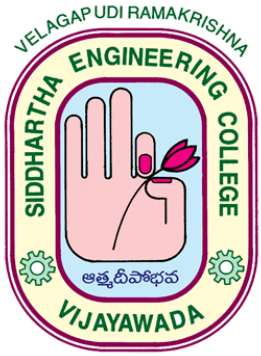
B. Tech
in
INFORMATION TECHNOLOGY



Scheme of Instruction and Syllabus

w.e.f. 2017-18

Department of Information Technology

(B. Tech. IT 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

VELAGAPUDI RAMAKRISHNASIDDHARTHA ENGINEERING COLLEGE
DEPARTMENT OF INFORMATION TECHNOLOGY
SCHEME OF INSTRUCTIONS FOR FOUR YEAR UG PROGRAMME [B.TECH VR17]
GROUP A
(CSE, ECE, EIE, IT)

SEMESTER I **CONTACT HOURS: 26**

S.No	Course Code	Title of the Course	L	P	T	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	17PH1151	Applied 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					-	-	-

SEMESTER II **CONTACT HOURS: 27**

S.No	Course Code	Title of the Course	L	T	P	C	CE	SE	T
1	17MA1201	Laplace Transforms And Integral Calculus	3	1	0	4	30	70	100
2	17CH1202	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, T-Total Marks

DEPARTMENT OF INFORMATION TECHNOLOGY
SCHEME OF INSTRUCTIONS FOR FOUR YEAR UG PROGRAMME [B.TECH VR17]

SEMESTER III **CONTACT HOURS: 27**

S.No	Course Code	Title of the Course	L	T	P	C	CE	SE	T
1	17MA1301	Complex Analysis and Numerical Methods	3	1	0	4	30	70	100
2	17IT3302	Discrete Mathematical Structures For Information Technology	2	1	0	3	30	70	100
3	17IT3303	Data Structures	3	1	0	4	30	70	100
4	17IT3304	Computer Organization	2	1	0	3	30	70	100
5	17HS2305	Humanities Elective	1	0	0	1	100	0	100
6	17TP1306	Logic and Reasoning	0	0	2	1	100	0	100
7	17IT3308	Object Oriented Programming	1	0	2	2	30	70	100
8	17IT3351	Data Structures Lab	0	0	3	1.5	30	70	100
9	17HS1352	Communication Skills Laboratory	0	0	2	1	30	70	100
		Total	12	4	9	20.5	410	490	900
10	17MC1307A	Environmental Studies	2	0	0	-	100	0	100

List of Humanities Electives

A	Yoga & Meditation	F	Visual Communication
B	Music	G	Film Appreciation
C	Human Rights and Legislative Procedures	H	Sanskrit Bhasha
D	Philosophy	I	Foreign Languages (German/French)
E	Development of societies		

SEMESTER IV **CONTACT HOURS: 31**

S.No	Course Code	Title of the Course	L	T	P	C	CE	SE	T
1	17IT3401	Statistics with R	2	0	2	3	30	70	100
2	17IT3402	Data Base Management Systems	2	1	0	3	30	70	100
3	17IT3403	Design & Analysis of Algorithms	2	1	0	3	30	70	100
4	17IT3404	Python Programming	3	0	0	3	30	70	100
5	17TP1405	English For Professionals	0	0	2	1	100	0	100
6	17IT3406	Operating Systems	3	0	2	4	30	70	100
7	17IT3451	Data Base Management Systems Lab	0	0	3	1.5	30	70	100
8	17IT3452	Python Programming Lab	0	0	3	1.5	30	70	100
9	17IT3453	Web Programming Lab	0	0	3	1.5	30	70	100
		Total	**12**	**2**	**15**	**21.5**	**340**	**560**	**900**
10	17MC1407B	Indian Constitution	2	0	0	-	100	0	100

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

DEPARTMENT OF INFORMATION TECHNOLOGY
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SEMESTER V **Contact Hours: 29**

S.No	Course Code	Title of the Course	L	T	P	Credits	CE	SE	T
1	17IT3501	Software Engineering	3	0	0	3	30	70	100
2	17IT3502	Data Mining	3	0	2	4	30	70	100
3	17IT3503	Computer Networks	2	0	2	3	30	70	100
4	17IT2504 Open Elective –I **(TO ALL THE DEPTS)**	A. AI Tools, Techniques and Applications B. LINUX Programming C. Mobile Application Development	3	0	0	3	30	70	100
5	17IT2505 Open Elective –II **(Inter Disciplinary Elective)**	A. DBMS B. OOPS C. Python Programming	3	0	0	3	30	70	100
6	17IT2506 Open Elective –III **(Self Learning Elective Course)***	A. Data Science for Engineers B. Scalable Data Science C. Business Analytics and Text Mining Modeling using Python D. Innovation, Business models and Entrepreneurship E. Human Computer Interaction	0	0	0	2	-	100	100
7	17TP1507	Personality Development	0	0	2	1	100	-	100
8	17IT3509	Java Programming	2	1	0	3	30	70	100
9	17IT3551	Java Programming Lab	0	0	2	1	30	70	100
10	17IT3552	Advanced Programming Lab-I	0	0	2	1	30	70	100
11	17MC1508A Mandatory Learning	Biology for Engineers	2	0	0	-	100	-	100
Total			**18**	**1**	**10**	**24**	**440**	**660**	**1100**

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

*Students can opt any one of the self-learning courses prescribed by the Department. Students register and cleared the opted course in MOOCS/ NPTEL on or before the Last Instruction Day of V Semester. They have to submit the certificate before the Last Instruction Day of V Semester.

DEPARTMENT OF INFORMATION TECHNOLOGY
SCHEME OF INSTRUCTIONS FOR FOUR YEAR UG PROGRAMME [B.TECH VR17]

SEMESTER VI **Contact Hours: 28**

S.No	Course Code	Title of the Course	L	T	P	Credits	CE	SE	T
1	17IT3601	Machine Learning	3	0	2	4	30	70	100
2	17IT3602	Web Programming and Development	3	0	0	3	30	70	100
3	17IT4603 Programme Elective -I	A. Fundamentals of Data Science B. Network Security C. Automata and Compiler Design D. Agile Software Development E. Industry Need Based Elective	3	0	0	3	30	70	100
4	17IT4604 Programme Elective -II	A. Big Data B. Internet of Things C. Dot Net Technologies D. Software Testing Methodologies	3	0	0	3	30	70	100
5	17IT2605 Open Elective IV	A. Cyber Security B. Data Visualization C. M Commerce	3	0	0	3	30	70	100
6	17TP1606 Soft skills IV	Quantitative Aptitude	0	0	2	1	100	-	100
7	17IT4651	A. Big Data Lab B. Internet of Things Lab C. Dot Net Technologies Lab D. Software Testing Methodologies Lab	0	0	2	1	30	70	100
8	17IT3652	Web Programming and Development Lab	0	0	2	1	30	70	100
9	17IT3654	Advanced Programming Lab -II	0	0	2	1	30	70	100
10	17IT5653 Project work	Engineering Project for Community Services*	0	1	2	2	30	70	100
		Total	**15**	**1**	**12**	**22**	**370**	**630**	**1000**

L-Lecture, T-Tutorial, P-Practical, C-Credits, CE-Continuous Evaluation, SE-Semester End, 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 student is encouraged to take up real life problems leading to innovative model building

*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.

DEPARTMENT OF INFORMATION TECHNOLOGY
SCHEME OF INSTRUCTIONS FOR FOUR YEAR UG PROGRAMME [B.TECH VR17]

SEMESTER VII **Contact Hours: 25**

S.No	Course Code	Title of the Course	L	T	P	Credits	CE	SE	T
1	17IT3701	Cloud Computing	3	1	0	4	30	70	100
2	17IT4702 Programme Elective - III	A. Data Analytics B. Computer Vision C. Routing and Switching Essentials D. Industry Need Based Elective	3	0	0	3	30	70	100
3	17IT4703 Programme Elective – IV	A. Deep Learning B. Block Chain Technologies C. Information Retrieval System	3	0	0	3	30	70	100
4	17IT4704 Programme Elective -V	A. Natural Language Processing B. Cloud based CRM Platform (Salesforce) C. DevOps Essentials	3	0	0	3	30	70	100
5	17HS1705	Engineering Economics and Finance	2	0	0	2	30	70	100
6	17IT3751	Cloud Computing Lab	0	0	3	1.5	30	70	100
7	17IT4752	A. Deep Learning Lab B. Block Chain Technologies Lab C. Information Retrieval System Lab	0	0	3	1.5	30	70	100
8	17IT5753 Design Project 1	Mini Project*	0	0	4	2	30	70	100
9	17IT6754	A. Internship B. Industry Offered Course C. Global Professional certification				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, T-Total Marks

DEPARTMENT OF INFORMATION TECHNOLOGY
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SEMESTER VIII **Contact Hours: 19**

S.No	Course Code	Title of the Course	L	T	P	Credits	CE	SE	T
1	17IT4801 Programme Elective -VI	A. Business Intelligence B. Mobile Computing C. Service Oriented Architecture D. Software Metrics and Quality Assurance	3	0	0	3	30	70	100
2	17IT2802 Open Elective –V*	NPTEL / SWAYAM courses (approved by BOS members)	3	0	0	3	-	100	100
3	17IT5851 Project work	Major Project**	0	5	8	9	30	70	100
Total			**6**	**5**	**8**	**15**	**60**	**240**	**300**

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

*Open Elective- V may also opt as self-learning course. Students 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 (L-Low, M-Medium, H-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:		**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 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, M-Medium, H-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	**H**													
CO2	**H**													
CO3	**H**								**M**					
CO4	**H**								**M**					

COURSE CONTENT

UNIT-I

Quantum Mechanics: Dual nature of light, Matter waves and Debroglie's hypothesis, G. P. Thomson experiment, Heisenberg's uncertainty principle and its applications (Nonexistence 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:** **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 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 (L-Low, M-Medium, H-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	**H**	**M**												
CO2	**L**		**H**											
CO3	**L**		**H**											
CO4	**L**	**L**							**H**					

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 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
[2] http://cs103.net/video-lectures/
[3] MATLAB Programming, https://www.youtube.com/watch?v=zJm8VHg4TbQ
[4] https://www.edx.org/learn/matlab

17EE1104 - BASICS OF ELECTRICAL ENGINEERING

Course Category:	Engineering Sciences	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:		**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 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 (L-Low, M-Medium, H-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	**H**	**L**			**M**									
CO2	**H**	**L**												
CO3	**M**				**M**									
CO4	**M**													

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 (L-Low, M-Medium, H-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				**M**	**H**	**H**	**H**	**H**		**M**				
CO2				**H**	**H**	**H**	**H**	**H**		**M**				
CO3	**M**			**H**	**H**	**H**	**H**	**H**		**M**				
CO4	**L**	**L**	**M**	**H**	**2**	**H**	**H**	**H**		**M**				

COURSE CONTENT

UNIT I

Professional Writing Skills

- Professional Letter- Business, Complaint and Transmittal
- Essay Writing- Descriptive and Analytical
- Administrative and On-line drafting skills –Minutes and Web notes including e-mail

UNIT II

Interpersonal Communication Skills

- **Communicative Facet**- Speech acts- Extending Invitation, Reciprocation, Acceptance, Concurrence, Disagreeing without being disagreeable
- **Articulation-oriented Facet**- Transcription using International Phonetic Alphabet, Primary Stress

UNIT III

Vocabulary and Functional English

- A basic List of 500 words – Overview
- Verbal analogies, Confusables, Idiomatic expressions and Phrasal Collocations
- Exposure through Reading Comprehension- Skimming, Scanning and Understanding the textual patterns for tackling different kinds of questions
- Functional Grammar with special reference to Concord, Prepositions, use of Gerund an Parallelism

UNIT IV

Technical Communication skills:

- Technical Proposal writing
- Technical Vocabulary- a representative collection will be handled
- Introduction to Executive Summary
- Technical Report writing(Informational Reports and Feasibility Report

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

17PH1151 - APPLIED PHYSICS LABORATORY

Course Category:	Institutional Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:		**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 (L-Low, M-Medium, H-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	**H**										**M**			
CO2	**H**													
CO3	**H**													

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:** **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 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 (L-Low, M-Medium, H-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	**L**								**H**					
CO2		**H**	**L**											
CO3	**H**		**L**											
CO4			**H**						**L**					

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: compute name share name)

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:** **Semester end Evaluation:** **Total Marks:**	30 70 100

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 (L-Low, M-Medium, H-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	**H**			**L**										
CO2	**M**			**L**										
CO3	**M**			**L**										
CO4	**L**			**L**										

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:**	1
Course Type:	Theory	**Lecture -Tutorial-Practice:**	1 - 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	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 (L-Low, M-Medium, H-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	**H**							**L**						
CO2	**H**				**M**		**L**							
CO3	**H**							**L**						
CO4	**H**				**M**		**L**							

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:** **Semester end Evaluation:** **Total Marks:**	30 70 100

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 (L-Low, M-Medium, H-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	**H**	**L**												
CO2	**H**	**L**												
CO3	**H**	**L**												
CO4	**H**	**L**												

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 (L-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		**H**												
CO2	**M**													
CO3														
CO4			**M**						**H**					

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:** **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 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, Data types, Structures and Unions.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-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	**H**													
CO2		**L**	**H**											
CO3		**L**	**H**											
CO4	**H**	**L**												

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 4th, 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:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Fundamentals of electronic components, devices, transducers
CO2	Principles of digital electronics
CO3	Principles of various communication systems.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High

	PO 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	**H**	**H**			**M**									
CO2	**H**	**H**												
CO3	**M**				**M**									

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:** **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 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 (L-Low, M-Medium, H-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	H			H							L			
CO2	M			H							M			
CO3	M			M							M			
CO4	L			H							M			

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 (L-Low, M-Medium, H-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			**H**											
CO2									**M**					
CO3		**M**												

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:** **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 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 (L-Low, M-Medium, H-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	**L**		**H**											
CO2		**L**	**H**											
CO3		**L**	**H**											
CO4			**H**								**L**			

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 statements (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:** **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 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 (L-Low, M-Medium, H-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	**M**													
CO2								**M**						
CO3					**H**									
CO4											**M**			

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).

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] R.S Naagarazan**,** https://soaneemrana.org/onewebmedia/Professional%20Ethics%20and%20Human%20Values%20by%20R.S%20NAAGARAZAN.pdf

[2] https://www.youtube.com/watch?v=vS31O3XfH_0

[3] https://www.youtube.com/watch?v=krGRP-Iq2SM

[4] https://www.youtube.com/watch?v=WUlwtUHxREw

SEMESTER - III

17MA1301 - COMPLEX ANALYSIS AND NUMERICAL METHODS

Course Category:	Mathematics III	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-1-0
Prerequisites:	17MA1201 - Laplace Transforms And Integral Calculus	**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 analytic, non-analytic functions and evaluate complex integrals.
	CO2	Analyze Taylor, Laurent series and evaluate real definite integrals using residue theorem.
	CO3	Solve Algebraic, transcendental, system of equations and estimate functions using polynomial interpolation.
	CO4	Solve initial and boundary value problems numerically.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	M												
CO2	H	M												
CO3	H	M		M	M								L	L
CO4	H	M		M	M								L	L

Course Content	**UNIT I:** **Complex Analysis:** Introduction, continuity, Cauchy-Riemann equations. Analytic functions, Harmonic functions, Orthogonal systems, Complex integration, Cauchy's integral theorem, Cauchy's integral formula
	UNIT II: Taylor's series, Laurent's series, Zeros and singularities, Residue theorem, calculation of residues, evaluation of real definite integrals (by applying the residue theorem). Standard transformations: Translation - Magnification and Rotation – Invertion and reflection - Bilinear transformation.
	UNIT III: **Numerical Methods**: Solution of Algebraic and Transcendental Equations : Introduction, Newton - Raphson method, Solution of simultaneous linear equations – Gauss Elimination Method - Gauss - Seidel iterative method. **Interpolation:** Introduction, Finite Differences – Forward, Backward, Central Differences, Symbolic Relations, Differences of a polynomial, Newton's formulae for interpolation, Central difference interpolation formulae –Gauss's, Sterling's, Bessel's formulae Interpolation with unequal intervals – Lagrange's and Newton's Interpolation formulae.
	UNIT IV: **Numerical Differentiation And Integration** : Finding first and second order differentials using Newton's formulae. Trapezoidal rule and Simpsons 1/3 Rule

	Numerical Solutions of Differential Equations: Taylor's series method Picard's method. Euler's method, Runge - Kutta method of 4th order, Boundary value problems, Solution of Laplace's and Poisson's equations by iteration.
Text books and Reference books	**Text Book(s):** [1]. B.S.Grewal, "Higher Engineering Mathematics", 43rd Edition,KhannaPublishers, 2014 **Reference Book(s):** [1]. Krezig, "Advanced Engineering Mathematics", 8th Edition, JohnWiley& Sons.2007, [2]. R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishers. [3]. N.P.Bali, Manish Goyal, "A Text book of Engineering Mathematics", 1st Edition, Lakshmi Publications (P) Limited, 2011 [4]. H.K.Das, Er. RajnishVerma, "Higher Engineering Mathematics", 1st Edition, S.Chand& Co., 2011. [5]. S. S. Sastry, "Introductory Methods of Numerical Analysis", PHI , 2005.
E-resources and other digital material	[1]. faculty.gvsu.edu/fishbacp/complex/complex.html. [2]. nptelvideolectures/iitm.ac.in [3]. https://nptel.ac.in/courses/111/107/111107056/ [4]. Prof R.Usha, IIT Madras, Numerical Analysis, 2017 https://nptel.ac.in/courses/111/106/111106101/

17IT3302 - DISCRETE MATHEMATICS FOR INFORAMTION TECHNOLOGY

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	2-1-0
Prerequisites:	Basic concepts of Set Theory	**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 logical inference and counting techniques
	CO2	Classify functions, relations and concepts of generating functions.
	CO3	Solve recurrence relations and understand the concepts of Groups and their properties.
	CO4	Classify Groups and Graph isomorphism.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	H			H				H					L
CO2	H	H			H				H					L
CO3	H	H			L				L				L	L
CO4	H	L							L				L	

Course Content

UNIT I:
Mathematical Logic: Basic Structures: Sets and subsets, set operations
The Foundations: Logic and Proofs-Propositional Logic, Propositional equivalences, Predicates and Quantifiers, Rules of inference, Introductions to proofs
Counting: Basics of counting, Pigeonhole principle, permutations and combinations

UNIT II:
Relations and Functions: Relations and their Properties, functions- one to one and onto functions, equivalence relation, partial order relations, POSET and Hasse diagrams.
Generating Functions: Introduction, definition and examples, useful facts about power series, counting problems and generating functions.

UNIT III:
Advanced Counting Techniques: Recurrence Relations- Solving Linear recurrence relations-Solving homogeneous recurrence relations with constant coefficients-Solving Non homogeneous recurrence relations with constant coefficient.
Group Theory: Groups- definition of a group, examples and elementary properties, sub groups , group homomorphism

UNIT IV:
Group Theory: Cosets and Lagrange's Theorem, Normal subgroups and Quotient Groups, Permutation Groups.
Graph Theory: Definition of graph and examples edge sequence, walks paths and circuits, directed graphs, sub graphs and operations on graphs, isomorphism of graphs**.**

Text books and Reference books	**Text Book(s):** [1]. Kenneth H Rosen, Discrete Mathematics and Applications, 6th edition, McGrahill [2]. N.ChandraShekharan and M.Umaparvathi , Discrete Mathematics ,PHI 2010 **Reference Book(s):** [1]. J.L Mott and A.Kandel , Discrete Mathematics for Computer scientists and Mathematicians, 2nd edition, PHI [2]. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, 4th Edition (2003), Pearson Education.
E-resources and other digital material	[1]. Kamala Krithivasan, IIT Madras (25-06-2018). Discrete Mathematical Structures [NPTEL].Available: http://nptel.ac.in/syllabus/syllabus.php?subjectId=106106094 [2]. DominikScheduer, Assistant Professor, Department of CSE, Shanghai Jiao Tong Univeristy (25-06-2018). Discrete Mathematics [COURSERA]. Available: https://www.coursera.org/learn/discrete-mathematics. [3]. https://nptel.ac.in/courses/106/106/106106094/ [4]. Dr. Kamala Krithivasan, **IIT Madras, Discrete Mathematical Structures, http://www.infocobuild.com/education/audio-video-courses/computer-science/DiscreteMathematicalStructures-IIT-Madras/lecture-16.html**

17IT3303 - DATA STRUCTURES

Course Category:	Programme Core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-1-0
Prerequisites:	17CS1103- Problem Solving Methods 17CS1203- 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	Analyze operations on linear data structures like stack, queue and linked list
	CO2	Develop algorithms to solve a given problem using appropriate data structure
	CO3	Demonstrate the algorithms for operations on binary, binary search, AVL and B-trees
	CO4	Implement searching& sorting techniques and assess its performance.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	M	M	L		L					M		M	L
CO2	M	M	M	M		L					M		L	M
CO3	M	M	M	H		L					M		H	M
CO4	H	M	M	L		L					M		H	L

Course Content

UNIT I

Basic Concepts: Overview: System life cycle. Algorithm Specification, Data Abstraction, Performance Analysis- Space complexity, Time complexity, The Abstract Data Type.

Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Stacks: Stacks, Stacks using dynamic arrays, Evaluation of expressions: Infix to Postfix, Evaluating postfix expressions.

UNIT II

Queues: ADT queue, Types of Queue: Simple Queue, Circular Queue using Dynamic Arrays

Linked Lists: Single linked list and Chains, Representing chains in C, Linked Stacks and Queues, Doubly Linked List

Polynomials: Polynomial representation, adding polynomials, Circular List representation of polynomials

	UNIT III **Introduction to Binary Trees:** Basic Tree Terminologies, Properties of binary trees, binary tree representations. Binary Tree Traversals: In order, Preorder, Post order, level order traversal. **Binary Search Trees:** Definition, searching a Binary Search Trees (BST), Insertion into a binary search tree, Deletion from a binary search tree. **Efficient Binary Search Trees:** AVL trees- definition, rotations, insertion. **Efficient Multi Search Trees:** Introduction to m-way Search Trees, B Trees- insertion in to a B tree, deletion from a B tree.
	UNIT IV **Heaps:** Priority queues, Definition of max heap, insertion into a max heap, deletion from a max heap. **Graphs:** The graph abstract data type: Introduction, definitions, Graph Representations: Adjacency Matrix, Adjacency List. **Sorting:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Performance and Comparison among all the methods. **Hashing:** General idea, Hash Functions, separate chaining, open addressing, rehashing, extendable hashing.
Text books and Reference books	**Text Book(s):** [1]. Horowitz Sahni and Anderson-Freed, "Fundamentals of Data Structures in C", 2nd edition, Universities Press, 2011. [2]. Mark Allen Weiss, "Data structure and Algorithm Analysis in C", 2nd edition, Addison Wesley Publication, 2010. **Reference Books:** [1]. YedidyahLangsam, Moshe J. Augenstein and Aaron M. Tenenbaum, "Data Structures using C and C++", 2nd edition, Pearson Education, 1999. [2]. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with Applications", 2nd edition, McGraw Hill, 2008.
E-resources and other digital material	[1]. SudarshanIyengar: IIT Ropar (12, August, 2018). Data Structures and Algorithms[NPTEL]. Available: http://nptel.ac.in/ [2]. Erik Demaine, (12, may, 2018). Advanced Data Structures [MIT-OpenCourseWare]. Available: http://ocw.mit.edu/ [3]. https://www.youtube.com/playlist?list=PLyqSpQzTE6M_Fu6l8irVwXkUyC9Gwqr6 [4]. https://nptel.ac.in/courses/106/102/106102064/

17IT3304 - COMPUTER ORGANIZATION

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	2-1-0
Prerequisites:	17CS1103- 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	Design combinational & sequential circuits,digital components, arithmetic logic and control units
	CO2	Analyze the basic organization of computer, different instruction formats and addressing modes.
	CO3	Apply computer algorithms for performing arithmetic operations on binary number system.
	CO4	Analyze components of memory organization and modes of data transfer between CPU and I/O devices

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L	M								L		L	L
CO2	L	L	M								L		L	L
CO3	H										L		L	L
CO4	L		L								L		L	L

Course Content

UNIT I:

Digital Logic Circuits: Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Flip-Flops, Sequential circuits.

Digital Components: Integrated Circuits**,** Decoders, Multiplexers, Registers, Shift Registers, Binary Counters, Memory Unit.

UNIT II:

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 Instruction, Input-Output and Interrupt Instructions.

UNIT III:

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.

	UNIT IV: **Computer Arithmetic**: Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-point Arithmetic operations. **Memory Organization**: Memory Hierarchy, Associative Memory, Cache Memory. **Input-Output Organization**: Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA).
Text books and Reference books	**Text Book(s):** [1] M. Morris. Mano, "Computer Systems Architecture", 3rdedition, Prentice Hall India, 2007. **Reference Books:** [1]. V.Carl Hamachar, "Computer Organization", Fifth edition, McGraw Hill Edition, 2011 [2]. J.P.Hayes, "Computer Architecture and Organization" TMH, International Second Revised Edition, 1998 [3]. William Stallings, "Computer Organization and Architecture", Ninth Edition, Pearson/PHI, 2013 [4]. Andrew S. Tanenbaum, "Structured Computer Organization", Fifth Edition, PHI/Pearson, 2009
E-resources and other digital material	[1]. Video lectures by Prof. S. Raman, IIT Madras: http://www.myopencourses.com/subject/computer-organization-1 [2]. P. S. Raman. Lecture Series on Computer Organization: https://www.youtube.com/playlist?list=PL1A5A6AE8AFC187B7 [3]. Video lectures by Prof. Kamakoti, IIT, Chennai, May 2017 https://www.youtube.com/watch?v=MIWTxHbPBA0 [4]. https://freevideolectures.com/course/2274/computer-architecture

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 mediation
	CO4	Apply conscience for the missions of life

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M- Medium, H- 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						M		H	M			M	L	L
CO2						M		H	M			M	L	L
CO3						H			M			H	L	L
CO4									M			M	L	L

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 type 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 involvin 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 and Reference books

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

Reference Book:
[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* [4]. https://freevideolectures.com/course/4847/nptel-globalization-culture/27

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	Appreciate relation between science and values.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M- Medium, H- High)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						M		L	L			L	L	L
CO2						M				M			L	L
CO3						M			L			M	L	L
CO4						M		M				M	L	L

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 and Reference books	**Text Book:** [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
E-resources and other digital material	[1] https://nptel.ac.in/courses/109/106/109106051/ [2]. Dr. Satya Sundar Sethy, Department of Humanities and Social Sciences, IIT Madras. https://www.youtube.com/watch?v=ddJg3gzYEb8 [3]. Prof. Deepak Khemani ,IIT Madras, Introduction to Philosophy https://www.youtube.com/watch?v=uUnaBP-9zVI [4]. http://www.digimat.in/nptel/courses/video/109106052/L03.html

17HS2305I - FOREIGN LANGUAGE - GERMAN

Course Category:	Humanities elective	**Credits:**	1
Course Type:	Theory	**Lecture - Tutorial - Practice:**	1- 0 - 0
Prerequisites:		**Continuous Evaluation:** **Semester End Evaluation:** **Total Marks**	100M - 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 (L – Low, M - Medium, H – 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	PSO1	PSO2
	CO1									L	H		L	L	L
	CO2									L	H		L	L	L
	CO3									L	H		L	L	L
	CO4									L	H		M	L	L

Course Content	**UNIT I:** Alphabets, Numbers, Exact articles and not exact Articles
	UNITII: Prepositions**,** Present Tense
	UNIT III: Past Tense and about family
	UNIT – IV: Future Tenses
Text books and Reference books	**Text Book:** [1] Studio d A1Cornelsen Goyalaas Publications New Delhi. **Reference Books:**
E-resources and other digital material	[1] https://www.fluentin3months.com/french-for-kids/ [2] https://ielanguages.com/french.html [3] https://www.coursera.org/courses?query=learn%20german

17HS2305J - PSYCHOLOGY

Course Category:	Humanities Elective	**Credits:**	1
Course Type:	Theory	**Lecture-Tutorial-Practice:**	1-0-0
Prerequisites:	Introduction to Philosophy	**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 the 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 (L-Low, M-Medium, H-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						H			M	L		M		
CO2						M			M	M		M		
CO3										M		M		
CO4										H		M		

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 and Reference books	**Text Book(s):** [1]. Zimbardo, P. G. (2013). Psychology and Life (20th Ed.). New York: Pearson Education **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).
E-resources and other	[1]. *https://www.bestmastersinpsychology.com/lists/5-online-resources-for-psychology-majors/*

digital material	[2]. https://www.makeuseof.com/tag/10-psychology-websites-to-help-educate-yourself/ [3]. https://nptel.ac.in/courses/109/104/109104105/ [4]. https://nptel.ac.in/courses/109/104/109104082/

17TP1306 - LOGIC & 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	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 for companies and in other competitive exams

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1		M				M								
	CO2		M				M								
	CO3		M				M								
	CO4		M				M								
	CO5		M				M								
	CO6		M				M								

Course Content

UNIT I:

1. Series Completion,
2. Coding-Decoding,
3. Blood Relation Blood,
4. Puzzles test
5. Series Completion,
6. Coding-Decoding,
7. Blood Relation Blood,
8. Puzzles test

UNIT II:

1. Direction sense test,
2. Logical Venn diagrams,
3. Number test, ranking test,
4. Mathematical operations
5.

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 and Reference books	**Text Book(s):** [1]. R. S. Aggarwal, " Verbal and non-verbal reasoning", Revised Edition, S Chand publication, 2017 ISBN:81-219-0551-6
E-resources and other digital material	[1]. https://nptel.ac.in/courses/109/104/109104040/ [2]. https://www.youtube.com/watch?v=aRnO__stn04 [3]. Mr. Vineet Gupta,, General Aptitude https://www.youtube.com/watch?v=ZpP10UnilTg [4]. https://www.tcyonline.com/video-lectures-aptitude/100647

17IT3308 - OBJECT ORIENTED PROGRAMMING

Course Category:	Programme Core	**Credits:**	2
Course Type:	Theory	**Lecture-Tutorial-Practice:**	1-0-2
Prerequisites:	17CS1203: 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	Examine the characteristics of object oriented approach
	CO2	Demonstrate the concept of polymorphism in overload of functions and operators
	CO3	Construct object oriented programs through inheritance and templates
	CO4	Apply exception handling mechanism to handle errors occur at runtime

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	H												M	L
CO2	H		M										M	L
CO3	H	M	H						M		H		M	M
CO4	H		H								H		M	M

Course Content

UNIT I:

An Overview of C++: The Origins of C++, What Is Object-Oriented Programming?, Introducing C++ Classes

Classes and Objects: Classes, Structures and Classes Are Related, Unions and Classes Are Related, Friend Functions, Friend Classes, Parameterized Constructors, Static keyword, The Scope Resolution Operator, Passing Objects to Functions, Returning Objects .

UNIT II:

Arrays: Arrays of Objects, The this Pointer

Overloading: Function Overloading, Overloading Constructor Functions, Copy Constructors, Operator Overloading, Creating a Member Operator Function, Operator Overloading Using a Friend Function, Overloading new and delete, Overloading Some Special Operators, Overloading the Comma Operator

UNIT III:

Inheritance: Base-Class Access Control, Inheritance and protected Members, Inheriting Multiple Base Classes, Constructors, Destructors and Inheritance, Virtual Base Classes

Virtual Functions: Calling a Virtual Function through a Base Class, Pure Virtual Functions, Early vs. Late Binding

UNIT IV:

Templates: Generic Functions, A Function with Two Generic Types, Explicitly Overloading a Generic Function. **Applying generic Functions**: A Generic Sort Generic Classes, An Example with Two Generic Data Types

Applying Template Classes: A Generic Array Class

	Exception Handling: Exception Handling Fundamentals, Handling Derived-Class Exceptions, Exception Handling Options
Text books and Reference books	**Text Book(s):** [1]. Herbert Schildt, C++ Complete Reference, Third Edition, McGraw-Hill,1998 **Reference Book:** [1]. BjarneStroustrup, The C+ + Programming Language, Third Edition, Addison-Wesley,1997
E-resources and other digital material	[1]. Ira Pohl, C++ For C Programmers, University of California, Santa Cruz, (08, 05, 2018). Available:https://www.coursera.org/learn/c-plus-plus-a [2]. Gerry O'Brien, Kate Gregory, James McNellis, Introduction to C++, (08, 05, 2018). Available:https://www.edx.org/course/introduction-c-microsoft-dev210x-5 [3]. Prof Partha Pratim Das , IIT Kharagpur, Programmiing in C++, https://nptel.ac.in/courses/106/105/106105151/ [4]. Object Oriented Programming (OOP) Paradigm https://www.youtube.com/watch?v=p3H-53kzMuA [5]. Prof Deepak B Phatak, IIT Bombay, Object Oriented Programming https://www.edx.org/course/object-oriented-programming

17IT3351 - DATA STRUCTURES LAB

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-3
Prerequisites:	17CS1103 Problem Solving Methods 17CS1203 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	Implement various operations of stack, queue and linked list data types.
	CO2	Analyze and solve a given problem using appropriate data structure.
	CO3	Implement operations on different trees data structures like binary, binary search, AVL and Btrees.
	CO4	Design various searching and sorting algorithms.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-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	H		M	M									M	L
CO2	H	M	M	L		L					M		L	M
CO3	M	M	M	M		L					M	L	H	M
CO4	M	M	M	H		L					M	L	H	L

Course Content

Week 1: Fundamental programs & Searching
Menu driven programs
Write a program to implement linear and binary search techniques.

Week 2: Stack using array and its applications
Write a program to implement the operations on stacks using arrays.
Write a program for converting a given infix expression to postfix form using stacks
Write a program for evaluating a given postfix expression using stacks

Week 3 & 4: Queue and Circular queue implementation using array
Write a program to implement the operations on queues using arrays.
Write a program to implement the operations on circular queues using arrays

Week 5: Single and Double linked list
Write a program to implement stack operations using singly linked list.
Write a program to implement queue operations using singly linked list
Write a program to implement the operations on doubly linked list

Week 6 & 7: Circular linked list and its applications
Write a program to implement the operations on circular linked list.
Write a program for the representation of polynomials using linked list and for the addition of two such polynomials.

	Week 8:Sorting techniques Implement sorting techniques using C:Insertion Sort, Merge Sort, Quick Sort Design experiment using Searching and sorting techniques
	Week 9: Binary search tree and operations Write a program to create binary search tree operations Write a program to implement tree traversal techniques using recursion.
	Week 10 & 11: Application oriented Case Studies Design experiment using single/double/circular linked lists. Design experiment on Binary Search Trees Design experiment using sorting and searching techniques.
	Week 12:AVL Tree and B-Tree operations Write a program to perform the following operations: Insertion into an AVL-tree and Deletion from an AVL-tree. Write a program to perform B-tree operations: Insertion into a B-tree and Deletion from it.
Text books and Reference books	**Text Book(s):** [1]. Horowitz Sahni and Anderson-Freed, "Fundamentals of Data Structures in C",2nd edition, Universities Press, 2011. [2]. Mark Allen Weiss, "Data structure and Algorithm Analysis in C", 2ndedition, Addison Wesley Publication, 2010. **Reference Books:** [1]. YedidyahLangsam, Moshe J. Augenstein and Aaron M. Tenenbaum, "Data Structures using C and C++", 2nd edition, Pearson Education, 1999. [2]. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with Applications", 2nd edition, McGraw Hill, 2008.
E-resources and other digital material	[1]. SudarshanIyengar: IIT Ropar (12, August, 2018). Data Structures and Algorithms[NPTEL]. Available: http://nptel.ac.in/ [2]. Erik Demaine, (12, may, 2018). Advanced Data Structures [MIT-OpenCourseWare]. Available: http://ocw.mit.edu/ [3]. https://www.youtube.com/playlist?list=PLyqSpQzTE6M_Fu6l8irVwXkUyC9Gwqr6 [4]. https://nptel.ac.in/courses/106/102/106102064/

14HS1352 - COMMUNICATION SKILLS LAB

Course Category:	Programme Core	**Credits:**	2
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-2
Prerequisites:	17HS1105/17HS1205 - 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 (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						H				H			L	M
CO2			M	M	M	H	H	H	M	H	M		L	M
CO3	H		M	M	M	H	H	M	H	H	M		L	H
CO4	M	L	M	M	L	H	H	H	H	H	M	M	L	H

Course Content

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
- Textual Patterns
- 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 and Reference books	**Text Book(s):** [1]. Martin Cutts, Oxford Guide to Plain English, 7th Impression, OUP, 2011 [2]. Exercises in Spoken English, Prepared by Department of Phonetics and Spoke 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*

17MC1307 - ENVIRONMENTAL STUDIES

Course Category:	Institutional Core	**Credits:**	-
Course Type:	Theory Mandatory course	**Lecture-Tutorial-Practice:**	2-0-0
Prerequisites:	-	**Continuous Evaluation:**	46S1+46S2 3 A+ 5 HA
		Semester end Evaluation:	-
		Total Marks:	100

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

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L							H	L		L			
CO2			L			H		H						
CO3			L			H								
CO4			L			H		H		L				

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. Disaster 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 and Reference books	**Text Book(s):** [1]. Text book for ENVIRONMENTAL STUDIES for under graduate courses of all branches of higher education – ErachBharucha -- For University Grants Commission, University press,2004 **Reference Books:** [1]. Anjaneyulu Y. Introduction to Environmental sciences, B S Publications PVT Ltd, Hyderabad 2004
E-resources and other digital material	[1]. collegesat.du.ac.in/UG/Envinromental%20Studies_ebook.pdf [2]. https://nptel.ac.in/courses/127/105/127105018/ [3]. https://nptel.ac.in/courses/120/108/120108004/ [4]. http://www.nptelvideos.in/2012/12/fundamentals-of-environmental-pollution.html

SEMESTER – IV

17IT3401 - STATISTICS WITH R

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	2-0-2
Prerequisites:	17IT3302- 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	Comprehend the semantics, data handling and control statements in R
	CO2	Analyze the libraries for data manipulation and to data visualization in R
	CO3	Demonstrate the knowledge of probability and conduct hypothesis tests for statistical inference
	CO4	Synthesize data to fit linear and nonlinear models

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	M	M											M	M
	CO2	M	L			M								M	M
	CO3	H	M		H							M		H	M
	CO4	H	M	H	M	M						H		H	M

Course Content

UNIT I:

The R Environment: Command Line interface, R Studio, Installing R Packages.

Basics of R: Basic math, variables, data types, vectors, calling function, missing data, data frames, lists, matrices, arrays.

Reading data into R: Reading CSVs, Excel Data.

Statistical Graphs: Base Graphs, ggplot2.

Writing R functions, control statements – if and else, switch, compound tests, for loops, while loops.

UNIT II:

Group manipulation: Apply Family, aggregate, plyr, data.table.

Data Reshaping: cbind, rbind, joins, reshape2. **Strings:** paste, sprint, extracting text, regular expressions.

Doing math and simulations in R: **Math Functions**: Calculating a Probability, cumulative sums and products, minima and maxima, calculus, sorting, set operations.

Simulation Programming in R: Built-in-Random Variable generators, obtaining the same random stream in repeated runs, an example to a combinatorial simulation

UNIT III:

Probability Distributions: Normal Distribution, Binomial Distribution, Poisson Distribution, Other Distributions, Basic Statistics, summary statistics, correlation and covariance, t-tests, ANOVA

	UNIT IV: **Linear Models:** Simple Linear Regression, Multiple Regression, Logistic Regression, Poisson Regression. **Nonlinear Models**: Nonlinear least squares, splines, generalized additive models, decision trees, random forests. **Time Series:** Autoregressive Moving Average, VAR, GARCH **Clustering:** K Means, PAM, Hierarchical Clustering
Text books and Reference books	**Text Book(s):** [1]. Jared P. Lander, R for Everyone, Addison Wesley Data & Analytics Series, Pearson, 2014. [2]. Norman Matloff, The Art of R Programming, No Strach Press, San Francisco 2011 **Reference Books:** [1]. G. Jay Kerns, Introduction to Probability and Statistics using R, First Edition, 2010 [2]. Peter Dalgaard, Introductory Statistics with R, Springer, Second Edition, 2008
E-resources and other digital material	[1]. Rafael Irizarry, Michael Love, Statistics with R, Harvard University (18, 04, 2018). Available:https://www.edx.org/course/statistics-r-harvardx-ph525-1x-1 [2]. *Mine Çetinkaya-Rundel, David Banks, Colin Rundel, Merlise A Clyde, Duke University, (18, 04, 2018). Statistics with R Specialization. Available:https://www.coursera.org/specializations/statistics* [3]. Dr. Shalabh , Professor , IIT Kanpur, Introduction to R software, 2019 https://onlinecourses.nptel.ac.in/noc19_ma33/preview [4]. David Romney, Harvard University https://scholar.harvard.edu/dromney/online-resources-learning-r

17IT3402 - DATABASE MANAGEMENT SYSTEMS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	2-1-0
Prerequisites:	17IT3303 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	Analyze the characteristics, architecture of DBMS and constraints of relational model
	CO2	Formulate solutions to a broad range of query problems using SQL and relational algebra
	CO3	Design the databases using ER model and normalization for a given requirement specification
	CO4	Implement the isolation property using serializabilty and concurrency control techniques

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	L		L								L		M	L
CO2	H		M								H		M	L
CO3	H		M								H		M	M
CO4	M		H								L		M	H

Course Content

UNIT I:

Databases And Database Users: Introduction, characteristics of the database approach, actors on the scene, workers behind the scene, advantages of using the DBMS approach

Database System Concepts And Architecture: Data models, schemas, and instances, three schema architecture and data independence, Database languages and interfaces, the database system environment

Relational Data Model And Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas

UNIT II:

SQL: SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries, Insert, Delete and Update Statements in SQL, Views (Virtual Tables) in SQL

The Relational Algebra: 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: **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 **Database Design Theory And Methodology**: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal forms based on Primary keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multi valued dependency and Fourth normal form, Properties of relational decompositions
	UNIT IV: **Transaction Processing Concepts And Theory :** Introduction to transaction processing, transaction and system concepts, desirable properties of transactions, characterizing schedules based on recoverability and Serializability **Concurrency Control Techniques:** Two phase locking techniques for concurrency control, Concurrency control based on Timestamp ordering, **NoSQL :** An Overview of NoSQL , List of NoSQL Databases.
Text books and Reference books	**Text Book(s):** [1]. Elmasri and Navathe.Fundamentals of Database Systems. Ed 5. Pearson Education. [2]. Gauravvaish,"Getting Started with NoSQL"(Kindle Edition),1st edition,2007. **Reference Books:** [1]. Silberschatz, Korth and Sudharshan. Data base System Concepts. Ed4. McGrawHill. [2]. Raghu Ramakrishnan and Johannes Gehrke., Database Management Systems . Ed 3. McGraw-Hill
E-resources and other digital material	[1]. Jennifer widom,(09,05,2015). Introduction to Databases https://www.youtube.com/watch?v=ShjrtAQmIVg [2]. P. B. Mahanty,(09,05,2015). DBMS and RDBMS. http://nptel.iitm.ac.in/video.php?courseId=1128&v=7952RsbAx2w8 [3]. Prof.D.Janakiram,(09,05,2015). DBMS. https://www.youtube.com/watch?v=EUzsy3W4I0g&list=PL536244562840E982 [4]. Karl seguin, "The Little MongoDBBooK", 2/E version 2.6, 2011.

17IT3403 - DESIGN AND ANALYSIS OF ALGORITHMS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	2-1-0
Prerequisites:	17IT1301 Discrete Mathematical Structures 17IT3303 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	Analyze the performance of algorithms using time and space complexities.
	CO2	Synthesize design techniques like Divide & Conquer, Greedy and choose appropriate technique to solve novel problems.
	CO3	Apply algorithm design techniques using non-linear data structures to solve problems.
	CO4	Classify problems as P, NP, NP-hard and NP-complete and analyze the significance

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	PS O1	PS O2
CO1	L	L	L		L						L		L	H
CO2	H	H	L		H								M	
CO3	L	H	M	H	H						H			M
CO4		L			M									L

Course Content

UNIT I:

Introduction: Algorithm Specification: Pseudo code Conventions, Recursive Algorithms, Performance Analysis: Space Complexity, Time Complexity, Asymptotic Notation (Big ―oh, Omega, Theta, Little ―oh).

Elementary Data Structures: Sets and Disjoints: Introduction, union and find operations.

Basic Traversal and Search Techniques: Techniques for Binary trees, Techniques for Graphs: Breadth First Search and Traversal, Depth First Search and Traversal, Connected components and Spanning trees, Biconnected components and DFS.

UNIT II:

Divide and conquer: General method, Binary search, Finding the Maximum and Minimum, Merge sort, Quick sort, Strassen‘s matrix multiplication.

Greedy method: General method, knapsack problem, Job Sequencing with deadlines, Minimum cost spanning trees: Prim‘s and Kruskal‘s algorithms, Single source shortest path problem.

	UNIT III: **Dynamic Programming:** General method, Multistage graph problem, All pairs shortest Path problem, 0/1 knapsack problem, Travelling sales person problem. **Backtracking:** General method, 8-queens problem, sum of subsets, graph coloring, Hamiltonian cycles.
	UNIT IV: **Branch and Bound:** The method: Least Cost (LC) Search, Control Abstractions for LC-Search, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1knapsack problem: LC Branch and Bound solution, FIFO Branch and Bound solution, Travelling sales person problem. **NP-Hard and NP-Complete problems**: Basic concepts, non-deterministic algorithms, the classes NP Hard and NP Complete and Cook's theorem.
Text books and Reference books	**Text Book(s):** [1]. E. Horowitz, et al, ―Fundamentals of Computer Algorithms, 2 Edition, University Press(India)Pvt. Ltd, 2011. **Reference Books:** [1]. S.K.Basu, ―Design Methods and Analysis of Algorithms, PHI Learning Private Limited, New Delhi, 2008 [2]. .T.H.Cormen, et al, ―Introduction to Algorithms, 2 ed, PHI Pvt. Ltd. / Pearson Education, 2001.
E-resources and other digital material	[1]. Prof. AbhiramRamade, (03, 05, 2018).Computer Science Department, IIT-Bombay, Available: http://nptel.ac.in/courses/106101060/ [2]. Prof.TimRoughgarden, (03, 05, 2018). Kleinberg and Tardos, Algorithm Design, 2005, Available:http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms [3]. Robert Sedgewick, Princeton University, Analysis of Algorithms, https://www.coursera.org/lecture/analysis-of-algorithms/resources-jMWPy [4].https://freevideolectures.com/course/2281/design-and-analysis-of-algorithms

17IT3404 - PYTHON PROGRAMMING

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17CS1103- Problem Solving Methods 17CS1203- Programming in C 17IT3303- 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 building blocks in python programming language to construct different applications.
	CO2	Apply the necessary data structures to solve a given problem.
	CO3	Extract and import packages for developing different solutions for real time problems.
	CO4	Implement the problems in terms of real-world objects using concept of OOPS.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	H	M	M						M			H	M	L
CO2	M	M	M						M			H	L	M
CO3	M	M	M						M			H	H	M
CO4	M	M	M						M			H	H	L

Course Content

UNIT I

Introduction: History-Origins of python, Features of Python- why choose python, what can I do with python, Installing, Python 2 & 3 installation on windows

Variables, Expressions & Statements: Variables, Variable names & keywords, Operators & operands, Expressions, Order of operations, Modulus Operator, String Operations.

Conditional Execution: Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, exceptions using try and except, Short circuit evaluation of logical expressions.

Iterations: The while statement, Infinite loops, "Infinite loops" and break, finishing iterations with continue, Definite loops using for.

UNIT II

Functions: Function Calls, Built-in functions, type conversion functions, random numbers, math functions, adding new functions, definition and uses, flow of execution, parameters & arguments, fruitful and void functions, why functions?,

	recursion, scope of a variable. **Modules:** Packages small description about modularity, Third Party Packages, A brief tour of standard library, command line arguments, Error output redirection and program termination, String pattern matching, Mathematics, Internet Access, Dates & times, Date Compressions
	UNIT III **Lists:** Syntactically, accessing element from list, slicing a list, lists are mutable sequences, deleting items in a list and deleting list, methods, searching **Dictionaries:** Creating a dictionary, Dictionary operations, Dictionary methods, Aliasing and copying **Tuples:** Tuples are immutable, comparing tuples, Tuple assignment, Dictionaries and tuples, Multiple assignment with dictionaries, Using tuples as keys in dictionaries **Strings:** A string is a sequence, Getting the length of a string using len, Traversal through a string with a loop, String slices, Strings are immutable, Looping and counting, The in operator, String comparison, string methods **Sets:** Modifying a Set, removing items from set, set operations.
	UNIT IV **Object Oriented Programming OOP in Python:** Python Classes, Methods, Constructors, Class variables & Instance Variables, Basic inheritance, Special methods, Data Hiding **Error and Exceptions:** Expect the unexpected- Exceptions, Exceptions aren't Exceptional, Exceptions defining clean up actions, predefined clean up actions
Text books and Reference books	**Text Book(s):** [1]. VamsiKurama, "Python Programming: A Modern Approach", Pearson India, 2017. [2]. Charles Severance, " Python for Informatics- Exploring Information", 1st edition Shroff Publishers, 2017. **Reference Books:** [1]. Mark Lutz,"Learning Python", 5th edition, Orielly, 2013. [2]. Allen Downey "Think Python, How to Think Like a Computer Scientist", 2nd edition, Green Tea Press, 2015. [3]. W.Chun , "Core Python Programming", 2nd Edition, Prentice Hall, 2006. [4]. Kenneth A. Lambert, "Introduction to Python", 1st edition, Cengage Learning, 2011.
E-resources and other digital material	[1]. Charles Severance: University of Michigan,Python for Everybody [COURSERA]. Available: https://www.coursera.org/ [2]. MadhavanMukund, (12, may, 2018). Programming, Data Structures & Algorithms using Python [NPTEL]. Available: http://nptel.ac.in/ [3]. Prof. S.R.S.Iyengar, IIT Ropar, The Joy of Computing using Python, 2018 https://nptel.ac.in/courses/106/106/106106182/ [4]. Charles Russell Sevarance, University of Michigan, Python for Everybody, 2019 https://www.coursera.org/learn/python

17TP1405 - ENGLISH FOR PROFESSIONALS

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Learning by Doing	**Lecture-Tutorial-Practice:**	0-0-2
Prerequisites:		**Continuous valuation:**	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 by shedding off their inhibitions about communicating in English
	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 (L-Low, M-Medium, H-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	PSO1	PSO 2
CO1		M				M								
CO2		M				M								
CO3		M				M								
CO4		M				M								
CO5		M				M								
CO6		M				M								

Course Content

UNIT I:

1. Beginners, Functional, Situational Conversations
2. Practicing on Functional Conversations.

UNIT II:

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

UNIT III:

1. Introducing Self & Others
2. Structures and Forming Sentences
3. Telephonic Etiquette, Social Etiquette and Table Manners
4. Practicing on Functional Conversations.

UNIT IV:

1. Direct, Indirect/Reporting Speech
2. Public Speaking Basics
3. Versant Test Preparation
4. Practicing on Situational Conversations.

Text books and Reference books

Reference Books:

[1]. Swaroopa Polineni, "Strengthen Your Communication Skills", I ed., Maruthi Publications, 2013. ISBN:978-81-907052-2-6

[2]. MamtaBhatnagar & NitinBhatnagar, "Communicative English", I ed., Pearson India, 2010. ISBN:8131732045

17IT3406 - OPERATING SYSTEMS

Course Category:	Programme Core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-2
Prerequisites:	14CS1103 Introduction to computing	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Analyze different Operating Systems and its Services & Functions
	CO2	Implement CPU scheduling & synchronization algorithms
	CO3	Demonstrate the techniques for handling deadlock & memory management
	CO4	Analyze various I/O management, File systems and disk scheduling techniques

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, Medium-M, H- High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1												M	L	L
	CO2	L	M										M	L	L
	CO3	L	M										H	L	L
	CO4	M	M										H	L	L

Course Content	**UNIT I** **Introduction:** What operating system do, Computer System Organization, Computer System Architecture **System Structures:** Operating-System Services, User Operating-System Interface System Calls, Types of System Calls, System Programs, Operating-System Structure. **Process Concept:** Process Concept, Process Scheduling, Operations on Processes, Inter Process Communication.
	UNIT II **Multithreaded Programming:** Overview, Multi-Threading Models, Threading Issues: fork() and exec(),signal handling. **Process Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms **Synchronization:** Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization
	UNIT III: **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. **Memory Management Strategies:** Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation.

	Virtual Memory Management: Background, Demand Paging, Copy-on-Write, Page Replacement -FIFO, LRU, OPTIMAL, Thrashing.
	UNIT IV: **File System:** File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection. **Implementing File Systems:** File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management. **Second Storage Structure:** Overview of Mass-Storage Structure, Disk Scheduling, Disk Management
Text books and Reference books	**Text Book(s):** [1]. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, "Operating System Concepts", 8thed, John Wiley &Sons (Asia) Pvt .Ltd, 2012. **Reference Books:** [2]. Dhananjay M. Dhamdhere, "Operating Systems: A Concept-Based Approach", 3ed, McGraw-Hill Education India Pvt. Ltd, 2010 [3]. William Stallings, "Operating System: Internals and Design Principles", 6 ed, 2009 [4]. Andrew S. Tanenbaum, "Modern Operating Systems", 3 rd, PHI, 2008.
E-resources and other digital material	[1]. Prof. P.K. Biswas , Video Lectures on "Operating Systems" Available: http://www.satishkashyap.com/2013/02/video-lectures-on-operating-systems-by.html [2]. C. Franklin and D. Coustan, Memory Management Available: http://computer.howstuffworks.com/operating-system7.html [3]. https://www.tutorialspoint.com/operating_system/os_types.htm [4]. Mythili Vutukuru, IIT Bombay, Lecture notes on Operating Systems https://www.cse.iitb.ac.in/~mythili/os/

17IT3451 - DATABASE MANAGEMENT SYSTEMS LAB

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-3
Prerequisites:	14CS1203- Programming in C	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Experiment DDL and DML commands with different integrity constraints
	CO2	Apply functions and operators in SQL queries
	CO3	Formulate solutions to query problems using nested queries and aggregate operators
	CO4	Demonstrate PL/SQL concepts on the given database

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-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	L		L								L		M	L
CO2	M		M								L		M	L
CO3	M		M								M		M	L
CO4	L		M								M		M	M

Contents

Week 1: Compare the features of different DBMS software and implement the Data Definition language.
Week 2: Apply different Integrity Constraints on relations
Week 3: Working with Data Manipulation commands, Basic SQL commands with relational , logical operators
Week 4: Mathematical, String, date/time functions
Week 5: SQL nested queries
Week 6:Select statement with group by, having and aggregate operations
Week 7: PL /SQL programming: Cursors , Triggers, Functions and Procedures
Week 8: Case study: ER model and normalization for any real life application
Week 9: Case study: Creation of tables ,data insertion for the case study
Week 10: Case study: Basic queries practiced in Week 2,3,4 for the case study
Week 11: Case study: Advanced queries practiced in Week 5,6 for the case study
Week 12: Case study: Apply PL/SQL concepts practiced in Week7 for the case study

Text books and Reference books

[1]. Sanjay Mishra, Alan eaulieu, "Mastering Oracle SQL Paperback ", 2nd edition ,O'Reilly Media, 2004.

[2]. Steven Feuerstien,"Oracle Pl/SQL Best Practices, 2/E (Covers Oracle Database 11G)", O'Reilly Media ,2007.

E-resources and other digital material	[1]. ShyamalalKumawat,(09,05,2015). MYSQL.https://www.youtube.com/watch?v=XiDnK9Lq-Ng [2]www.techgig.com/practice/Specializations/Databases [3] www.w3schools.com/sql/ [4] https://www.tutorialspoint.com/sql/index.htm

17IT3452 - PYTHON PROGRAMMING LAB

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-3
Prerequisites:	17CS1103- Problem Solving Methods 17CS1203- Programming in C 17IT3303- 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 python programming constructs to build small to large scale applications.
	CO2	Implement the problems in terms of real-world objects usingOOPs technology.
	CO3	Evaluate and handle the errors during runtime involved in a program.
	CO4	Extract and import packages for developing different solutions for real time problems.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, Medium-M, H- 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	H		M						M			H	M	L
	CO2	H	M	M						M			H	L	M
	CO3	M	M	M						M			H	H	M
	CO4	M	M	M						M			H	H	L

Course Content	**Week 1: Fundamental programs** Running instructions in Interactive interpreter and a Python Script Write a program to purposefully raise Indentation Error and Correct it
	Week 2: Operations Develop Python programs using basic operations in Python
	Week 3 & 4: Conditional &Control Flow Develop Python programs that makes use of conditional and control flow structures
	Week 5: Data Structures Develop Python programs using suitable Data structures
	Week 6 & 7: Data Structures Develop Python programs using suitable Data structures
	Week 8: Functions Develop Python programs using recursive and non-recursive functions
	Week 9: Modules Illustrate installing packages via PIP and develop python programs using modules
	Week 10 & 11: Application oriented Case Studies

	Week 12: Classes, Inheritance & Exception handling Illustrate Class variables and instance variable Develop Python programs to exemplify the concepts of inheritance and overloading. Develop Python programs to illustrate exception handling.
Text books and Reference books	**Text Book(s):** [1]. VamsiKurama, "Python Programming: A Modern Approach", Pearson India, 2017. [2]. Charles Severance, " Python for Informatics: Exploring Information", 1st edition Shroff Publishers, 2017. **Reference Books:** [1]. Mark Lutz,"Learning Python", 5th edition, Orielly, 2013. [2]. Allen Downey "Think Python, How to Think Like a Computer Scientist", 2nd edition, Green Tea Press, 2015. [3]. W.Chun , "Core Python Programming", 2nd Edition, Prentice Hall, 2006. [4]. Kenneth A. Lambert, "Introduction to Python", 1st edition, Cengage Learning, 2011.
E-resources and other digital material	[1]. Charles Severance: University of Michigan,Python for Everybody [COURSERA]. Available: https://www.coursera.org/ [2]. MadhavanMukund, (12, may, 2018). Programming, Data Structures & Algorithms using Python [NPTEL]. Available: http://nptel.ac.in/ [3]. Prof. S.R.S.Iyengar, IIT Ropar, The Joy of Computing using Python, 2018 https://nptel.ac.in/courses/106/106/106106182/ [4]. Charles Russell Sevarance, University of Michigan, Python for Everybody, 2019 https://www.coursera.org/learn/python

17IT3453 - WEB PROGRAMMING LAB

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-3
Prerequisites:	14CS1103- Introduction to computing 14CS1203- Programming in C	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Understand the importance of the web as an effective medium of communication
CO2	Develop basic skills in analyzing the usability of a web site using HTML.
CO3	Develop hands on experience using open source technologies such as HTML, CSS, JavaScript, PHP and MySQL
CO4	Generate an application based upon the concepts of HTML & PHP

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M- Medium, H- 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	L	L											M	M
CO2					H								M	M
CO3	L				H								M	M
CO4	L												M	M

Course Content

Week 1:
Create a simple webpage using HTML.
Use frames to Include Images and Videos.
Add a Cascading Style sheet for designing the web page.

Week 2:
Write a program in html to create a webpage with four frames (Picture,table,list, and hyperlink).

Week 3:
Write a program in html to create a webpage to show various confectionary items using ordered list and unordered list.
Design a dynamic web page with validation using JavaScript.

Week 4:
Develop web pages using HTML to exercise Control Statements
Case Study :Design the static web pages required for an online book store web site.

Week 5:
Develop web pages using Functions, Arrays, Objects

Week 6:
Develop WebPages using PHP on making use of Data types

	Week 7: Develop web pages using PHP that makes use of operators
	Week 8: Develop web pages using PHP that makes use of control structures Case Study: A simple calculator web application that takes numbers and an operator (+,-,*, /, %) from an HTML page and returns the result page with the operation performed on the operands. Modify the above program such that it stores each query in a database and checks the database first for the results. If the query is already available in the DB ,it returns the value that was previously computed (from DB) or it computes the result and returns it after storing the new query and result in DB.
	Week 9: Develop web pages using PHP arrays and functions
	Week 10: Database manipulation using PHP
	Week 11: Case Study: Implement form validation using PHP PHP Sessions – Illustrated with a simple login system
Text books and Reference books	**Text Books:** [1]. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel,Internet& World Wide Web How to Program, Prentice Hall, Fifth Edition, 2011 [2]. C. Bates, "Web Programming building Internet Applications", Willey DreamTech, 3rd edition, 2006 [3]. Kevin Tatroe, Peter MacIntyre, "Programming PHP", O'REILLY, 3rd Edition,2013 **Reference Books:** [1]. David Flanagan, JavaScript: The Definitive Guide, O'Reilly Media, 6th Edition, 2011 [2]. S. M. Grath, XML by Example, Prentice Hall of India, 5 edition C. Bates, Web Programming building Internet Applications, Willey Dream Tech, 3rd edition, 2006
E-resources and other digital material	**Web resources:** [1]. http://nptel.ac.in/syllabus/syllabus.php?subjectId=106105084 [2]. XML in 10 point. http://www.w3.org/XML/1999/XML-in-10-points [3]. Cascading Style Sheets from W3. http://www.w3.org/Style/CSS/

17MC1407B - INDIAN CONSTITUTION

Course Category:	Humanities elective	**Credits:**	1
Course Type:	Theory	**Lecture-Tutorial-Practice:**	2-0-0
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	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 the consequences are.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-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										M				
CO2														
CO3							L							
CO4							M					H		

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 and Reference books	**Text Book(s):** [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

17IT3501- SOFTWARE ENGINEERING

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	Introduction to Computers	**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 an appropriate software model that would implement the customer requirements.
	CO2	Analyze the requirements and identify the suitable architecture for the problem.
	CO3	Discriminate the specifications at each stage of Software Development Life Cycle.
	CO4	Implement various software testing strategies for verification and validation of the software products.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-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	PSO2
CO1	L	M			L						M		M	L
CO2		H	L				L	L	M	L	M		L	L
CO3		H	L				L	L	M	L	M		M	M
CO4		H	L	M							M		M	M

Course Content

UNIT I:

Introduction: Software Engineering Ethics, Software, Software Myths, Capability Maturity Model Integration.

Software Process Models: Prescriptive process model, Waterfall Model, Incremental process model, Evolutionary process model, Unified process.

Agile Process Models: Agility, Agile Process, Agile Process Models.

UNIT II:

Software Requirements: Functional ,Non-Functional requirements, User requirements, System Requirements, Software Requirements Specification Document,

Requirements Engineering: Requirements Engineering tasks, Initiating the Requirements engineering process, Eliciting Requirements- Developing use cases, Building the Analysis model, Negotiating, validating Requirements.

UNIT III:

Building Analysis Model: Data modeling concepts,

Architectural Design: Architectural Styles and Patterns, **Design Engineering:** Design Process and Design Quality, Design Concepts.

Introduction to UML: An Overview of the UML, A Conceptual Model of UML, Class Diagrams, Object Diagrams, Use Case Diagrams, Interaction Diagrams, Activity Diagram, State Diagrams, Deployment Diagrams.

UNIT IV:

Testing Strategies: A Strategic Approach to Software Testing – Verification and

	Validation, Organizing for software testing, Test Strategies for Conventional software, Validation Testing, System Testing, Art of Debugging **Testing Tactics:** Software Testing Fundamentals, Black Box Testing, White Box Testing, Basis Path Testing, Control Structure Testing.
Text books and Reference books	**Text Books:** [1]. Roger S Pressman, "Software Engineering – A Practitioner's Approach", Sixth Edition, MCGRAW Hill Publications, 2010. [2]. I. Somerville, "Software Engineering", 6 ed.: Pearson Education. [3]. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language user guide", Tenth Edition, Pearson, 2011. **Reference Books:** [1]. C. Ghezzi, et al., "Fundamentals of Software Engineering", Second Edition, PHI. [2]. RajibMall, "Fundamentals of Software Engineering", Second Edition, PHI.
E-resources and other digital material	[1]. Prof.N.L. Sarda, Prof. UmeshBellur,Prof.R.K.Joshi and Prof.ShashiKelkar, Department of Computer Science & Engineering ,IIT Bombay, Oct 8, 2008. https://www.youtube.com/watch?v=Z6f9ckEElsU, [2]. NPTEL, Lecture Series on Software Engineering by Software engineering NPTEL. Available: http://nptel.iitm.ac.in/video.php?courseId=1076 [3]. Software engineering MIT Videos. Available: http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-912- introduction-to-copyright-law-january-iap-2006/video-lectures/lecture- 4-softwarelicensing [4]. https://www.youtube.com/watch?v=4qKnEgsF.CA&list=PLrYIqcAgMeQg yMfiyWf7hn8BPUw8j_ors

17IT3502 - DATA MINING

Course Category:	Programme Core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-2
Prerequisites:	17IT3402 -DBMS	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Understand the basic concepts of warehousing and mining.
	CO2	Derive various interesting patterns and associations in datasets.
	CO3	Design and develop classifier models to predict future trends.
	CO4	Apply unsupervised learning techniques for a given application.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1				H	L							M	H	L
CO2	L	M		H	L								H	L
CO3	M	M		H	M							L	H	L
CO4	H	M		H	M							M	H	L

Course Content

UNIT I:

Data Warehouse and Online Analytical Processing: Data Warehouse basic concepts, Data Warehouse Modeling: Data cube and OLAP, Data Warehouse Implementation, Data Generalization by Attribute Oriented Induction.

Data Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT II:

Data Mining Introduction: Introduction, Why Data Mining, kinds of Data that can be mined, Patterns that can be Mined, technologies where it can be used, major issues in data Mining.

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts, Frequent Item-set Mining Methods, Which Patterns Are Interesting—Pattern Evaluation Methods.

UNIT III:

Classification: Introduction, Decision tree induction, Bayesian Classification, Rule-Based Classification, Model Evaluation and Selection, Techniques to improve Classification Accuracy, Classification by Back propagation, Support Vector Machines, Other classification methods.

UNIT IV:

Cluster Analysis: Introduction, overview of basic clustering methods, Partitioning methods, Hierarchical methods, Density-Based Methods: DBSCAN & OPTICS, Grid-based Clustering Method: STRING & CLIQUE, Evaluation of Clustering, Outlier Analysis.

Text books and Reference books	**Text Book(s):** [1]. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" Third Edition, Elsevier, 2012. **Reference Books:** [1]. G. K. Gupta ,"Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006 [2]. A Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to DataMining", Second Edition Pearson Education, 2016 [3]. K.P. Soman, ShyamDiwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006
E-resources and other digital material	[1] Data Warehouse Tutorial For Beginners | Data Warehouse Concepts | Data Warehousing | Edureka (2017) https://www.youtube.com/watch?v=J326LIUrZM8&t=4s [2] How Artificial Neural Network (Ann) Algorithm Work | Data Mining | Introduction To Neural Network (2016) https://www.youtube.com/watch?v=fwnaijgpih, [3].https://Www.Kdnuggets.Com/2015/05/Most-Viewed-Data-Mining-Videos-Youtube.Html [4]. https://Bigdata-Madesimple.Com/Free-Video-Tutorials-On-Data-Mining/

17IT3503 - COMPUTER NETWORKS

Course Category:	Programme core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	2-0-2
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	Analyze the reference models and physical connections of network systems
	CO2	Apply different protocols functioning at Application layer and Transport layer.
	CO3	Evaluate various Routing algorithms for finding the optimal path.
	CO4	Understand the concepts of wireless communication , mobility and security

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, Medium-M, H- 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	PS O1	PS O2
	CO1					L						L		H	M
	CO2		L			L	M	M				L		H	M
	CO3	H	L			M		L				L		H	M
	CO4	L				L		M				L		H	M

Course Content	**UNIT I:** **Introduction:** Uses of Computer Networks, Network Hardware, LANs, MANs, WANs, Network Software. The Network core **Reference Models**: The OSI Reference Model, TCP/IP Reference Model, the comparison of OSI, and TCP/IP reference models
	UNIT II: **Application Layer**: Principles of network applications, The Web and HTTP, FTP, E-Mail in the internet, DNS-The internet's directory service. **Transport Layer**: Connectionless Transport: UDP, Connection-Oriented Transport: TCP, Principles of congestion control, TCP Congestion Control.
	UNIT III: **The Network Layer**: Introduction, Virtual circuits and Datagram Networks, The Internet Protocol(IP), Routing Algorithms, Case Studies- Distance Vector, Link State **The Link Layer and Local Area Networks** :Introduction and services, Error Detection and Correction Techniques, Switched Local Area Networks
	UNIT IV: **Wireless and Mobile Networks**: Introduction, Wireless links and Network characteristics, Wi-fi, Mobile IP, Multimedia Networking Applications **Security in Computer Networks** : Network security, Principles of Cryptography , Firewalls
Content Beyond Syllabus	**Principles of Data Transfer**

Text books and Reference books	**Text Book(s):** [1]. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Sixth ed.: Pearson Education,2013 [2]. A. S. Tanenbaum, "Computer Networks", 5th Edition, Pearson Education / PHI, 2011 **Reference Books:** [1]. Behrouz A Fourzan, Data communications and networking 4th edition, TMH [2]. *Larry L. Peterson*, Bruce S. Davie, "Computer Networks: A Systems Approach", 5th edition, Morgan Publishers, 2011.
E-resources and other digital material	[1] Prof. SOUMYA K GHOSH, Prof. SANDIP CHAKRABORTY , Department of Computer Science & Engineering ,IIT Kharagpur, NPTEL, Lecture Series on Computer Networks and Internet protocol by July 8, 2018 https://nptel.ac.in/courses/106105183/, [2] Tech terms ,OSI Animation ,Aug 2018 https://www.youtube.com/watch?v=vv4y_uOneC0 , [3] Ravindrababu Ravula , Classless Inter Domain Routing (CIDR),May 30 , 2014 https://www.youtube.com/watch?v=86RDE_bP1Bs&index=7&t=0s&list=PLEbnTDJUr_IegfoqO4iPnPYQui46QqT0j , [4].https://www.tlm.unavarra.es/~daniel/docencia/arss/arss10_11/practicas/Tutorial_CSMA-CD.pdf, Daniel ,CSMA/CD [5]. Internet Technologies , Internet Domain Name System http://www.tutorialspoint.com/internet_technologies/internet_domain_name_system.htm,

17IT2504A – AI TOOLS, TECHNIQUES AND APPLICATIONS

Course Category:	Open Elective-I	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	Introduction to Computers	**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 problems that are amenable to solution by AI methods and Represent knowledge of the world using logic and Infer new facts from that knowledge
	CO2	Demonstrate the capability to create simple AI applications using Natural Language Processing and machine learning.
	CO3	Elucidate the best practices for Chatbot development
	CO4	Explicate the purpose of Reinforcement Learning and apply Reinforcement Learning to real life planning problems.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	M			L								L	
CO2	L	H	L			M			L					L
CO3		M			H								M	
CO4		L	M		M	L								M

Course Content

UNIT I:
Introduction, Applications of AI, Constraint Satisfaction Problems- Backtracking Search for CSPs, Knowledge and reasoning- Knowledge-based Agents, Propositional Logic, First order logic, Uncertain and probabilistic reasoning - Basic Probability Notation, Bayes' Rule and Its Use, Representing Knowledge in an Uncertain Domain, the Semantics of Bayesian Networks

UNIT II:
Learning: Learning from observations, Forms of Learning, Inductive Learning, Learning decision trees, why learning works, Learning in Neural and Belief networks, Statistical Learning Methods- Statistical Learning, Learning with Complete Data, Natural Language Processing, Overview of NLP, Components of NLP, Enterprise Applications of NLP, Usage of NLP

UNIT III:
Chatbots: Introduction, The Rise of Chatbots, NLP in the cloud, NL Interface, Building a Chatbot, Transformative user experience of chatbots, Designing elements of a chatbot, Best practices for chatbot development, NLP components, NLP wrapper to chatbots, Audiobots and Musicbots.
Virtual Assistants: Architecture of a Virtual Assistant.

	UNIT IV: Introduction to Reinforcement Learning, Game Playing [Deep Blue in Chess, IBM Watson in Jeopardy, Google's DeepMind in AlphaGo], Agents and Environment, Action-Value Function, Deep Reinforced Learning Applications: Robotics, Gaming
Content beyond Syllabus	Diagnostic systems, Virtual Assistants Smart Applications: Smart Manufacturing, Smart Agriculture, Smart Healthcare, Smart Education, Smart Grids, Smart Transportation and Autonomous Vehicles, Smart Homes, Smart Cities.
Text books and Reference books	**Text books:** [1] Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach [2] Tom Markiewicz& Josh Zheng,Getting started with Artificial Intelligence, Published by O'Reilly Media,2017 **References:** [1] AurélienGéron, Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017
E-resources and other digital material	[1]. Pytorch: https://pytorch.org/ https://github.com/pytorch [2]. Keras: https://keras.io/ https://github.com/keras-team [3]. Theano: http://deeplearning.net/software/theano/ https://github.com/Theano/Theano [4]. Cafee2: https://caffe2.ai/ https://github.com/caffe2 [5]. Deeplearning4j: https://deeplearning4j.org/ [6]. Scikit-learn:https://scikit-learn.org/stable/ https://github.com/scikit-learn/scikit-learn [7]. Deep Learning.Ai: https://www.deeplearning.ai/ [8]. YOLO: https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/ [9]. nVIDIA:CUDA https://developer.nvidia.com/cuda-math-library

17IT2504B - LINUX PROGRAMMING

Course Category:	Open Elective - I	**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	Apply Linux utilities and Shell scripting language (bash) to solve Problems.
	CO2	Develop the skills necessary for working with files
	CO3	Understanding of Linux environment which includes program arguments and Environment variables.
	CO4	Familiar with the skills necessary for memory Management, process management and Locks.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	H			M								M	L
CO2	L	L											M	L
CO3	L	L			L								M	L
CO4	M	M			M								M	M

Course Content	**UNIT I:** **Getting Started**: An Introduction to Unix, Linux and GNU, Programming Linux. Shell Programming: A bit Philosophy, What s shell, Pipes and Redirection, Shell as a programming Language, Shell Syntax
	UNIT II: **Working with Files**: Linux file structures, System calls and Device drivers, Library functions, Low-Level File Access, The standard I/O Library, Formatted Input and Output Files And Directory Maintenance
	UNIT III: Scanning Directories Scanning Directories and Errors **Linux environment**: Program Arguments, Environment variables, ,Time and Date, Temporary Files, User information, Host information, Logging, Resources and Limits.
	UNIT IV: **Data Management**: Managing Memory, File Locking. Processes and Signaling: What is a process, Process structure, Starting new process, Signals
Text books and Reference	**Text Book(s):** [1] Neil Matthew and Richard Stones "Beginning Linux Programming" 4th edition Wrox Publication.

books	**References:** [1]Unix and Shell Programming, B. A. Forouzan and R. F. Gilberg, Cengage Learning. [2]Linux System Programming, OReilly, SPD.
E-resources and other digital material	[1]www.edx.org/course/introduction-to-linux?source=aw&awc=6798_1542702468_21911ce46d678d6e6c9d565e4a3be10e [2]https://nptel.ac.in/courses/117106113/ [3]https://www.youtube.com/watch?v=akU1Ji8Vzdk

17IT2504C - MOBILE APPLICATION DEVELOPMENT

Course Category:	Open Elective - I	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3509- Java Programming	**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	Comprehend the basics of Android development framework.
	CO2	Develop an application using the interfaces, Intents & Layouts
	CO3	Create the User Interface Programmatically.
	CO4	Demonstrate the saving of data & Navigation using Maps.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	L	L									H		H	L
CO2		L	H	H									H	L
CO3		L	H	H									H	L
CO4	H										H		H	L

Course Content

UNIT I

Getting Started With Android Programming: About Android - Android Versions, Features of Android, Architecture of Android, Android Devices in the Market, The Android Market.

Obtaining the Required Tools: Android Studio, Android SDK, Creating Android Virtual Devices (AVDs), The Android Developer Community. Launching Your First Android Application.

Activities, Fragments, and Intents: Understanding Activities - Applying Styles and Themes to an Activity, Hiding the Activity Title, Displaying a Dialog Window.

UNIT II

Linking Activities Using Intents: Returning Results from an Intent, Passing Data Using an Intent Object

Fragments-Adding Fragments Dynamically, Life Cycle of a Fragment, Interactions between Fragments, Understanding the Intent Object, Using Intent Filters.

Getting to know the Android User Interface: Understanding the Components of a Screen - Views and ViewGroups, Frame Layout, Linear Layout (Horizontal & Vertical), Table Layout, Relative Layout, Frame Layout, Scroll View.

UNIT III:

Getting to know the Android User Interface: Managing changes to Screen Orientation-Persisting State Information During Changes in Configuration, Detecting Orientation Changes, Controlling the Orientation of the Activity, Utilizing

	the Action Bar - Adding Action Items to the Action Bar. **Designing your User Interface with Views:** Using Basic Views - TextView View, Button, ImageButton, EditText, Checkbox, ToggleButton, RadioButton, and Radio Group Views, ProgressBar View,AutoCompleteTextView View.
	UNIT IV: **Designing your User Interface with Views:** Using Picker Views - TimePicker View, DatePicker View, Using List Views to Display Long Lists- ListView View, Using the Spinner View. **Displaying Pictures and Menus with Views:** Using Image Views to Display Pictures-Image View View, ImageSwitcher, GridView, Using Menus with Views- Creating the Helper Methods, Options Menu, and Context Menu, Using WebView-WebView.
Text books and Reference books	**Text Book(s):** [1]. J.F.DiMarzio (Wrox) ,"Beginning Android Programming with Android Studio",4th Edition, 2016. **Reference Books:** [1]. Reto Meier , "Professional Android 4 Application Development" ,Wiley Publishing, 2012. [2]. James Steele, Nelson , "The Android Developer"s Cookbook: Building Applications with the Android SDK", 2nd Edition, Addison-Wesley Professional, 2013. [3]. Sayed Y. Hashimi, SatyKomatineni , "Pro Android 3" , Apress, 2011
E-resources and other digital material	[1]. Wei Meng Lee , Beginning Android 4 Application Development , Worx WileyPublishing,2014. http://www.kmvportal.co.in/Course/MAD/Android%20Book.pdf [2]. Android Tutorial Simply Easy Learning, https://www.tutorialspoint.com//android/android_tutorial.pdf [3]. https://www.udacity.com/course/new-android-fundamentals--ud851 [4]. https://developer.android.com/training/basics/firstapp

17IT2505A - DATABASE MANAGEMENT SYSTEMS

Course Category:	Interdisciplinary Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	Introduction to Computers	**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 the information storage issues and derive an information model in the form of an entity relation diagram.
	CO2	Transform information model into a relational database schema.
	CO3	Formulate solutions to a broad range of query problems using formal and Informal query languages.
	CO4	Understand the normalization theory and construct normalized databases.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	PS O1	PS O2
CO 1	L	H											L	L
CO 2		L	H								M		L	M
CO 3		M		H							L		L	M
CO 4	L	H		H							H	H	M	M

Course Content	**UNIT I:** **Overview of Data base systems:** File systems vs DBMS, advantages of a DBMS, Describing and storing data in a DBMS, structure of a DBMS, People who work with databases. **Introduction to Database Design**: Database Design and ER Diagrams; Entities, attributes and Entity sets; Relationships and relationship sets; additional features of the ER Model.
	UNIT II: **Relational Model:** Introduction to the Relational Model; Integrity Constraint Over relations ; Querying relational data ; Logical data base Design ; Introduction to Views; Destroying / altering Tables and Views. **SQL: Queries And Constraints** – Part I: Form of Basic SQL Query - Examples of Basic SQL Queries ; UNION, INTERSECT, and EXCEPT;
	UNIT III: **SQL**: Queries And Constraints – Part II: Nested Queries - Introduction to Nested Queries , Correlated Nested Queries , Set - Comparison Operators ; Aggregative Operators ; NULL values - Comparison using Null values , Logical connectivity's - AND, OR and NOT, Impact on SQL Constructs, Outer Joins, Disallowing NULL

	values .
	UNIT IV: **Schema Refinement and Normal forms**: Schema refinement - Problems Caused by redundancy; Functional Dependencies: reasoning about FDS, Closure of a Set of FDs; NORMAL FORMS-FIRST, SECOND, THIRD Normal forms, BCNF; properties of decomposition - Lossless join Decomposition, Dependency preserving Decomposition; Multi valued Dependencies - forth Normal Form. **NoSQL**: An Overview of NoSQL, List of NoSQL Databases.
Text books and Reference books	**Text Book(s):** [1]. Raghurama Krishnan, Johannes Gehrke, "Database Management Systems", 3rd Edition, TATA McGrawHill. [2]. Gaurav vaish,"Getting Started with NoSQL"(Kindle Edition),1st edition,2007. **Reference Books:** [1]. Elmasri and Navathe.Fundamentals of Database Systems. Ed 5. Pearson Education. [2]. Silberschatz, Korth and Sudharshan. Data base System Concepts. Ed4. McGrawHill.
E-resources and other digital material	[1]. S. Sharma, "Introduction to DBMS", 09-05-2015 http://www.youtube.com/watch?v=1f34MwqUhx8 [2]. P. B. Mahanty, "DBMS and RDBMS", 09-05-2015 http://nptel.iitm.ac.in/video.php?courseId=1128&v=7952RsbAx2w8 [3]. Shyamalal Kumawat, "MYSQL", 09-05-2015 https://www.youtube.com/watch?v=XiDnK9Lq-Ng [4]. Prof.D.Janakiram, " DBMS", 09-05-2015 https://www.youtube.com/watch?v=EUzsy3W4I0g&list=PL536244562840E982 [5]. Jennifer widom, " Introduction to Databases" , 09-05-2015 https://www.youtube.com/watch?v=ShjrtAQmIVg.

17IT2505B - OBJECT ORIENTED PROGRAMMING

Course Category:	Interdisciplinary Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17CS1203-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	Examine the characteristics of object oriented approach
	CO2	Demonstrate the concept of polymorphism in overload of functions and operators
	CO3	Construct object oriented programs through inheritance and templates
	CO4	Apply exception handling mechanism to handle errors occur at runtime

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H												M	L
CO2	H		M										M	L
CO3	H	M	H						M		H		M	M
CO4	H		H								H		M	M

Course Content

UNIT I:

An Overview of C++: The Origins of C++, What Is Object-Oriented Programming? Introducing C++ Classes

Classes and Objects: Classes, Structures and Classes Are Related, Unions and Classes Are Related, Friend Functions, Friend Classes, Parameterized Constructors, Static keyword, The Scope Resolution Operator, Passing Objects to Functions, Returning Objects .

UNIT II:

Arrays: Arrays of Objects, The this Pointer

Overloading: Function Overloading, Overloading Constructor Functions, Copy Constructors, Operator Overloading, Creating a Member Operator Function, Operator Overloading Using a Friend Function, Overloading Some Special Operators, Overloading the Comma Operator

UNIT III:

Inheritance: Base-Class Access Control, Inheritance and protected Members, Inheriting Multiple Base Classes, Constructors, Destructors and Inheritance, Virtual Base Classes

Virtual Functions: Calling a Virtual Function through a Base Class, Pure Virtual Functions, Early vs. Late Binding.

UNIT IV:

Templates: Generic Functions, A Function with Two Generic Types, Explicitly Overloading a Generic Function.

Applying generic Functions: A Generic Sort Generic Classes, An Example with

	Two Generic Data Types **Applying Template Classes:** A Generic Array Class **Exception Handling:** Exception Handling Fundamentals, Handling Derived-Class Exceptions, Exception Handling Options
Text books and Reference books	**Text Book:** [1]. Herbert Schildt, C++ Complete Reference, Third Edition, McGraw-Hill,1998 **Reference Book:** [1]. Bjarne Stroustrup, The C+ + Programming Language, Third Edition, Addison-Wesley,1997
E-resources and other digital material	[1]. Ira Pohl, C++ For C Programmers, University of California, Santa Cruz, (08, 05, 2018). Available: https://www.coursera.org/learn/c-plus-plus-a [2]. Gerry O'Brien, Kate Gregory, James McNellis, Introduction to C++, (08, 05, 2018). Available: https://www.edx.org/course/introduction-c-microsoft-dev210x-5 [3]. Prof Partha Pratim Das , IIT Kharagpur, Programmiing in C++, https://nptel.ac.in/courses/106/105/106105151/ [4]. Object Oriented Programming (OOP) Paradigm https://www.youtube.com/watch?v=p3H-53kzMuA [5]. Prof Deepak B Phatak, IIT Bombay, Object Oriented Programming https://www.edx.org/course/object-oriented-programming

17IT2505C - PYTHON PROGRAMMING

Course Category:	Interdisciplinary Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17CS1203– 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	Analyze the constructs, conditional and iterative statements in python
	CO2	Demonstrate the applicability of file and string handling in python
	CO3	Interpret the knowledge of python modules and packages
	CO4	Synthesize data structures such as list, dictionary, set and tuple to solve a given problem

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H		M	M									H	M
CO2	H	M	M	L		L					M		H	M
CO3	M	M	M	M		L					M	L	M	M
CO4	M	M	M	H		L					M	L	M	H

Course Content

UNIT I:

Introduction- Variables, expressions and statements-Values and types, variables, variable names and keywords, statements, operators and operands, expressions, order of operations, modulus operator, string operations, asking the user for input, comments, choosing mnemonic variable names.

Conditional execution- Boolean expressions, logical operators, conditional execution, alternative execution, chained conditionals, nested conditionals, catching exceptions using try and except, short circuit evaluation of logical expressions.

Iteration- Updating variables, the *while* statement, infinite loops, "infinite loops" and *break*, finishing iterations with *continue*, definite loops using *for*, loop patterns.

UNIT II:

Functions- Function calls, built-in functions, type conversion functions, random numbers, math functions, adding new functions, definitions and uses, flow of execution, parameters and arguments, fruitful functions and void functions, why functions.

Strings- A string is a sequence, getting the length of a string using *len*, traversal through a string with a loop, string slices, strings are immutable, looping and counting, the *in* operator, string comparison, *string* methods, parsing strings, format operator.

	UNIT III: **Modules Packages and Distribution-** Packages Small Description about Modularity, Sound -A Package, Third Party Packages, A Brief Tour of Standard Library: Operating System Interface, File Wildcards. Command Line Arguments, Error Output Redirection and Program Termination, String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Performance Measurement, Quality Control. **Files-** Persistence, Opening Files, Text Files and Lines, Reading Files, Searching through a File, Letting the user choose the Filename, Using *try, except and open*, Writing Files. **Regular Expressions:** Character matching in regular expressions, Extracting data using regular expressions, Combining searching and extracting, Escape character
	UNIT IV: **Lists and Dictionaries:** A list is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Deleting elements, Lists and functions, Lists and strings, Parsing lines, Objects and values, Aliasing, List arguments. Dictionary as a set of counters, Dictionaries and files, Looping and dictionaries, Advanced text parsing. **Tuples and Sets:** Tuples are immutable, Comparing tuples, Tuple assignment, Dictionaries and tuples, Multiple assignment with dictionaries, The most common words, Using tuples as keys in dictionaries. Sets: Modifying a set, Removing Items from the Set, Set Operations, Set's Membership.
Text books and Reference books	**Text Book(s):** [3]. Charles Severance, Python for Informatics- Exploring Information. [4]. VamsiKurama,"Python Programming: A Modern Approach", Pearson India, 2017. **Reference Books:** [1]. David M. Beazley. Python Essential Reference. 3rd Ed. Sams, Indianapolis. 2006. ISBN: 0-6723-2862-3.H. [2]. Wesley J. Chun. Core Python Programming.2nd Ed. Prentice Hall, Upper Saddle River, NJ. 2007. ISBN: 0-132-26993-7. [3]. Allen B. Downey, Think Python - An Introduction to Software Design, Green Tea Press Needham, Massachusetts, Version 2.0.17, 2012. [4]. Mark Lutz, "Learning Python", 5th edition, Orielly,2013.
E-resources and other digital material	[1]. **Charles Severance** "Programming for Everybody (Getting Started with Python)" **https://www.coursera.org/course/pythonlearn** [2]. **John Guttag** "Introduction to Computer Science and Programming Using Python" **https://www.edx.org/course/introduction-computer-science-mitx-6-00- 1x-0** [3]. https://www.thenewboston.com/videos.php?cat=36 [4]. http://diveintopython.org/

17IT2506 - SELF LEARNING ELECTIVE COURSE

OPEN ELECTIVE – III

Credits – 2

*Students can opt any one of the self-learning courses prescribed by the Department. Students register and cleared the opted course in MOOCS/ NPTEL on or before the Last Instruction Day of V Semester. They have to submit the certificate before the Last Instruction Day of V Semester.

17TP1507 - PERSONALITY DEVELOPMENT

Course Category:	Soft Skills III	**Credits:**	1
Course Type:	Learning by Doing	**Lecture-Tutorial-Practice:**	0 – 0 – 2
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 the corporate etiquette.
	CO2	Make presentations effectively with appropriate body language
	CO3	Be composed with positive attitude
	CO4	Understand the core competencies to succeed in professional and personal life

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								M		H				
CO2									M	H			L	M
CO3										H			L	L
CO4									M	H				L

Course Content

UNIT – I

1. **Analytical Thinking & Listening Skills**

Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.

2. **Communication Skills**

Verbal Communication; Non Verbal Communication (Body Language)

UNIT – II

3. **Self-Management Skills**

Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities

4. Etiquette

Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT – III

5. Standard Operation Methods

Note Making, Note Taking, Minutes Preparation, Email & Letter Writing

6 Verbal Ability

Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action -Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work

	UNIT-IV **7. Job-Oriented Skills -I** Group Discussion, Mock Group Discussions **8. Job-Oriented Skills –II** Resume Preparation, Interview Skills, Mock Interviews
Text books and Reference books	[1]Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011. [2] S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010. [3] R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018. [4] Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
E-resources and other digital material	[1] www. Indiabix.com [2] www.freshersworld.com [3] https://freevideolectures.com/course/4844/nptel-soft-skill-development/30 [4] https://nptel.ac.in/courses/109/105/109105110/

17IT3509 - JAVA PROGRAMMING

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practice:**	2-1-0
Prerequisites:	17CS1203 Programming in C 17IT3308 Object Oriented 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	Paraphrase the fundamental concepts of object oriented approach
	CO2	Analyze exception handling techniques and I/O streams to handle user input and output
	CO3	Demonstrate the usage of multi threads and collection framework for structures
	CO4	Synthesize Graphical User Interfaces using applets and event handling

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L												M	L
CO2		M	H										L	M
CO3			M						H			M	H	H
CO4			M						M			H	M	H

Course Content

UNIT I:

Introduction: Overview of Java, Data Types, Variables and arrays.

Classes and objects: Class fundamentals, declaring objects, assigning object reference variables, introducing methods, constructors, this keyword, overloading methods, static and final keywords.

String Handling: The String Constructors, String Tokenizer class**.**

UNIT II:

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

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

Exception handling:

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

	subclasses.
	UNIT III: **Assertions:** Using assert statement, Assertion enabling and disabling options **Multithread Programming:** The Java thread model, creating a thread: implementing runnable, extending thread, creating multiple threads, thread priorities **Collections Framework:** Collections overview, Collection interfaces: Collection, List, and Set. Collection Classes: ArrayList, LinkedList, HashSet, TreeSet
	UNIT – IV **The Applet Class**: Applet basics, applet architecture, applet skeleton, applet initialization and termination**.** **Event Handling:** The delegation event model- Events, Event Sources, Event Listeners. Event Classes, KeyEvent Class, Event Listener Interfaces **Swing Components:** JLabel and ImageIcon, JTextField, The Swing Buttons: JButton, CheckBox, RadioButton, JList, JComboBox
Content Beyond Syllabus	Java Database Connectivity
Text books and Reference books	**Text Books:** [1] Herbert Schildt, "Java The Complete Reference", 10thEdition, McGraw-Hill Education, New Delhi, 2018. **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. Department of Computer Science & Engineering, I.I.T.,Kharagpur, "Internet Technologies", NPTEL, (4th, May, 2018), http://nptel.ac.in/video.php?subjectId=106105084 [2] Mia Minnes, Leo Porter, Christine Alvarado, University of California, San Diego ", Object Oriented Programming in Java", (04-05-2018) Available: https://www.coursera.org/learn/object-oriented-java [3] Cay Horstmann, Cheng-Han Lee, Sara Tansey, San Jose State University, "Intro to Java Programming", (04-05-2018) Available https://eu.udacity.com/course/intro-to-java-programming--cs046

17IT3551- JAVA PROGRAMMING LAB

Course Category:	Programme Core	**Credits:**	1
Course Type:	Lab	**Lecture - Tutorial - Practice:**	0 - 0 - 2
Prerequisites:	17IT3308 Object Oriented 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	Design Java Applications on object oriented concepts													
	CO2	Implement techniques to handle run time errors and different types of inheritance													
	CO3	Develop java applications on multithreading and collection classes													
	CO4	Design GUI applications through Swing components and handle the raised events.													
Contribution of Course Outcomes towards achievement of Program Outcomes **(L – Low, M - Medium, H – High)**		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	POl2	PSO1	PSO2
	CO1	L												M	M
	CO2		M	H										M	M
	CO3			M						H			M	M	M
	CO4			M						M			H	M	H
Course Content	**Week 1**: Java application to implement arithmetic operations. Creating classes containing methods with and without arguments and creating objects. **Week 2:** Java application to make use of constructors Java application to implement polymorphism **Week 3:** Java application on String operations Java application to implement inheritance Java application to implement interfaces Java application to implement packages **Week 4:** Java application on implementing abstract classes and implement run time														

	polymorphism Java application on Exception Handling techniques and assertions **Week 5:** Java application on user defined exceptions, throw and throws keywords Java application to create threads using Thread Class and Runnable interfaces **Week 6:** Java application on streams Java application to copy contents of one file to another **Week 7:** Java application to develop web based programs Java application to implement mouse event handling **Week 8 & Week 9:** Java application on Swing components & GUI Design **Week 10 & Week 11:** Java application on Collection Framework **Case Studies:** 1. Simulate the bank, college, library applications using java technology 2. Develop GUI based application using Applets and handle events raised by the application
Text books and Reference books	**Text Books:** [1]. Herbert Schildt, "Java The Complete Reference", 10th Edition, McGraw-Hill Education, New Delhi, 2018. [UNIT – I , UNIT – II ,UNIT- III , UNIT-IV] **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. [4] Herbert Schildt, "Java The Complete Reference", 8th Edition, McGraw-Hill Education, New Delhi, 2011.
E-resources and other digital material	[1]. Prof. I. Sengupta. Department of Computer Science &Engineering, I.I.T.,Kharagpur, "Internet Technologies", NPTEL, (14th , May , 2015), http://nptel.ac.in/video.php?subjectId=106105084 [2]. Prof. Shane P. Department of Computer Science & Engineering,, NPTEL Videos, (14th , May , 2015), http://www.nptelvideos.com/video.php?id=1461&c=15 [3]. https://www.javatpoint.com/java-tutorial [4]. https://www.youtube.com/playlist?list=PLE7E8B7F4856C9B19

17IT3552 - ADVANCED PROGRAMMING LAB I

Course Category:	Programming Core	**Credits:**	1
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-2
Prerequisites:	17CS1203 Programming in C 17IT3303 Data Structures 17IT3404 Python Programming 17IT3509 Java programming	**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	Demonstrate the knowledge to find solutions that uses structured and object oriented languages
	CO2	Implement data structures linear, non-linear and python structures to solve real world problems

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H					H					H	H	H	M
CO2	H					H					H	H	H	M

Course Content

Cycle I

Design solutions with Structure oriented Languages

Week 1

Programming Applications on Structured Oriented Languages to implement:

- Control structures
- Modularity

Week 2

- Implement applications with Arrays and Strings
- Programming applications which use references

Cycle II

Create applications that uses Python Constructs

Week 3

- Create applications that uses the Control flow structures

Week 4

- Solve applications that uses the list, list comprehension, tuples, sets and dictionaries

Week 5

- Programs that can handle the run time errors/exceptions

Cycle III

Solution to the applications that uses Object Oriented Programming

	Week 6 Design solutions that makes use of object oriented programming constructs such as control structures, inheritance, exception handling techniques
	Cycle IV **Applications that uses Data structures** **Week 7** Programs that can be solved through Linear Data structures **Week 8** Programs that can be solved through Non-Linear Data structures **Week 9** Applications that can be solved through hashing techniques
Text books and Reference books	**Text Book(s):** [1]. Antti Laaksonen, "Guide to Competitive Programming", 1st edition, Springer International Publishing, 2017 **Reference Books:** [1]. Halim, Steven and Halim, Felix, Competitive Programming 3, 2013. [2]. Ahmed Shamsul Arefin, Art of Programming Contest, ACMSolver, Second Edition, 2012
E-resources and other digital material	[1]. Hacker Rank, 10-05-2019 Available https://www.hackerrank.com/ [2]. Hacker Earth, 10-05-2019 Available https://www.hackerearth.com/ [3]. Topcoder, 10-05-2019 Available https://www.topcoder.com/challenges/ [4]. Coder Byte, 10-05-2019 Available https://www.coderbyte.com/ [5]. Code wars, 10-05-2019 Available https://www.codewars.com/ [6]. Code Signals, 10-05-2019 Available https://codesignal.com/ Code Chef, 10-05-2019 Available https://www.codechef.com/

17MC1508A - 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 (L-Low, M- Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		H		M										
CO2		H												
CO3		M		H										
CO4		L		M	H									

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 :** "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 :** 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 and Reference books	**Text Books & Reference 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

17IT3601 - MACHINE LEARNING

Course Category:	Program Core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-2
Prerequisites:	17IT3502 Data Mining	**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	Recognize the characteristics of machine learning , binary classification and Bayesian learning
	CO2	Solve classification problems using concept learning and decision trees
	CO3	Apply Linear and distance based learning models
	CO4	Analyze Genetic and Neural network algorithms

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L	L	L	M								M	M
CO2	H	M	M	M	H								H	H
CO3	H	M	M	M	H								H	H
CO4	H	M	M	M	H								H	H

Course Content

UNIT I

The ingredients of machine learning, **Tasks**: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning.

Binary classification and related tasks: Classification, Scoring and ranking, Class probability estimation

Bayesian and Computational Learning: Bayes Theorem, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier

UNIT II

Beyond binary classification: Handling more than two classes, Regression, Unsupervised and descriptive learning.

Concept learning: The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts.

Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction.

UNIT III

Linear models: The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods.

	Distance Based Models: Introduction, Neighbours and exemplars, Nearest Neighbours classification
	UNIT IV **Artificial Neural Networks**: Introduction, Neural network representation, appropriate problems for neural network learning, Multilayer networks and the back propagation algorithm. **Genetic Algorithms**, Hypothesis Space Search, Genetic Programming
Text books and Reference books	**Text Book(s):** [1]. Machine Learning: The art and Science of algorithms that make sense of data, Peter Flach, Cambridge University Press, 2012 [2]. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education **Reference Books:** [1]. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014 [2]. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press. [3]. T. Hastie, R. Tibshirani and J. Friedman, "Elements of Statistical Learning", Springer Series , 2nd edition
E-resources and other digital material	[1]. Kevin Murphy,"MachineLearning:AProbabilisticPerspective" , MIT Press, 2012, https://www.cs.ubc.ca/~murphyk/MLbook/pml-intro-5nov11.pdf [2]. Professor S. Sarkar , IIT Kharagpur "Introduction to machine learning", https://www.youtube.com/playlist?list=PLYihddLF-CgYuWNL55Wg8ALkm6u8U7gps , [3] Professor Carl Gustaf Jansson, KTH, Video Course on Machine Learning https://nptel.ac.in/noc/individual_course.php?id=noc19-cs35 [4]. Tom Mitchell, "Machine Learning", http://www.cs.cmu.edu/~tom/10701_sp11/lectures.shtml

17IT3602 - WEB PROGRAMMING AND DEVELOPMENT

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3308 Object Oriented Programming 17IT3509 Java Programming	**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	Develop secure and dynamic web pages using JavaScript													
	CO2	Design applications that interact with relational databases through Java Database Connectivity													
	CO3	Develop and deploy Servlets and JSP technologies													
	CO4	Design single page web applications through Angular technology													
Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	M	M	H								L		M	L
	CO2	M	M	H								L		M	L
	CO3	M	M	H								L		M	M
	CO4			H								H		M	M

Course Content

UNIT I:

XML: Introduction, XML Basics, Structuring Data, XML namespaces ,Document Type Definitions(DTDs), W3CXML schema Documents

JDBC: The concept of JDBC,JDBC Driver Types, JDBC Packages, A Brief Overview Of The JDBC Process, Database Connection, Associating The JDBC/ODBC bridge with the Database, Statement objects, Result Set

UNIT II:

Java Servlets: Java Servlets and common gateway interface programming, benefits of using a java servlets, simple java servlet, anatomy of a java servlet, deployment descriptor, reading data from a client, reading http request headers, sending data to a client and working the http response header, working the cookies, tracking sessions

UNIT III:

Java Server Pages: JSP, JSP tags, Tomcat, Request String. User Sessions, Cookies, Sessions Objects

Java Script: Introduction to scripting, Functions, Arrays, Objects

UNIT IV:

Angular:

Introduction to angular, Hello Angular, starting first angular project, understanding the Angular CLI, Basics of Angular Applications, creating a Component, built-in Angular directives, understanding and using angular components, testing angular components, Template driven forms

Content Beyond Syllabus	**Case Study:** Deploy Web application into a server using Servelt/JSP Technology or Develop a web applications using Angular technology
Text books and Reference books	**Text Book(s):** [1]. James Keogh, "J2Ee: The Complete Reference", 1st Edition, Mcgraw Hill Education, 2002 [2]. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, "Internet & World Wide Web How to Program", 5th Edition, Pearson Education, 2011 [3]. ShyamSeshadri, "Angular: Up and Running",O'Relly Media, Inc., First Edition, 2018 **Reference Books:** [1]. Chris Bates, "Web Programming, building internet applications", 2nd Eedition, WILEY Dreamtech,2006 [2]. Hans Bergsen, "Java Server Pages", SPD O'Reilly, 2nd edition, 2002 [3]. Matt Frisbie, Angular 2 Cookbook, 1st Edition,Kindle Edition, 2017
E-resources and other digital material	[1]. Patrick Royal, Java EE Essentials: Servlets and JavaServer Faces, 20-11-2018, Available: https://www.lynda.com/Java-tutorials/Java-EE-Essentials-Servlets-JavaServer-Faces/124399-2.html [2]. Advanced Java Programming by Infinite Skills, 20-11-2018 Available: https://www.udemy.com/advanced-java-programming/ [3]. Programming Tutorials by Rose India, 20-11-2018 Available: http://www.roseindia.net/ [4]. Front-End JavaScript Frameworks:Angular, The Hong Kong University of Science and Technology, 28-11-2018 Available https://www.coursera.org/learn/angular,

17IT4603A - FUNDAMENTALS OF DATA SCIENCE

Course Category:	Programme Elective - I	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3502 - Data Mining 17IT3401 - Statistics with R	**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 need and significance of data life cycle.
	CO2	Apply statistical techniques to visualize the data and evaluate Type I and II errors.
	CO3	Design classifier model to predict future trends and validate accuracy of the classifier and to implement clustering techniques on the datasets.
	CO4	Implement Linear model selection methods for real time applications/ Analyze algorithms for dimensionality reduction on data.

Contribution of Course Outcomes towards achievement (L-Low, M-Medium, H-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	PSO1	PSO2
CO1	H												H	M
CO2	L	M		M									H	M
CO3	M	L										M	H	M
CO4	M	M		M									H	M

Course Content

UNITI:
Introduction: Introduction to Datasets, A Brief history of Statistical Learning, Notation and Simple Matrix Algebra.
Statistical Learning: What is Statistical Learning, Assessing Model Accuracy, Introduction to R.

UNITII:
Linear Regression: Simple Linear Regression, Multiple Linear Regression, other Considerations in the Regression Model, The Marketing Plan, Comparison of Linear Regression with K-Nearest Neighbors.

UNITIII:
Classification: An Overview of Classification, Why Not Linear Regression?, Logistic Regression, Linear Discriminant Analysis, A Comparison of Classification Methods.
Resampling Methods: Cross- Validation and The Bootstrap.

UNITIV:
Linear Model Selection and Regularization: Subset Selection, Shrinkage Methods, Dimension Reduction Methods, Considerations in High Dimensions.
Tree-Based Methods: The Basics of Decision Trees, Bagging: Random Forest, Boosting.
Support Vector Machine: Maximum Margin classifiers, Support vector classifiers

Textbooks and Reference books	**Text Book(s):** [1]. Gareth James, Daniela Witten, Trevor Hatie, RoberstTibhirani , "An Introduction to Statistical Learning-with Applications in R ", 2015 **Reference Books:** [1]. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014. [2]. Mark Gardener, "Beginning R: The statistical programming language", 2012
E-resource sand Other digital material	[1]. Latika Singh, K-NN, https://www.youtube.com/watch?v=2YQHPfwVuF8 [2]. David Longstreet, Linear regression, https://www.youtube.com/watch?v=zPG4NjIkCjc [3]. https://www.digimat.in/nptel/courses/video/106105186/L01.html [4]. https://www.youtube.com/watch?v=XohgKT13FKY

17IT4603B - NETWORK SECURITY

Course Category:	Programme Elective - I	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3503 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 security attacks, services, mechanisms and encryption algorithms to mitigate security issues in a network
	CO2	Apply authentication techniques to safeguard the data transfer.
	CO3	Analyze security practices in IP and web based systems.
	CO4	Identify malicious activities and incorporate counter measures on digital data.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	M	M	M		L		M	L				M	L
CO2	L	H	H	M	H			M					H	M
CO3	L	H	H	M	M			M					M	M
CO4			H			H		H					M	M

Course Content

UNIT I:

Overview: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security.

Classical Encryption Techniques: Symmetric Cipher Model – Cryptography, Cryptanalysis and Brute Force Attack.

Block Ciphers and the Data Encryption Standard: Traditional block cipher structure, The Data Encryption Standard, The strength of DES, Block cipher design principles.

Advanced Encryption Standard: AES Structure.

UNIT II:

Public key cryptography and RSA : Principles of public-key cryptosystems, The RSA Algorithm.

Other Public-Key Cryptosystems: Diffie Hellman Key exchange. **Cryptographic Hash Functions:** Applications of cryptographic hash functions, Two simple hash functions, Secure Hash Algorithm (SHA).

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, MACs based on Hash Functions : HMAC.

Digital Signatures : Digital signatures.

UNIT III:

Transport Level Security : Web Security Considerations, Secure Sockets Layer (SSL), Transport Layer Security (TLS)

Wireless Network Security : Wireless Security, Mobile Device Security.

	IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload (ESP).
	UNIT IV: **Malicious Software :** Types of Malicious softwares, Viruses, Worms. **Intruders** – Intruders, Intrusion Detection. **Firewalls :** Need for firewalls, Firewall Characteristics, Types of Firewalls.
Content beyond	SPAM, Trojans, Zombie, Bots, Keyloggers, Phishing, Backdoors, Rootkits, **Cloud Security, WLAN Security**
Text books and Reference books	**Text Book(s):** [1].W.Stallings, "Cryptography and Network Security: Principles and Practice", 6th ed, Pearson education, 2014. [2].W.Stallings, "Network Security Essentials : Applications and Standards", 4rth ed, Pearson education, 2011. **Reference Books:** [1]. AtulKahate, "Cryptography and Network Security", Third Edition, TataMcGraw Hill, Ltd , 2013.
E-resources and other digital material	[1]. Focus Group, "Symmetric and Asymmetric encryption", *https://www.youtube.com/watch?v=btj1skzR5yA*, Sept 2018 [2]. Sri Vasan V S, "Digital Signatures", NPTEL IIT MADRAS, https://www.youtube.com/watch?v=1NMZuLZPUKc, Dec 2017 [3]. Intrigano "IDS vs IPS", https://www.youtube.com/watch?v=r_gdx39qV1g, Dec 2017

17IT4603C- AUTOMATA AND COMPILER DESIGN

Course Category:	Program Elective - I	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	Introduction to Computing	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Construct finite state machines and regular expressions for modeling and solving computation problems.
	CO2	Implement top down and bottom up parsing techniques on context free grammars
	CO3	Apply techniques for code generation and code optimization.
	CO4	Design Pushdown Automata and Turing machines for the given grammar or language.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	L			L						M		L	M
CO2	M	H									H		L	L
CO3	H	L									L		L	M
CO4	H	H		M							L		L	L

Course Content

UNIT I:

Finite Automata: Deterministic Finite Automata-Definition of DFA, How a DFA processes strings, Simpler Notations for DFA's, Extending the Transition Function to Strings, The Language of DFA, Nondeterministic Finite Automata – Definition of NFA, Extended Transition Function, Language of NFA, Equivalence of Deterministic and Nondeterministic Finite Automata, Finite automata with Epsilon – Transitions – Uses of €-Translations, Formal notation for an €-NFA, Epsilon-Closures, Extended Transitions and Languages for €-NFA's, Eliminating €-Transitions.

Regular Expressions and Languages: Regular expressions – Operators of Regular Expressions, Building Regular Expressions, Finite Automata and Regular Expressions - Converting DFA's to Regular expressions by eliminating states, Converting regular expressions to automata.

UNIT II:

Introduction: Structure of a compiler **Lexical Analysis** – Role of Lexical Analyzer – Lexical Analysis Vs. Parsing, Token, patterns and Lexemes, Lexical Errors

Simple Syntax Directed Translator: Syntax definition – Definition of Grammars, Derivations, Parse Trees, Ambiguity, Parsing-Top-Down Parsing, Predictive Parsing, When to use € Productions, Designing a Predictive Parser, Left Recursion

Syntax Analysis : Introduction - Role of a parser, Context Free Grammars – definition of CFG, Derivations, Parse Trees and Derivations, Ambiguity, Top Down Parsing-Recursive-Descent Parsing, FIRST and FOLLOW, LL(1) Grammars,

	Nonrecursive Predictive Parsing, Bottom Up Parsing – Reductions, Handle Pruning, Shift Reduce Parsing, Introduction to LR Parsing – Why LR Parsers, Items and the LR(0)Automaton, LR-Parsing Algorithm, Construction of SLR-Parsing Tables, More Powerful LR Parsers- Canonical LR(1) Items, Constructing LR(1) Sets of Items, Canonical LR(1) Parsing Tables, Constructing LALR Parsing Tables
	UNIT III: **Syntax Directed Translation**: Syntax Directed definition, Evaluation orders for SDD's, Applications of Syntax Directed Translation **Intermediate Code Generation** : Variants of Syntax Trees, Three Address Code, Type Checking- Rules for Type Checking, Type Conversions **Code generation:** Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Simple code Generator, Peephole Optimization.
	UNIT IV: **Pushdown Automata**: Definition of the Pushdown automata, The languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Push Down Automata. **Turing Machines**: Introduction, The Turing Machine – Notations, Descriptions, Transition diagrams, Language of a Turing Machine, Turing Machines and Halting.
Text books and Reference books	**Text Book(s):** [1]. John E..Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, " Introduction to Automata Theory, Languages and Computation", 3rd Edition, Pearson Education, 2011 [2].Daniela Witten, Trevor Hatie, RoberstTibhirani , "Compilers Principles, Techniques and Tools", Pearson Education, Second Edition, 2009. **Reference Books:** [1]. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing. [2] Lewis H.P. & Papadimitriou C.H , "Elements of Theory of Computation", Second edition, Pearson /PHI. [3]. K.L.P.Mishra and N. Chandrashekaran, "Theory of computation" , 2nd edition, PHI
E-resources and other digital material	[1]. Prof.Kamala Krithivasan, IIT, Madras, "Theory of Automata, Formal Languages and Computation" , 2011, https://nptel.ac.in/courses/106106049/http://dev.tutorialspoint.com/automata_theory/index.htm [2]. Neso Academy, "Introduction to Theory of Computation", Dec 2016. https://www.youtube.com/watch?v=58N2N7zJGrQhttp://www.nptelvideos.in/2012/11/theory-of-computation.html [3]. GeeksfoGeeks, " Theory of Computation", https://www.geeksforgeeks.org/toc-introduction-theory-computation/

17IT4603D - AGILE SOFTWARE DEVELOPMENT

Course Category:	Programme Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3501 - 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 nature of agile software development to establish a professional software development environment and build teams.
	CO2	Analyze the customer role and time related problems in agile development environments.
	CO3	Apply measures for quality assurance and Test Driven Development in agile software development environments.
	CO4	Analyze the abstraction levels in agile software development and develop trust among team members in learning environment.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	M											L	M
CO2	L												L	M
CO3	L		L									M	L	M
CO4		M										M	L	L

Course Content

UNIT I:

Introduction to Agile Software Development-Overview, Objectives, Three Perspectives on Software Engineering, The Agile Manifesto, Application of Agile Software Development, Data About Agile Software Development, Agile Software Development in Learning Environments

Teamwork- Overview, Objectives, A Role Scheme in Agile Teams, Dilemmas in Teamwork, Teamwork in Learning Environments,

UNIT II:

Customers and Users- Overview, Objectives, The Customer, The User, Customers and Users in Learning Environments

Time- Overview, Objectives, Time-Related Problems in Software Projects, Tightness of Software Development Methods, Sustainable Pace, Time Management of Agile Projects, Time in Learning Environments,

UNIT III:

Measures- Overview, Objectives, Why Are Measures Needed?, Who Decides What Is Measured?, What Should Be Measured?, When Are Measures Taken?, How Are Measures Taken?, Who Takes the Measures?, How Are Measures Used?, Case Study- Monitoring a Large-Scale Project by Measures, Measures in Learning

	Environments. **Quality-** Overview, Objectives, The Agile Approach to Quality Assurance, Test-Driven Development, Measured TDD, Quality in Learning Environments.
	UNIT IV: **Learning-** Overview, Objectives, How Does Agile Software Development Support Learning Processes, Learning in Learning Environments **Abstraction-** Overview, Objectives, Abstraction Levels in Agile Software Development, Abstraction in Learning Environments **Trust-** Overview, Objectives, Software Intangibility and Process Transparency, Game Theory Perspective in Software Development, Ethics in Agile Teams, Diversity, Trust in Learning Environments,
Text books and Reference books	**Text Book(s):** [1] Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009. **Reference Books:** [1]. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004. [2]. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.
E-resources and other digital material	[1]. https://www.coursera.org/learn/agile-planning-for-software-products [2]. Prof Umesh Bellur, IIT Bombay, https://www.youtube.com/watch?v=jRs-aFETAXY [3]. Praveen Mittal, University of Minnesota, courser, https://www.coursera.org/learn/agile-software-development [4]. http://www.nptelvideos.in/2012/11/software-engineering.html

17IT4604A - BIG DATA

Course Category:	Programme Elective-II	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3502- Data Mining	**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 Hadoop Architecture—Name Node, Big Data Lifecycle.
	CO2	Master the concepts of Hadoop Distributed File System.
	CO3	Acquire knowledge on Map Reduce Framework.
	CO4	Apply Pig and Hive concepts for Data Processing.

Contribution of Course Outcomes towards achievement (L-Low, M-Medium, H-High)

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

Course Content

UNIT I

Introduction to Big Data:

Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity), Data in the Warehouse and Data in Hadoop, Why is Big Data Important? Patterns for Big Data Development.

Introduction to Hadoop:

Data, Data Storage and Analysis, Comparison with Other Systems: RDBMS, Grid Computing, Volunteer Computing, A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem, Hadoop Releases.

UNIT II

Hadoop Distributed File System: The Design of HDFS, HDFS Concepts, Blocks, Namenodes and Datanodes, Basic Filesystem Operations, Hadoop Filesystems, Interfaces, The Java Interface, Reading Data from a HadoopURL, Data Flow, Anatomy of a FileRead, Anatomyof a FileWrite, Coherency Model.

UNIT III

Map Reduce–A Weather Dataset, Data Format, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Map and Reduce, Java Map Reduce, Scaling Out, Hadoop Streaming, Hadoop Pipes.

Pig-Installation and Running of Pig, Execution Types, Running Pig Programs, Pig Latin Editors, Comparison with databases, Pig Latin, Functions, Data Processing Operators.

	UNITIV: **Hive-**Installing Hive, An Example, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data.
Textbooks and Reference books	**Text Book(s):** [1]. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch , "Understanding Big Data Analytics for Enterprise Class Hadoop and StreamingData", 1st Edition, TMH,2012. [2].TomWhite,Hadoop,"TheDefinitiveGuide",3rdEdition,O'Reilly Publications, 2012 **Reference Books:** [1].Michael Berthold, DavidJ. Hand, "Intelligent Data Analysis", Springer, 2007**.** [2].David Loshin, "BigDataAnalytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann Publishers, 2013 [3].Hadoopin PracticebyAlexHolmes, MANNING [4].Hadoop in Action byChuckLam, MANNING
E-resources and Other digital materials	[1].Big Data Use cases for Beginners | Real Life Case Studies | Success Stories https://www.youtube.com/watch?v=HHR0-iJp2sM [2].Alexey Grishchenko, Hadoop vs MPP, https://0x0fff.com/hadoop-vs-mpp/ [3].Random notes on bigdata- SlideShare: www.slideshare.net/yiranpang/random-notes-on-big-data-26439474 [4]. https://nptel.ac.in/courses/106/104/106104189/

17IT4604B - INTERNET OF THINGS

Course Category:	Programme Elective II	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3503 – 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 design concepts, protocols, privacy and security of Internet of Things
	CO2	Analyze the methods of data acquiring, organizing and analytics using Cloud platform for IoT applications.
	CO3	Design IoT applications using Raspberry Pi board using Python interfacing various sensors.
	CO4	Apply the steps of the design methodology in developing IoT applications.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L		H		L		M					M	L	
CO2	L		M		M		M						L	M
CO3	L		M		M		M						L	
CO4	L		M		M		M					M	L	M

Course Content

UNIT I:

Introduction to Internet of things: Introduction, Physical design of IoT, Logical Design of IoT, IoT Enabling technologies, IoT levels & Deployment templates.

Domain Specific IoTs: Home Automation, Cities

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT

UNIT II:

Internet Connectivity Principles: Introduction, Internet Connectivity, Internet-Based Communication, IP Addressing in the IoT, Media Access Control, Application Layer Protocols-HTTP, HTTPS, FTP

Data Acquiring, Organizing, Processing and Analytics: Introduction, Data Acquiring and Storage, Organizing the Data, Transactions, Business, Processes, Integr ation and Enterprise Systems, Analytics.

Data Collection, Storage and Computing Using a Cloud Platform: Introduction, Cloud Computing Paradigm for Data Collection, Storage and Computing, Everything as a Service and Cloud Service Models.

	UNIT III: **Sensors, Participatory Sensing, RFIDs and Wireless Sensor Networks:** Introduction, Sensor Technology, Actuator, Sensor Data Communication Protocols, Radio Frequency Identification Technology, Wireless Sensor Networks Technology. **IoT physical devices & Endpoints: IoT Device,** Raspberry Pi Board, Raspberry Pi interfaces, programming Raspberry pi with python.
	UNIT IV: **IoT Platforms Design Methodology:** Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring**.** **IoT Privacy, Security and Vulnerabilities Solutions:** Vulnerabilities, Security Requirements and Threat Analysis – Privacy, Vulnerabilities of IoT, Security Requirements, Threat Analysis, IoT Security Tomography and Layered Attacker Model.
Text books and Reference books	**Text Book(s):** [1] Vijay Madisetti and ArshdeepBahga, **"Internet of Things (A Hands-on-Approach)",** 1st Edition, University Press Private Limited, 2017 [2] Raj Kamal, "**Internet of Things, Architecture and Design Principles**" 1st Edition, McGraw Hill Education Private Limited, 2017. **Reference Books:** [1] Francis daCosta, **"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",** 1st Edition, Apress Publications, 2013 [2] Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, **"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",** 1st Edition, Academic Press, 2014.
E-resources and other digital material	[1] Prof Sudip Misra, IIT, Kharagpur, "Introduction to Internet of Things", 2017 https://www.youtube.com/watch?v=WUYAjxnwjU4 [2] IoT Tutorial for Beginners | Internet of Things (IoT) | Edureka, 2017 https://www.youtube.com/watch?v=UrwbeOIlc68 [3] Prof Sudip Mishra, IIT Kharagpur, Introduction to IoT, https://nptel.ac.in/courses/106/105/106105166/ [4] https://freevideolectures.com/course/4638/nptel-introduction-internet-things

17IT4604C-DOT NET TECHNOLOGIES

Course Category:	Program Elective - II	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3509 Java Programming	**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	Understanding the architecture and benefits of Dot Net Frame work..
	CO2	Analyze the importance of object oriented features in Dot Net frame work.
	CO3	Design dynamic web applications using web Controls and validation controls.
	CO4	Build web applications that include database interactivity with different databases.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	H		L					H		H			H
CO2		H		H					H		H			H
CO3		H		H	H				H		H			H
CO4		H		H					H		H			H

Course Content

UNIT I:

Getting started with .NET Framework: Benefits of dot Net, Architecture of dot Net Frame work: components of .Net Frame work, new Features of .Net Frame work.

Introduction to C# : Need of C#, C# pre-processor Directives, New Features of C#, simple C# console Application, Identifiers and key words, Data types, Variables and constants: value type, reference type, pointer type, Type conversion, Boxing and unboxing variables, Expressions and operators.

Namespaces, Classes, Objects, and Structs: Namespaces, Classes and objects, constructors and destructors, Static class and ststic class members, properties, Indexers and Structs.

UNIT II:

Object Oriented Programming: Encapsulation, Inheritance, Polymorphism, Abstraction, Interfaces.

Pointers, Delegates and Events: Pointers, Delegates, Events. Flow control and Exception Handling: Control Flow Statements, Exception Handling.

	UNIT III: **ASP.NET Essentials:** Introduction to Features of ASP.NET, ASP.NET Life cycle, creating a sample ASP.NET web application. **Web Forms:** Standard Controls: The Control Class, Web Control class, CSS in web Applications, Label Control, Button Control, TextBox Control, Literal Control, Place Holder Control, Hidden Field control, File Upload Control, Image Control, Image Button Control, Image Map Control, List Box Control, Drop Down List Control, Bulleted List Control, Drop Down List Control, Bullet List Control, Hyper Link Control, Link Button , Check Box Control, Radio Button Control, Table Control, user Control and ustom Control. **Validation controls:** Base Validator Class, Required Field validator Control, Range validator Control, Regular Expression validator Control, Compare validator Control, ustom Validator validator Control.
	UNIT IV: **Data Access with ADO.NET**: Understanding Databases, Features of ADO.NET, Architecture of ADO.NET, Types Vs. Untyped DataSets, Data Reader, Connection String, Connecting to a Data base: SQL Server DataBase, OLEDB Data Base, ODBC Data Source, Command Object, Data Adapter : DataSet and Data Adapter, paging with Data Adapter, updating with Data Adapter, Adding Multiple Tables to a DataSet, Creating a Data View, Data Reader to work with databases
Text books and Reference books	**Text Book(s):** [1] Kogent Learning Solutions, "NET4.5 PROGRAMMING" Black Book, dream tech press, 2013. **Reference Books:** [1] Herbert Schildt, "C# 4.0:complete reference",McGrawHill,2010. [2]Matthew MacDonald, "ASP.NET: The complete Reference", McGrawHill, 2002. [3] Chris Hart, John Kauffman, Dave Sussman, Chriss Ullman "ASP.Net 2.0 with c#" Wrox, 2006.
E-resources and other digital material	[1] Gerry O Brien , "Introduction to C #", https://www.edx.org/course/introduction-to-c-2 [2] Gerry O Brien , "Object Oriented Programming in C#", https://www.edx.org/course/programming-c-microsoft-dev204x-1 [3] Dr. Tim, Dr. T. Chamillard, " Introduction to C# programming and Unity", https://www.coursera.org/specializations/programming-unity-game-development [4]Tiberiu Covaci, "ASP.NET Web Forms Essential Training" , https://www.lynda.com/ASP-NET-training-tutorials/157-0.html

17IT4604D - SOFTWARE TESTING METHODOLOGIES

Course Category:	Programme Elective-II	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3501 :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 differences between testing and debugging
	CO2	Analyze the testing techniques for performing Transaction-Flow and Data-Flow testing
	CO3	Implement transaction flow testing, domain testing and state testing for a given application and apply in commercial environments.
	CO4	Interpret the control flow graph and identify the path products, path sums and path expressions.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO2
CO1	L	M	L		L							M	L	
CO2	M	M	M	M							M			L
CO3	H	L	M	L					M	M				M
CO4	M	L	H	L					L				L	

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:
Transaction Flow Testing: Transaction flows, transaction flow testing techniques.
Domain Testing: Domains and paths, Nice and Ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT III:
Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.
Paths, path products and Regular expressions: Path products & Path expression, reduction procedure, applications and flow anomaly detection.

UNIT IV:
State, State Graphs Testing: State Graphs, good and bad state graphs,
Transition Testing: state testing, Impact of Bugs, Principles, Limitations and Extensions testability tips.

Content Beyond Syllabus	Software Metrics, Test Suit Management.
Text books and Reference books	**Text Book(s):** [1]. B. Beizer, Software Testing Techniques, Second Edition, International Thomson Computer Press, 2009 **Reference Books:** [1] B. Marick, The craft of software testing: Prentice Hall series in innovative technology. [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]. Prof. Rajib Mall, IIT Kharagpur, NPTEL SOFWARE Testing video. Available: https://nptel.ac.in/courses/106105150/ [2]. Software testing MIT. Available: http://ocw.mit.edu/courses/electrical- engineering-and-computer-science/6-912-introduction-to-copyright-law-january- iap-2006/video-lectures/lecture-4-software-licensing/ [3]. http://www.nptelvideos.in/2012/11/software-engineering.html

17IT2605A - CYBER SECURITY

Course Category:	Open Elective-IV	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3503- 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	Identify the assets of information and significance of security.
	CO2	Apply data leakage, protection and security policies on digital systems.
	CO3	Analyze log files and backup strategies for securing the data in real time environment.
	CO4	|Implement the issues in handling web vulnerabilities.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	H	H										M	H
CO2			L	M									M	M
CO3	L	L	H	L	L								L	M
CO4	L		M	H	L	L							H	L

Course Content

UNIT I: Information Security and Threats

Introduction – Information Security, Information Assets & Threats - Threats to Information Assets, Types of Attacks, Types of Virus, Types of Worms, Types of Trojans, Network Attacks, Common Vulnerabilities and Exposures (CVE).

Fundamentals of Information Security: Elements of information security – Network Security, Application Security, Communications Security. Principles and concepts – data security – Critical Information Characteristics, Information States, Prevention Vs Detection, Types of controls – Access Control Models.

UNIT II: Data Leakage and Prevention

Introduction to Data Leakage, Organizational Data Classification, Location and Pathways, Content Awareness, Content Analysis Techniques, Data Protection

Network Sniffers and Injectors –Sniffers Overview, Tcp dump , Wireshark.

UNIT III: Log Correlation and Management

Event Logs - Concepts, Log Management and its need, Log Management Process, IIS Log Files, Log Analysis and Response.

Data Backup : Data Backup -Overview, Types of Backup, Backup Procedures., Types of Storage,

UNIT IV:

Web Application Hacking : Scanning for web vulnerabilities : Nikto, , HTTP utilities - Curl, Open SSL, Stunnel, Application Inspection – Zed Attack Proxy,

	Sqlmap.
Content Beyond Syllabus	**Handling Network Security Incidents** Network Reconnaissance Incidents ,Denial of Service Incidents, Unauthorized Access Incidents, Inappropriate usage incident, Multiple component incident
Text books and Reference books	**Text Book(s):** [1]. Student Handbook – Security Analyst, NASSCOM [2]. Anti-Hacker Tool Kit (Indian Edition) Fourth Edition by Mike Shema, Publication McGraw Hill,2014 **Reference Books:** [1]. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley [2]. Nelson Phillips and EnfingerSteuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009. [3]. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005 [4]. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006. [5]. McClure, Stuart, Saumil Shah, and Shreeraj Shah. Web Hacking:attacks and defense. Addison Wesley. 2003.
E-resources and other digital material	[1]. Hacker HighSchool http://www.hackerhighschool.org/lessons.html [2]. E.Rahul Naidu ,"Importance of Cyber Security" Available at : https://www.youtube.com/watch?v=MvK3lIDR3ms [3]. https://nptel.ac.in/courses/106/105/106105031/ [4]. https://www.youtube.com/watch?v=_mxufDbcK5A

17IT2605B - DATA VISUALIZATION

Course Category:	Open Elective - IV	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT4604A - Big Data	**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	Illustrate visualizations that represent the relationships contained in complex data sets and their interpretation.
	CO2	Analyze and select appropriate data that can be used in order to create a visualization that answers a particular research application
	CO3	Identify the statistical analysis needed to validate the trends present in data visualizations.
	CO4	Choose leading open source software packages to create and publish visualizations that enable clear interpretations of big, complex and real world data.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L	M								L		L	
CO2	L	L	M								L			
CO3		M												L
CO4	L		L								L		L	

Course Content

UNIT I:

The Context of Data Visualization : Visualization as a discovery tool, The bedrock of visualization knowledge, Defining data visualization, Visualization skills for the masses, The data visualization methodology.

Setting the Purpose and Identifying Key Factors: Establishing intent – the visualization's function, Establishing intent – the visualization's tone, Key factors surrounding a visualization project, The " eight hats" of data visualization design

UNIT II:

Conceiving and Reasoning Visualization Design Options: Data visualization design is all about choices, The visualization anatomy – data representation, The visualization anatomy – data presentation

Taxonomy of Data Visualization Methods: Data visualization methods, Choosing the appropriate chart type, Assessing hierarchies and part-to-whole relationships.

	UNIT III: **Constructing and Evaluating Your Design Solution:** For constructing visualizations, technology matters, The construction process, Approaching the finishing line, Post-launch evaluation, Case Studies on real-time applications.
	UNIT IV: **An Introduction to Connecting to Data:** An Introduction to Connecting to Data in Tableau, Shaping Data for Use with Tableau, Getting a Lay of the Land: Tableau Terminology, View the Underlying Data, View the Number of Records, Dimension Versus Measure, What Is a Measure? What Is a Dimension? Discrete Versus Continuous **Five Ways to Make a Bar Chart/An Introduction to Aggregation**: Five Ways to Create a Bar Chart in Tableau An Introduction to Aggregation in Tableau, Line Graphs, Independent Axes, and Date Hierarchies, How to Make a Line Graph in Tableau, Independent Axes in Tableau, Date Hierarchies in Tableau, Marks Cards, Encoding, and Level of Detail, An Explanation of Level of Detail, An Introduction to Encoding, Label and Tooltip Marks Cards, Case studies.
Text books and Reference books	**Text Book(s):** [1] Andy Kirk, "Data Visualization: a successful design process", Packt Publishing (26 December 2012) [2] Ryan Sleeper, Practical Tableau, O'Reilly Media, Inc.April2018. **Reference Books:** [1]. Chakrabarti, S,"Mining the web: Discovering knowledge from hypertext data ",Morgan Kaufman Publishers, 2003. [2]. Fry ,Vilisualizing data, Sebastopo,O'Reily, 2007.
E-resources and other digital material	[1]. Dr. Gaurav Dixit,Department of Management Studies, Indian Institute of Technology, Roorkee: https://nptel.ac.in/courses/110107092/7,2017 [2]. P Adam Marcus, and Eugene Wu. RES.6-009 How to Process, Analyze and Visualize Data. January IAP 2012. Massachusetts Institute of Technology: MIT Open Courseware, https://ocw.mit.edu.,2012 [3] Prof.Shankar Narasimhan,Ragunatha Rengasamy,IIT Madras , Data Visualization in R Basic graphics, 2016 https://nptel.ac.in/courses/106106179/11, [4] Dr. Ed Vul, Dr. Mike Frank, Massachusetts Institute of Technology, " Statistics and Visualization for Data Analysis and Inference", 2009. https://ocw.mit.edu/resources/res-9-0002-statistics-and-visualization-for-data- analysis-and-inference-january-iap-2009/,

17IT2605 C - M COMMERCE

Course Category:	Open Elective - IV	**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 application of tools and services to the development of small scale E-Commerce applications.
	CO2	Identify the benefits and limitations of M-Commerce to support mobile marketing
	CO3	Recognize the impact of technology advances in Wireless devices for M-Commerce
	CO4	Analyze the factors influencing the adoption of Mobile Gaming Services and M-Commerce Business Models.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	M	L	M								L		L	
	CO2	L	L	M								L		L	
	CO3		M									L			L
	CO4	L		L								L		L	

Course Content	**UNIT I** **ELECTRONIC COMMERCE** Traditional commerce and E-commerce – Internet and WWW – Role of WWW – Value Chains – Strategic Business And Industry Value Chains – Role of E-commerce. Packet Switched Networks – TCP/IP Protocol Script – Internet Utility Programmes – SGML, HTML And XML – Web Client And Servers – Web Client/Server Architecture – Intranet And Extranets – Web Based Tools For E-commerce – Security
	UNIT II **MOBILE COMMERCE** Introduction – Infrastructure of M–Commerce – Types of Mobile Commerce Services – Technologies of Wireless Business – Benefits and Limitations, Support, Mobile Marketing & Advertisement, Non– Internet Applications In M–Commerce – Wireless/Wired Commerce Comparisons
	UNIT III **MOBILE COMMERCE: TECHNOLOGY** A Framework For The Study Of Mobile Commerce – NTT Docomo's I-Mode – Wireless Devices For Mobile Commerce – Towards A Classification Framework For Mobile Location Based Services – Wireless Personal And Local Area Networks

	The Impact Of Technology Advances On Strategy Formulation In Mobile Communications Networks.
	UNIT IV **MOBILE COMMERCE: THEORY AND APPLICATIONS** The Ecology Of Mobile Commerce – The Wireless Application Protocol – Mobile Business Services – Mobile Portal – Factors Influencing The Adoption of Mobile Gaming Services – Mobile Data Technologies And Small Business Adoption And Diffusion – E–commerce in The Automotive Industry – Location– Based Services: Criteria For Adoption And Solution Deployment – The Role of Mobile Advertising In Building A Brand – M–commerce Business Models
Text books and Reference books	**TEXT BOOKS** [1]. E.BrianMennecke, J.TroyStrader, "Mobile Commerce: Technology, Theory and Applications", Idea Group Inc., IRM press, 2003. [2]. Ravi Kalakota, B.AndrewWhinston, "Frontiers of Electronic Commerce", Pearson Education, 2003. **REFERENCES** [1]. P. J. Louis, "M-Commerce Crash Course", McGraw- Hill Companies February 2001. **[2].** Paul May, "Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business" Cambridge University Press March 2001.
E-resources and other digital material	[1]. Dr.GauravDixit, Department of Management Studies, Indian Institute of Technology, Roorkee: https://nptel.ac.in/courses/110107092/7 [2]. P Adam Marcus, and Eugene Wu. RES.6-009 How to Process, Analyze and Visualize Data. January IAP 2012. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. [3]. https://www.datacamp.com/courses/topic:data_visualization

17TP1606 -QUANTITATIVE APTITUDE

Course Category:	Soft Skills - IV	**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	Solve various Basic Mathematics problems by following different methods
	CO2	Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
	CO3	Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
	CO4	Analyze, summarize and present information in quantitative forms including table, graphs and formulas

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	PSO1	PSO2
CO1	M													L
CO2		M											L	L
CO3	M												L	M
CO4				M									L	L

Course Content

UNIT I

Numerical ability l:

Number system, HCF & LCM, Average, Simplification, Problems on numbers

Numerical ability II:

Ratio & Proportion, Partnership, Percentages, Profit & Loss

UNIT II

Arithmetical ability l

Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.

Arithmetical ability ll:

Time & Distance, Problems on boats &Steams, Problems on Trains

UNIT III

Arithmetical ability lll:

Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,

Logical ability:

Permutations and Combination and Probability. .

	UNIT IV **Mensuration:** Geometry, Areas, Volumes, **Data interpretation:** Tabulation, Bar graphs, Pie charts, line graphs
Text books and Reference books	[1]. R. S. Aggarwal "Quantitative Aptitude", Revised ed., S Chand publication, 2017 ISBN:8121924987
E-resources and other digital material	[1]. https://blog.feedspot.com/aptitude_youtube_channels/ [2]. https://www.tutorialspoint.com/quantitative_aptitude/ [3]. https://www.careerbless.com/aptitude/qa/home.php

17IT4651A- BIG DATA LAB

Course Category:	Program Elective - II	**Credits:**	1
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-2
Prerequisites:	17IT3402 - DBMS, 17IT3502 -Data Mining	**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 challenges in analyzing big data.
	CO2	Learn to work with ecosystems available in Hadoop.
	CO3	Understand the impact of big data for business strategies & decisions.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2
CO 1	H	H		L	H				L				L	M
CO 2	H	H		L	H				L				L	M
CO 3	H				L				L			L		L

Course Content

Week 1
- Introduction to big Data
- Applications of Big Data
- Challenges of Big Data
- Characteristics of Big Data
- Tools

Week 2
MySQL Queries.

Week 3
Installation of Cloudera.

Week 4
Exploring HDFS. Listing of files, exploring dictionaries.

Week 5
Hdfs Operations using various commands.

Week 6
Hive architecture, Creating hive tables using hiveql language.

Week 7
Loading data into Hive warehouse. Apply aggregate operations on data.

Week 8
Implement partitioning of data in Hive Warehouse using HiveQL.

	Week 9 Implement the concepts of pig.
	Week 10 Implement the concept of map reduce for various examples.
	Week 11 Case Study on Hive.
	Week 12 Case Study on Map Reduce.
Text books and reference books	**Text Book(s)** [1].Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch,"Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data",1st Edition, TMH,2012. [2].Tom White, Hadoop, "The Definitive Guide", 3rd Edition, O'Reilly Publications, 2012. **Reference Book(s)** [1].Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007. [2].David Loshin, "BigDataAnalytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph",Morgan Kaufmann Publishers, 2013. [3].Hadoop in Practice by Alex Holmes, MANNING Publ. [4].Hadoop in Action by Chuck Lam, MANNING Publ.
E-resources and other digital material	[1].An overview of "Big Data": Available http://www.jbonneau.com/doc/2012-04-27-big_data_lecture_1.pdf [2].Hadoop Tutorial: Developing Big-Data Applications with Apache Hadoop: Available http://www.coreservlets.com/hadoop-tutorial/ [3].Random notes on big data – SlideShare: Available www.slideshare.net/yiranpang/random-notes-on-big-data-26439474 [4].http://www.cloudera.com/content/cloudera-content/clouderadocs/HadoopTutorial/CDH4/Hadoop -Tutorial.html [5]. https://www.ibm.com/developerworks/community/blogs Susan Visser Editionntry/flash book understanding big data analytics for enterprise class hadoop and streaming data? lang en

17IT4651B - IOT LAB

Course Category:	Program Elective - II	**Credits:**	1
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-2
Prerequisites:	17IT3503- Computer Networks 17CS1203- 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	Analyze the architecture of various embedded platforms
	CO2	Implement basic IoT applications on embedded platform reading the data from analog and digital sensors

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L		L									H	L	M
CO2	L		L									H	L	M

Course Content

Week 1&2:

- Select any one development board(Ex Arduino, Node MCU, Raspberry pi) and control LED using the board.
- By using the Arduino/ Raspberry Pi board read data from a sensor. Experiment with both analog and digital sensor.
- Write an Arduino program to control an LED light using push button and print the status of button and LED on serial monitor.

Week 3

- Write an Arduino program for interfacing the Arduino board with the LDR sensor and print output on Serial monitor.
- Arduino board interfacing with the temperature and humidity sensor and prints the output on LCD / serial monitor

Week 4

- Control any two actuators which are connected to development board using Bluetooth
- Write an Arduino program for interfacing the Arduino board with the LDR sensor and activate the LED based on threshold value and print output on LCD.

Week 5:

- Write an Arduino program for activating the buzzer when motion is

	detected using relay • Write an Arduino program for interfacing Arduino board with the Ultrasonic sound sensor and printthe output on Serial monitor
	Week 6: • Write an Arduino program for interfacing Arduino board with the IR sensor and print output on Serial monitor • Write an Arduino program for interfacing Arduino board with the Gas sensor and activate the buzzer if the value is greater than threshold value and print output on Serial monitor
	Week 7: • Write a Python program to control an LED light using switch with Raspberry Pi board • Write a Python program to blink an LED using Raspberry Pi board
	Week 8: • Write a Python program to interface LDR sensor with Raspberry Pi board. • Write a Python program to interface IR sensor with Raspberry Pi board and display the distance of the object.
	Week 9: • Write a Python program to interface Ultrasonic sensor with Raspberry Pi board and display the values of the sensor • Develop a Python program to interface temperature and humidity sensor with Raspberry Pi board and display the DHT values on LCD
	Week 10 : Case Study • Create any cloud platform account. Explore IoT Services. Register a thing in the platform and push the sensor data to cloud using MQTT protocol
Text books and reference books	**Text Book(s):** [1]. Vijay Madisetti and ArshdeepBahga, **"**Internet of Things (A Hands-on-Approach)**",** 1st Edition, VPT, 2014. [2]. Charalampos Doukas "Building Internet of Things with the Arduino" **Reference Books:** [1] Francis daCosta, **"**Rethinking the Internet of Things: AScalableApproach to Connecting Everything**",** 1st Edition, Apress Publications, 2013 [2] Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, **"**From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**",** 1st Edition, Academic Press, 2014.
E-resources and other digital material	[1]. Raspberryt Pi3 Tutorial, Edureka, December 2017. https://www.youtube.com/watch?v=QlApoEKGfU4 [2]. Sudip Mishra, IIT, Kharagpur, "Introduction to IoT", NPTEL, https://nptel.ac.in/courses/106105166/

17IT4651C - DOT NET TECHNOLOGIES LAB

Course Category:	Program Elective - II	**Credits:**	1
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-2
Prerequisites:	17IT3308 - Object Oriented Programming	**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	Develop applications that make use of data types and control strutures
	CO2	Implement object oriented features in Dot Net frame work.
	CO3	Design dynamic web applications using web Controls and validation controls.
	CO4	Build web applications that include database interactivity with different databases.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	H		L					H		H		M	H
CO2		H		H					H		H		M	H
CO3		H		H	H				H		H		M	H
CO4		H		H					H		H		M	H

Course Content

Week 1

Implement a c# class containing variables, methods with parameters ,without parameters and invoking the methods with the help of object.

Week 2

C# applications that make use of loops, default and parameterized constructors

Week 3

C# applications that make use of polymorphism concepts.

Week 4

C# applications that implements inheritance.

Week 5

C# applications that implements abstract class and exception handling techniques.

Week 6

Design an ASP.NET applications that display the various Web Controls.

Week 7

Design an web application with the calendar web control .

	Week 8: Design web applications with different web controls using ASP.net Week 9 Design web applications with different validation controls using ASP.net Week 10 Design interactive web application with ADO.net
Text books and Reference books	**Text Book(s):** **[1]** Kogent Learning Solutions, "NET4.5 PROGRAMMING" Black Book, dream tech press, 2013. **Reference Books:** [1] Herbert Schildt, "C# 4.0:complete reference",McGrawHill,2010. [2]Matthew MacDonald, "ASP.NET: The complete Reference", McGrawHill, 2002. [3] Chris Hart, John Kauffman, Dave Sussman, Chriss Ullman "ASP.Net 2.0 with c#" Wrox, 2006.
E-resources and other digital material	[1] Gerry O Brien , "Introduction to C #", https://www.edx.org/course/introduction-to-c-2 [2] Gerry O Brien , "Object Oriented Programming in C#", https://www.edx.org/course/programming-c-microsoft-dev204x-1 [3] Dr. Tim, Dr. T. Chamillard, " Introduction to C# programming and Unity", https://www.coursera.org/specializations/programming-unity-game-development [4]Tiberiu Covaci, ASP.NET Web Forms Essential Training , https://www.lynda.com/ASP-NET-training-tutorials/157-0.html

17IT4651D - SOFTWARE TESTING METHODOLOGIES LAB

Course Category:	Programme Elective - II	**Credits:**	1
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-2
Prerequisites:	17IT3501 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	Develop test suits for applications.
CO2	Understand the JUnit tool to perform testing.
CO3	Understand Selenium tool to perform testing.
CO4	Analyze bug tracking and QTP tool.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	M	L		L							M	M	H
CO2	M	M	M	M							M		M	H
CO3	H	L	M	L					M	M			M	H
CO4	M	L	H	L					L				M	H

Course Content

Week 1 & 2:
Introduction to various software testing methodologies
Implementation of Path Testing
a. Statement Testing
b. Branch Testing
c. Cyclomatic Complexity

Week3&4:
Write the test cases for ATM Application.
Write the test cases for Banking Application.

Week 5:
Introduction to JUnit
To check whether given no is palindrome or not.
To check given number is even or odd
To check whether given number is prime or not

Week 6&7:
To check given number is factorial or not.
To check whether given number is Armstrong or not.

Week 8&9:
Introduction to Selenium
Testing of online Mortgage Calculator application.

	Week 10: Testing of online pressure conversion application using Selenium
	Week 11: a) Introduction to QTP b) Login Page of flight application. c) Insertion of order in flight application.
Text books and Reference books	**Text Book(s):** [1]. B. Beizer, Software Testing Techniques, second edition ed.: International Thomson Computer Press. **Reference Books:** [1] B. Marick, The craft of software testing: Prentice Hall series in innovative technology. [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]. Prof. Rajib Mall, IIT Kharagpur, NPTEL SOFWARE Testing video. Available: https://nptel.ac.in/courses/106105150/ [2]. Software testing MIT. Available: http://ocw.mit.edu/courses/electrical- engineering-and-computer-science/6-912-introduction-to-copyright-law-january- iap-2006/video-lectures/lecture-4-software-licensing/

17IT3652 - WEB PROGRAMMING AND DEVELOPMENT LAB

Course Category:	Programming Core	**Credits:**	1
Course Type:	Lab	**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	Develop secure and dynamic web pages using JavaScrip and Angular
	CO2	Implement the basics of XML and JDBC Objects
	CO3	Develop and deploy Servlets, JSP technologies

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L				L								M	M
CO2											M		H	M
CO3	M				M						H		M	M

Course Content

Week 1
Create XML documents for various applications with XML DTD and XML Schema

Week 2
Develop JDBC application to interact with a relational Database using
a) MS Access

Week 3
Create a Java application that will interact with database and makes use of three statement intefaces

Week 4 & 5
Deploy servlets for student details application

Create and deploy servlets for client server application.
Develop and deploy servlets that interacts with database using JDBC

Week 6&7
Develop a JSP page that handles objects
Develop JSP pages that makes use of components – Scripting and Directives
Create a JSP page for passing the parameters.
Create a JSP page using use Bean.

	Week 8 Create a JSP page for an application using JDBC **Week 9** Design web applications that uses angular component, decorators and directives Case Studies: 1. Create an interactive website for online systems 2. Design a website that provides online examination. Users must register to take exam. It stores results regarding the previous exams taken by users. It provides all the common operations related to users such as registration, login, change password and forgot password.
Text books and Reference books	**Text Book(s):** [1]. James Keogh, "J2Ee: The Complete Reference", 1st Edition, Mcgraw Hill Education, 2002 [2]. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, "Internet & World Wide Web How to Program", 5th Edition, Pearson Education, 2011 [3]. ShyamSeshadri, "Angular: Up and Running",O'Relly Media, Inc., First Edition, 2018 **Reference Books:** [4]. Chris Bates, "Web Programming, building internet applications", 2nd Eedition, WILEY Dreamtech,2006 [5]. Hans Bergsen, "Java Server Pages", SPD O'Reilly, 2nd edition, 2002 [6]. Matt Frisbie, Angular 2 Cookbook, 1st Edition,Kindle Edition, 2017
E-resources and other digital material	[1]. Patrick Royal, Java EE Essentials: Servlets and JavaServer Faces, 20-11-2018, Available: https://www.lynda.com/Java-tutorials/Java-EE-Essentials-Servlets-JavaServer-Faces/124399-2.html [2]. Advanced Java Programming by Infinite Skills, 20-11-2018 Available: https://www.udemy.com/advanced-java-programming/ [3]. Programming Tutorials by Rose India, 20-11-2018 Available: http://www.roseindia.net/ [4]. Front-End JavaScript Frameworks:Angular, The Hong Kong University of Science and Technology, 28-11-2018 Available https://www.coursera.org/learn/angular,

17IT3654 - ADVANCED PROGRAMMING LAB II

Course Category:	Programming Core	**Credits:**	1
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-2
Prerequisites:	17C1203 Programming in C 17IT3303 Data Structures Python Programming 17IT3509 Java programming 17IT3552 Advanced Programming Lab I	**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	Demonstrate the knowledge to find solutions that uses structured and object oriented languages
	CO2	Implement data structures linear, non-linear and python structures to solve real world problems

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H					H					H	H	H	M
CO2	H					H					H	H	H	M

Course Content	Students have to solve the problems from various online portals like hackerrank, hackerearth, codechef etc., on the constructs of various programming languages. The programs will test the efficacy of student knowledge on problem solving skills and which ranges from easy to hard. Students are expected to solve around 100 problems from the portals and participate in online tests.
Text books and Reference books	**Text Book(s):** [1]. Antti Laaksonen, "Guide to Competitive Programming", 1st edition, Springer International Publishing, 2017 **Reference Books:** [1]. Halim, Steven and Halim, Felix, Competitive Programming 3, 2013. [2]. Ahmed Shamsul Arefin, Art of Programming Contest, ACMSolver, Second Edition, 2012

E-resources and other digital material	[1]. Hacker Rank, 10-05-2019 Available https://www.hackerrank.com/ [2]. Hacker Earth, 10-05-2019 Available https://www.hackerearth.com/ [3]. Topcoder, 10-05-2019 Available https://www.topcoder.com/challenges/ [4]. Coder Byte, 10-05-2019 Available https://www.coderbyte.com/ [5]. Code wars, 10-05-2019 Available https://www.codewars.com/ [6]. Code Signals, 10-05-2019 Available https://codesignal.com/ Code Chef, 10-05-2019 Available https://www.codechef.com/

17IT5653 – ENGINEERING PROJECT FOR COMMUNITY SERVICES

Course Category:	Project	**Credits:**	2
Course Type:	Practical	**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 societal problem from the villages or towns with well-defined objectives.
	CO2	Build a model for the problem chosen using modern tools and technology.
	CO3	Organize the Technical report effectively.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M – Medium, H- 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	PSO1	PSO2
CO1	L	H	l	M	M	H	H	H	H		L	M	L	M
CO2	M	M	M	M	H	L		M	M		L	L	M	L
CO3						L		H	M	H	M	L	L	M

Guidelines:

- Students need to identify the problem going to society (Villages / Towns)
- Students should survey the literature for the problem identified for a feasible solution.
- Work will be carried out during summer vacation after IV semester
- Students need to take up a real life problem leading to innovative model building.

SEMESTER VII

17IT3701 - CLOUD COMPUTING

Course Category:	**Program Core**	**Credits:**	4
Course Type:	**Theory**	**Lecture-Tutorial-Practice:**	3-1-0
Prerequisites:	**17IT3503 – 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	Analyze the architecture, services and models of cloud computing
	CO2	Deploy applications for storing data and accessibility in different cloud ecosystems
	CO3	Interpret local cloud and virtualization techniques based on application requirements
	CO4	Identify real time cloud applications in different scenarios appropriate to society

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	L	L								H			L	L
CO2		M	H		L								M	H
CO3				H				L					M	M
CO4			L			H							L	M

Course Content

UNIT I: INTRODUCTION

Cloud Computing Basics: Cloud Computing Overview – Cloud Components, Infrastructure, Cloud Services, Applications – Storage, Database services.

Organizing the Cloud computing: When You can use Cloud Computing, Benefits, Limitations, Security Concerns.

Hardware and Infrastructure: Clients, Security, Network.

UNIT II: CLOUD COMPUTING TECHNOLOGY

Accessing the Cloud: Platforms, Web Applications, Web APIs, and Web Browsers.

Cloud Storage: Overview, Cloud Storage Providers – Amazon S3, Google Bigtable Datastore, MobileMe, LiveMesh.

Standards: Application, Client, Infrastructure, Service.

UNIT III: CLOUD ECOSYSTEM

Software as a service : Overview, Advantages, Driving Forces, Company Offerings – Intuit, Google, Microsoft

Software plus services : Overview, Pros, Cons,Vendors, Mobile Device Integration, Providers-Adobe AIR, Microsoft Online

Developing Applications: Google, Microsoft

UNIT IV: VIRTUALIZATION

Local clouds and Thin Clients: Virtualization in an organization, Why Virtualization, How to virtualize, Server Solutions- Microsoft HyperV, VMWare, Thin Clients.

	Cloud Applications: Scientific applications : Healthcare, Geoscience, Business and consumer applications : CRM, Salesforce.com, Productivity : Dropbox and icloud, Cloud desktops: EyeOS and XIOS/3, Social Networking : Facebook.
Text books and Reference books	**Text Book(s):** [1]. Velte T. Antony, Velte J. Toby., Elsenpeter Robert, "Cloud Computing: A Practical Approach", Tata McGraw- Hill , 2010 [2] Rajkumar Buyya, Christian Vecchiola, S Tamarai Selvi "Mastering Cloud Computing Foundations And Applications Programming" , McGraw Hill Education, 2016. **Reference Books:** [1]. Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishers, 2012 [2]. Miller Michael, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, 2008.
E-resources and other digital material	[1]. Sanjay Pathak, "Cloud Concepts", *https://www.youtube.com/watch?v=vv16c3BazSs* [2]. MaciejArkit,"GoogleAppEngine", https://www.youtube.com/watch?v=UBa4ZsEAvP4 [3]. Prof.Sowmya Kanti Ghosh,IIT Kharagpur, "Cloud Computing Benefits, services, models, applications" https://nptel.ac.in/courses/106/105/106105167/ [4]. Suresh S, Udemy, " Server Virtualization", https://www.udemy.com/tutorial/cloud-computing-the-technical-essentials/basics-of-virtualization/

17IT4702 A – DATA ANALYTICS

Course Category:	Programme Elective III	**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 basics and Life cycle of Data Analytics
	CO2	Apply probability and Sampling distributions for data modeling.
	CO3	Develop forecasting and Monte Carlo simulation models
	CO4	Solve linear optimization and Decision problems

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	L												L	
CO2	M	L		L									L	L
CO3	L	M		L									M	L
CO4	M	M		M									M	L

Course Content

UNIT I:

Introduction to Data Analytics

Introduction to Big Data Analytics: Big Data Overview, Data Structures, Analyst perspective on Data Repositories, State of the Practice in Analytics, Current Analytical Architecture, Emerging Big Data ecosystem and a New Approach to Analytics

Data Analytic Life Cycle: Overview, phase 1- Discovery, Phase 2- Data preparation, Phase 3- Model Planning, Phase 4- Model Building, Phase 5- Communicate Results, Phase 6-Opearationalize

UNIT II:

Descriptive Analytics

Probability Distributions and Data Modeling: Basic concepts of probability, Random variables and probability distribution, Discrete Probability Distributions, Continuous Probability Distributions.

Sampling and Estimation: Statistical Sampling, Estimating Population parameters, Sampling Error, Sampling Distributions, Interval Estimates, Confidence Intervals, Using confidence intervals for decision making, Prediction intervals, Confidence intervals and sample size

UNIT III:

Predictive Analytics

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Selecting appropriate Time-Series-Based Forecasting models

	Monte Carlo Simulation and Risk Analysis: Spreadsheet Models with Random Variables, New-Product Development Model, Newsvendor Model
	UNIT IV: **Prescriptive Analytics** **Linear Optimization**: Building Linear Optimization Models **Applications of Linear Optimization**: Types of constraints in Optimization models, Process Selection Models, Blending Models, Portfolio Investment Models, Transportation Models **Decision Analysis:** Formulating Decision Problems, Decision Strategies without Outcome Probabilities, Decision Strategies with Outcome Probabilities, Decision trees, The value of information, Utility and decision making
Text books and Reference books	**Text Book(s):** **[1].** EMC Education Services (Editor) ,"Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley, March 2015. **[2].** James Evans, "Business Analytics, Second Edition, Pearson Publications, 2017. **Reference Books:** **[1].** Hastie, Trevor, et al. "The elements of statistical learning." Vol. 2. No. 1. New York: springer, 2009 **[2].** Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010. **[3].** SeemaAcharya R N Prasad, "Fundamentals of Business Analytics", 2nd Edition, Wiley Publications, 2016
E-resources and other digital material	**[1].** Ingo Mierswa, CTO & Co-Founder at RapidMiner, "From Predictive to Prescriptive Analytics",Jan 26, 2016 https://www.youtube.com/watch?v=lXdCnOQCCAE **[2].** Rahul, CEO, Treasury Consulting LLP, "Data Analytics - Descriptive , Predictive and Prescriptive Analytics", Dec 3,2018 https://www.youtube.com/watch?v=qYdNFqWHKQA

17IT4702B- COMPUTER VISION

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

Course Outcomes

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

CO1	Understand the basic concepts and methods in computer vision
CO2	Analyze various feature extraction and image segmentation techniques.
CO3	Apply various clustering and classification techniques for different applications.
CO4	Explore video processing methods in computer vision.

Contribution of Course Outcomes towards achievement of Program Outcomes(L-Low, M-Medium, H- 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	PSO1	PSO2
CO1	H		M		L								L	M
CO2	M		L											M
CO3		M				H						L	M	H
CO4	H		H		M							L	L	M

Course Content

UNIT I:

Introduction: Computer vision, A brief history.

Image formation: Geometric primitives and transformations**,** Photometric image formation

Image processing: Point operators, Linear filtering, More neighborhood operators, Fourier transforms, Pyramids and wavelets.

UNIT II:

Feature detection and matching:

Points and patches, Application: Performance-driven animation Edges, Application: Edge editing and enhancement, Lines, Application: Rectangle detection.

UNIT III:

Image Segmentation

Split and merge, Mean shift and mode finding, Normalized cuts, Graph cuts and energy-based methods, Application: Medical image segmentation.

Feature-based alignment:

Pose estimation, Application: Augmented reality

UNIT IV:

Dense motion estimation:

Parametric motion, Application: Video stabilization, Optical flow, Application: Video de-noising, Layered motion, Application: Frame interpolation.

Text books and Reference

Text Book(s):

[1]. Richard Szeliski, Computer Vision: Algorithms and Applications,

books	Springer-Verlag London Limited 2011. **Reference Books:** [1]. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003. [2]. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990. [3]. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison-Wesley, 1992.
E-resources and other digital material	[1]. Dr. Mubarak Shah, (13, 08, 2019). UCF Computer Vision Video Lectures,https://www.youtube.com/watch?v=715uLCHt4jE&list=PLd3hlSJsX_ImKP68wfKZJVIPTd8Ie5u-9 [2]. Stanford University School of Engineering , Introduction to Convolutional Neural Networks for Visual Recognition,2020 https://www.youtube.com/watch?v=vT1JzLTH4G4&list=PLf7L7Kg8_FNxHATtLwDceyh72QQL9pvpQ

17IT4702C-ROUTING AND SWITCHING ESSENTIALS

Course Category:	Program Elective III	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3503 :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 role of dynamic routing protocols in the context of modern network design.
	CO2	Apply the configuration steps for static and dynamic routing in the topology.
	CO3	Compare the working of various routing protocols.
	CO4	Apply distance routing protocols in network communication.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M- Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	L	L	L		L							L	L
CO2					H			M					L	M
CO3	L		L	L	H	L							L	L
CO4		M				L		M					L	L

Course Content

UNIT I:
Inside the router, CLI configuration and addressing, Building the routing table, Path determination and switching

UNIT II:
Static Routing, Routers and the network, router configuration review, exploring directly connected networks, static router "with next" hop addresses, static router with exit interfaces

UNIT III:
Introduction to dynamic routing protocols, classifying dynamic routing protocols, metrics, administrative distance

UNIT IV*:*
Introduction to distance vector routing protocols, network discovery, route table maintenance, routing loops, RIPv1: Distance Vector, Classful Routing Protocol, Basic RIPv1 configuration, verification and trouble shooting ,automatic summarization, default route and RIPv1..

Text books and Reference books

Text Book(s):

[1]. Rick Graziani, "Routing Protocols and Concepts"; CCNA Exploration Companion Guide, Pearson Education, 2011

Reference Books:

[1]. Diane Barrett & Todd King, "Computer Networks Illuminated", Jones and Bartlett Publishers (2005).

[2]. Wayne Lewis, "LAN Switching and Wireless: CCNA Exploration Companion Guide", Pearson Education, 2014

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/

17IT4703A -DEEP LEARNING

Course Category:	Program Elective IV	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3601 - 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 linear and non linear activation functions, over fitting, different neural network architectures, dimensionality reduction
	CO2	Analyze feed forward neural network and auto encoder architecture for various applications
	CO3	Apply convolution, pooling operations in convolution neural networks and choose various encoding frameworks for a given application.
	CO4	Identify a suitable RNN architecture for the given sequence modeling.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M- Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L												L	L
CO2		M		M							M		M	M
CO3	H				M						M	H	H	H
CO4		M										H	M	M

Course Content

UNIT I:

The Neural Network : Building Intelligent Machines , The Limits of Traditional Computer Programs , The Mechanics of Machine Learning , The Neuron , Expressing Linear Perceptrons as Neurons , Feed-Forward Neural Networks, Linear Neurons and Their Limitations , Sigmoid, Tanh, and ReLU

Training Feed-Forward Neural Network : Gradient Descent , The Delta Rule and Learning Rates , Gradient Descent with Sigmoidal Neurons, The Backpropagation Algorithm , Stochastic and Minibatch Gradient Descent , Test Sets, Validation Sets, and Overfitting, Preventing Overfitting in Deep Neural Networks

UNIT II:

Convolutional Neural Networks : Neurons in Human Vision ,The Shortcomings of Feature Selection, Vanilla Deep Neural Networks, Filters and Feature Maps, Full Description of the Convolutional Layer , Max Pooling

Full Architectural Description of Convolution Networks : Closing the Loop on MNIST with Convolutional Networks, Image Preprocessing Pipelines Enable More Robust Models , Accelerating Training with Batch Normalization

UNIT III:

Embedding and Representation Learning : Learning Lower-Dimensional Representations, Principal Component Analysis , Motivating the Autoencoder Architecture , Implementing an Autoencoder, Denoising to Force Robust Representations, Sparsity in Autoencoders, The Word2Vec Framework , Implementing the Skip-Gram Architecture

	UNIT IV: **Sequence Modeling**: **Recurrent and Recursive nets:** Unfolding Computational Graphs, Recurrent neural networks, Bidirectional RNNS, Encoder-Decoder sequence-to –sequence architectures, Deep Recurrent networks, Recursive neural networks **The Challenge of Long-Term Dependencies**: Echo State Networks, Leaky Units & Other strategies for multiple timescales, The Long Short-Term memory and other Gated RNNs, Optimization for Long-Term Dependencies.
Text books and Reference books	**Text Book(s):** [2]. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly Media, 2017 [3]. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning (Adaptive Computation and Machine Learning series", MIT Press, 2017 **Reference Books:** [1]. Li Deng and Dong Yu, "Deep learning Methods and Applications", Now publishers, 2013 [2]. Michael Nielsen, "Neural Networks and Deep Learning", Determination Press 2015
E-resources and other digital material	[1]. Mitesh Khapra, "Deep Learning", Sep 20, 2018 https://www.youtube.com/watch?v=4TC5s_xNKSs&list=PLH-xYrxjfO2VsvyQXfBvsQsufAzvlqdg9 [2]. AfshineAmidi and ShervineAmidi ,"Deep Learning cheat sheets for Stanford's CS 230", 2018, https://github.com/afshinea/stanford-cs-230-deep-learning [3]. YoshuaBengio, Deep learning: "Theoretical Motivations, Canadian Institute for Advanced Research", 2015 http://videolectures.net/deeplearning2015_bengio_theoretical_motivations/ [4]. Geoffrey Hinton's GoogleTech Talk,"Recent developments on Deep Learning" March 2010, https://www.youtube.com/watch?v=VdIURAu1-aU

17IT4703B- BLOCKCHAIN TECHNOLOGIES

Course Category:	Program Elective – IV	**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 blockchain terminologies and its properties and the emerging models for blockchain technology
	CO2	Familiarize with the functional/operational aspects of crypto currency ecosystem.
	CO3	Design, code, deploy and execute a smart contract – the computational element of the blockchain technology using Solidity and Remix IDE
	CO4	Build private-permissioned blockchain-based applications for enterprises and businesses

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L		L										L	L
CO2	L	L											L	L
CO3	M	M	M		H	L							M	M
CO4	H	M	M		M	L							M	M

Course Content

UNIT I:

Understanding Blockchain: Introduction – Structure of a Block, Block Header, Block Identifiers : Block Header Hash and Block Height, Genesis Block, Linking Blocks in the Blockchain, Merkle Trees, Tiers and Types of Blockchain, Features of a Blockchain, Benefits and Limitations of Blockchain

UNIT II:

Cryptocurrency: Introduction – History of Bitcoin and its Uses, Hash Functions, Transactions, Blocks, Mining, Keys, Addresses, Digital Signatures, Wallets, Types of Consensus, Bitcoin Improvement Proposals (BIPs), Altcoins

UNIT III:

Ethereum and Smart Contracts: The Birth of Ethereum, Stages of Development, Components of Ethereum, Development Tools and Frameworks, Tokens on Ethereum – ERC20 Token, What is a Smart contract, Life Cycle of a Smart Contract, Ethereum Virtual Machine and Gas, Building a Smart Contract with Solidity, Ethereum Improvement Proposals (EIPs)

	UNIT IV: **Decentralized Applications and Hyperledger**: DApp and its Full Ecosystem, Operations of a DApp, Hyperledger Architecture, Projects under Hyperledger, Consensus and Transaction Life Cycle in Hyperledger Fabric **Application of Blockchain Technology:** Introduction to major Blockchain platforms – Government - Border Control, Voting, Identity Management - Health Finance – Insurance, Post-Trade Settlement, Financial Crime Prevention - Media and Miscellaneous
Text books and Reference books	**Text Book(s):** [1]. Mastering Bitcoin: Antonopoulos, Andreas M. [2]. Mastering Blockchain: Distributed Ledgers, Decentralization and Smart Contracts Explained by Bashir, Imran. [3]. Mastering Ethereum: Building Smart Contracts and DApps. **Reference Books:** [1]. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder. [2]. Bitcoin: A Peer-to-Peer Electronic Cash System. Satoshi Nakamoto.
E-resources and other digital material	[1]. Blockchain Demo https://tools.superdatascience.com/blockchain/hash/ [2]. Bitcons Monetary Policy https://www.blockchain.com/explorer [3]. Blockchain &Web3.0 Why the Web 3.0 Matters and you should know about it [4]. Ethereum Virtual Machine & Gas Calculating Costs in Ethereum Contracts [5]. Mempools : An in-depth guide into how the mempool works

17IT4703C - INFORMATION RETRIEVAL SYSTEM

Course Category:	Programme Elective -IV	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3502: Data Mining	**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	Interpret the functional processes and effectiveness of information storage and retrieval systems
	CO2	Utilize techniques and architectures necessary to speed up the retrieval process for information retrieval systems
	CO3	Apply metadata organization for effective information access.
	CO4	Evaluate and use different information retrieval techniques in various application areas

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-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		L	L											L
CO2		L		M									L	M
CO3	L	M	M			H							L	M
CO4	L	M	M	M		H							H	H

Course Content

UNIT I

Introduction: Information Retrieval, Early Development, Information Retrieval in Libraries and Digital Libraries, IR at the Center of the Stage. The IR Problem, The IR Problem, The User's Task, Information versus Data Retrieval The IR System ,Software Architecture of the IR System ,The Retrieval and Ranking Processes

Modeling: Introduction, A Taxonomy of Information Retrieval Models, Retrieval: Ad Hoc and Filtering, A Formal Characterization of IR Models.

UNIT II

Classic Information Retrieval: Basic Concepts, Boolean Model, Term weighting, TF-IDF weights, Document length normalization, vector model, Probabilistic Model, Brief Comparison of Classic Models.

Retrieval Evaluation: Introduction, The Cranfield Paradigm, ,A Brief History, Reference Collections, Retrieval Metrics, Precision and Recall, Reference Collections ,The TREC Collections..

UNIT III

Documents : Languages & Properties: Introduction, Document Preprocessing , Lexical Analysis of the Text , Elimination of Stopwords , Stemming , Keyword Selection , Thesauri

Query Languages: Keyword-Based Querying, Beyond Keywords, Structural Queries, Query Protocols.

	Query Properties: Characterizing Web Queries, User Search behavior , Query Intent, Query Topic, Query Sessions and missions, Query Difficulty
	UNIT IV **Text Classification:** Introduction, A Characterization of Text Classification , Machine Learning , The Text Classification Problem , Text Classification Algorithms **Indexing and Searching:** Introduction, Inverted Indexes , Basic Concepts , Full Inverted Indexes , Searching , Ranking , Construction ,Compressed Inverted Indexes , Structural Queries , Signature Files, Suffix Trees and Suffix ,Structure: Tries and Suffix Trees , Searching for Simple Strings.
Text books and Reference books	**Text Books:** [1] Ricardo Baeza-Yaets and Berthier Ribeiro-Neto, Modern Information Retrieval: The Concept and Technology behind Search, 2nd Edition, Addison-Wesley, 2011. **Reference Books:** [1]. G. G. Chowdhurry, Introduction to Modern Information Retrieval, Neal-Schuman Publishers; Third edition , 2010 [2]. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, *Introduction to Information Retrieval*, Cambridge University Press. 2008..
E-resources and other digital material	[1] Information Retrieval,Prof.Pabitra Mitra,IIT Kharagpur, http://cse.iitkgp.ac.in/~pabitra/course/ir06/ir06.html [2] Information Retrieval,Prof.Pawan Goyal,IIT Kharagpur, http://cse.iitkgp.ac.in/~pawang/courses/IR16/lec1.html [3] Natural Language Processing by Prof. Pushpak Bhattacharyya, Department of Computer science & Engineering,IIT Bombay, https://www.youtube.com/watch?v=m0oiAOgSQFw [4] Introduction to Information Retrieval https://www.youtube.com/watch?v=yluvahNq3wk

17IT4704 A– NATURAL LANGUAGE PROCESSING

Course Category:	**Program Elective V**	**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	Comprehend the concepts of natural language processing, its applications and language modeling techniques
	CO2	Evaluate probabilistic language models and Solve NLP sub problems using tokenizing and tagging
	CO3	Analyze linguistic structure in text using parsing and CFG
	CO4	Interpret Methods to recognize syntactic and semantics structures of a sentence

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M- Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L		L	L									L	M
CO2	H			H	M				L				L	M
CO3	M	M		M									L	M
CO4	H	M	M		M				M				L	M

Course Content

UNIT I:

Introduction–Models and Algorithms

Regular Expressions and Automata - Regular Expressions, Finite State Automata, Regular Languages and FSAs

Words and Transducers: Survey of English Morphology, Finite-State Morphological Parsing, Construction of a finite State Lexicon, Morphological parsing with FST, Transducers and ortho graphic rules, Combining an FST Lexicon and Rules.

UNIT II:

N-grams-Counting Words in Corpora, Unsmoothed N-grams, Training and Test sets, Smoothing, Backoff, Interpolation, Entropy-Cross entropy for comparing models.

Classes and Part-of-Speech Tagging- English Word Classes, Tag sets for English, Part of Speech Tagging, Rule-Based Part of Speech Tagging, HMM Part of Speech Tagging, Transformation-Based Tagging.

Hidden Markov and Maximum Entropy Models: Markov Chains, The hidden Markov Model.

UNIT III:

Automatic Speech Recognition: Speech Recognition Architecture, HMM applied to Speech.

Formal Grammars of English- Constituency, Context-Free Grammars, Some Grammar Rules for English, Grammar equivalence and Normal form

	Syntactic Parsing–Parsing as Search, ambiguity, Search in the face of Ambiguity, The Earley Algorithm.
	UNIT IV: **Representing Meaning -**Computational Desiderata for Representations, First Order Logic, Event and State Representations. **Computational Semantics-**Syntax Driven Semantic Analysis-Semantic augmentations to Syntactic rules.
Text books and Reference books	**Text Book(s):** [1]. D.JurafskyandJ.Martin,"SpeechandLanguageProcessing:AnIntroduction To Natural Language Processing, Computational Linguistics, and Speech Recognition", Second Edition,PearsonEducation,2009. **Reference Books:** [1]. C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press,1999. [2]. Nitin Indurkhya, Fred J. Damerau, "Handbook of Natural Language Processing", 2nd Edition, Chapman and Hall/CRC Press, 2010. [3]. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
E-resources and other digital material	[1] Dan Jurafsky and Christopher Manning, Natural Language Processig Course,Stanford,26thJun2019, https://web.stanford.edu/~jurafsky/NLPCourseraSlides.html [2] Dan Jurafsky and Christopher Manning, Natural Language Processig Course,10thJun2018, https://www.youtube.com/watch?v=3Dt_yh1mf_U&list=PLQiyVNMpDLKnZYBTUOlSI9mi9wAErFtFm [3] Prof. Sudeshna Sarkar and Prof. Anupam Basu, Lecture Series on Artificial Intelligence Department of CSE, I.I.T, Kharagpur, NPTEL, 2008, Oct http://nptel.iitm.ac.in

17IT4704B - CLOUD BASED CRM PLATFORM (SALESFORCE)

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

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Understand the basic concepts and framework of salesforce platform.
	CO2	Explore data modelling and management techniques.
	CO3	Analyze various levels to control data access and issues in lightining flow & apex programming
	CO4	Apply testing for various functionalities of applications.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	L												L	L
CO2			L	M							L		L	M
CO3	H	L							M				L	L
CO4	H				L							M	M	M

Course Content

UNIT I: Salesforce Platform Basics

Introduction: Salesforce Platform

Terms Used in Salesforce: Objects,Records, Fields, App, Database, Org.

Customize the Salesforce Platform with simple example: Declarative development, Programmatic development,

Salesforce Architecture Brief, Navigate Setup: Tells how to navigate to Setup page where we will setup our application.

Developer Beginner : Get Started with SF Platform, **Declarative Programming:** Objects, Fields, Records, Tab, Record detail page etc, Workflow Rules, Process Builder, Approval Processes,

Programmatic Development Brief: Lightning Component Framework, Apex, Visualforce

UNIT II:

Data Modelling: Objects (Both Standard/Custom), Custom Field types, Object Relationships (Lookup/Master-Detail) with simple example, Schema Builder (Create Data model with schema builder)

Data Management: Data Import: Data Import Wizard, Data Loader**,** Import simple data

Export Data: Data Export Wizard, Data Loader, Schedule Data Export

UNIT III:

Data Security: What is data security, **Access to Org:** Manage Users, Trusted IP Ranges for the Org**,** Restrict Login IP Ranges At Profiles**,** Login Access by Time.

Access to Objects, Fields: Profiles**,** View All, Modify All**,** Permission Sets

Access to Records: Org Wide Defaults, Role Hierarchy, Sharing Rules, Manual Sharing

	Formulas & Validations: Formula fields with example, Roll-up Summary fields with example, Validation rules
	UNIT IV: **Lightning Flow:** Choose appropriate Automation Tool, Process Builder, Flow Builder, Workflow Rule, Approval Process **Apex Programming:** Uses, Objects**,** Manipulate Data with DML**,** SOQL , SOSL queries**,** **Apex Triggers:** Trigger on Single and Multiple records **Apex Testing:** Test Data, Coverage, Test Classes Visual Force Basics, Usage of Developer Console, VS Code for Development, Search Functionality
Content Beyond Syllabus	**What is Salesforce.com:** Sales Cloud, Service Cloud, Collaboration Cloud, Force.com Custom Cloud, Custom Application Development, VMforce **Force.com Database:** Standard Field Types, Relationship Fields, System Fields
Text books and Reference books	**Text Book(s):** [1].https://trailhead.salesforce.com/en/content/learn/trails/force_com_dev_beginner **Reference book:** [1] file:///C:/Users/admin/Downloads/salesforce-crm-admin-cookbook.pdf
E-resources and other digital material	[1]. https://drive.google.com/file/d/1sWalwbzwfTMkfhFKquAkku1vI_6y305/view [2]. file:///C:/Users/admin/Downloads/119655699slaesforce.pdf [3]. https://trailhead.salesforce.com/ [4]. https://www.salesforce.com/products/sales-cloud/resources/ [5]. https://www.salesforce.com/in/services/resources/

17IT4704C- DEVOPS ESSENTIALS

Course Category:	**Program Elective V**	**Credits:**	3
Course Type:	**Theory**	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	**17IT3501: 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 basic concepts of Devops, Kubernetes and trends of microservices.
	CO2	Apply Docker file syntax for developing a Dockerfile.
	CO3	Analyze Kubernetes resources, objects, namespaces which is a portable, extensible open-source platform for managing.
	CO4	Create kubernetes namespaces for monitoring and logging external resources.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	M												M	L
CO2	L		H		L								M	L
CO3				H							L		M	L
CO4			M		H				L				L	H

Course Content

UNIT I:

Introduction to Devops: Software delivery challenges, Waterfall and physical delivery, Agile and electrical delivery, software delivery on the cloud, continuous Integration, Continuous Delivery, Configuration management, Infrastructure as code, Orchestration

Trend of Microservices: Modular programming, package management, MVC design pattern, Monolithic application, Remote Procedure call, RESTful design, Microservices.

UNIT II:

DevOps with Container: understanding container, Resource isolation, Linux container concept, Containerized delivery, getting started container, Installing Docker for Ubuntu, Installing Docker for CentOS, Installing Docker for macOS. **Container life cycle**: Docker basics, Layer, image, container, and volume, distributing images, connect container

Working with Dockerfile: writing your first Dockerfile, Dockerfile syntax, Organizing a Dockerfile.

UNIT III:

Understanding Kubernetes: Understanding Kubernetes, Kubernetes components, Master components, API server, Controller, Scheduler, Node components, Kubelet, Proxy, Docker, Interaction between kubernets master and nodes.

Getting started with Kubernetes :Preparing the environment, kubectl, kubernetes resources, kubernets objects, Namespace, Name, Label and selector, Annotation,

	Pods, ReplicaSet(RS) and Replication Controller (RC), Deployments, Services, volumes, Secrets, Control Map, Using ConfigMap via volume, Using ConfigMap via environment variables
	UNIT IV: **Monitoring and Logging:** Inspecting a container, Kubernetes dashboard, Montoring in Kubernetes, Application, Host, External resources, container, Kubernetes, Getting monitoring essentials for Kubernetes, **Cluster Administration**: Kubernetes namespaces, Default namespaces, Create a new namespace.
Text books and Reference books	**Text Book(s):** [1] DevOps with Kubernetes: Accelerating software delivery with container by Hideto Saito, Hui-Chuan Chloe Lee, Cheng-Yang Wu, O' Reilly publications, 2017. **Reference Books:** [1]. Managing Kubernetes:Operating Kubernetes Clusters in the Real Worls by Brendan Burns, Craig Tracey, O'Reilly publications, 2017..
E-resources and other digital material	[1]. Introduction to DevOps Tools, Edureka, April, 2018, https://www.youtube.com/watch?v=lpWjKXa_4Hs [2]. Hitesh Choudary, What is DevOps? Easy way, Aug 16, 2019 https://www.youtube.com/watch?v=_Gpe1Zn-1fE [3] https://www.threatstack.com/blog/50-best-online-devops-training-resources [4] https://geekflare.com/learn-devops/ http://www.scmgalaxy.com/tutorials/top-10-devops-online-resources-to-learn-share-and-practice/

17HS1705- ENGINEERING ECONOMICS AND FINANCE

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

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 economically

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	M											M		M
CO2	M				H							M		M
CO3	M											M		M
CO4	M				H							M		M

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 and Reference books	**Text Book(s):** [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/

17IT3751-CLOUD COMPUTING LAB

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-3
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	Analyze the applications in cloud environment
	CO2	Develop applications in IaaS, PaaS and SaaS cloud models.
	CO3	Develop applications in different cloud ecosystems.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	L								H			L	M
CO2		L	H		L							M	L	L
CO3				H				L				M	M	M

Course Content

Week 1 :
Cloud Simulation
Develop applications in Google Cloud Platform

Week 2 : PaaS
Host a website application in Google App Engine
Host a php app in GCP with cloud IDE as cloud sdk

Week 3 : CLOUD ANALYST TOOL
Simulate the cloud environment of three data centers in different geographical locations and add virtual machines to them along with resources like storage, compute and bandwidth using Cloud Analyst.
Case studies

Week 4 : SaaS
Create warehouse application in Salesforce.com platform

Week 5 : IaaS
Implement virtualization using VirtualBox and configure with any OS
Implement virtualization using Vmware hypervisor, create virtual instance and install multiple guest operating systems using **ESXI**

Week 6 : AWS
Configure Web Server on Amazon Linux instance with Elastic IP
Manage Elastic Block Storage(EBS) for usage

Week 7:
Create IAM user, Manage IAM User, with Groups and Policies
Configure Relational Database Service in AWS

Week 8 :
Implement Web services in SOAP for JAVA Applications

	Week 9 : Case studies on Facebook, Amazon S3
Text books **Reference books**	**Text Book(s):** [1] Enterprise Cloud Computing by Gautam Shroff, Cambridge,2010 **Reference Books:** [1] Getting Started with OwnCloud by Aditya Patawar , Packt Publishing Ltd, 2013 [2]Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishers, 2012 [3]Miller Michael, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, 2008.
E-resources and other digital material	[1]Sanjay Pathak, "Cloud Concepts", *https://www.youtube.com/watch?v=vv16c3BazSs* [2] MaciejArkit,"GoogleAppEngine", https://www.youtube.com/watch?v=UBa4ZsEAvP4 [3]. Prof.Sowmya Kanti Ghosh,IIT Kharagpur, "Cloud Computing Benefits, services, models, applications" https://nptel.ac.in/courses/106/105/106105167/ [4]. Suresh S, Udemy, " Server Virtualization", https://www.udemy.com/tutorial/cloud-computing-the-technical-essentials/basics-of-virtualization/

17IT4752 A- DEEP LEARNING LAB

Course Category:	Program Elective	**Credits:**	1.5
Course Type:	Laboratory	**Lecture-Tutorial-Practice:**	0-0-3
Prerequisites:	Python programming	**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 installation process and basics of tensor flow
	CO2	Construct a Multi Layer Neural Network
	CO3	Build a convolution neural network model for image classification
	CO4	Implement a sentiment analysis model using LSTM

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					M									
CO2	M	L		M									M	M
CO3	L	M		L									L	L
CO4	H	M		M									M	M

Course Content

Week 1
Install Tensor flow in your local development environment using python. Create and manipulate tensor flow variables and implement mathematical, array and matrix operations.

Week 2
Test variable scoping mechanisms of tensor flow by considering your own examples

Week 3
Build a simple logistic regression model to tackle MNIST data set. The model should identify hand written digits.

Week 4
Construct a feed-forward model with two hidden layers, each with 256 Relu neurons to create MNIST digit reader. Compare accuracy model of the with the logistic regression model.

Week 5
Build a convolution neural network with two pooling and two convolutional interleaved, followed by a fully connected layer (with dropout, p = 0.5) and a terminal softmax.to solve MNIST digit reader problem and compare the accuracy with above two methods.

Week 6
Consider some noisy images and apply various image preprocessing techniques using TensorFlow

Week 7
Build a convolution neural network model for CIFAR-10 challenge with and without using batch normalization

	Week 8 Apply dimensionality reduction techniques using PCA and Autoencoder on MNIST dataset
	Week 9 Implement parts-of -speech (POS) tagger by considering your own lines of text.
	Week 10 Implement a sentiment analysis model using LSTM. Analyze the sentiment of movie reviews taken from the Large Movie Review Dataset
Text books and Reference books	**Text Book(s):** [1]. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly Media, 2017 [2]. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning(Adaptive Computation and Machine Learning series",MIT Press, 2017 **Reference Books:** [1]. Li Deng and Dong Yu, "Deep learning Methods and Applications", Now publishers, 2013 [2]. Michael Nielsen,"Neural Networks and Deep Learning", Determination Press 2015
E-resources and other digital material	[1]. Mitesh Khapra, "Deep Learning", Sep 20, 2018 https://www.youtube.com/watch?v=4TC5s_xNKSs&list=PLH-xYrxjfO2VsvyQXfBvsQsufAzvlqdg9 [2]. AfshineAmidi and ShervineAmidi ,"Deep Learning cheat sheets for Stanford's CS 230", 2018, https://github.com/afshinea/stanford-cs-230-deep-learning [3]. YoshuaBengio, Deep learning: "Theoretical Motivations, Canadian Institute for Advanced Research", 2015 http://videolectures.net/deeplearning2015_bengio_theoretical_motivations/ [4]. Geoffrey Hinton's GoogleTech Talk,"Recent developments on Deep Learning" March 2010, https://www.youtube.com/watch?v=VdIURAu1-aU

17IT4752 B - BLOCKCHAIN TECHNOLOGIES LAB

Course Category:	Program Elective	**Credits:**	1.5
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-3-0
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	Build smart contracts using Remix IDE, Ganache and Myether Wallet in Ethereum Platform.
	CO2	Build private-permissioned blockchain-based applications for enterprises and businesses.
	CO3	Develop IPFS file system using peer to peer networks

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	L											H	
CO2		L	H		L									
CO3				H					L					

Course Content

Week 1 : Prasanth is an instructor for Blockchain and Cryptocurrency, as part of the course, Prasanth wants to set the environment to deploy smart contract help Prasanth to deploy a smart contract.

Week 2 : Shinchan is a student in Kasukabey city school in Japan, His teacher gave him homework to check whether a number is Incrementing or Decrementing. Help Shinchan to solve the problem

Week 3 : Akash started learning solidity language, He completed his theory classes now it is time for practical session. Akash was given a problem to print the string "VRSE College". Help Akash to print the String.

Week 4 : How to write a smart contract to insert value into the ethereum blockchain using metamask.

Week 5 : You had a friend in the United States of American who's studying Computer Science Engineering at Stanford University, California. He asked you for help for transferring Ethers through online so he can pay a fee to the college. Use Metamask for transferring the Ethers to your friend.

Week 6 : Building a blockchain raffle using Solidity programming language. Apart from a coin toss, the most straightforward example of gambling is probably a raffle. Let's build one to see who wins the game.

Week 7:A finance company wishes to use Ethereum platform to speed up and simplify payments deposits. You are an Ethereum developer and have been asked by the company to create a Smart Contract for a banking application. Create a Smart Contract for a banking application in solidity which allows users to do the following:

a. Mint money into your account

	b. Withdraw money from your account c. Send money from your account to smart contract address d. Check balance After a contract is created, deploy the contract on Ethereum Testnet network
	Week 8 : To design an electronic voting system, using the ethereum blockchain (smart contracts) and more precisely the RPC test which enables account generation with a private and publicKey. Blockchain electronic voting system using smart contracts.
	Week 9 : Building an improved P2P file system to provide originality and authenticity of published and posted free online digital content such as books, music, and movies. Our solution utilizes a blend of the latest emerging technologies that include IPFS and blockchain smart contracts.
	Week 10: Smart cities and smart houses are in fashion and thus all this can be blockchained. The student can focus on building system which can manage all the real estate related contracts through blockchain technology using IPFS which will enhance security and will provide more efficiency.
	Week 11: How to write a smart contract to insert a value into the ethereum blockchain using Ganache (using intranet)
	Week 12: Hyperledger Composer Demo
	Text Book(s): [1]. Mastering Bitcoin: Antonopoulos, Andreas M. [2]. Mastering Blockchain: Distributed Ledgers, Decentralization and Smart Contracts Explained by Bashir, Imran. [3]. Mastering Ethereum: Building Smart Contracts and DApps. **Reference Books:** [1]. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder. [2]. Bitcoin: A Peer-to-Peer Electronic Cash System. Satoshi Nakamoto.
E-resources and other digital material	[1]. Prof Sandeep Shukla,Department of CSE, IIT, Kharagpur, "Introduction to Blockchain technology and Applications", 2019 https://nptel.ac.in/courses/106104220/ [2]. Prof. Sandip Chakraborty, Department of CSE, IIT, Kharagpur, "Blockchain Architecture Design and Use Cases", 2018 https://www.youtube.com/watch?v=I2mJazpVfCo

17IT4752C - INFORMATION RETRIEVAL SYSTEM LAB

Course Category:	Program Elective	**Credits:**	1.5
Course Type:	Lab	**Lecture-Tutorial-Practice:**	0-0-3
Prerequisites:	17IT3502 : Data Mining	**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	Demonstrate genesis and diversity of information retrieval situations for text and hyper media.
	CO2	Analyze the usage of different data/file structures in building computational search engines..
	CO3	Implement applications for the performance of information retrieval using classification, clustering, and filtering over multimedia.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	L	L								H	
CO2		L	H		L						
CO3				H				L			

Course Content	**Week 1 :** Implement Tokenization breaking a stream of text up into words, phrases, symbols, or other meaningful elements called tokens
	Week 2 : Perform stop word removal for filtering out prior to, or after, processing of natural language data (text).
	Week 3 : Implement Stemming for reducing inflected (or sometimes derived) words to their stem, base or root form—generally a written word form. Case studies
	Week 4 : Implement database index to improve the speed of data retrieval operations on a database table at the cost of slower writes and increased storage space
	Week 5 : Perform searching in the indexed data in database
	Week 6 : Configure and run Eclipse Intelligent Information Retrieval and Web Search
	Week 7: Extract data using web scraping and web crawling with python
	Week 8 : Build a corpus of language data and analyze this text, and visualize the results.

	Week 9 : Case studies on Sentiment Analysis, image query processing
Text books **Reference books**	**Text Book(s):** [1] G. G. Chowdhury, Introduction to Modern Information Retrieval, 3rd edition, Face publishing, 2010. **Reference Books:** [1] Gerald J Kowalski, Mark T Maybury Information Storage and Retrieval Systems: Theory and Implementation, Springer, 2004. [2] Soumen Chakrabarti, Mining the Web : Discovering Knowledge from Hypertext Data, Morgan – Kaufmann Publishers, 2002. [3] Christopher D Manning, PrabhakarRaghavan, HinrichSchutze, An Introduction to Information Retrieval By Cambridge University Press, England, 2009
E-resources and other digital material	[1] Pabitra Mitra , Professor,CSE Department,IIT Khargapur,Information Retrieval, https://cse.iitkgp.ac.in/~pabitra/course/ir06/ir06.html [2] Shehzaad Dhuliawala Maulik achhani, Information Retrieval, http://www.cfilt.iitb.ac.in/viva_workshop/Day4-Information_Retrieval-ShehzaadDhuliawala

17IT5753 - MINI PROJECT

Course Category:	Project	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial-Practice:**	0-0-4
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	Identify the problem, define objectives and scope of the project.
	CO2	Analyse the problem from state of the art for arriving at feasible solutions.
	CO3	Prepare an organized report employing elements of technical writing & critical thinking.
	CO4	Summarize and communicate the content to audience in an effective manner.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L					M	H	M		L	L		L
CO2		H	M	M							M	M	M	M
CO3						H	M	H	M	M	M	L	L	M
CO4						L	M	M	H	H		M	L	L

Course Content

Mini Project could be done in 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

17IT6754 – A: INTERNSHIP / B: INDUSTRY OFFERED COURSE / C: GLOBAL PROFESSIONAL CERTIFICATION

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

As per the regulations of VR17 the students can register for any one of the following

a) Internships

The students may undergo internship of minimum 3 weeks duration in the industry approved by respective head of the department

b) Industry offered courses

The student can opt for the courses under this category offered by the industry experts whose minimum academic qualification is Bachelor or Engineering or equivalent.

c) Global Professional Certification

The students can complete the global professional certification under this category.

SEMESTER VIII

17IT4801A - BUSINESS INTELLIGENCE

Course Category:	Programme Elective VI	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3502 - Data Mining	**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 the concepts and components of business intelligence
	CO2	Evaluate the use of BI for supporting decision making in an organization.
	CO3	Discover the requirements need to design a business intelligence model.
	CO4	Implement a behavioural model to assess the behaviour of the customer.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-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		L	L											L
CO2		L		M									L	M
CO3	L	M	M		H								L	M
CO4	L	M	M	M	H								H	H

Course Content

UNIT I

Business Intelligence and Information Exploitation-Improving the Decision-Making Process, Why a Business Intelligence Program, Business Intelligence and Program Success, The Analytics Spectrum, Taming the Information Explosion.

The Value of Business Intelligence-Value Drivers and Information Use**,** Performance Metrics and Key Performance Indicator, Using Actionable Knowledge**,** Horizontal Use Cases for Business Intelligence**,** Vertical Use Cases for Business Intelligence

UNIT II

Planning for Success- Introduction, Organizational Preparedness for Business Intelligence and Analytics, Initial Steps in Starting a Business Intelligence Program, Bridging the Gaps between Information Technology and the Business Users, Knowing the Different Types of Business Intelligence Users, Business Intelligence Success Factors: A Deeper Dive, More on Building Your Team, Strategic Versus Tactical Planning

Developing Your Business Intelligence Roadmap- A Business Intelligence Strategy: Vision to Blueprint, The Business Intelligence Roadmap: Example Phasing, Planning the Business Intelligence Plan

UNIT III

The Business Intelligence Environment- Aspects of Business Intelligence and Analytics Platform and Strategy, The Organizational Business Intelligence Framework, Services and System Evolution

Business Processes and Information Flow- Analytical Information Needs and Information Flows, Information Processing and Information Flow, The

	Information Flow Model. **Data Requirements Analysis-** Introduction, Business Uses of Information, Metrics: Facts, Qualifiers and Models, What is Data Requirements Analysis?
	UNIT IV **Data Profiling-** Establishing Usability of Candidate Data Sources, Data Profiling Activities, Attribute Analysis, Relationship Analysis **Deriving Insight from Collections of Data-** Introduction, Customer Profiles and Customer Behaviour, Customer Lifetime Value, Demographics, Psychographics, Geographic's, Geographical Clusters, Behaviour Analysis
Text books and Reference books	**Text Books:** [1]. D. Loshin, Business Intelligence: The savvy manager's guide, Morgan Kaufmann Publishers, 2013. **Reference Books:** [1]. Business Intelligence And Analytics Systems For Decision Support by Efraim Turban and Ramesh Sharda, Pearson India, 2018. [2]. Business Intelligence and Analytics in Small and Medium Enterprises , Pedro Novo Melo , Carolina Machado ,CRC Press,2019
E-resources and other digital material	[1] Need for Data Warehouse & Business Intelligence, Microsoft Business Intelligence, https://freevideolectures.com/course/3635/microsoft-business-intelligence/11 [2] Business Analytics & Text Mining Modeling Using Python, Prof.Gaurav Dixit, Department of Management, IT Roorkee, https://nptel.ac.in/courses/110/107/110107092/ [3] Business Analytics & Intelligence, IIM Bangalore, https://iimb.ac.in/eep/product/259/Business-Analytics-Intelligence

17IT4801B – MOBILE COMPUTING

Course Category:	Program Elective - VI							**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 concept of mobile computing paradigm, its novel applications and access techniques.												
	CO2	Analyze cellular systems that adapt mobility for wireless data transmissions												
	CO3	Analyze wireless data transmission techniques in mobile communications												
	CO4	Evaluate mechanisms extended in network layer for mobility and satellite systems for supporting mobile communications												

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Moderate, H-High)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					M		M			H		L	M	L
CO2		H		L			M					M		M
CO3				H					M			M		M
CO4	L				M						M	H	H	H

Course Content	
	UNIT I: **Overview and classification of mobile communication systems:** Introduction, Paging systems, Wireless telephony, Trucking systems, Cellular telephony, Personal satellite communication systems, Wireless access to the local area networks. **Elements of digital communication systems theory:** Multiple access methods used in mobile communications, Methods of duplex transmission, Competing for channel access,X.25 - a protocol for a packet switching network.
	UNIT II: **First generation cellular telephony - NMT and AMPS examples:** First Generation Cellular Systems, NMT Architecture, Services offered by NMT, Typical Mobile Station And Base Station Design, The Overview Of AMPS. **GSM cellular telephony : Introduction,** Basic GSM Architecture, Basic Radio Transmission Parameters Of The GSM System, Logical Channel Description, GSM time hierarchy, GSM burst structures, Description Of The Call Set-Up Procedure, Handover, Ensuring Privacy And Authentication Of A User.
	UNIT III: **Data Transmission in GSM :**General Packet Radio Service – GPRS, GPRS system architecture, GPRS services. **CDMA in Mobile Communication Systems** – Introduction, Motivation For Considering Cdma As A Potential Multiple Access Method

	UNIT IV: **Mobile Network Layer :** Mobile IP, Entities and terminology, IP packet delivery, Agent discovery, Registration, tunneling and encapsulation, optimization, IPv6. **Satellite systems :** History, Applications, Basics – GEO, LEO, MEO, Routing, Localization, Handover.
Text books **Reference books**	**Text Book(s):** [1] Krzysztof Wesolowski, "Mobile Communication Systems", Wiley publication, 2002 [2]Jochen Schilller ,"Mobile Communication ", Addision wisely,Pearson Education, 2003 **Reference Books:** [1]W. Frank Ableson, Robi sen, Chris King, " Android IN ACTION ", ThirdEdition, Dreamtech Press, 2011 [2] Mobile Computing By Rajkamal (Oxford), 2007 [3] Uwe Hansmann, Lothar Merk, Martin S. Nicklous, Thomas Stober, "Principles ofMobile Computing", Springer, 2006
E-resources and other digital material	[1] Prof Soumya Kanti Ghosh, IIT Kharagpur, Mobile Computing, https://www.digimat.in/nptel/courses/video/106105167/L01.html [2]. Prof. Bikash Kumar Dey, IIT Bombay, "Digital Communication", May 2020, https://freevideolectures.com/course/2311/digital-communication [3]. Prof Ranjan Bose, IITDelhi, "Mobile Radio Propagation", https://nptel.ac.in/courses/117/102/117102062/

17IT4801C - SERVICE ORIENTED ARCHITECTURE

Course Category:	Programme Elective-VI	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3602 : Web Programming and Development	**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	Build applications based on XML using Document Object Model and Simple API for XML
CO2	Understand the basic principles and standards of Service-Oriented Architecture
CO3	Analyze web services using technology elements
CO4	Build SOA-based applications for intra-enterprise and inter-enterprise applications.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- 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	L	H											L	H
CO2		L	H								M			L
CO3		M		H							L			M
CO4	L	H		H							H	H	L	H

Course Content

UNIT I BUILDING XML- BASED APPLICATIONS

Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML.

UNIT II SERVICE ORIENTED ARCHITECTURE

Characteristics of SOA, Comparing SOA with Client-Server and Distributed architectures – Benefits of SOA — Principles of Service orientation – Service layers.

UNIT III WEB SERVICES

Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Message Exchange Patterns – Orchestration – Choreography –WS Transactions.

UNIT IV BUILDING SOA-BASED APPLICATIONS

Service Oriented Analysis and Design – Service Modeling – Design standards and guidelines — Composition – WS-BPEL – WS-Coordination – WS-Policy – WS-Security – SOA support in J2EE.

Text books and Reference books

Text Book(s):

[1].Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2008.

[2].Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.

Reference Book(s):

[4]. Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002

	[5]. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2005 [6]. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004. [7]. James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, "Java Web Services Architecture", Morgan Kaufmann Publishers, 2011.
E-resources and other digital material	[1]. Prof.Umesh Bellur IIT Bombay, Service Oriented Architectures with web services https://www.youtube.com/watch?v=PZfYM48Gnj8&list=PL_uaeekrhGzK2FapcTxvuuXOwCPSZvFn3 [2]. Prof Soumya Kanti Ghosh, Cloud Computing Web services Service Oriented Architecture, IIT, Kharagpur http://www.infocobuild.com/education/audio-video-courses/computer-science/CloudComputing-IIT-Kharagpur/lecture-10.html [3]. https://freevideolectures.com/course/3616/java-j2ee-and-soa/45 [4] .https://www.protechtraining.com/service-oriented-architecture-and-web-services-pt15514

17IT4801D - SOFTWARE METRICS AND QUALITY MANAGEMENT

Course Category:	Programme Elective-VI	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	17IT3501: 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 different metrics associated with Software Development and evaluation
	CO2	Apply quality measurement , metrics and quality plan for software projects.
	CO3	Analyze various SQA standards and software process assessments
	CO4	Identify quality factors, quality metrics and SQA models and their impact on the final product.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-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											L	L	H	L
CO2	M			M							M	L	M	L
CO3	L											L	H	L
CO4	L			L							H	L	M	L

Course Content

UNIT I

Software Metrics: Need of Software Measurement, Definition of Software Metrics, Classification of Software Metrics, Entities to be Measured, Size of Metrics.

Testing metrics for Monitoring and Controlling the Testing Process: Measurement Objectives for Testing, Attributes and Corresponding Metrics in Software Testing, Attributes, and Estimation models for Estimation Testing Efforts, Architectural Design Metric Used for Testing, Information Flow Metrics Used for Testing, Cyclomatic Complexity Measures for Testing, Function Point Metrics for Testing, Test Point Analysis (TPA).

UNIT II

Product Metrics: Software Quality, Metrics for analysis model, Metrics for Design model, Metrics for source code, Metrics for Testing, Metrics for Maintenance.

Metrics for Process and Projects: Metrics in the Process and Project Domains, Software Measurement, Metrics for Software Quality, Integrating metrics within the software process, Metrics for Small Organization, Establishing a Software metric Program.

	UNIT III **Quality Management:** Quality concepts, Software Quality Assurance, Software Reviews, Formal Technical Reviews, Statistical software Quality Assurance, Software reliability, The ISO 9000 Quality Standards, The SQA plan.
	UNIT IV **Software Quality Management:** Software Quality, Broadening the concept of Quality, Benefits of Investment on Quality, Quality Control and Quality Assurance, Quality Management, Quality Factors, Methods of Quality Management, Software Quality Metrics, SQA Models
Text books and Reference books	**Text Books:** [1]. Naresh Chauhan, Software Testing- Principles and Practices, Oxford Higher Education, 2010. [2]. Roger S. Pressman, Software Engineering- A Practitioner's Approach, McGraw-Hill international sixth edition, 2005. **Reference Books:** [3]. Norman Fenton, James Bieman, Software Metrics – A Rigorous and Practical Approach, CRC Press, 2014. [4]. Stephen H.Khan, Metrics & Models in Software Quality Engineering, second edition, Addison Wisley, 2004
E-resources and other digital material	**Web resources:** [1]. http://aima.cs.berkeley.edu/ai.html [2]. http://airesources.blogspot.in/ [3]. https://www.youtube.com/watch?v=KqDlDubS-OU

17IT5851 - MAJOR PROJECT

Course Category:	Project	**Credits:**	9
Course Type:	Practical	**Lecture-Tutorial-Practice:**	0-5-8
Prerequisites:	Mini Project	**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 appropriate research methodology to provide a solution to the chosen problem
	CO2	Design, develop and test software using current techniques.
	CO3	Prepare a comprehensive report of the project work using modern tools
	CO4	Demonstrate and Communicate the project objectives and outcomes in an effective manner.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	H	H	H	M				M			M	M	M
CO2	L	M	H	M	H						M	M	M	M
CO3						H	M	H	M	M	L	L	L	M
CO4						L	M	M	H	H		M	L	L

Course Content

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