theorem and concept learning, Bayes optimal classifier, Naïve Bayes classifier, Bayesian belief networks- Conditional independence, Learning Bayesian belief networks, The EM algorithm- general statement of EM algorithm,

Computational learning theory – Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces- Shattering a Set of Instances

Instance-Based Learning- k -Nearest Neighbour Learning- Locally Weighted Regression, Case-Based Reasoning

UNIT IV

Genetic Algorithms – An illustrative Example, Genetic Programming- **Representing Programs, Illustrative Example**, Models of Evolution and Learning

Learning Sets of Rules – Sequential Covering Algorithms- **General to Specific Beam Search**, Learning First Order Rules, Learning Sets of First Order Rules: FOIL

TEXT BOOKS

[1] Tom M. Mitchell, "Machine Learning", McGraw Hill, Indian Edition, 2017

REFERENCE BOOKS

[1] Stephen Marsland, Taylor & Francis, "Machine Learning: An Algorithmic Perspective", 2nd Edition, 2014.

[2] William W Hsieh, "Machine Learning Methods in the Environmental Sciences, Neural Networks and kernels" Cambridge Univ Press, 1st Edition,2009

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Evaluating a hypothesis, Stanford University, https://www.coursera.org/learn/machine-learning/lecture/yfbJY/evaluating-a-hypothesis, Last accessed on 26-8-2019

[2] Balaraman Ravindran, NPTEL Lecture 1 - Introduction to Machine Learning, https://www.youtube.com/watch?v=fC7V8QsPBec, Last accessed on 26-8-2019

[3] Benchmarking Neural Networks on Oracle Cloud Infrastructure with Mapr, https://mapr.com/whitepapers/benchmarking-neural-networks-on-oracle-cloud-infrastructure-with-mapr/ Last accessed on 26-8-2019

[4] George Crump, Dealing with The AI and Analytics Data Explosion https://mapr.com/whitepapers/dealing-with-the-ai-and-analytics-data-explosion/ Last accessed on 26-8-2019

[5] Sargur Srihari Department of Computer Science and Engineering, University at Buffalo https://cedar.buffalo.edu/~srihari/CSE574/

17CS4704B
SOFTWARE TESTING METHODOLOGY

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

COURSE OUTCOMES

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

CO1	Understand the different concepts of testing and apply path testing.
CO2	Apply data flow and transaction flow testing.
CO3	Apply reduction procedure for any application.
CO4	Perform logic and state testing for any given application

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**1**	**1**											
CO2	**3**	**1**	**1**											
CO3			**1**											
CO4		**1**	**1**											

COURSE CONTENT

UNIT I

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.

Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT II

Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

Transaction flow testing: Transaction flows, Transaction Flow Testing Techniques, Implementation.

UNIT III

Domain Testing: Domains and paths, Nice domains and ugly domains, Domain testing, Domain and interface testing, Domains and testability.

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

UNIT – IV

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

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

TEXT BOOKS

[1] Boris Beizer, Software Testing Techniques, 2 ed, Dreamtech

REFERENCE BOOKS

[1] Naresh Chauhan, Software testing : principles and practices, Oxford University Press, 2010.

[2] Perry, Effective Methods of Software Testing, John Wiley

[3] Edward Kit, Software Testing in the Real World. Pearson.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Software Testing Tutorial for Beginners - 1
https://freevideolectures.com/course/3655/software-testing,
Last accessed on 18th November 2019

[2] Software testing introduction Prof Meenakshi D'Souza, IIIT Bangalore
https://www.digimat.in/nptel/courses/video/106101163/L01.html,
Last accessed on 18th November 2019

17CS4704C
ROUTING AND SWITCHING ESSENTIALS

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

COURSE OUTCOMES

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

CO1	Determine the subnets with the required number of hosts per subnet or the required number of subnets.
CO2	Apply the configuration steps and correctly configure static or dynamic routing on all the routers in the topology.
CO3	Identify the correct category of routing protocols and also be able to compare and contrast the relative merits and demerits.
CO4	Design the Local Area Network (LAN) by selecting the appropriate router and switch and correctly configuring them.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		**3**											**1**	
CO2			**3**										**1**	
CO3					**2**									
CO4				**1**									**1**	

COURSE CONTENT

UNIT I

Inside the router, CLI configuration and addressing, Building the routing table, Path determination and switching, static route with next hop, static route with exit interface, summary and default static route, managing and troubleshooting static route. Introduction to dynamic routing protocols, classifying dynamic routing protocols, metrics, administrative distance.

UNIT II

Introduction to distance vector routing protocols, network discovery, route table maintenance, routing loops, RIPv1, Basic RIPv1 configuration, verification and trouble shooting, automatic summarization, default route and RIPv1, Classful and Classless addressing, VLSM, CIDR, RIPv1 Limitations, Configuring RIPv2, The Routing table structure.

UNIT III

Introduction to EIGRP, Basic EIGRP configuration, EIGRP Metric calculation, DUAL, More EIGRP configurations. Link state protocols, Link state routing, implementing link state routing, Introduction to OSPF, Basic OSPF configuration, The OSPF metric, OSPF and multiclass networks, More OSPF configuration.

UNIT IV

Forwarding Frames Using a Switch, Switch Management Configuration, Configuring Switch Security, Introducing VLANs, VLAN trunking, Configuring VLANs and Trunks, VTP Concepts, VTP Operation, Configuring VTP, Inter VLAN Routing, Configuring Inter VLAN Routing.

TEXT BOOKS

[1] Rick Graziani, "Routing Protocols and Concepts"; CCNA Exploration Companion Guide, Pearson Education, 2011

[2] Wayne Lewis, " LAN Switching and Wireless: CCNA Exploration Companion Guide", Pearson Education, 2014

REFERENCE BOOKS

[1] Diane Barrett & Todd King, "Computer Networks Illuminated", Jones and Bartlett Publishers (2005).

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.youtube.com/watch?v=zvfjHIBV814

[2] https://study-ccna.com/

[3] https://www.udemy.com/course/cisco-ccna-video-training/

17HS1705
ENGINEERING ECONOMICS AND FINANCE

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

COURSE OUTCOMES

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

CO1	Understand various forms of organizations and principles of management
CO2	Understand the various aspects of business economics.
CO3	Acquire knowledge on Human resources and Marketing functions
CO4	Understand different methods used in calculating depreciation and evaluating alternatives economicaly.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**2**											**2**		**2**
CO2	**2**				**3**							**2**		**2**
CO3	**2**											**2**		**2**
CO4	**2**				**3**							**2**		**2**

COURSE CONTENT

UNIT - I

Forms of Business Organization: Salient Features of Sole Proprietorship, Partnership, Joint Stock Company, Co-operative Society and Public Sector.

Management: Introduction to Management, Functions of Management, Principles of Scientific Management, Modern Principles of Management.

UNIT - II

Introduction to Economics: Introduction to Basic Economic Concepts, Utility Analysis: Marginal Utility and Total Utility, Law of Diminishing Marginal Utility, Law of Equi Marginal Utility.

Demand Analysis: Theory of Demand: Demand Function, Factors Influencing Demand, Demand Schedule and Demand Curve, Shift in Demand, Elasticity of Demand: Elastic and Inelastic Demand, Types of Elasticity.

Supply Analysis: Supply Schedule and Supply Curve, Factors Influencing Supply, Supply Function.

UNIT – III

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

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

UNIT – IV

Financial Management: Functions of Financial Management, Time value of money with cash flow diagrams, Concept of Simple and Compound Interest.

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

Economic Alternatives: Methods of Evaluating Alternatives under Present worth method, Future worth method, Annual Equivalent method - Problems.

TEXT BOOKS

[1] M. Mahajan Industrial Engineering and Production Management Dhanpat Rai Publications 2nd Edition.

[2] Martand Telsang" Industrial & Business Management" S.Chand publications

REFERENCE BOOKS

[1] R.Paneer selvam "Production and Operations Management" PHI

[2] Philip Kotler & Gary Armstrong "Principles of Marketing" ,pearson prentice

Hall, New Delhi,2012 Edition.
[3] IM Pandey, "Financial Management" Vikas Publications 11th Edition
[4] B.B Mahapatro, "Human Resource Management",New Age International, 2011

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]https://www.toppr.com/guides/fundamentals-of-economics-and-management/supply/supply-function/
[2]https://keydifferences.com/difference-between-personnel-management-and-human-resource-management.html
[3] http://productlifecyclestages.com/
[4] https://speechfoodie.com/cash-flow-diagrams/

17CS4751A
DATA ANALYTICS LABORATORY

Course Category:	Programme Elective	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Database Management Systems	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the concepts of Data mining and Big Data Analytics
CO2	Apply machine learning algorithms for data analytics
CO3	Analyze various text categorization algorithms
CO4	Use Technology and tools to solve the Big Data Analytics problems

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2		3	1						1		1			
CO3		2	1						1		1			
CO4		2	2						3		1			

COURSE CONTENT

PART-A (Data Mining)

Task 1:

Preprocessing: Removal specified attribute, discrimination of a

continuous valued attribute, standardization and normalization of data.

Task 2:

Association Mining: Finding Association Rules using Apriori principle

Task 3:

Classification: Use the Classification technique to classify y the given dataset

Task 4:

Clustering: Apply the clustering technique to classify the given dataset

Task 5:

Time Series: Apply Time series techniques for prediction.

Task 6:

Text Analysis: Use text analysis methods for sentiment analysis

PART-B (Big Data Analytics)

Task :7

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

Task 8:

Word Count application: MapReduce program to understand MapReduce Paradigm

Task 9:

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

Task 10:

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

Task 11:

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

Task 12:

Functions and indexes in Hive

PART-C (Data Analytics Lab Project)

TEXT BOOKS

[1] Data Science and Big Data Analytics, EMC2 Education Services
[2] Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, 3 ed, Elseiver Publishers

REFERENCE BOOKS

[1] Simon Walkowiak Big Data Analytics with R: Leverage R Programming to uncover hidden patterns in your Big Data ,Packt publishing, 2016
[2] Nathan Marz, James Warren, "Big Data-Principles and best practices of scalable real-time data systems", DreamTech Press, 2015
[3] Benjamin Bengfort, Jenny Kim, Data Analytics with Hadoop: An Introduction for Data Scientists, OReilly ,1st Edition, 2016

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof.D. Janaki Ram and S. Srinath, III Madras, Data Mining and Knowledge Discovery https://freevideolectures.com/course/2280/database-design/35, Last accessed on 11th August 2018
[2] Prof. Nandansudharsanam and Prof . B.Ravindran , IIT Madras, Introduction to Data Analytics http://nptel.ac.in/courses/110106064/23, Last accessed on 11th August 2018

17CS4751B
HIGH PERFORMANCE COMPUTING LABORATORY

Course Category:	Programme Elective	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Data Structures, Computer Organization & Architecture	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the parallel programming platforms for parallel computer systems.
CO2	Optimize the performance of parallel programs.
CO3	Understand the working group communication operations of MPI.
CO4	Understand algorithm for multicore processors systems using MPI and thread Techniques

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**2**	**3**			**2**									
CO2		**3**	**1**											
CO3	**2**	**3**			**2**									
CO4	**2**	**3**	**1**		**2**									

COURSE CONTENT

Task 1: Implement Basic of MPI Programs.

Task 2: Implement a Program for Communication between MPI processes.

Task 3: Implement advance communication between MPI processes

Task 4: Implement MPI collective operations using 'Synchronization'

Task 5: Implement MPI collective operations using 'Data Movement'

Task 6: Implement MPI collective operations using 'Collective Computation'

Task 7: Write a program for MPI Non-Blocking operation

Task 8: Implement Matrix-Matrix multiplication - Cannon's.

Task9: Implement Sorting using MPI– Shell sort, Quick sort, Bucket.

Task10: Implement Problems using OpenMP.

Task11: Implement Problems using Pthreads.

Task12: Implement Problems using CUDA.

Task13: Implement problems using OpenCL.

TEXT BOOKS

[1] Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar: Introduction to Parallel Computing, Second Edition Pearson Education, 2016.(Chapters:1-10)

[2] Jason Sanders, Edward Kandrot, CUDA By Example – An Introduction to General-Purpose GPU Programming, Addison Wesley, 2011. (Chapters:1-4)

[3] Benedict R Gaster, Lee Howes, David R Kaeli Perhaad Mistry Dana Schaa, Heterogeneous Computing with OpenCL McGraw-Hill, Inc. Newyork , 2012(Chapters-2)

REFERENCE BOOKS

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

[2] David B. Kirk, Wen-mei W. Hwu, Programming Massively Parallel Processors – A Hands-on Approach, Third Edition, Morgan Kaufmann, 2016.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] nptel.ac.in/courses/106108055/

[2] http://www.nvidia.com/object/cuda_home_new.html

[3] http://www.icrar.org/research/postgraduuate/igh-performance-computing-honours-course

[4] http://www.openCL.org

17CS4752A
MACHINE LEARNING LABORATORY

Course Category:	Programme Elective	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Probability and Statistics, Artificial Intelligence Tools Techniques and Applications	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Identify instance based learning algorithms
CO2	Design neural network to solve classification and function approximation problems
CO3	Build optimal classifiers using genetic algorithms
CO4	Analyze probabilistic methods for learning

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**2**	**2**							**1**				**1**	**1**
CO2		**2**							**1**				**1**	**1**
CO3		**2**	**1**										**1**	**1**
CO4			**1**						**1**				**1**	**1**

COURSE CONTENT

Task 1: Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
https://www.youtube.com/watch?v=v9jXnT7tvbs

Task 2: For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples

Task 3: Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Task 4: Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Task 5: Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

Task 6: Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Task 7: Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.

Task 8: Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Task 9: Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML

library classes can be used for this problem.

Task 10: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

TEXT BOOKS

[1] John Anderson, Hands On Machine Learning with Python 1st Edition, AI Sciences Publisher, 2018

REFERENCE BOOKS

[1] Michael Bowles,Machine Learning in Python: Essential Techniques for Predictive Analysis 1st Edition,John Wiley,2015

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Evaluating a hypothesis, Stanford University, https://www.coursera.org/learn/machine-learning/lecture/yfbJY/evaluating-a-hypothesis, Last accessed on 26-8-2019

[2] Balaraman Ravindran, NPTEL Lecture 1 - Introduction to Machine Learning, https://www.youtube.com/watch?v=fC7V8QsPBec, Last accessed on 26-8-2019

[3] Benchmarking Neural Networks on Oracle Cloud Infrastructure with Mapr, https://mapr.com/whitepapers/benchmarking-neural-networks-on-oracle-cloud-infrastructure-with-mapr/ Last accessed on 26-8-2019

[4] George Crump, Dealing with The AI and Analytics Data Explosionhttps://mapr.com/whitepapers/dealing-with-the-ai-and-analytics-data-explosion/ Last accessed on 26-8-2019

17CS4752B
SOFTWARE TESTING METHODOLOGY LABORATORY

Course Category:	Programme Elective	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Probability and Statistics, Artificial Intelligence Tools Techniques and Applications	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the different concepts of testing and apply path testing.
CO2	Apply data flow and transaction flow testing.
CO3	Apply reduction procedure for any application.
CO4	Perform logic and state testing for any given application

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**1**												
CO2	**3**	**1**	**1**											
CO3			**1**						1					
CO4		**1**									**2**			

COURSE CONTENT

Task 1: Design test cases for a given application

Task 2: Implementation of Path Testing

Task 3: Testing programs using JUNIT Tool

Task 4: Testing programs using JUNIT Tool

Task 5: Testing programs using JUNIT Tool

Task 6: Testing User Interface for VB application

Task 7: Testing a VB/.Net application

Task 8: Testing programs using NUNIT Tool

Task 9: Debugging and error handling

Task 10: Test a program using SELENIUM Tool.

Task 11: Test a program using SELENIUM Web Driver.

Task 12: Test a program using SELENIUM Web Driver.

TEXT BOOKS

[1] B. Beizer," Software Testing Techniques", second edition ed.: International Thomson Computer Press

REFERENCE BOOKS

[1] Perry, Effective Methods of Software Testing, John Wiley
[2] Dr.K.V.K.K.Prasad, Software Testing Tools: Dreamtech.
[3] E. Kit, Software Testing in the Real World: Pearson.
[4] Software Testing Techniques: SPD(Oreille).

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://nunit.org/ Last accessed on 18th November 2019
[2] http://www.codeproject.com/Articles/178635/Unit-Testing-Using-NUnit Last accessed on 18th November 2019
[3] http://docs.seleniumhq.org/ Last accessed on 18th November 2019

17CS5753
MINI PROJECT

Course Category:	Programme Core	**Credits:**	2
Course Type:	Project	**Lecture -Tutorial-Practice:**	0 - 0 - 4
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

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

17CS6754
INTERNSHIP/INDUSTRY OFFERED COURSE/GLOBAL PROFESSIONAL CERTIFICATION

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

The students may register for one of the following:

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

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

(c) Global Professional Certification: The students are expected to do Global Professional Certification approved by respective Head of the Department. It carries two credits. The candidate shall submit the certificate to the department.

SEMESTER - VIII

17CS4801A
BUSINESS INTELLIGENCE

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

COURSE OUTCOMES

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

CO1	Understand the concepts Business Intelligence
CO2	Apply the Knowledge Delivery methods to visualize the customized quires
CO3	Apply the Business Intelligence methods to solve the applications and measure the efficiency
CO4	Understand the Future of Business Intelligence

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2		1							2		3			
CO3		1							2		3			
CO4	3													

COURSE CONTENT

UNIT I

Business Intelligence: Effective And Timely Decisions – Data, Information And Knowledge – Role Of Mathematical Models – Business Intelligence

Architectures: Cycle Of A Business Intelligence Analysis – Enabling Factors In Business Intelligence Projects – Development Of A Business Intelligence System – Ethics And Business Intelligence.

UNIT II

Knowledge Delivery: The Business Intelligence User Types, Standard Reports, Interactive Analysis And Ad Hoc Querying, Parameterized Reports And Self-Service Reporting, Dimensional Analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards And Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing The Presentation For The Right Message.

UNIT III

Efficiency: Efficiency Measures – The CCR Model: Definition Of Target Objectives- Peer Groups – Identification Of Good Operating Practices; Cross Efficiency Analysis – Virtual Inputs And Outputs – Other Models. Pattern Matching – Cluster Analysis, Outlier Analysis.

Business Intelligence Applications: Marketing Models – Logistic And Production Models

UNIT IV

Future Of Business Intelligence: Future Of Business Intelligence – Emerging Technologies, Machine Learning, Predicting The Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future Beyond Technology

TEXT BOOKS

[1] Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support And Business Intelligence Systems", 10th Edition, Pearson 2014.

REFERENCE BOOKS

[1] Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle Of
Decision Making", Addison Wesley, 2003.
[2] Carlo Vercellis, "Business Intelligence: Data Mining And Optimization For Decision Making", Wiley Publications, 2009.
[3] David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy

Manager"S Guide", Second Edition, 2012.
[4] Cindi Howson, "Successful Business Intelligence: Secrets To Making BI A Killer App",
McGraw-Hill, 2007.
[5] Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle Toolkit", Wiley Publication Inc.,2007.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Deepu Philip,IIT Kanpur, Business Intelligence & Analytics, accessed on 05-12-2019
https://www.youtube.com/watch?v=BgA8SbVJlqU
[2] Prof. Gaurav Dixit, IIT Rookee, Business Intelligence and Data Mining Modeling Using R accessed on 05-12-2019
https://nptel.ac.in/courses/110107092/
[3] Hasan Mir, What is Business Intelligence? accessed on 05-12-2019
https://www.youtube.com/watch?v=N8F7eOqgH8Q

17CS4801B
M COMMERCE

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

COURSE OUTCOMES

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

CO1	Identify the infrastructure required for building a M-commerce application
CO2	Understand the M-Commerce Technologies.
CO3	Identify the applications of M-Commerce
CO4	Understand the Challenges in implementing M Commerce applications

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1					**2**	**1**	**1**							**1**
CO2					**2**	**1**	**1**							**1**
CO3					**1**	**2**	**2**			**2**				
CO4					**1**	**2**	**2**			**2**				**2**

COURSE CONTENT

UNIT I

ELECTRONIC COMMERCE

Traditional commerce and E-commerce – The Dimensions of E-Commerce – E-Commerce Business Models – E-Commerce information System Function Model

MOBILE COMMERCE

Introduction – The Impact of mobility on e-commerce - Infrastructure of M–Commerce – Types Of Mobile Commerce Services – M-Commerce Business Models – the M-Commerce Value Chain – M-Commerce information system function Model

UNIT II

M COMMERCE: TECHNOLOGY

Mobile Clients: Types – Device limitations – Device location technology

Mobile Client Software: Mobile Device Operating System – Micro Browsers – Mobile Device Communication protocols: WAP, i-Mode – Page Description languages – application Software

WIRELESS COMMUNICATION TECHNOLOGY: Wireless wide area network Technology: Cellular Systems – 2G(CDMA, TDMA, GSM) – 2.5G(GPRS, EDGE) – 3G(UMTS, CDMA-2000) – 4G – Wireless LAN (Wi-fi) – WMAN (wi-max) – WPAN(Bluetooth).

UNIT III

MOBILE COMMERCE: APPLICATIONS

Mobile Financial Services – Mobile Advertising – Mobile Inventory Management – Mobile Product location and Shopping – Mobile Proactive Service Management – Mobile Business Services – Mobile Auction – Mobile Entertainment – Mobile Office – Mobile Distance Education – Mobile Information access – Vehicular Mobile Commerce – Location Based Applications.

WIRELESS APPLICATION DEVELOPMENT: Client Side – Server side – WAP

UNIT IV

M-COMMERCE TRUST, SECURITY, AND PAYMENT

Trust in M-Commerce, Encryption, Authentication, Confidentiality, Integrity and Non repudiation – Mobile Payment.

M-COMMERCE ISSUES

Technology Issues – Mobile Client Issues – Communication infrastructure Issues – other technology Issues – Application issues – Global m-Commerce issues

BEYOND M-COMMERCE

TEXT BOOKS

[1] Norman Sadeh, "M-Commerce Technologies, Services and Business Models" Wiley publications, 2002.
[2] http://online.sfsu.edu/~rnick/dauphine

REFERENCE BOOKS

[1] Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, "E-Commerce fundamentals and applications", John Wiley.
[2] Paul May, "Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business" Cambridge University Press March 2001.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Lecture Series on Internet Technologies by Prof.I.Sengupta, Department of Computer Science & Engineering ,IIT Kharagpur
http://www.youtube.com/watch?v=xKJjyn8DaAw
[2] http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/System%20Analysis%20and%20Design/pdf/Lecture_Notes/LNm13.pdf

17CS4801C
INFORMATION RETRIEVAL SYSTEMS

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

COURSE OUTCOMES

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

CO1	Understand the overview of Information Retrieval Systems
CO2	Compute the process of indexing and Information Extraction
CO3	Learn the stemming algorithms and implement with various data structures
CO4	Understand the concepts of term clustering and Information Visualization
CO5	Learn various text search algorithms.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**													
CO2		**2**	**1**											
CO3														**2**
CO4	**1**	**2**												
CO5	**1**	**2**												

COURSE CONTENT

UNIT I

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses.

Information Retrieval System Capabilities: Search, Browse

UNIT II

Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction.

Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure, Hidden Markov Model.

UNIT III

Automatic Indexing: Statistical indexing: Probabilistic Weighting, Vector Weighting, Natural language, Concept indexing

Document and Term Clustering:

Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

UNIT IV

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

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

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

TEXT BOOKS

[1] M. T. M. Gerald J Kowalski, Information Storage and Retrieval Systems: Springer International Edition, 2018

REFERENCE BOOKS

[1] W. B. Frakes, Ricardo Baeza-Yates, Information Retrieval Data Structures and Algorithms: Prentice Hall PTR, 2015.

[2] R. Baeza-Yates, Modern Information Retrival: Pearson Education, 2012.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://nlp.stanford.edu/IR-book/pdf/01bool.pdf

[2]http://shodhganga.inflibnet.ac.in/jspui/bitstream/10603/141878/10/10_chapter02.pdf

17CS4801D
DATA VISUALISATION

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

COURSE OUTCOMES

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

CO1	Understand basic and advanced techniques of information visualization and scientific visualization
CO2	Apply key techniques of the visualization process for good visualization
CO3	Develop visualization methods and visualization systems, and methods for their evaluation
CO4	Use interaction and distorting techniques for visual mapping and visualization

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1												1	1
CO2		2									2		1	1
CO3		2									2		1	1
CO4									2				1	1

COURSE CONTENT

UNIT I

Introduction : What is Visualization, relationship between visualization and other fields, visualization process, the role of cognition, pseudocode conventions, scatter plot, role of the user

Data Foundations: Types of data, structure within and between records, data pre-processing

Human perception and information processing: what is perception, physiology, perception in visualization, metrics ,cognition

UNIT II

Visual foundations: Visualization process, semiology of graphical symbols, eight visual principles, taxonomies

Visualization techniques for spatial data: visualizing spatial data , Visualization of Point Data, Visualization of Line Data, Visualization of Area Data

Visualization Techniques for Multivariate Data: Point-Based Techniques, Line-Based Techniques, Region-Based Techniques, Combinations of Techniques.

UNIT III

Visualization Techniques for Trees, Graphs, and Networks: Displaying Hierarchical Structures, Displaying Arbitrary Graphs/Networks

Text and Document Visualization: Introduction, Levels of Text Representations, The Vector Space Model, Single Document Visualizations, Document Collection Visualizations, Extended Text Visualizations .

Interaction Techniques: Visualization Structure Space (Components of the Data Visualization)

UNIT IV

Designing Effective Visualizations: Steps in Designing Visualizations, Problems in Designing Effective Visualizations

Comparing and Evaluating Visualization Techniques: User Tasks, User Characteristics, Data Characteristics, Visualization Characteristics, Structures for Evaluating Visualizations

Visualization Systems: Systems Based on Data Type, Systems Based on Analysis Type, Text Analysis and Visualization, Modern Integrated Visualization Systems

TEXT BOOKS

[1] Matthew O. Ward, Georges Grinstein, Daniel Keim Interactive Data Visualization: Foundations, Techniques, and Applications 2nd Edition, CRC press, 2015

REFERENCE BOOKS

[1] Andy Kirk , Data Visualization: A Handbook for Data Driven Design, 1st edition, SAGE publication, 2016

[2] Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Han-Wei Shen Introduction to Data Visualization, http://web.cse.ohio-state.edu/~shen.94/5544/

17CS4801E
CYBER SECURITY

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

COURSE OUTCOMES

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

CO1	Understand the classification of cyber crimes.
CO2	Assess various security attacks.
CO3	Understand the process to counter the cyber crimes.
CO4	Analyze various tools and methods used in cyber crimes

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2		2			2						2			
CO3	3													
CO4		2			2						2			

COURSE CONTENT

UNIT I

Introduction of Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, **Classifications of Cybercrimes**: E-Mail Spoofing, Spamming, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking, Hacking, Online Frauds, Pornographic

Offenses , Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft **Cyber offenses:** Criminals Plan: Categories of Cybercrime,

UNIT II

Cyber Attacks: Reconnaissance, Passive Attack, Active Attacks, Scanning/Scrutinizing gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, and Classification of Social Engineering **Cyberstalking**: Types of Stalkers, Cases Reported on Cyberstalking, Working of Stalking, Real-Life Incident of Cyber stalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Botnet, Attack Vector

UNIT III

DoS and DDoS Attacks: DoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. **Malicious Softwares:** Threat Model, Virus – types, Worms- types, **Penetration Testing:** Introduction, Penetration Testing types, Phases, Reconnaissance, Scanning-Types, Techniques, Gaining Access, Maintaining Access, Reporting and Analysis.

UNIT IV

Tools and Methods: Proxy Servers and Anonymizers, Phishing and Identity Theft : Working of Phishing, Identity Theft (ID Theft), **Password Cracking**: Online Attacks, Offline Attacks, Strong, Weak and Random Passwords, Random Passwords, **Keyloggers and Spywares:** Software Keyloggers, Hardware Keyloggers, Antikeylogger, Spywares, **Legal And Ethical Issues:** Cybercrime and Computer Crime, Intellectual Property, Privacy, Ethical Issues

TEXT BOOKS

[1] Nina Godbole, Sunit Belapur, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, 2nd edition, Wiley India Publications, April, 2011

[2] William Stallings, Cryptography and Network Security: Principles and Practice. 7th Ed, Pearson Education, 2017

REFERENCE BOOKS

[1] “Fundamental on Cyber Security”,CISCO
[2] “ Cyber Security Essentials”,CISCO
[3] “Security Analyst”, NASSCOM

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Michael McPhee, “Mastering Khali Linux for Web Penetration testing”,Pact Publishing, 2017

17CS2802A
BLOCKCHAIN TECHNOLOGIES

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Cryptography and Network Security	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand the blockchain architecture and design
CO2	Analyze the consensus protocols Role in Blockchain
CO3	Understand functioning of Bitcoins
CO4	Analyze security and privacy aspects of Bitcoin

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2		2			2						2			
CO3	3													
CO4		2			2						2			

COURSE CONTENT

UNIT I

Blockchain: Introduction, Structure of a Block, Block Header, Block Identifiers - Block Header Hash and Block Height, The Genesis Block, Linking Blocks in the Blockchain, Merkle Trees, Merkle Trees and Simplified Payment Verification (SPV).

Mining and Consensus I : Introduction, Bitcoin Economics and Currency

Creation, De-centralized Consensus, Independent Verification of Transactions, Mining Nodes, Aggregating Transactions into Blocks, Transaction Age, Fees, and Priority

UNIT II

Mining and Consensus II : The Generation Transaction, Coinbase Reward and Fees, Structure of the Generation Transaction, Coinbase Data, Constructing the Block Header, Mining the Block, Proof-of-Work Algorithm , Difficulty Representation, Difficulty Target and Re-Targeting, Successfully Mining the Block, Validating a New Block , Assembling and Selecting Chains of Blocks, Blockchain Forks, Mining and the Hashing Race, The Extra Nonce Solution, Mining Pools, Consensus Attacks. **Bitcoin:** Introduction, History, Bitcoin Uses, Users and Their Stories, Getting Started, Quick Start, Getting your first bitcoins, Sending and receiving bitcoins,

UNIT III

Bitcoin Functioning: Transactions, Blocks, Mining, and the Blockchain, Bitcoin Overview, Buying a cup of coffee, Bitcoin Transactions, Common Transaction Forms, Constructing a Transaction, Getting the right inputs,Creating the outputs, Adding the transaction to the ledger, Bitcoin Mining, Mining transactions in blocks, Spending the transaction

Bitcoin Transactions : Bitcoin Transactions, Common Transaction Forms,Constructing a Transaction, Getting the right inputs, Creating the outputs, Adding the transaction to the ledger , Bitcoin Mining, Mining transactions in blocks, Spending the transaction

UNIT IV

Bitcoin Network : Peer-to-Peer Network Architecture, Nodes Types and Roles, The Extended Bitcoin Network, Network Discovery, Full Nodes, Exchanging "Inventory", Simplified Payment Verification (SPV) Nodes, Bloom Filters, Bloom Filters and Inventory Updates, Transaction Pools,

Alert Messages

Bitcoin Security: Security principles, Developing Bitcoin Systems Securely, The Root of Trust,

User Security Best Practices, Physical Bitcoin Storage, Hardware Wallets, Balancing Risk (loss vs. theft), Diversifying Risk, Multi-sig and Governance,Survivability

Alternative Chains, Currencies, and Applications: A taxonomy of alternative currencies and chains, Meta-Coin Platforms, Colored Coins, Mastercoin, Counterparty, Alt-coins, Evaluating an alt-coin, **Alt-Coins**: CryptoNote, Bytecoin, Monero, Zerocash/Zerocoin, Darkcoin, Namecoin, Bitmessage, Ethereum

TEXT BOOKS

[1] Andreas M. Antonopoulos, " Mastering Bitcoin", O'Reilly, 2016

REFERENCE BOOKS

[1] Melanie Swan, " Blockchain –Blueprint For a New economy", 1st Edition, O'Reilly, 2018

[2] Don TapScott, Alex Tapscott, "Block chain Revolution". 2nd Edition, Penguin publisher, 2018

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://onlinecourses.nptel.ac.in/noc18_cs47/announcements?force=true

[2] Marco Iansiti, Karim R. Lakhani, " Truth About Blockchain",Harvard Bsiness Review, Harward University, Jan 2017

17CS2802B
CYBER FORENSICS

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

COURSE OUTCOMES

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

CO1	Understand the concepts of cyber forensics related Issues.
CO2	Analyse the process of various forensic systems.
CO3	Analyze Evidence capture mechanism and Recovery steps
CO4	Evaluate and Report electronic communications evidences.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1					**3**									
CO2	**2**								**2**					
CO3					**3**									
CO4	**2**								**2**					

COURSE CONTENT

UNIT I

Forensic overview:

Introduction, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/ Employment Proceedings, Forensics Services, Benefits of Professional Forensics Methodology, Steps Taken by

Computer Forensics Specialists.

Types of Forensics Systems: Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems , Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems, Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy System, Identity Management Security Systems, Identity Theft, Homeland Security Systems

UNIT II

Data Recovery: Defination, Data Backup and Recovery, The Role of Backup in Data Recovery, The Data-Recovery Solution, Hiding and Recovering Hidden Data

Evidence Collection and Data Seizure, Need of collection, Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps.

UNIT III

Duplication and Preservation of Digital Evidence, Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collecting and Preserving Computer Forensic Evidence, Special Needs of Evidential Authentication.

Computer Image Verification and Authentication: Special Needs of Evidential Authentication,

Practical Consideration, Practical Implementation, **Reconstructing Past Events**: Introduction, Useable File Formats, Unusable File Formats, Converting Files.

UNIT IV

Forensic Analysis: Computer Forensic Analysis, Discovery of Electronic Evidence,

Electronic Document Discovery: A Powerful New Litigation Tool, Identification of Data, Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices.

Network Forensics Scenario: A Technical Approach, Destruction of Email,

Damaging Computer Evidence, Tools Needed for Intrusion Response to the Destruction of Data, System Testing

E-mail Forensic: Exploring the Role of E-mail in Investigations, Exploring the Role of Client and Server in E-mail, Investigating E-mail Crimes and Violations, Using Specialized E-mail Forensics Tools, Understanding Acquisition Procedure for Cell. Report Writing

TEXT BOOKS

[1] Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", Pearson Education, 3rd Edition, 2015.

[2] John R. Vacca, " Computer Forensics, Computer Crime Investigation", Firewall Media, 2005 Andreas M. Antonopoulos, " Mastering Bitcoin", O'Reilly, 2016

REFERENCE BOOKS

[1] Nelson, Phillips Enfinger, Steuart "Computer Forensics and Investigations", CENGAGE, 2015

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.cybrary.it/glossary/d-the-glossary/digital-forensics/

[2] https://www.udemy.com/topic/digital-forensics/

17CS2802C
DEEP LEARNING

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

COURSE OUTCOMES

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

CO1	Understand the fundamentals of Applied Math for deep learning
CO2	Understand deep networks and Regularization for Deep Learning
CO3	Analyse Sequence Modeling and convolutional neural networks
CO4	Apply Monte Carlo Methods and recurrent neural networks

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2												2	2
CO2		2							1				2	2
CO3		2							2				2	2
CO4		2							2				2	2

COURSE CONTENT

UNIT I

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks- Introduction to various networks

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed – forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT II

Regularization for Deep Learning

Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

UNIT III

Optimization for Training Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Algorithms with Adaptive Learning Rates

Convolutional Networks: The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning

UNIT IV

Sequence Modeling: Recurrent and Recursive Nets: Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, Leaky Units and Other Strategies for Multiple

Time Scales

Practical Methodology: Performance Metrics, Selecting Hyper parameters, Debugging Strategies

Monte Carlo Methods**:** Sampling and Monte Carlo methods, Marko Chain Carlo Methods, Gibbs Sampling

TEXT BOOKS

[1] Ian Goodfellow,Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2017

REFERENCE BOOKS

[1] Antonio Gulli, Sujit Pal, Deep Learning with Keras, Packt Publishing, 2017

[2] Tom Hope, Yehezkel S. Resheff, Itay Lieder,Learning Tensor Flow: A Guide to Building Deep Learning Systems, OReilly 2017

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Ian GoodFellow, Introduction to Deep Learning, https://www.youtube.com/embed//vi7lACKOUao

[2] Ian GoodFellow, Deep Feed forward Neural Networks, https://drive.google.com/file/d/0B64011x02sIkRExCY0FDVXFCOHM/view

[3] Ian GoodFellow , Recurrent and Recursive Nets, https://www.youtube.com/watch?v=ZVN14xYm7JA&feature=youtu.be

17CS2802D
USER INTERFACE AND EXPERIENCE DESIGN

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

COURSE OUTCOMES

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

CO1	Understand the key terms of interactive graphical systems.
CO2	Use appropriate device and screen based controls for presenting information.
CO3	Apply design principles for developing sophisticated User interfaces.
CO4	Identify faults in the interfaces and suggest alternative designs.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**2**													
CO2		**3**							**2**		**2**		**2**	
CO3		**3**							**2**		**2**			
CO4		**3**							**2**		**2**		**2**	

COURSE CONTENT

UNIT I

Introduction: 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, principles and characteristics.

UNIT II

Design process: Understanding how people interact with computers, Important Human Characteristics in Design, Human Considerations in Design, Human interaction speeds.
Screen designing: Interface design goals, screen meaning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, visually pleasing composition, amount of information, focus and emphasis, presenting information simply and meaningfully, technological considerations in interface design.

UNIT III

Windows: Characteristics, components, operations, Selection of devices based and screen based controls.
Components: Icons and images, Multimedia.

UNIT IV

Organize and Layout windows and pages: General Guidelines, Organization guidelines, control navigation, window guidelines, web page guidelines.
Testing User interfaces: The purpose of Usability testing, Importance of Usability testing, Scope of Testing, prototypes and kind of Tests, Developing and Conducting the Test .

TEXT BOOKS

[1] Wilbert O Galitz, "The Essential Guide to User Interface Design- An Introduction to GUI Design Principles and Techniques", 3rd Edition, Wiley DreamaTech, 2017.

REFERENCE BOOKS

[1] Steven Jacobs, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, "Designing the User Interface: Strategies for Effective Human - Computer Interaction" 6th Edition, Pearson Education Asia, 2017.
[2] Alan Dix, Janet Fincay, Gre Goryd, Abowd and Russell Bealg, "Human

Computer Interaction", 2nd Edition, Pearson Education.
[3] Scott Mackenzie, "Human-Computer Interaction: An Empirical Research Perspective" 2016, Elsevier Publications.
[4] Rogers, "Interaction Design: Beyond Human - Computer Interaction", Third Edition, Wiley Publications, 2013.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Dr. Samit Battacharya IIT Guwahati, Department of Computer Science & Engineering, NPTEL Videos,
Available:https://nptel.ac.in/courses/106103115/ Last accessed on August 2018.
[2] Prof. Pradeep Yammiyavar IIT Guwahati, Department of Design, NPTEL Videos, Available:https://nptel.ac.in/courses/106103115/ Last accessed on August 2018.

17CS2802E
PATTERN RECOGNITION

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

COURSE OUTCOMES

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

CO1	Explain the basic concepts and importance of pattern recognition.
CO2	Compare the supervised, unsupervised and semi-supervised learning
CO3	Discuss the Bayesian decision theory for continuous and discrete features
CO4	Explain the Maximum likelihood and Bayesian parameter estimation
CO5	Identify the major issues in clustering

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**1**													
CO2											**1**			
CO3	**2**	**2**												
CO4	**3**	**2**							**1**					
CO5	**2**		**1**						**1**		**1**			

COURSE CONTENT

UNIT I

Introduction: Machineperception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation, Bayesian Decision Theory: Introduction, continuous features –two categories classifications, minimum error-rate classification-zero–one lossfunction, classifiers, discriminant functions, and decision surfaces.

Unit II

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

Unit III

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

Unit IV

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

TEXT BOOKS

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

REFERENCE BOOKS

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

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. P.K. Biswas. (June 2014). Pattern Recognition and Applications

[NPTEL, Video lecture]. Available: http://www.nptel.ac.in/courses/117105101/

17CS5851
MAJOR PROJECT

Course Category:	Programme Core	**Credits:**	9
Course Type:	Project	**Lecture -Tutorial-Practice:**	0 - 5 – 8
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

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