SRI VENKATESWARA COLLEGE OF ENGINEERING
(An Autonomous Institution, Affiliated to Anna University, Chennai)
SRIPERUMBUDUR TK. - 602 117
REGULATION – 2018 (CBCS)
B.TECH. INFORMATION TECHNOLOGY
CURRICULUM

SEMESTER I										
S. No	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**	**Pre requisite**	**F/M**
THEORY										
1	HS18151	Communicative English (Common to all Branches)	HS	3	3	0	0	3	-	F
2	MA18151	Engineering Mathematics I (Common to all Branches Except MR)	BS	4	3	1	0	4	-	F
3	PH18151	Engineering Physics (Common to all Branches)	BS	3	3	0	0	3	-	F
4	CY18151	Engineering Chemistry (Common to all Branches Except MR)	BS	3	3	0	0	3	-	F
5	EE18151	Basic Electrical and Electronics Engineering (Common to AE, BT, CE, CS,IT,MR & ME)	ES	3	3	0	0	3	-	F
6	IT18101	Programming for Problem Solving (Common to all Branches Except MR)	ES	3	3	0	0	3	-	F
PRACTICAL										
7	PC18161	Physics and Chemistry Laboratory (Common to all Branches)	BS	2	0	0	2	1	-	F
8	GE18161	Engineering Practices Laboratory (Common to all Branches)	ES	3	0	0	3	1.5	-	F
9	IT18111	Programming for Problem Solving Laboratory (Common to all Branches Except MR)	ES	3	0	0	3	1.5	-	F
			TOTAL	27	18	1	8	23		

SEMESTER II										
S. No	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**	**Pre requisite**	**F/ M**
THEORY										
1	HS18251	Technical English (Common to all Branches)	HS	3	3	0	0	3	-	F
2	MA18251	Engineering Mathematics II (Common to all Branches Except MR)	BS	4	3	1	0	4	-	F
3	GE18151	Engineering Drawing (Common to all Branches)	ES	5	3	0	2	4	-	F
4	GE18251	Environmental Science and Engineering (Common to all branches)	BS	3	3	0	0	3	-	F
5	CS18201	Digital Principles and System Design (Common to CS & IT)	ES	3	3	0	0	3	-	F
6	IT18201	OOPS using C++ and Python	PC	3	3	0	0	3	-	F
PRACTICAL										
7	CS18211	Digital Principles and System Design Laboratory (common to CS & IT)	ES	3	0	0	3	1.5	-	F
8	IT18211	OOPS using C++ and Python Laboratory	PC	3	0	0	3	1.5	-	F
			TOTAL	27	18	1	8	23		

SEMESTER III										
S. No	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**	**Pre requisite**	**F/ M**
THEORY										
1	MA18352	Discrete Mathematics (common to CS & IT)	BS	4	3	1	0	4	-	F
2	IT18301	IT Essentials	PC	3	3	0	0	3	-	F
3	IT18302	Computer Organization and Architecture	PC	3	3	0	0	3	-	F
4	IT18303	Information and Coding Theory	ES	3	3	0	0	3	-	F
5	IT18304	Data structures and Algorithms	PC	3	3	0	0	3	-	F
6	IT18305	Database Systems	PC	3	3	0	0	3	-	F
PRACTICAL										
7	IT18311	IT Essentials Laboratory	PC	3	0	0	3	1.5	-	F
8	IT18312	Data structures and Algorithms Laboratory	PC	3	0	0	3	1.5	-	F
9	IT18313	Database Systems Laboratory	PC	3	0	0	3	1.5	-	F
			TOTAL	28	18	1	9	23.5		

SEMESTER IV										
S. No	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**	**Pre requisite**	**F/ M**
THEORY										
1	MA18453	Probability and Queuing Theory (common to CS & IT)	BS	4	3	1	0	4	-	F
2	IT18401	Paradigms of Algorithm Design	PC	4	3	1	0	4	IT18304	F
3	IT18402	Microprocessors and Microcontroller Interfacing	PC	3	3	0	0	3	-	F
4	IT18403	Operating System Concepts	PC	3	3	0	0	3	-	F
5	IT18404	Software Engineering Methodologies	PC	3	3	0	0	3	-	F
PRACTICAL										
6	IT18411	Microprocessors and Microcontroller Interfacing Laboratory	PC	3	0	0	3	1.5	-	F
7	IT18412	Operating System Concepts Laboratory	PC	3	0	0	3	1.5	-	F
8	IT18413	Software Engineering Methodologies Laboratory	PC	3	0	0	3	2	-	F
			TOTAL	26	15	2	9	22		

SEMESTER V										
S. No	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**	**Pre requisite**	**F/ M**
THEORY										
1	IT18501	Data Communication and Networking	PC	4	3	1	0	4	-	F
2	CS18501	User Interface Technologies (Common to CS & IT)	PC	4	3	1	0	4	-	F
3	IT18502	Mobile Computing (Common to IT & CS)	PC	4	3	1	0	4	-	F
4		Professional Elective –I	PE	3	3	0	0	3	-	M
5	IT18503	Internet of Things	PC	4	3	1	0	4	-	F
PRACTICAL										
6	CS18511	User Interface Technologies Laboratory (Common to CS & IT)	PC	3	0	0	4	2	-	F
7	IT18511	Data Communication and Networking Laboratory	PC	3	0	0	3	2	-	F
8	IT18512	Internet of Things Laboratory	PC	3	0	0	3	2	-	F
			TOTAL	29	15	4	10	25		

SEMESTER VI										
S. No	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**	**Pre requisite**	**F/ M**
THEORY										
1	IT18601	Computational Intelligence	PC	4	3	1	0	4	-	F
2	IT18602	Automata and Compiler Design	PC	4	3	1	0	4	-	F
3	IT18603	Information Security	PC	4	3	1	0	4	-	F
4		Professional Elective – II	PE	3	3	0	0	3	-	M
5		Open Elective I	OE	3	3	0	0	3	-	M
PRACTICALS										
6	IT18611	Automata and Compiler Design Laboratory	PC	3	0	0	3	2	-	F
7	HS18561	Interview and career skills Laboratory (Common to all Branches Except BT & EE)	EEC	4	0	0	3	2	-	F
8	IT18612	Information Security Laboratory	PC	3	0	0	3	1.5	-	F
			TOTAL	27	15	3	9	23.5		

SEMESTER VII										
S. No	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**	**Pre requisite**	**F/ M**
THEORY										
1	IT18701	Cyber Forensics	PC	4	3	1	0	4	IT18603	F
2	IT18702	Big Data Analytics	PC	4	3	1	0	4	-	F
3	IT18703	Cloud Computing	PC	4	3	1	0	4	-	F
4		Professional Elective – III	PE	3	3	0	0	3	-	M
5		Open Elective II	OE	3	3	0	0	3	-	M
PRACTICALS										
6	IT18711	Mini Project	EEC	6	0	0	6	3	-	F
7	IT18712	Big Data Mining and Analytics Laboratory	PC	3	0	0	3	2	-	F
8	IT18713	Cloud computing Laboratory	PC	3	0	0	3	2	-	F
9	IT18714	Cyber Security and Forensics Laboratory	PC	3	0	0	3	2		
			TOTAL	33	15	3	15	27		

SEMESTER VIII										
S. No	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**	**Pre requisite**	**F/ M**
THEORY										
1		Professional Elective - IV	PE	3	3	0	0	3	-	M
2		Professional Elective –V	PE	3	3	0	0	3	-	M
PRACTICAL										
3	IT18811	Project Work	EEC	24	0	0	24	12	-	F
			TOTAL	30	6	0	24	18		

Total Credits : 185

Professional Electives – I & III (offered in ODD semester)

S. No	Course Code	Course Title
1	IT18001	Deep Learning
2	IT18003	Embedded Systems
3	IT18005	Free and Open Source Software
4	IT18007	Functional Programming using SCALA
5	IT18009	Graphics and Multimedia
6	IT18011	Information Retrieval
7	IT18013	Digital Forensics Tools and Techniques
8	IT18015	Statistical analysis using R-Programming
9	IT18017	Service Oriented Architecture
10	IT18019	Software Project Management
11	IT18021	Machine Learning

Professional Electives – II, IV & V (offered in EVEN semester)

S. No	Course Code	Course Title
12	CS18002	Advanced User Interface Technologies (Common to CS and IT)
13	GE18051	Intellectual Property Rights (Common to All Branches Except BT)
14	CS18004	Agile Methodologies (Common to CS and IT)
15	IT18002	Principles of Digital Image Processing (Common to IT and CS)
16	IT18004	Software Testing and Quality Assurance (Common to IT and CS)
17	IT18006	Ethical Hacking
18	IT18008	Information Systems Security Engineering and Management
19	IT18010	Next Generation Cloud
20	GE18054	Professional Ethics (Common to CE, CS, IT, EE, EC and MR)
21	IT18012	Security Principles and Techniques
22	IT18014	Web Technology
23	IT18016	Blockchain for Business
24	IT18099	Professional Readiness for Innovation, Employability and Entrepreneurship

Professional Electives – Special Electives (can be chosen whenever offered)

1	SE18001	Mathematics For AI & ML(Common to All Branches Except MR)	PE
2	SE18002	Corporate Finance (Common to All Branches Except MR)	PE
3	SE18003	Financial Statement Analysis (Common to All Branches Except MR)	PE
4	SE18004	Managerial Economics (Common to All Branches Except MR)	PE
5	SE18007	Project Management (Common to All Branches Except MR)	PE
6	SE18008	Introduction to Securities Market (Common to All Branches Except MR)	PE

List of Open Electives Offered To All Branches Except IT

Open Elective I (Odd)										
1	OE18801	IT essentials for engineers	OE	3	3	0	0	3	-	M
2	OE18803	Internet of Everything	OE	3	3	0	0	3	-	M
3	OE18805	Foundation on Mobile App Development	OE	3	3	0	0	3	-	M

Open Elective II (Even)										
1	OE18802	Embedded and Real Time Systems	OE	3	3	0	0	3	-	M
2	OE18804	Ethical hacking and IT security	OE	3	3	0	0	3	-	M
3	OE18806	User Interface Design	OE	3	3	0	0	3	-	M
4	OE18808	AI for Android	OE	3	3	0	0	3	-	M

List of Value Added Courses

S.No	Course Code	Course Name	L	T	P	C
1	VD18801	Data Analysis using R	2	0	0	2
2	VD18802	Block chain Technology	2	0	0	2
3	VD18803	Web design essentials	2	0	0	2
4	VD18804	Programming Framework	2	0	0	2
5	VC18001	Communicative German (Common to all branches)	2	0	0	2
5	VC18002	Communicative Japanese (Common to all branches)	2	0	0	2
6	VC18003	Communicative Hindi (Common to all branches)	2	0	0	2
7	VC18004	Design Thinking and Prototyping laboratory (Common to all branches)	0	0	4	2
8	VC18005	Basics of Entrepreneurship Development (Common to All Branches)	2	0	0	2

List of Mandatory Courses

S. No	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre requisite	F/ M
1	MC18001	Indian constitution and Society	MC	3	3	0	0	0	-	-

HS18151	COMMUNICATIVE ENGLISH (Common To All Branches)	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable learners to interact fluently on everyday social contexts.
- To enable learners engage in conversations in an academic/scholarly setting.
- To enable learners overcome public speaking barriers.
- To develop learners' ability to take notes and in the process, improve their listening skills
- To develop learners' reading skill through reading text passages for comprehension and contemplation.
- To enable learners write on topics of general interest and drafting correspondences for general purposes.

UNIT I 9

Listening – short video clips – conversational scenes form movies, celebrities' speeches/interviews. Speaking – several ways of introducing oneself at several situations, introducing others at several situations, inviting people for several occasions, describing people and their places. Reading – short comprehension passages – making inferences, critical analysis. Writing – completing the incomplete sentences– developing hints from the given information. Grammar – Wh- Questions and Yes or No questions –Parts of speech. Vocabulary development– prefixes- suffixes- articles – countable / uncountable nouns.

UNIT II **9**

Listening – customer care voice files, short narratives – identifying problems and developing telephone etiquettes. Speaking – speaking over skype/whatsapp, making business calls, making self-recorded informative videos, inquiring about a concept/activity, describing a concept/activity. Reading – reading the headlines on news magazines – slogans and taglines from advertisements. Writing - free writing – writing - headlines , slogans and taglines individual inspirations. Grammar – conjunctions, idioms, phrases, quotes. Vocabulary development – guessing the meanings of words in various different contexts.

UNIT III **9**

Listening – courtroom scenes from movies, debates and talks from news channels, notes taking. Speaking – language and tone for arguments, discussion, deliberation, contemplation, expressing opinions, reacting to different situations in an alien country. Reading–language used in instruction manuals of household appliances, cookery and other basic instructions. Writing- understanding the structure of texts - use of reference words, discourse markers-coherence, rearranging the jumbled sentences. Grammar – adjectives - degrees of comparison, framing direct and indirect questions. Vocabulary development – concise approach, single word substitution.

UNIT IV **9**

Listening – Sports commentaries, advertisements with users' criticisms; Speaking –for social causes, for promoting a concept, negotiating and bargaining; Reading – review of a product, movie, movement or a system; Writing – writing for advertisements, selling a product; Grammar – Tenses – Simple Past, Present and Future, Continuous - Past, Present and Future; Vocabulary Development – synonyms, antonyms and phrasal verbs.

UNIT V **9**

Listening – video lectures, video demonstration of a concept; Speaking – presenting papers/concepts, delivering short speeches, discourses on health, suggesting natural home remedies, cleanliness, civic sense and responsibilities; Reading – columns and articles on home science; Writing – correspondences of requests, basic enquiry/observation and basic complaints; Grammar - modal verbs, perfect tenses – Vocabulary development – collocations.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of course,learners will be able to

- Read articles and infer meanings from specific contexts from magazines and newspapers.
- Participate effectively in informal/casual conversations; introduce themselves and their friends and express opinions in English.
- Comprehend conversations and short talks delivered in English.
- Write short write-ups and personal letters and emails in English.

REFERENCES:

1. Department of English, Anna University. "Mindscapes : English for Technologists and Engineers" Orient Black swan, Chennai. 2017.
2. Downes and Colm, "Cambridge English for Job-hunting", Cambridge University Press, New Delhi. 2008.
3. Murphy and Raymond,"Intermediate English Grammar with Answers", Cambridge University Press 2000.
4. Thomson, A.J." Practical English Grammar 1& 2 "Oxford 1986.

WEBSITES:

1. http://www.usingenglish.com
2. http://www.uefap.com3.
3. https://owl.english.purdue.edu/owl/
4. www.learnenglishfeelgood.com/esl-printables-worksheets.html

SOFTWARE:

1. Face 2 Face Advance – Cambridge University Press, 2014
2. English Advance Vocabulary- Cambridge University Press
3. IELTS test preparation – Cambridge University Press 2017
4. Official Guide to the TOEFL Test With CD-ROM, 4th Edition
5. CAMBRIDGE Preparation for the TOEFL TEST- Cambridge University Press, 2017

MA18151	ENGINEERING MATHEMATICS I (Common To All Branches Except MR)	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To understand and apply matrix techniques for engineering applications.
- To make the student knowledgeable in statistical methods of analyzing and interpret the data for engineering problems.
- To familiarize the student with basic calculus including functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with Mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES 12

Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors – Statement and Applications of Cayley-Hamilton Theorem – Diagonalization of matrices– Reduction of a quadratic form into canonical form by orthogonal transformation-Nature of quadratic forms.

UNIT II STATISTICAL METHODS 12

Scatter diagram- Karl Pearson coefficient of correlation for raw data- Spermann rank correlation coefficient- lines of regression – Regression equation X on Y and Y on X- Curve fitting by Principle of least squares – Fitting a straight line $y = ax + b$ and a parabola $y = ax^2 + bx + c$.

UNIT III APPLICATION OF DIFFERENTIAL CALCULUS 12

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes.

UNIT IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES 12

Limits and Continuity - Partial derivatives – Total derivatives – Differentiation of implicit functions – Jacobians and properties– Taylor's series for functions of two variables – Maxima and Minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V MULTIPLE INTEGRALS 12

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves - Change of variables in double integrals – Triple integrals – Volume of solids.

TOTAL (L:45+T:15): 60 Periods

OUTCOMES:

At the end of course,learners will be able to

- Develop the use of matrix algebra techniques which is needed for practical applications.
- Apply the skill to solve statistical probems under correlation and regression and acquire the knowledge for fitting the straight line and parabola.
- Acquire the skills to evaluate the functions of several variables.
- Express proficiency in handling the concept of improper integrals of gamma,beta and error functions.
- Acquaint the student with mathematical tools neede in evaluating multiple integrals and their usage.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley, 1999
2. Bali N. P and Manish Goyal, “A Text book of Engineering Mathematics”, Eighth Edition, Laxmi Publications Pvt Ltd., 2011.
3. Grewal. B.S, “Higher Engineering Mathematics”, 41stEdition, Khanna Publications, Delhi, 2011.

REFERENCES:

1. S C Gupta and V K Kapoor, "Fundamentals of Mathematical Statistics", S.Chand Private Ltd.,11th Edition 2005.
2. Glyn James, “Advanced Modern Engineering Mathematics”, 3rd Edition, Pearson Education, 2012.
3. Peter V.O’Neil, “Advanced Engineering Mathematics”, 7th Edition, Cengage learning, 2012.
4 Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company New Delhi, 2008.
5 Sivarama Krishna Das P. and Rukmangadachari E., “Engineering Mathematics”, Volume I, Second Edition, Pearson Publishing 2011.

PH18151	ENGINEERING PHYSICS (Common To All Branches)	L	T	P	C
		3	0	0	3

OBJECTIVES:

To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I Crystal Physics 12

Unit cell - Bravais Lattices - Miller indices - Distance between Inter planar distance 'd' (derivation) - discussion of various crystal structures: calculation of Atomic radius, Coordination number, effective number of lattice points and Atomic Packing Factor for the SC, BCC, FCC, HCP, Diamond Cubic (derivation) - discussion about the NaCl, Graphite structures. Crystal defects : Zero dimensional, one dimensional, Two dimensional and Three dimensional defects. Diffraction of X-rays by crystal planes - Bragg's spectrometer - Powder Diffraction method.

UNIT II Thermal Physics 6

Modes of heat transfer: Newton's law of cooling – Thermal conductivity - Lee's disc method (derivation and expt) – Radial heat flow – Rubber tube method – Conduction through compound media (series and parallel).

UNIT III Wave Mechanics 9

Quantum principles: Black body radiation – Planck's Hypothesis (qualitative), Compton's effect (derivation).Wave-particle duality – de-Broglie's matter waves – Heisenberg's uncertainty principle - Wave function and its significance - Schrödinger's wave equation (Time dependent and Time independent) (derivation) – Application of Schrodinger's wave equation - Particle in one dimensional box (derivation) – Degenerate and non-degenerate energy states.

UNIT IV Acoustics and Ultrasonics 9

Acoustics: Classification of Sound – Characteristics of Musical Sound : Quality (Timbre), Pitch, Intensity of Sound – Units of Sound – decibel - Reverberation of sound – Reverberation time – absorption of sound energy by materials – Absorption coefficient – Sabine's Formula (derivation) – Factors affecting the acoustics of buildings – Remedies. Ultrasonics : Introduction to Ultrasonics – Properties of Ultrasonic waves – Production of Ultrasonics - Magnetostriction method, Piezo electric method – Detection of Ultrasonics – Ultrasonic Acoustic grating - Applications of Ultrasonic waves – SONAR, NDT, Sonogram.

UNIT V Optoelectronics and Fiber optics 9

Lasers: Basic properties of Lasers - Einstein's coefficients (Derivation) – Population inversion – Types of Lasers – Molecular Gas Lasers (CO_2 Laser) – Solid state Laser (Nd: YAG Laser) – Applications of Lasers in Engineering and Medicine. Fibreoptics : Introduction - Principle and structure of optical fibers- Acceptance angle-Numerical aperture-Types of optical fibers- Fiber Optical communication system (block diagram) - Advantages and its applications.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

- Interpret the thermal properties of the materials
- Exhibit the ability to solve the problems pertaining to the behavior of sub-atomic particles using quantum mechanics.
- Learn to solve the issues related to defects in the buildings due to acoustic design
- Develop an understanding about photonics and Fiber Optic communication system
- Classify and demonstrate the fundamentals of crystals and their defects.

TEXT BOOKS:

1. Gaur R.K. and Gupta S.L, "Engineering Physics", Dhanput Publications, 2015.
2. Shatendra Sharma and Jyotsna Sharma, "Engineering Physics", Pearson, 2006.
3. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
4. Arumugam M, "Materials Science", Anuradha Publications, 2015.

REFERENCES:

1 David Halliday, Robert Resnick Jearl Walker, "Principles of Physics", 10th Edition, Wiley, 2015.

2. Peter Atkins and Julio De Paula, "Physical Chemistry", 10th Edition., Oxford University Press, 2014.
3. Arthur Beiser, Shobhit Mahajan and Rai Choudhury S, "Concepts of Modern Physics", 7th Edition, McGraw Hill Education, 2017.
4. Raghavan V, "Materials Science and Engineering", PHI Learning Pvt. Ltd., 2010.

CY18151	Engineering Chemistry (Common To All Branches Except MR)	L 3	T 0	P 0	C 3

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and the water treatment techniques.
- To develop an understanding the principle, types and mechanism of corrosion and protective coatings.
- To acquaint the students with the basics of nanomaterials, their properties and applicants.
- To develop an understanding of the laws of photochemistry and basic spectral (UV and IR)analysis .
- To enable the students to understand the types of fuels, its calorific values and significance of flue gas analysis.

UNIT I WATER TECHNOLOGY 9

Sources, hard and soft water, estimation of hardness by EDTA method, boiler feed water, boiler problems, cause and preventive measures, softening of water, zeolite process and demineralization by ion exchangers, internal treatment methods, specifications for drinking water, BIS and WHO standards, treatment of water for domestic use, desalination - reverse osmosis and electrodialysis.

UNIT II CORROSION AND ITS CONTROL 9

Corrosion: Basic concepts - mechanism of chemical, electrochemical corrosion - Pilling Bedworth rule – Types of Electrochemical corrosion - galvanic corrosion - differential aeration corrosion - pitting corrosion – stress corrosion – factors influencing corrosion. Corrosion control: Cathodic protection – sacrificial anodic method - corrosion inhibitors. Protective coatings: surface preparation for metallic coatings - electro plating (copper plating) and electroless plating (Nickel plating) - chemical conversion coatings - anodizing, phosphating and chromate coating.

UNIT III NANOCHEMISTRY 9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles, nanocluster, nanorod, - nanotube (CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and applications of nanomaterials.

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss - Draper law, Stark-Einstein law and Lambert Beer Law. Quantum efficiency - Photo processes - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence and Photo-sensitization. Spectroscopy: Electromagnetic spectrum - Absorption of radiation - Electronic, Vibrational and rotational transitions. UV-visible and IR spectroscopy - principles, instrumentation (Block diagram only) and applications.

UNIT V FUELS AND COMBUSTION 9

Fuel: Introduction - classification of fuels - calorific value - higher and lower calorific values - coal analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum- refining - manufacture of synthetic petrol (Bergius process) - knocking octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - producer gas - water gas. Combustion of fuels: introduction - theoretical calculation of calorific value - calculation of stoichiometry of fuel and air ratio - flue gas analysis by ORSAT Method.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course, students will be able to

- Estimate the hardness of water, asses the boiler feed water requirement and related problems also identification of suitable water treatment methods.
- Differentiate the mechanisms of different types of corrosion and suggest suitable corrosion control techniques

to mitigate the problem of corrosion including protective coatings

- Compare the nano and bulk materials, their synthesis and its applications in various fields.
- Interpret the photochemical reactions and spectroscopic techniques.
- Asses the types and quality of fuels, its calorific values and significance of flue gas analysis.

TEXT BOOKS:

1. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010.
2. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
3. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.

REFERENCES:

1 Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.

2 B.R. Puri, L.R. Sharma, M.S. Pathania., "Principles of Physical Chemistry" Vishal Publishing Company, 2008.

EE18151	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common To AE, BT, CE, CS, IT, MR &ME)	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic theorems used in Electrical circuits and the principles of measuring instruments.
- To educate the different concepts and function of electrical machines.
- To introduce the fundamentals of semiconductor and applications.
- To explain the principles of digital electronics.
- To impart knowledge of communication.

UNIT I ELECTRICAL CIRCUITS & MEASURMENTS 10

Ohm's Law – Kirchhoff's Laws – Steady State Solution of DC Circuits using Mesh Analysis – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase AC Balanced Circuits. Construction and working Principle of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters (Qualitative treatment only)

UNIT II ELECTRICAL MACHINES 10

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single phase induction Motor-,Single Phase Transformer.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 9

Characteristics of PN Junction Diode – Zener Effect – Zener Diode – LED, Photo diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Photo transistors.

UNIT IV DIGITAL ELECTRONICS 9

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts).

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 7

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.
Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fiber (Block Diagram approach only).

TOTAL : 45 PERIODS

OUTCOMES:

- Study the fundamental laws governing electrical circuits and to describe the working of measuring instruments.
- Understand the construction and characteristics of different electrical machines.
- Describe the fundamental behavior of different semiconductor devices and circuits.
- Learn the fundamental concepts of digital electronics circuits.
- Recognize the type of signals, data transfer and able to apply in communication systems

TEXT BOOKS:

1. Mittle V.N, Arvind Mittal “Basic Electrical Engineering”, Tata McGraw Hill(India), Second Edition, 2013.
2. Sedha R.S., “A Text Book of Applied Electronics”, S. Chand & Co., 2014.

REFERENCES:

1 Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basic Electrical, Electronics Engineering”, Tata McGraw Hill, 2013.

2 I.J.Nagrath and D.P. Kothari, “Basic Electrical Engineering”, Tata McGraw Hill ((India), Third Edition, 2010.

3 Mehta V K, “Principles of Electronics”, S.Chand& Company Ltd, 2010

4 M.Morris Mano, “Digital Logic & Computer Engineering”,Printice Hall of India, 2004.

5 Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill, Fourth Edition,2007

IT18101	PROGRAMMING FOR PROBLEM SOLVING (Common to All Branches Except MR)	L	T	P	C
		3	0	0	3

OBJECTIVES

The students should be made to:

- Learn the organization of a digital computer.
- Learn to think logically and write algorithms or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION TO PROBLEM SOLVING 9

Simple model of a Computer – Hardware – Software – Data Representation, Introduction to Computer Networks and Internet, Problem Solving Techniques – Bottom up design and top down design - applications, Introduction to Algorithms and Flow Chart.

UNIT II C PROGRAMMING BASICS 9

Introduction to 'C' programming – structure of a 'C' program – compilation and linking processes. Conversion of simple algorithm to program.

Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays - String- String operations –Arrays of strings.

UNIT IV FUNCTIONS AND USER DEFINED DATA TYPES 9

Function – definition of function – Declaration of function – Pass by value - Pass by reference– Recursion - Enumerators - Structures - Unions.

UNIT V POINTERS AND FILES 9

Macros - storage classes - Pointers- Definition – Initialization – Pointers arithmetic – Double Pointers, Basic file operations-Example problems.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply various problem solving techniques and represent solutions to problems in the form of algorithms and flow charts.
- Examine given problems, design solutions and write C programs using the constructs of C language.
- Apply the advanced constructs and string manipulation feature available in C programming language to solve problems.
- Demonstrate the use functions, structures and unions to create modularized applications in C language.
- Illustrate the dynamics of memory by the use of files and pointers.

TEXT BOOKS:

1. Pradip Dey, Manas Ghosh, " Programming in C ", First Edition, Oxford University Press, 2018.
2. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, Tata McGraw-Hill, 2010.

REFERENCES:

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.
2. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.
3. Paul J Deitel,Dr.HarveyM.Deitel,"C How to Program", Seventh Edition, Pearson Education, 2016.

PC18161 **PHYSICS AND CHEMISTRY LABORATORY** **L T P C**
(Common To All Branches) **0 0 2 1**
PHYSICS LABORATORY

OBJECTIVES

- To make the student to acquire practical skills in the determination of various physical properties of materials.

List of Exercises (Any 5 experiments to be conducted)

1. Determination of compressibility of the liquid - Ultrasonic interferometer.
2. Determination of thickness of the given object by Air wedge method.
3. Determination of dispersive power of a prism by Spectrometer.
4. Determination of Young's modulus of wooden scale by Non-Uniform bending.
5. Determination of wavelength, particle size and numerical aperture of fibre using Lasers.
6. Lee's Disc – Thermal conductivity of the poor conductor.
7. Torsional Pendulum – Determination of Rigidity modulus and moment of inertia.

OUTCOMES:

- Analyze the physical principle using the various instruments, also relate the principle to engineering applications.
- Experiment the areas of optics, mechanics and thermal physics will nurture the students in all branches of Engineering.
- Think innovatively and also improve the creative skills that are essential for engineering.

LIST OF EQUIPMENTS FOR THE BATCH OF 30 STUDENTS :

Spectrometer, Mercury Vapour lamp, Lee's disc experimental setup, Travelling microscope, Ultrasonic interferometer, Sodium vapour lamp, Diode laser, Optical fiber kit.

CHEMISTRY LABORATORY

OBJECTIVES

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometery.

List of Exercises (Any 5 experiments to be conducted)

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Estimation of copper by EDTA.
3. Conductometric titration of a strong acid with a strong base
4. Estimation of iron content of the given solution using potentiometer.
5. Estimation of iron content of the water sample using spectrophotometer.
6. Determination of molecular weight of polymer using viscometer.
7. Determination of Alkalinity in water

TOTAL: 30 PERIODS

OUTCOMES:

- The students will be equipped with hands - on knowledge in the quantitative chemical analysis of water quality related parameters.

LIST OF EQUIPMENTS FOR THE BATCH OF 30 STUDENTS :

1. Conductivity meter – 10 Nos
2. Spectrophotometer – 10 Nos
3. Ostwald Viscometer – 10 Nos
4. Potentiometer - 10 Nos
5. Electronic Balance - 2 Nos

Common Apparatus: Pipette, Burette, conical flask, iodine flask, porcelain tile, dropper (each 30 Nos.)

REFERENCES:

1. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
2. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogels Textbook of Practical Organic Chemistry", 8th Edition, LBS Singapore, 2014.

GE18161	ENGINEERING PRACTICES LABORATORY (Common To All Branches)	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

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

LIST OF EXPERIEMNTS

GROUP A (CIVIL & MECHANICAL)

I **CIVIL ENGINEERING PRACTICE**

Buildings:

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

Plumbing Works:

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

Carpentry using Power Tools only:

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

II **MECHANICAL ENGINEERING PRACTICE**

Welding:

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

Basic Machining:

a) Simple Turning and Taper turning
b) Drilling Practice

Sheet Metal Work:

a) Forming & Bending:
b) Model making – Trays, funnels, etc.
c) Different type of joints.

Machine assembly practice:

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

Demonstration on:

a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
b) Foundry operations like mould preparation for gear and step cone pulley.
c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement and comparison of energy for resistive and LED load using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.
7.

IV ELECTRONICS ENGINEERING PRACTICE

1. Identification of circuit components
    a) Resistor, capacitor, diode (PN & Zener), transistors.
    b) Soldering practice – Circuits – Using general purpose PCB.
2. Evaluating the parameters for DC power supply and AC power supply (peak-peak, rms, average, period, frequency) using function generator and CRO.
3. Study and implementation of logic functions using NAND, NOR, and NOT gates.
4. VI Characteristics of PN Junction diode.
5. VI Characteristics of Solar photovoltaic panel.
6. Design a 5V/12V Regulated Power Supply: using FWR rectifier and IC7805/IC7812.

TOTAL: 45 PERIODS

OUTCOMES:

- Fabricate carpentry components and to lay pipe connections including plumbing works.
- Use welding equipments to join the structures.
- Perform wiring of basic electrical system and measurement of electrical parameters.
- Implement the basic electronic components, circuits and solar photovoltaic panel.
- Design a basic regulated power supply.

REFERENCES:

1. Jeyachandran K., Natarajan S. & Balasubramanian S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
2. Jeyapoovan T., Saravanapandian M. & Pranitha S., "Engineering Practices Lab Manual", Vikas Puplishing House Pvt.Ltd, 2006.
3. Bawa H.S., "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2007.
4. Rajendra Prasad A. and Sarma P.M.M.S., "Workshop Practice", Sree Sai Publication, 2002.
5. Kannaiah P. & Narayana K.L., "Manual on Workshop Practice", Scitech Publications, 1999.
6. Mittle V.N, Arvind Mittal, "Basic Electrical Engineering", Tata McGraw Hill(India), Second Edition,2013.
7. Sedha R.S., "A Text Book of Applied Electronics", S. Chand & Co., 2014.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No.	Description of Equipment	Qty
	CIVIL	
1.	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets.
2.	Carpentry vice (fitted to work bench)	15 Nos.
3.	Standard woodworking tools	15 Sets.
4.	Models of industrial trusses, door joints, furniture joints	5 each
5.	Power Tools: (a) Rotary Hammer (b) Demolition Hammer (c) Circular Saw (d) Planer (e) Hand Drilling Machine (f) Jigsaw	2 Nos
	MECHANICAL	
1.	Arc welding transformer with cables and holders	5 Nos.
2.	Welding booth with exhaust facility	5 Nos.
3.	Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
4.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5.	Centre lathe	2 Nos.
6.	Hearth furnace, anvil and smithy tools	2 Sets.
7.	Moulding table, foundry tools	2 Sets.
8.	Power Tool: Angle Grinder	2 Nos
9.	Study-purpose items: centrifugal pump, air-conditioner	1 each
	ELECTRICAL	
1.	Assorted electrical components for house wiring	15 Sets
2.	Electrical measuring instruments	10 Sets
3.	Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4.	Megger (250V/500V)	1 No.
5.	Power Tools: (a) Range Finder 2 Nos (b) Digital Live-wire detector	2 Nos.
6.	LED lamp 8 W & 16 W	2 Nos. each

ELECTRONICS

1.	Soldering guns	10 Nos.
2.	Assorted electronic components for making circuits	50 Nos.
3.	Small PCBs	10 Nos.
4.	Multimeters	10 Nos.
5.	Study purpose ICs: IC7805/IC7812	1 each
6.	Photovoltaic panel: 5 W/10 W	2 Nos.
7.	Light Source for PV panel	1 No.

IT18111	PROGRAMMING FOR PROBLEM SOLVING LABORATORY	L	T	P	C
		0	0	3	1.5

(Common to All Branches Except MR)

OBJECTIVES

The students should be made to:

- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

LIST OF EXERCISES

1. Usage of Basic Linux commands
2. C Programming using Simple statements and expressions
3. Scientific problem solving using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings
6. C Programming using Pointers
7. C Programming using user defined functions (Pass by value and Pass by reference)
8. C Programming using Recursion
9. C Programming using structures and union
10. C Programming using enumerated data types
11. C Programming using macros and storage classes
12. C Programming using Files

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Demonstrate the shell commands of Linux OS.
- Apply problem solving techniques using Basic 'C' constructs.
- Demonstrate various control structures and advanced constructs in C language.
- Demonstrate the use of functions, structures, unions and pointers in developing modularized applications.
- Experiment data handling and data processing using files in ‘C’ language.

REFERENCES :

1. Pradip Dey, Manas Ghosh, “ Programming in C ”, First Edition, Oxford University Press, 2018.
2. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Third Edition, Tata McGraw-Hill, 2010

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	Description of Equipment	Qty
HARDWARE:		
1.	Computer	30
SOFTWARE:		
2.	Open Source Linux OS	30
3.	C compiler	30

HS18251	TECHNICAL ENGLISH	L	T	P	C
	(Common to All Branches)	3	0	0	3

OBJECTIVES

- To enable learners define and understand technical communication and scientific writing
- To expose learners to nuances of seminar presentation, group discussion, and public speaking
- To expose learners to writing for scientific purposes
- To expose learners to drafting correspondences for business purposes
- To expose learners to writing for documenting purposes
- To enable students have a holistic understanding of job interviews and recruiting process.

UNIT I **9**

Listening – AV files pertaining to manufacturing processes of products, scientific documentaries; Speaking- syllable division and word stress, intonation, sharing opinions; Reading – news articles related to science and technology; Writing – definitions, instruction, recommendation, data interpretation, resume; Grammar – tenses and their aspects, sentence connectors - discourse markers, sequential words, active and passive voice, subject-verb agreement.

UNIT II **9**

Listening – AV pertaining to marketing strategies, peer reading and pronunciation; Speaking - turn taking, sharing opinions; conducting and attending a meeting, understanding the nuances of spoken communication among internal audience and external audience,; Reading - analytical documents, descriptive documents; Writing - fliers, brochures, resume- letter of application, checklists; Grammar - modal verbs, clauses – types and uses, conditional clauses, articles.

UNIT III **9**

Listening – AV related to how to use components, scientific description, Speaking - speaking for motivation and initiation, speaking at a seminar presentation; Reading – scientific journals, papers; Writing – Technical descriptions – process description, purpose and function, PowerPoint, Google forms, user manuals; Grammar - phrasal verbs, prepositions, technical and scientific affixes.

UNIT IV **9**

Listening - scientific debates, crisis management; Speaking - handling conflicts, speaking about the loss of benefits, progress or decline of business, identifying the connotative meanings, Reading- documented evidences of uses and functions of a product, review of a product, Writing – memos, follow-up letters, reports - proposal, project, progress reports, sales reports, reports on industrial visits, executive summary. Grammar - reported speech and tag questions, sentence structure – comparative, imperative, cause and effect, infinitive of result.

UNIT V **9**

Listening – AV of Group discussions, panel discussions, face to face interviews for recruitment purposes; Speaking- speaking at group discussions, interviewing a personality, answering at the interviews; Reading – WebPages of topnotch engineering companies, Writing - blogging, e-mails, letter of complaint, minutes of the meeting ; Grammar - one word substitution, collocations, better word/sentence substitution (rephrasing the content/improvising ideas).

TOTAL: 45 PERIODS

Suggested Activities [task based] – case study, guest lectures as models, problem solving, understanding team work.

OUTCOMES:

At the end of the course, learners will be able to:

- Understand the nuances of technical communication and scientific writing
- Present papers and give seminars
- Discuss in groups and brainstorm
- Draft business correspondences and write for documenting purposes
- Face job interviews with confidence

REFERENCES:

1. Department of English, Anna University. Mindscapes : English for Technologists and Engineers. Orient Blackswan, Chennai. 2012.
2. Downes, Colm, Cambridge English for Job-hunting, Cambridge University Press, New Delhi. 2008
3. Murphy, Raymond, Intermediate English Grammar with Answers, Cambridge University Press 2000
4. Thomson, A.J. Practical English Grammar 1& 2 Oxford 1986.
5. Herbert A J, The Structure of Technical English Longman, 1965

WEBSITES:

1. http://www.usingenglish.com
2. http://www.uefap.com3
3. https://owl.english.purdue.edu/owl/
4. www.learnenglishfeelgood.com/esl-printables-worksheets.html

SOFTWARE:

- Face2Face Advance – Cambridge University Press, 2014
- English Advance Vocabulary- Cambridge University Press
- IELTS test preparation – Cambridge University Press 2017
- Official Guide to the TOEFL Test With CD-ROM, 4th Edition
- CAMBRIDGE Preparation for the TOEFL TEST- Cambridge University Press, 2017

MA18251	ENGINEERING MATHEMATICS II (Common to all Branches Except MR)	L	T	P	C
		3	1	0	4

OBJECTIVES

- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I VECTOR CALCULUS 12

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 12

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

UNIT III LAPLACE TRANSFORM 12

Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transforms -Statement of Convolution theorem – Initial and final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

UNIT IV ANALYTIC FUNCTION 12

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping- Translation, rotation and inversion (w = z+c, cz, 1/z, z2) - Bilinear transformation. .

UNIT V COMPLEX INTEGRATION 12

Complex integration –Statement and applications of Cauchy's integral theorem and Cauchy's integral formula –Taylor's and Laurent's series expansions – Singular points– Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

TOTAL(L:45+T:15):60 PERIODS

OUTCOMES:

At the end of the course, learners will be able to:

- Interpret the fundamentals of vector calculus and be fluent in the use of Stokes theorem and Gauss divergence theorem.
- Express proficiency in handling higher order differential equations.
- Determine the methods to solve differential equations using Laplace transforms and Inverse Laplace transforms.
- Explain Analytic functions and Categorize transformations.
- Solve complex integrals using Cauchy integral theorem and Cauchy's residue theorem.

TEXT BOOKS:

1. Erwin Kreyszig, Advanced engineering mathematics, 8th Edition, John Wiley, 1999.
2. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth edition, Laxmi Publications Pvt Ltd., 2011.
3. Grewal. B.S, "Higher Engineering Mathematics", 41stEdition, Khanna Publications, Delhi, 2011.

REFERENCES:

1. Dass, H.K., and Er.Rajnish Verma, "Higher Engineering Mathematics", S.Chand Private Ltd.,2011.
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.
3. Peter V.O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning, 2012.
4. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company New Delhi, 2008.
5. Sivarama Krishna Das P. and Rukmangadachari E., "Engineering Mathematics", Volume I, Second Edition, PEARSON Publishing, 2011.

GE18151	ENGINEERING DRAWING (Common To All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

- This course will introduce students to Engineering Drawing and build their ability to read drawings and interpret the position and form of simple geometry, culminating into understanding of simple technical assemblies.

UNIT 0 ENGINEERING DRAWING FUNDAMENTALS 5
(Not for Examination)

Drawing standard: BIS, Lettering,Dimensioning, Type of lines, Conventions, Geometrical constructions: Dividing a straight line into equal parts, Bisecting a given angle, Construction of polygon – Triangle, Square, Pentagon and Hexagon using drawing tools.

UNIT I CURVES AND PROJECTION OF POINTS AND LINES 15

Construction of Engineering Curves: Conic Sections - Ellipse, Parabola, Hyperbola using Eccentricity method, Cycloid, Involute of Circle and Pentagon.

Projection: Principal Planes, Projection of Points using Four Angles of Projection, Projection of Straight Lines - Lines parallel or inclined to one or both planes using Rotating Line Method in First Angle of Projection.

UNIT II PROJECTION OF PLANES AND SOLIDS 15

Projection of Plane Figures – Inclined to any one Principal Plane, Projection of Solids – Simple Solids (Prisms, Pyramids, Cone and Cylinder) axis inclined to any one Principal Plane.

UNIT III SECTION OR SOLIDS & DEVELOPMENT OF SURFACES 15

Section of Solids –Sectional views of simple vertical solids cut by section plane inclined to any one Principal Plane.

Development of Surfaces – Development of lateral surfaces of truncated and frustum of simple solids.

UNIT IV PICTORIAL PROJECTION 15

Introduction to Pictorial Projection, Isometric Projection - Principle, Isometric Planes, Isometric Scales, Isometric Projection of simple solids and their combination.

Free Hand Drawing - Orthographic Projection - Orthographic views of simple blocks from their Isometric view, Isometric view of simple blocks from their Orthographic views.

UNIT V PERSPECTIVE PROJECTION 10

Perspective Projection of full solids in simple positions with respect to projection planes by visual ray and vanishing point method.

TOTAL: 75 PERIODS

OUTCOMES:

On Completion of the course the student will be able to

- Understand the importance of BIS Standards in Engineering Drafting
- Graphically construct and understand the importance of Conic sections and special curves in Engineering applications
- Given a problem statement in geometric elements such as points, lines, planes, solids, Orthographic projections will be drafted.
- Draw the orthographic projections of sectioned solids and also will Develop their surfaces
- Interpret Orthographic, Isometric and Perspective views of objects

TEXT BOOKS:

1. Bhatt N.D, Panchal Pramod V.M and Ingle R, "Engineering Drawing", Charotar Publishing House, 2014.

REFERENCES:

1. Venugopal K and Prabhu Raja V, "Engineering Graphics", New Age International (P) Limited, 2009.
2. Shah M.B and Rana B.C, "Engineering Drawing", Pearson Education, 2009.
3. Gopalakrishna K.R, "Engineering Drawing" (Vol. I & II), Subhas Publications, 2010.
4. Natrajan K.V, "A Textbook of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2006.
5. Gowri S and Jeyapoovan T, "Engineering Graphics", Vikas Publishing House Pvt. Ltd., 2011.

GE18251	ENVIRONMENTAL SCIENCE AND ENGINEERING (Common To All Branches)	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the nature and facts about environment.
- To study the interrelationship between living organism and environment.
- To implement scientific, technological, economic and political solutions to environmental problems.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 12

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems, Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity - Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity - man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT II NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people - Water resources: Use and over - utilization of surface and ground water, floods, drought, conflicts over water, dams - benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies - Land resources: Land as a resource - role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles.

UNIT III ENVIRONMENTAL POLLUTION AND DISASTER MANAGEMENT 10

Definition - causes, effects and control measures Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards - solid waste management: causes, effects and control measures of municipal solid wastes, e-Waste, risk related to e-Waste - role of an individual in prevention of pollution - pollution case studies - disaster management: floods, earthquake, cyclone and landslides, land degradation, man induced landslides, soil erosion and desertification.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

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, case studies – role of non-governmental organization- Environmental ethics: Issues and possible solutions – Principles of green chemistry, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – 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 – central and state pollution control boards - Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS, Swine flu, Dengue fever – women and child welfare – role of information technology in environment and human health management – case studies.

TOTAL : 45 PERIODS

OUTCOMES:

On completion of the course, the student will be able to

- Solve problems that cannot be solved by mere environmental laws
- Acquire awareness on environmental issues at their infant stage
- Integrate facts, concepts and methods for multiple disciplines and apply them to solve environmental and social problems.
- Analyse the connectivity between manmade activities – pollution – environmental issues – social problem and provide eco-friendly solutions.

TEXT BOOKS:

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2012.
2. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2010.

REFERENCES:

1 Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi, 2012.
2 Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hydrabad, 2015.
3 Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2011.
4 Tyler Miller. G and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2013.

CS18201 **DIGITAL PRINCIPLES & SYSTEM DESIGN** **L T P C**

(Common To CS & IT) **3 0 0 3**

OBJECTIVES

- To understand various number systems, different methods used for the simplification of Boolean functions
- To design and implement a system that uses combinational logic for the given specification; Simulate combinational logic systems using verilog or VHDL
- To design and implement synchronous sequential system for the given specification; Simulate sequential logic systems using verilog or VHDL.
- To design and implement Asynchronous sequential system for the given specification.
- To design and implement memory accessing systems and systems using PLA, PAL.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Review of Number Systems – Arithmetic Operations – Binary Codes – Boolean algebra and Theorems – Boolean Functions - Logic Gates – Simplification of Boolean Functions using Karnaugh Map and Tabulation Methods-NAND & NOR Implementation

UNIT II COMBINATIONAL CIRCUITS 9

Combinational Circuits – Analysis and Design Procedures – Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders – Multiplexers and De-multiplexers – Tri-State Gates– Introduction to HDL programs

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9

Latches and Flip Flops – Analysis and Design Procedures –Shift Registers – Counters –State Diagram, State Table, State Assignment & Minimization

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9

RAM - Memory Decoding – Error Detection and Correction- ROM–Programmable Logic Array – Programmable Array Logic

TOTAL : 45 PERIODS

OUTCOMES:

- Identify the components required for designing a network.
- Demonstrate a network at high-level using different networking technologies.
- Compare and Contrast the various protocols of wireless and cellular networks.
- Classify the features of 4G and 5G networks.
- Describe the principles for network design.

TEXT BOOKS:

1. Morris Mano M and Michael D. Ciletti, "Digital Design with An Introduction to Verilog HDL", 5th Edition, Pearson Education India, 2013.

REFERENCES:

1. John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson

Education, 2007.
2. Charles H. Roth Jr, "Fundamentals of Logic Design", Fifth Edition, Jaico Publishing House, Mumbai, 2003.
3. Donald D. Givone, "Digital Principles and Design", Tata McGraw Hill, 2003.
4. Kharate G. K., "Digital Electronics", Oxford University Press, 2010.
5. Morris Mano, "Computer System Architecture", Third Edition, Pearson Education India, 2007.
6. https://www.cs.tcd.ie/John.Waldron/CS1026/lec9adder.pdf
7. http://digitalbyte.weebly.com/code-converters.html
8. http://www.learnabout-electronics.org/Digital/dig44.php
9. http://ece.gmu.edu/~clorie/Spring11/ECE-301/Lectures/Lecture_16.pdf
10. https://www.iitg.ernet.in/asahu/cs221/Lects/Lec11.pdf.

IT18201	OOPS USING C++ AND PYTHON	L	T	P	C
		3	0	0	3

OBJECTIVES

- Be familiar with the C++ concepts of abstraction, encapsulation, constructor, polymorphism, overloading and Inheritance.
- Be familiar with objects in python.
  Be familiar with python data structures and design patterns.

UNIT I OBJECT ORIENTED PROGRAMMING FUNDAMENTALS 9

C++ Programming features - Data Abstraction - Encapsulation - Class -Object - Constructors – Static members – Constant members – Member functions – Pointers – References - Role of this pointer – String Handling.

UNIT II OBJECT ORIENTED PROGRAMMING CONCEPTS 9

Dynamic memory allocation - Nested classes - Polymorphism – Compile time and Run time polymorphisms – Function overloading – Operator overloading - Inheritance – Virtual Functions - Abstract class.

UNIT III C++ PROGRAMMING ADVANCED FEATURES 9

Generic Programming - Function template - Class template - Exception handling - Standard template libraries – containers – iterators – function adaptors – allocators - File handling concepts.

UNIT IV OBJECTS IN PYTHON 9

Creating python classes, modules and packages, basic inheritance and multiple inheritance, Managing objects

UNIT V PYTHON DATA STRUCTURES AND DESIGN CONCEPTS 9

Tuples, Dictionaries, List, Sets, Built-in functions, Design patterns-Decorator, Observer, Strategy, State, Singleton, Template.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Examine the features and basics of OOPS.
- Apply the various features of object oriented programming to construct applications in C++.
- Develop the software using advanced features of Object oriented programming to solve real time problems.
- Develop the programs to implement the basics of python
- Choose the data structures and design patterns to construct applications using python

TEXT BOOKS:

1. Bjarne Stroustrup, “The C++ Programming Language”, 4th Edition, Addison-Wesley Professional, 2013.
2. Dusty Philips Python 3 Object-oriented Programming - Second Edition 2015, packt publishers.

REFERENCES:

1. KR.Venugopal& Rajkumar Buyya “ Mastering C++”, second edition 2013.
2. Reema Thareja "PYTHON PROGRAMMING Using Problem Solving Approach", Oxford University Press, 2017.

CS18211	DIGITAL PRINCIPLES & SYSTEM DESIGN LABORATORY (Common To CS & IT)	L	T	P	C
		0	0	3	1.5

OBJECTIVES

- To be an adjunct to the "Digital Principles and System design" Course through hands-on experience with design, construction, and implementation of digital circuits like combinational /sequential
- To provide the capability to understand and to simulate digital circuits through Xilinx

LIST OF EXPERIMENTS

1. Study of logic gates
2. Verification of Boolean theorems.
3. Combinational circuits-Implementation of arbitrary functions and code converters.
4. Design and implementation of Binary adder/subtractor.
5. Design and implementation of Parity generator/checker.
6. Design and implementation of magnitude comparator.
7. Design and implementation of applications using multiplexers.
8. Study and Implementation of Flip-Flops.
9. Design and implementation of shift registers.
10. Design and implementation of synchronous and asynchronous counters
11. Coding combinational circuits using hardware description language. (HDL s/w required)
12. Coding sequential circuits using HDL. (HDL s/w required)
13. Design and implementation of simple digital System(Mini Project)

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Enumerate the working of various logic gates.
- Enumerate the various combinational circuits and their applications.
- Analyse and design sequential circuits.
- Use the HDL softwares.
- Design various building blocks of digital computers

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Digital Trainer Kits
2. Bread board and components
3. PC s – with Xilinx for HDL
4. IC tester-1

IT18211	OOPS USING C++ AND PYTHON LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES

The students should be made to:

- To understand the concepts of Object Oriented Programming
- To understand the features of C++ constructs.
- To understand python data structures and design patterns

List of Exercises

Creating simple applications using C++ by implementing the following concepts

1. Constructors and Destructor.
2. Friend Function and Friend Class.
3. Polymorphism and Function Overloading.
4. Overload Unary and Binary Operators Both as Member Function and Non Member Function.
5. Inheritance.
6. Virtual Functions.
7. Class Templates and Function Templates.
8. Exception Handling Mechanism.
9. Standard Template Library concept

Creating simple applications using Python by implementing the following concepts

1. Classes, Modules and Packages
2. Basic Inheritance and Multiple Inheritance
3. Tuples, Dictionaries, List, Sets
4. Built-in functions
5. Design patterns.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Develop programs using OOPS concepts to solve the problems
- Apply design patterns to design the solution for the problem
- Choose inheritance, polymorphism or exception handling mechanism to implement reusable robust C++ programs
- Apply the concepts of classes, packages, data structures using python
- Design user interface using C++ and Python for the real time applications.

REFERENCES:

1. Bjarne Stroustrup, “The C++ Programming Language”, 4th Edition, Addison-Wesley Professional, 2013.
2. Dusty Philips Python 3 Object-oriented Programming - Second Edition 2015, packt publishers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Computers installed with Linux OS/Windows OS and Python Compiler - 30 No.s

MA18352	DISCRETE MATHEMATICS (Common to CS and IT)	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To extend student's Logical and Mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the fundamental concepts of the Graph theory and Network connectivity.

UNIT I PROPOSITIONAL LOGIC AND PROOFS 9+3

Propositional Logic – Propositional equivalences – Predicates and Quantifiers – Nested Quantifiers – Rules of inference.

UNIT II COMBINATORICS 9+3

Mathematical induction- The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT III GRAPH THEORY 9+3

Graphs and Graph models- Graph terminology and special types of Graphs – Matrix representation of Graphs and Graph isomorphism – connectivity – Eulerian and Hamiltonian Graphs.

UNIT IV ALGEBRAIC STRUCTURES 9+3

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA 9+3

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

At the end of the course, students would:

- Test the logic of a program.
- Identify structures on many levels.
- Demonstrate a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
- Demonstrate the counting principles.
- Demonstrate concepts and properties of algebraic structures such as groups, rings and fields.

TEXT BOOKS:

1. Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to ComputerScience", Tata Mc Graw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
2. Kenneth H.Rosen, "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
3. Bondy J A and Murthy U S R , Graph Theory with Applications, Elsevier Science Publishing Co. Inc. New York, 1982.

REFERENCES:

1. Ralph P.Grimaldi., "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Thomas Koshy., "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. Seymour Lipschutz and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

IT18301	IT ESSENTIALS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To know the difference between data and information
- To introduce the concept of Internet, Networks and its working principles.
- To know scripting languages.
- To understand various applications related to Information Technology.

UNIT I INFORMATION SYSTEMS 9

Data and Information, Acquisition of Data – Text – Image – Audio - Video, Internet Application, E-commerce, Business Information Systems, Social Impact of Information Technology.

UNIT II WEB ESSENTIALS 9

Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server.

UNIT III SCRIPTING ESSENTIALS 9

Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts.

UNIT IV NETWORKING ESSENTIALS 9

Fundamental computer network concepts - Types of computer networks - - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi - Network Routing - Switching - Network components.

UNIT V MOBILE COMMUNICATION ESSENTIALS 9

Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies / architecture - Voice calls & SMS.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Choose the various information systems and technologies may improve an organization's performance.
- Develop web based applications using suitable client side and server side web technologies.
- Appraise the requirements and build static, dynamic and interactive Web pages.
- Relate the general principles and technological components of Computer networks.
- Demonstrate their understanding on functioning of cellular radio concepts and standards.

TEXT BOOKS:

1. V. Rajaraman, "Introduction to Information Technology", PHI Learning , Second Edition, 2013
2. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY, 2014.
3. James F. Kurose, ―Computer Networking: A Top-Down Approach‖, Sixth Edition, Pearson, 2012.

REFERENCES:

1. GottapuSasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012.
2. R. Kelly Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014.

IT18302 COMPUTER ORGANIZATION AND ARCHITECTURE

L	T	P	C
3	0	0	3

OBJECTIVES:

- To make students understand the basic structure and operation of digital computer
- To understand the hardware-software interface
- To familiarize the student with arithmetic and logic unit and implementation of fixed point and floating point arithmetic operations.
- To expose the students to the concept of pipelining
- To familiarize the students with hierarchical memory system including cache memory and virtual memory
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I BASIC COMPUTER ORGANIZATION AND DESIGN 9

Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions,Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.

UNIT II ALU AND CU 9

ALU - Addition and subtraction – Multiplication – Division – Floating Point operations –Subword parallelism. CPU- General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC).

UNIT III PIPELINING AND HAZARDS 9

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions, The ARM Cortex-A8 and Intel Core i7 Pipelines.

UNIT IV MEMORY AND I/O SYSTEMS 9

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance -- Input/output system, programmed I/O, DMA and interrupts, I/O processors.

UNIT V MULTICORES, MULTIPROCESSORS, AND CLUSTERS 9

Shared Memory Multiprocessors, Clusters and Other Message-Passing Multiprocessors Hardware Multithreading, SISD, MIMD, SIMD, SPMD, and Vector, Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers, and Other Message-Passing Multiprocessors.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Build the basic structure of computer, operations and instructions
- Design arithmetic and logic unit
- Discuss the pipelined execution and design control unit
- Evaluate performance of memory systems
- Construct the parallel processing architectures

TEXT BOOKS:

1. David A. Patterson and John L. Hennessey, “Computer organization and design“, Morgan kauffman / elsevier, Fifth edition, 2014.

REFERENCES:

1. V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, “Computer Organisation“, VI edition, McGraw-Hill Inc, 2012.
2. William Stallings “Computer Organization and Architecture”, Seventh Edition, Pearson Education, 2006.
3. Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, Second Edition, Pearson Education, 2005.
4. Govindarajalu, “Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.
5. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill, 1998.
6. http://nptel.ac.in/.

IT18303 INFORMATION AND CODING THEORY L T P C
3 0 0 3

OBJECTIVES:

- To understand encoding and decoding of digital data streams.
- To have a complete understanding of error–control coding.
- To have a detailed knowledge of compression and decompression techniques.

UNIT I INFORMATION ENTROPY FUNDAMENTALS 9

Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.

UNIT II DATA AND VOICE CODING 9

Pulse Amplitude Modulation, Pulse Code Modulation, Time Division Multiplexer, Digital Multiplexers,Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC).

UNIT III ERROR CONTROL CODING 9

Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes-Code tree, Trellis Diagram, Viterbi decoding.

UNIT IV COMPRESSION TECHNIQUES 9

Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards.

UNIT V AUDIO AND VIDEO CODING 9

Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG Video standards.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of course the students will able

- Calculate Entropy, mutual information and channel capacity for various channels
- Demonstrate different encoding and decoding of digital data streams.
- Evaluate various methods of generating and detecting different types of error correcting codes
- Identify different compression and decompression techniques.
- Evaluate the performance of digital communication system by evaluating the probability of error for different error-correcting codes.

TEXT BOOKS:

1. Simon Haykin, “Communication Systems”, John Wiley and Sons, 4th Edition, 2004.
2. Khalid Sayood, “Introduction to Data Compression”, Fifth Edition,Elsevier, 2017

REFERENCES:

1.Fred Halsall, “Multimedia Communications, Applications Networks Protocols and Standards”, Pearson Education, Asia 2002.
2.R Bose, “Information Theory, Coding and Cryptography”, Fifth Edition, Tata Mcgraw Hill, 2009.

IT18304	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Be exposed to implementing abstract data types .
- Learn to implement sorting and searching algorithms.

UNIT I LINEAR DATA STRUCTURES - I **9**

Arrays – ADT - Linked Lists – Singly Linked List – Doubly Linked List – Circular Linked List – Applications of Linked Lists – Polynomial Manipulation – Problems on Linked Lists

UNIT II LINEAR DATA STRUCTURES – II **9**

Stack ADT – Applications – Expression Conversion – Expression Evaluation – Problems on Stacks - Queue ADT – Linear Queue - Circular Queue – Problems on Queues

UNIT III NON LINEAR DATA STRUCTURES – I **9**

Trees – Binary Trees – Expression Trees - Binary Search Trees – Operations - AVL Trees – Operations – Binary Heaps – Min Heap – Max Heap

UNIT IV NON LINEAR DATA STRUCTURES – II **9**

Graphs – Applications - Representation – Topological Sort – Single Source Shortest Path Algorithm – All Pair Shortest Path Algorithm – Minimal Spanning Trees - Problems on Graph algorithms

UNIT V SORTING AND SEARCHING **9**

Need for Sorting– Classification of Sorting algorithms – Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Linear Search – Binary Search – Hashing

TOTAL: 45 PERIODS

OUTCOMES:

At the end of course the students will able

- Apply the concepts of ADT to design efficient algorithms.
- Select suitable linear data structures to solve computational problems.
- Choose appropriate non-linear data structures to solve computational problems
- Develop solution for real world problems using hashing, Sorting, and Searching algorithms
- Experiment the use of appropriate data structures and design efficient algorithms to develop software applications.

TEXT BOOKS:

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

REFERENCES:

1. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education,1983
2. Narasimha Karumanchi, “Data Structures and Algorithms Made Easy”, CareerMonk, 2016.
3. Narasimha Karumanchi, “Data Structures and Algorithmic Thinking with Python”, CareerMonk, 2015.
4. Thomas H Cormen at el, “Introduction to Algorithms”, 3e The MIT Press, 2009.

IT18305	DATABASE SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To learn about the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
- To have an introductory knowledge about the Storage and Query processing Techniques

UNIT I RELATIONAL DATABASES 9

Purpose of Database System – Levels of Data Abstraction – Data Models– Database System Architecture, – Introduction to relational databases - Relational Model - Keys -- Relational Algebra – Relational Calculus - SQL fundamentals - Advanced SQL features- Triggers- Embedded SQL– Dynamic SQL - Database connectivity.

UNIT II DATABASE DESIGN 9

Entity-Relationship Model – E-R Diagrams – Motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's–, Non-loss Decomposition– First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form - Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTION MANAGEMENT 9

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit -- Save Points – Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Recovery Isolation Levels.

UNIT IV IMPLEMENTATION TECHNIQUES 9

Overview of Physical Storage Media – RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Evaluation of relational algebra expressions, query equivalence, join strategies, query optimization algorithms.

UNIT V ADVANCED TOPICS 9

NoSQL databases - Hbase,MongoDB, Cassandra, CouchDB, Neo4J,In-memory Database - Redis, Object Relation Map - Alkami, Distributed databases, Spatial Databases, Temporal Databases, XML Databases, Multimedia Databases.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

At the end of course the students will able

- Evaluate the basic concepts and various data model used in database design ER modelling concepts and architecture use and design queries using SQ
- Apply various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.
- Apply concurrency control and recovery mechanisms for practical problems
- Interpret internal storage structure based on the requirement
- Evaluate the types of database and use for real world applications

TEXT BOOKS:

1. RamezElmasri, Shamkant B. Navathe, Fundamentals o f Database Systems , Seventh Edition, Pearson Education, 2016.

REFERENCES:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2010.
2. Raghu Ramakrishnan, Johannes Gehrke Database ManagementSystems, Fourth Edition, Tata Mc Graw Hill, 2010.
3. G.K.Gupta, TDatabase Management Systems, Tata McGraw Hill, 2011.

4 Carlos Coronel, Steven Morris, Peter Rob, Database Systems: Design, Implementation and Management, Ninth Edition, Cengage Learning

5 Bipin Desai, An Introduction to Database Systems, Galgotia .

6 Pang, N. T., Steinbach, M. and Kumar,V., “Introduction to Data Mining”, Pearson Education.

IT18311	IT ESSENTIALS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop simple websites and mobile applications.
- To incorporate multimedia elements in websites.
- To gain knowledge about how to set up simple network.

List of Exercises

1. Develop static web pages - using HTML and Authoring Tools
2. Develop interactive web pages using HTML and Authoring Tools
3. Incorporate dynamism in websites - PHP scripts
4. Incorporating images in web pages.
5. Incorporating audio elements in web pages.
6. Develop simple mobile applications.
7. Develop Personal information system
8. Study of networking components
9. Set up a simple network

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design both front end and back end portions of web application(FULL STACK
- DEVELOPMENT).
- Develop IT enabled applications.
- Develop simple mobile applications for Android OS.
- Develop Personal Information System for an organization.
- Set up a simple network using network components.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:
Java, MySQL or Equivalent, Apache Server, Android SDK.

HARDWARE:
Standalone desktops 30 Nos

IT18312	DATA STRUCTURES AND ALGORITHMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

The student should be made to:

- Be exposed to implementing abstract data types
- Learn to implement sorting and searching algorithms

LIST OF EXPERIMENTS:

1. Implementation of problems on Array of structures
2. Implementation of Singly Linked List operations
3. Implementation of Doubly Linked List operations
4. Implementation of Circular Linked List operations
5. (a)Implementation of Stack operations
   (b) Application of Stack – Expression conversion
   (c) Application of Stack – Expression evaluation
6. (a) Implementation of Linear Queue operations on an application
   (b) Implementation of Circular Queue operations on an application
7. Implementation of Binary search Tree operations on an application
8. Implementation of AVL Tree operations on an application
9. (a) Implementation of Min Heap operations on an application
   (b) Implementation of Max Heap operations on an application
10. Implementation of Dijkstra's algorithm for Single Source Shortest Path problem
11. Implementation of Warshall algorithm for All Pair Shortest Path problem
12. (a) Implementation of Bubble Sort on an application
    (b) Implementation of Insertion Sort on an application
    (c) Implementation of Selection Sort on an application
13. Implementation of Hash Table on an application
14. (a) Implementation of Linear Search on an application
    (b) Implementation of Binary Search on an application

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Use appropriate linear and non-linear data structures in various applications.
- Illustrate different operations applied on tree data structures.
- Apply various algorithmic techniques on graph data structures.
- Implement various sorting and searching techniques.
- Choose appropriate hashing techniques for efficient data storage and retrieval.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

Or

Server with C compiler supporting 30 terminals or more.

IT18313	DATABASE SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

The student should be made to:

- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of data bases
- To be familiar with the use of a front end tool
- To understand design and implementation of typical database applications

LIST OF EXPERIMENTS:

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins
3. Views, Sequences, Synonyms
4. Database Programming: Implicit and Explicit Cursors
5. Procedures and Functions
6. Triggers
7. Exception Handling
8. Database Design using ER modeling, normalization and Implementation for an application
9. Database Connectivity with Front End Tools
10. Case Study using real life database applications

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design and implement a database schema for a given problem domain
- Create and maintain tables using PL/SQL
- Analyze the database using queries to retrieve records
- Analyze an information storage problem and derive an information model
- Create the application using PL/SQL and front-end tools

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:

Standalone desktops 30 Nos.
(or)
Server supporting 30 terminals or more.

SOFTWARE:

Front end: VB/VC ++/JAVA or Equivalent
Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent

MA18453 PROBABILITY AND QUEUEING THEORY L T P C

(Common to CS and IT)

3 1 0 4

OBJECTIVES:

To provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.

UNIT I RANDOM VARIABLES 12+3

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 8+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression for two variables– Transformation of random variables.

UNIT III RANDOM PROCESSES 9+3

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

UNIT IV QUEUEING MODELS 8+3

Markovian queues – Birth and Death processes – Single and multiple server queueing models – Little's formula - Queues with finite waiting rooms - Finite source models

UNIT V ADVANCED QUEUEING MODELS 8+3

M/G/1 queue – PollaczekKhinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

The students will be able to

- Describe commonly used univariate discrete and continuous probability distributions by formulating fundamental probability distribution and density functions, as well as functions of random variables.
- Develop skills in dealing with scenarios involving multiple random variables.
- Express and characterize phenomenon which evolve with respect to time in a probabilistic manner
- Acquire skills in analyzing queueing models
- Develop skills in identifying best techniques to solve a specific problem

TEXT BOOKS:

1. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2. Gross. D. and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student edition, 2004.

REFERENCES:

1. Robertazzi, "Computer Networks and Systems: Queueing Theory and performance evaluation",Springer, 3rd Edition, 2006.
2. Taha H.A., "Operations Research", Pearson Education, Asia, 8th Edition, 2007.
3. Veerarajan. T, "Probability, statistics and random processes", McGraw Hill Publishers, 3rd edition, 2011.
4. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
5. Yates R.D. and Goodman. D. J., "Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.

IT18401 PARADIGMS OF ALGORITHM DESIGN

L	T	P	C
3	1	0	4

OBJECTIVES:

- To provide foundation on designing algorithms, complexity analysis of algorithms, and computational complexity.
- To learn the basics of Parallel algorithm and greedy algorithms.

UNIT I FUNDAMENTALS **9+3**

Algorithms - The Importance of Developing Efficient Algorithms - Analysis of Algorithms Order - Computational Complexity-sorting , searching, hashing, selection problem.

UNIT II ALGORITHMIC STRATEGY **8+3**

Divide-and-Conquer - Sorting -Searching- Strassen's Matrix Multiplication Algorithm Arithmetic with Large Integers. Dynamic Programming - Binomial co-efficient - Floyd's Algorithm for Shortest Paths - Chained Matrix Multiplication - Dynamic Programming and Optimization Problems- Optimal Binary Search Trees - The Traveling Salesperson Problem.

UNIT III DESIGN TECHNIQUES **12+3**

Greedy Approach - Minimum Spanning Trees-scheduling - The Greedy Approach versus Dynamic Programming: The Knapsack Problem – Backtracking - Using a Monte Carlo Algorithm - The Sum-of-Subsets Problem - Graph Coloring - The Hamiltonian Circuits Problem - Branch-and-Bound - Best-First Search.

UNIT IV NP-COMPLETENESS **7+3**

NP-completeness – Polynomial Time - Polynomial Time Verification - Reducibility - NP-completeness proofs - Approximation Algorithms - Vertex-Cover problem – Travelling-Salesman problem.

UNIT V PARALLEL ALGORITHMS **9+3**

Parallel Architectures - The PRAM Model - Designing Algorithms for the CREW PRAM Model - Designing Algorithms for the CRCW PRAM Model.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Develop simple and recursive algorithms to different problems
- Investigate the complexity of simple and recursive algorithms to different problems
- Solve computational problems using various algorithm design strategies
- Explore NP Completeness problem
- Implement parallel architecture models and develop parallel algorithms to solve complex problems.

TEXT BOOKS:

1. Foundations of Algorithms,Richard E Neapolitan, 5th Edition,Jones&Bartlett Learning, 2014.

REFERENCES:

1. S.Sridhar, "Design and Analysis of Algorithms", Oxford University Press, First Edition, 2015.
2. Steven S Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2010.
3. Robert Sedgewick and Kevin Wayne, Algorithms, Fourth Edition, Pearson Education,
4. 2011.
   T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms”, PHI Learning Private Limited, 2012.

IT18402	MICROPROCESSORS &MICROCONTROLLER INTERFACING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Study the Architecture of 8086 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study about communication and bus interfacing
- Study the Architecture of 8051 microcontroller.

UNIT I THE 8086 MICROPROCESSOR 9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – Pins in 8086-–System Bus architecture using 8086 — Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations

UNIT III 8086 INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller.

UNIT IV THE 8051 MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits – Instruction set – Addressing modes - Assembly language programming.

UNIT V 8051 INTERFACING 9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Develop programs in 8086 microprocessor by understanding its architecture, instruction set and interrupt process.
- Sketch the system bus structure of 8086 and multiprocessor configurations.
- Design I/O and Memory interfacing units.
- Develop programs in 8051 microcontroller by understanding its architecture and instruction set.
- Design various interfacing units with 8051 microcontroller based systems.

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, ―Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice GillispieMazidi, Rolin McKinlay, ―The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson Education, 2011.

REFERENCES:

1. DoughlasV.Hall, ―Microprocessors and Interfacing, Programming and Hardware:,TMH, 2012.

IT18403	OPERATING SYSTEM CONCEPTS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

UNIT I OPERATING SYSTEM CONCEPTS 9

Processes - Address Spaces - Files - Input/Output - Protection - The Shell -SYSTEM CALLS - System Calls for Process Management -System Calls for File Management - System Calls for Directory Management -The Windows Win32 API - OPERATING SYSTEM STRUCTURE - Monolithic Systems -Layered Systems -Microkernels -Client-Server Model - Virtual Machines .

UNIT II PROCESSES AND THREADS 9

PROCESSES -The Process Model -Process Creation -Process Termination -Process Hierarchies - Process States -THREADS -Thread Usage - The Classical Thread Model - POSIX Threads - INTERPROCESS COMMUNICATION - Race Conditions - Critical Regions - Mutual Exclusion with Busy Waiting - Semaphores - Mutexes - Message Passing CPU Scheduling – Scheduling criteria, Scheduling algorithms,- CLASSICAL IPC PROBLEMS - The Dining Philosophers Problem - The Readers and Writers Problem - Deadlock – Prevention,Detection,Avoidance

UNIT III Memory Management 9

ADDRESS SPACES - VIRTUAL MEMORY - Paging - Page Tables - PAGE REPLACEMENT ALGORITHMS - The First-In, First-Out (FIFO) Page Replacement Algorithm - The Least Recently Used (LRU) Page Replacement Algorithm - The Optimal Page Replacement Algorithm ISSUES FOR PAGING SYSTEMS - Local versus Global Allocation Policies - Page Size - Shared Pages - Page Fault Handling - SEGMENTATION -Implementation of Pure Segmentation - Segmentation with Paging: MULTICS .

UNIT IV I/O SYSTEMS 9

Mass Storage Structure- Overview, Disk Scheduling and Management; File System Storage-File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation- File System Structure, Directory Structure, Allocation Methods, Free Space Management, I/O Systems.

UNIT V CASE STUDY 9

Unix, Linux, windows 8 – Process Management, memory management , Input –Output management , File System.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Interpret the basic concepts and functions of operating systems.
- Apply various CPU scheduling algorithms and practice deadlock prevention and avoidance algorithms.
- Compare and Contrast various memory management schemes.
- Demonstrate the functionality of file systems
- Examine the working principles of various operating systems.

TEXT BOOKS:

1. Andrew S. Tanenbaum, ―Modern Operating Systems‖, Fourth Edition, Pearson Education, 2015.

REFERENCES:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.
2. Harvey M. Deitel, ―Operating Systems‖, Third Edition, Pearson Education, 2004.
3. Daniel P Bovet and Marco Cesati, ―Understanding the Linux kernel, 3rd edition, O‘Reilly, 2005.
4. Neil Smyth, ―iPhone iOS 4 Development Essentials – Xcode, Fourth Edition, Payload media, 2011.
5. Achyut S.Godbole, Atul Kahate, ―Operating Systems, McGraw Hill Education, 2016.

IT18404	SOFTWARE ENGINEERING METHODOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to

- Understand the roles of software process
- Understand how an iterative, incremental development process leads to faster delivery of more useful software
- Understand the essence of agile development methods

UNIT I SOFTWARE PROCESS AND SOFTWARE REQUIREMENT ANALYSIS 9

Generic process model, Process Assessment and Improvement, Perscriptive Process models, Specialized Process models, Personal and Team Process models. Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management.

UNIT II SOFTWARE DESIGN 9

Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary System Modeling - Context models-Interaction models-Structural models-Behavioral models-Model driven engineering,

UNIT III ARCHITECTURAL DESIGN 9

Introduction - Architectural design decisions-Architectural views-Architectural patterns-Application architecture- User Interface Design: Interface analysis, Interface Design. Introduction to Software Testing.

UNIT IV AGILE PRODUCT MANAGEMENT WITH SCRUM 9

Agile methods - Agile development techniques - Agile project management - Scaling agile methods. Understanding product owner role - Working with product backlog - Planning the release.

UNIT V ADVANCED SOFTWARE ENGINEERING 9

Software Reuse - Component based Software Engineering - Distributed Software Engineering - Service - oriented Software Engineering - Systems Engineering - Systems of Systems.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to

- Develop real-world software development projects
- Assess software Projects responding to change and involving customer in the development process.
- Compare different software engineering methodologies.
- Assess the roles of software process
- Adapt agile methodology in real world software engineering projects

TEXT BOOKS:

1. Ian Sommerville, “Software Engineering”, 10th Edition, Pearson Education Asia, 2016.
2. Roman Pichler,"Agile Product Management with Scrum Creating Products that Customers Love",Pearson Education, 2012

REFERENCES:

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Seventh Edition, Mc Graw-Hill International Edition, 2010.
2. Ken Schwaber ,"Agile Project Management with Scrum" , Microsoft Press,2014"
3. Tilak Mitra ," Practical Software Architecture: Moving from System Context to Deployment", IBM press,2016

IT18411	MICROPROCESSORS AND MICROCONTROLLER LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

The student should be made to:

- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

LIST OF EXPERIMENTS:

8086 Programs using kits and MASM

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments

7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Key board and Display
11. Printer status
12. Serial interface and Parallel interface
13. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM

14. Basic arithmetic and Logical operations
15. Square and Cube program, Find 2's complement of a number
16. Unpacked BCD to ASCII
17. Mini project using modern microcontrollers.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply the knowledge and skills to ALP Programmes for fixed and Floating-Point and Arithmetic
- Explore different I/Os with processor
- Demonstrate different waveforms using Microprocessors
- Demonstrate and Execute basic program for 8051
- Evaluate the difference between simulator and Emulator

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:

- 8086 development kits - 30 nos
- Interfacing Units - Each 10 nos
- Microcontroller - 30 nos

SOFTWARE:

- Intel Desktop Systems with MASM - 30 nos
- 8086 Assembler
- 8051 Cross Assembler

IT18412	OPERATING SYSTEM CONCEPTS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

The student should be made to:

- Learn shell programming and the use of filters in the UNIX environment.
- Be exposed to programming in C using system calls.
- Learn to use the file system related system calls.
- Be exposed to process creation and inter process communication.
- Be familiar with implementation of CPU Scheduling Algorithms, page replacement algorithms and Deadlock avoidance

LIST OF EXPERIMENTS:

1. Basics of UNIX commands.
2. Shell Programming.
3. Implement the following CPU scheduling algorithms
    a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
    a) Sequential b) Indexed c) Linked
5. Implement Semaphores
6. Implement all File Organization Techniques
    a) Single level directory b) Two level c) Hierarchical d) DAG
7. Implement Bankers Algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement e all page replacement algorithms
    a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique of memory management.
12. Implement Threading & Synchronization Applications Development of a reasonably sized dynamically loadable kernel module for Linux kernel

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to

- Interpret the concepts of Basic Unix Commands and Shell Programming.
- Implement deadlock avoidance, and Detection Algorithms.
- Compare the performance of various CPU Scheduling and analyze the performance of the various page replacement algorithms.
- Create processes and implement IPC.
- Demonstrate individual competence in building medium size operating system components.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

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

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

IT18413	SOFTWARE ENGINEERING METHODOLOGIES LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES:

The student should be made to:

- To capture the requirements specification for an intended software system
- To draw the UML diagrams for the given specification
- To map the design properly to code
- To test the software system thoroughly for all scenarios
- To improve the design by applying appropriate design patterns.

LIST OF EXPERIMENTS:

Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.

1.Identify a software system that needs to be developed.

2.Document the Software Requirements Specification (SRS) for the Identified system.

3. Identify use cases and develop the Use Case model.

4.Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.

5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams

6.Draw relevant State Chart and Activity Diagrams for the same system.

7.Implement the system as per the detailed design

8.Test the software system for all the scenarios identified as per the usecase diagram

9.Improve the reusability and maintainability of the software system by applying appropriate design patterns.

10.Implement the modified system and test it for various scenarios

SUGGESTED DOMAINS FOR MINI PROJECT:

1. Passport automation system.
2. Book bank
3. Exam registration
4. Inventory Management using QR code.
5. Online course reservation system
6. Airline/Railway reservation system
7. Portal for farmers.
8. Credit card processing
9. Criminal Management System
10. Alumni Tracking System.

11. Smart Management for food storage and waste reduction
12. Conference management system
13. Online Complaint portal
14. Library management system
15. Skill based online job portal

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to

- Examine the requirements specification for an intended software system
- Construct UML diagrams for the given specification
- Develop programs by mapping the design
- Inspect the software system thoroughly for all scenarios
- Design software systems by applying appropriate design patterns.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with Windows 7 or higher, ArgoUML/ Rational Suite that supports UML 1.4 and higher /Selenium/ JUnit 30 Nos.

IT18501	DATA COMMUNICATION AND NETWORKING	L	T	P	C
		3	1	0	4

OBJECTIVES:

The student should be made to:

- Understand the concepts of network architecture and transmission medium.
- Perform and understand methods for error detection and correction of data.
- Be exposed to various addressing schemes and routing protocols.
- Learn the flow control and congestion control algorithms.
- Be familiar with real time applications of networks.

UNIT I FUNDAMENTALS & DATA LINK LAYER 9+3

Fundamentals : Building a network – Requirements – Layering and protocols – OSI Model – Internet Architecture – Network Topology ; Physical Layer: Transmission Media; Data Link Layer: Framing – Error Detection and Correction

UNIT II MEDIA ACCESS & LOGICAL LINK CONTROL 9+3

Media access control – Ethernet (802.3) – Wireless LANs – 802.11 – Switching and bridging – Flow control – CIDR – ARP – DHCP - ICMP

UNIT III ROUTING & ADDRESSING SCHEMES 9+3

Basic Internetworking (IPv4, IPv6) - Routing (RIP, OSPF, metrics) – Multicast – Multicast routing (DVMRP, PIM)

UNIT IV TRANSPORT & APPLICATION LAYER 9+3

Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management –TCP Congestion control – Electronic Mail (SMTP, POP3, IMAP, MIME) – DNS - HTTP

UNIT V SOFTWARE DEFINED NETWORKS 9+3

Introduction to SDN – Control and Data Planes – VMWare – Network Function Virtualization – Virtualization and Data Plane I/O

TOTAL: (L:45+T:15)60 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explore the concepts of network architecture.
- Appraise the concept of addressing scheme and various routing protocols in data communication.
- Design flow control and congestion control algorithms.
- Relate the concepts to real time applications of networks.
- Analyze network function virtualization

TEXT BOOKS:

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

2. Thomas D Nadeau, Ken Gray, "SDN: Software Defined Networks", First Edition, O'Reilly, 2013.

REFERENCES:

1. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.

2. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.

3. Behrouz A. Forouzan, "Data Communications and Networking", Fourth Edition, McGrawHill, 2011.

CS18501	USER INTERFACE TECHNOLOGIES (COMMON TO CS & IT)	L	T	P	C
		3	1	0	4

OBJECTIVES

- To understand the concepts and architecture of the World Wide Web
- To understand and practice Markup Language
- To understand Embedded Dynamic Scripting on Client-side Internet Programming
- To understand and practice NoSQL MongoDB Database
- To understand and practice Server-side JS Framework

UNIT I INTRODUCTION TO WWW **9+3**

Introduction to Computer networks - Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response — Generation of dynamic web pages.

UNIT II UI DESIGN **9+3**

HTML5: What is HTML5 - Features of HTML5 – Semantic Tags – New Input Elements and tags - Media tags (audio and video tags) – Designing Graphics using Canvas API - Drag and Drop features – Geolocation API - Web storage (Session and local storage).CSS3: What is CSS3 –Features of CSS3 – Implementation of border radius, box shadow, image border, custom web font, backgrounds - Advanced text effects(shadow) - 2D and 3D Transformations - Transitions to elements - Animations to text and elements

UNIT III INTRODUCTION TO JAVASCRIPT **9+3**

Introduction - Core features - Data types and Variables - Operators, Expressions and Statements - Functions & Scope - Objects - Array, Date and Math related Objects - Document Object Model - Event Handling –Browser Object Model - Windows and Documents - Form handling and validations.Object-Oriented Techniques in JavaScript - Classes – Constructors and Prototyping (Sub classes and Super classes) – JSON –Introduction to AJAX – Introduction to jQuery

UNIT IV INTRODUCTION TO NOSQL DATABASE - MONGODB **9+3**

What is NoSQL Database - Why to Use MongoDB - Difference between MongoDB& RDBMS - Download & Installation - Common Terms in MongoDB – Implementation of Basic CRUD Operations using MongoDB

UNIT V INTRODUCTION TO SERVER-SIDE JS FRAMEWORK – NODE.JS **9+3**

Introduction - What is Node JS – Architecture – Feature of Node JS - Installation and setup - Creating web servers with HTTP (Request & Response) – Event Handling - GET & POST implementation - Connect to NoSQL Database using Node JS – Implementation of CRUD operations.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

- Demonstrate the functionalities of World Wide Web

- Build the interactive web pages
- Develop Client-side validation using scripting languages and Open source JavaScript libraries
- Identify the CURD operations and make Database Connectivity using MongoDB
- Interpret the functionalities of Client-side and Server-side JS frameworks

Text Books:

1. Web Technologies-A Computer Science Perspective-Jeffrey C.Jackson, 4th Edition, 2007
2. Amol Nayak, "MongoDB Cookbook " , Second Edition, Packt Publishing, 2016
3. KrasimirTsonev, "Node.js by Example", Packt Publishing, 2015

References:

1. An Introduction to web development and Programming- Michael Mendez Suny Fredonia, 2014
2. David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011
3. Sandro Pasquali, "Mastering Node.js", First Edition, Packt Publishing,2013.
4. Kristina Chodorow, "MongoDB : The Definitive Guide", Second Edition, O' Reilly Publications, 2013.
5. Matt Frisbie, "Angular 2 Cookbook", First Edition, Packt Publishing, 2017.

IT18502	MOBILE COMPUTING (Common to IT& CS)	L	T	P	C
		3	1	0	4

OBJECTIVES

- To understand the fundamentals of mobile computing
- To infer knowledge about the various technologies used in mobile communication
- To learn about development environment used in Mobile devices

UNIT I INTRODUCTION 9+3

Mobility of bits and bytes, Beginning of wireless, Mobile computing, Dialogue control, Networks, Middleware and gateway, Application and services, Developing mobile computing application, Security in mobile computing, Standards, Mobile computing architecture, Mobile computing through telephony.

UNIT II WIRELESS TECHNOLOGIES 9+3

Bluetooth, RFID, WIMAX, Mobile IP, GSM,GPRS,CDMA, 3G,4G and 5G networks.

UNIT III WIRELESS LAN AND INTELLIGENT NETWORKS 9+3

Introduction-Advantages, IEEE 802.11 standards, Architecture, Mobility, Deploying wireless LAN, Mobile Ad hoc and Sensor network, Security, Wireless access in vehicular environment, Wireless local loop, Hyper LAN , Wi-Fi versus 3G,Wireless Application Protocol, Fundamentals of call Processing, Intelligence in networks,SS#7 signaling, IN conceptual model, soft switch, programmable networks, Technologies and interfaces for IN,SS7 security, MAPsec, Virtual Private Network.

UNIT IV COMPUTING IN MOBILE ENVIRONMENT 9+3

Client Programming, Programming for palm OS, Wireless device with Symbian OS,J2ME,Wireless device with Windows CE, Wireless device with Android OS.

UNIT V APPLICATIONS 9+3

Voice over Internet and Convergence, SMS, CODEC, Networked Multimedia Applications, Issues in Multimedia delivery over the internet, Multimedia Networking Protocols, Security issues in mobile computing, Next generation networks, **APP DEVELOPMENT :** Native, Hybrid, Android Application development - SDK, Features of SDK, Android Application Components, software stack structure.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

Upon completion of this course, the students will be able :

- Interpret the working characteristics and limitations of mobile hardware devices including their user-interface modalities.
- Choose the suitable technologies for appropriate mobile communication.
- Summarize the various wireless LAN technologies.
- Assess the development environment used in mobile devices.
- Develop applications that are mobile-device specific.

TEXT BOOKS:

1. Asoke Talukder, Hasan Ahmed and Roopa R yavagal “Mobile computing Technology, Application and service creation”, Second edition, McGraw Hill, 2010.

2. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson, 2004.

REFERENCES:

1. “Beginning for Android 4 Application Development “, Wei Meng Lee, Wiley –India Edition, 2012.
2. ZigurdMednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, “Programming Android”, O‟Reilly, 2011.

IT18503	INTERNET OF THINGS	L	T	P	C
		3	1	0	4

OBJECTIVES

- To understand the state of the art - Internet of Things architecture.
- To learn about IoT protocols.
- To understand the integration of IoT and Cloud.
- To apply the concept of Internet of Things in the real world scenario.
-

UNIT I INTRODUCTION & CONCEPTS 9+3

Introduction and evolution of IoT from internet, IOT Physical Devices & Endpoints - Basic building blocks and Exemplary IOT Device: Raspberry Pi, Linux on Raspberry Pi , Raspberry Pi Interfaces - Serial , SPI , I2C , Programming Raspberry Pi with Python - Controlling LED with Raspberry Pi , Interfacing an LED and Switch with Raspberry Pi , Interfacing a Light Sensor (LDR) with Raspberry Pi , Other IoT Devices - Arduino with embedded C, Intel Galileo, pcDuino , BeagleBone Black , Cubieboard.

UNIT II IoT PROTOCOLS 9+3

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT-Software Defined Networking, Network Function Virtualization, IoT Protocol Stack, IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee, 6LowPAN.

UNIT III IoT PLATFORMS DESIGN METHODOLOGY 9+3

IoT Design Methodology- Purpose& Requirements Specification, Process Specification ,Domain Model Specification, Information Model Specification, Service Specifications , IoT Level specification, Functional View Specification , Operational View Specification , Device & Component Integration , Application Development , Case Study on IoT System for Weather Monitoring.

UNIT IV IoT PHYSICAL SERVERS & CLOUD OFFERINGS 9+3

Introduction to Cloud Storage Models & Communication APIs, WAMP - AutoBahn for IoT ,Xively Cloud for IoT, Python Web Application Framework – Django - Django Architecture , Starting Development with Django , Designing a RESTful Web API , Amazon Web Services for IoT - Amazon EC2 , Amazon AutoScaling , Amazon S3 , Amazon RDS , Amazon DynamoDB , Amazon Kinesis, Amazon SQS , Amazon EMR , SkyNet IoT Messaging Platform.

UNIT V IoT TOOLS 9+3

Introduction, Chef - Setting up Chef , Chef Case Studies - Multi-tier Application Deployment , Hadoop Cluster , Storm Cluster , Puppet , Puppet Case Study - Multi-tier Deployment , NETCONF-YANG Case Studies - Steps for IoT device Management with NETCONF-YANG , Managing Smart Irrigation IoT System with NETCONF-YANG, Managing Home Intrusion Detection IoT System with NETCONF-YANG.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Define the vision of IoT from a global context.
- Select various protocols to be used in IoT
- Conclude the Market perspective of IoT.
- Choose between available technologies and devices for stated IoT challenge
- Apply state of the art Methodologies in IoT application domain
- Illustrate the application of IoT and identify Real World Design Constraint

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things :A hands on approach", First Edition, Universities Press, 2015.
2. HonboZhou,"The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.

REFERENCES:

1. Dieter Uckelmann Mark Harrison; Florian Michahelles, "Architecting the Internet of Things ", Springer, 2011.

CS 18511	USER INTERFACE TECHNOLOGIES LABORATORY (Common to CS and IT)	L	T	P	C
		0	0	4	2

OBJECTIVES

- Be familiar with Web page design using HTML 5 and style sheets CSS 3
- Be exposed to creation of user interfaces using Java frames and applets.
- Learn to create dynamic web pages using server side scripting.
- Be familiar with the frameworks JSP Strut, Hibernate, Spring
- Be familiar with the NOSQL database and its installation process
- Be exposed in Client Server applications along with NodeJS installation and Setup

List of Experiments

Implement The Following: Webpage Concepts

1. Create a web page with the following using HTML
   a. To embed a map in a web page
   b. To fix the hot spots in that map
   c. Show all the related information when the hot spots are clicked.
2. Create a web page with the following.
   a. Cascading style sheets.
   b. Embedded style sheets.
   c. Inline style sheets. Use our college information for the web pages.
3. Create and save an XML document at the server, which contains 10 users Information.
   a. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document.

Typescript& Servlets

4. Write programs in Java using sockets to implement the following:
   a. HTTP request
   b. FTP
   c. SMTP
   d. POP3
5. Write a program in Java for creating simple chat application with datagram sockets and datagram packets.
6. Write programs in Java using Servlets:
   a. To invoke servlets from HTML forms
   b. To invoke servlets from Applets
7. Write programs in Java to create three-tier applications using servlets for conducting on-line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
8. NoSQL and MongoDB :

   What is the corresponding relational concept for each of these terms (e.g., “schema” or ”table”). Not any important differences:

   - Collection
   - document
   - field
   - index
9. In MongoDB, how do you define a selection operation and projection

10. How does mongodb store data - that is, what is the name of the file format of documents?
    Relational DBs define many-to-one relationships by defining distinct relationship tables (e.g., an Enrollee table encodes the many-to-many relationship between Courses and Students).
11. How does MongoDB use arrays/embedded docs to handle many-to-one relationships?
12. Set up a project using Node.js and NPM
13. Using the Data in HTML and Check your data types
14. Adding Handshaking (Call-and-Response)
15. Connecting from the Browser to the Node Program

Total Hours :60

OUTCOMES:

At the end of the course, the student should be able to:

- Develop the concepts of Web pages using HTML/XML and style sheets.
- integrate using Java frames and applets.
- Students will be able to the interface dynamic web pages using server side scripting.
- Students will be to accomplish the various functions frameworks JSP Strut, Hibernate, Spring.
- Students will be able to develop the applications with AJAX.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

Java, Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, IDE: Eclipse Neon

Editor: Notepad++, Browsers :IE, Chrome, Mozilla Firefox browsers (Latest Version), NodeJS (Latest Version)

MongoDB (Latest Version)

jQuery and Twitter Bootstrap Library Files

HARDWARE:

Standalone desktops 30 Nos

Pentium P5, 3 GHz or higher

8 GB (or higher) RAM, 100 GB (or higher) HD

Windows 8 or 10 (or higher)

IT18511	DATA COMMUNICATION AND NETWORKING LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES:

The student should be made to:

- Learn socket programming.
- Be familiar with simulation tools.
- Have hands on experience on various networking protocols.

LIST OF EXPERIMENTS:

1. Study of Socket Programming and Client – Server model

2. Applications using TCP Sockets
    1. Date and Time server & client
    2. Echo server & client,
    3. Chat
3. Applications using UDP Sockets
    1. Date and Time server & client
    2. Echo server & client,
    3. Chat
4. Simulation of DNS
5. Simulation of DHCP
6. Simulation of ARP /RARP protocols.
7. Simulation of PING and TRACEROUTE commands
8. Implementation RMI (Remote Method Invocation)
9. Implementation of Subnetting
10. Simulation of Cisco Packet Tracer,
    a). Establish a Local Area Network (LAN) with 4 hosts and a switch/Hub
    b). Connect two LANs using multi-router topology with static routes

10. Study of Network simulator (NS2) and Simulation of Congestion Control Algorithms using NS2

11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.
    i. Link State routing protocol
    ii. Distance vector routing protocol

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to

- Establish communication between the peers using socket programming
- Implement addressing scheme
- Simulate various routing protocols in data communication.
- Generate real time applications using networks protocols
- Simulate real time applications between host using simulation tools

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

- C / C++ / Java / Equivalent Compiler 30
- Network simulator like NS2/Glomosim/OPNET/ Equivalent

HARDWARE:

Standalone desktops 30 Nos

REFERENCES:

1. UNIX® Network Programming Volume 1, Third Edition: The Sockets Networking API By W. Richard Stevens, Bill Fenner, Andrew M. Rudoff.

IT18512	INTERNET OF THINGS LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES

To build a simple IoT application and to perform the predictive analysis on gathered data.

LIST OF EXPERIMENTS

1. Peripheral interfacing with IoT kit
    a. Working with LED,SWITCH and BUZZER
    b. Movement Detection with PIR
    c. Simulation of Traffic Light
    d. Controlling LED intensity using pwm signal
    e. Working with servo motor
2. I2C Communication and SPI Communication for displaying atmospheric temperature and pressure
3. Controlling pheripheral device with Mobile devices
    a. Controlling LED using Bluetooth
    b. Sending sensor data to user through SMS and Email
4. Designing GUI for capturing and analysing sensor data from IoT kit
5. Developing Video Surviellence application using IoT
6. Exercises to understand the data collected from sensors.
7. Exercises to perform predictive analysis.
8. A project to be implemented covering all IoT phases using Raspberry Pi / Arduino.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply the knowledge and skills acquired to build and test a complete, working IoT system involving prototyping, programming and data analysi
- Describe about the working of IoT components, systems and protocols.
- Choose the most appropriate IoT Devices and Sensors to build real time applications Using IoT
- Develop IoT solutions and demonstrate the relationship between IoT, cloud computing, big data and data analytics.
- Simulate the working of real time applications
- Evaluate the appropriate protocol for communication between IoT systems.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1	Arduino UNO Board R3 (SMD) with cable	10
2	GSM/GPRS Shield Modem – SIM800	5
3	Arduino Ethernet Shield	5
4	Arduino WiFi Shield	5
5	Arduino 37 in 1 Sensor pack	3
6	Relay Board	10
7	Power Supply Adapter for ESP – 5V/1A	10

8	Raspberry Pi 3 module with Cable	15
9	HDMI Cable	15
10	USB Keyboard & USB Mouse	15
11	Interface Board	10
12	Desktop	15

IT18601	COMPUTATIONAL INTELLIGENCE	L	T	P	C
		3	1	0	4

OBJECTIVES

- To learn search strategies and to understand the concepts of game playing
- To represent and infer knowledge using predicate logic
- To understand basic concepts of data mining
- To introduce the concepts of Expert Systems
- To learn evolutionary computation, neural networks, fuzzy systems

UNIT I PROBLEM SOLVING METHODS 9+3

Problems, Problem Spaces and Search - problem characteristics -production system characteristics- Heuristic Search Techniques – Generate and Test- Hill Climbing- Best First Search- Problem Reduction-Constraint Satisfaction Problems – Game Playing – Minimax procedure - Alpha-Beta Pruning.

UNIT II KNOWLEDGE REPRESENTATION 9+3

Knowledge representation-Using Predicate logic- Representing Simple Facts- Representing Instance – Computable Functions and Predicates -Resolution, Knowledge Inference – Backward chaining, Forward chaining.

UNIT III DATA MINING 9+3

Fundamentals – Data reduction – Classification - Decision tree Induction –Learning - Supervised Learning –Unsupervised Learning – Reinforcement Learning –Associations- Frequent Itemset Mining Methods, Clustering- Partitioning methods - Hierarchical methods- Data Mining Applications.

UNIT IV EXPERT SYSTEMS 9+3

Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition – Meta knowledge, Heuristics. , Expert systems shells- Typical expert systems - MYCIN, DART, XOON.

UNIT V ADVANCED TOPICS 9+3

Evolutionary Computation- Genetic Algorithms –Crossover- Mutation, Genetic programming ; Evolutionary Programming- Operators- Parameters- Implementations; Neural Networks – Multi layer Feed Forward Neural Network-Applications of Neural Networks- Fuzzy Systems- Fuzzy Sets – Fuzzy Logic and Reasoning – Creating a bot – Weather Monitoring bot.

TOTAL :60(L:45+T:15) PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Analyze the problems and solve them using AI techniques
- Infer knowledge for the problem represented in the language/framework using different AI methods
- Apply data mining techniques to real-world problems
- Design expert systems for various applications
- Generate solutions to problems using advanced concepts of Computational Intelligence

TEXT BOOKS:

1. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Third edition, McGraw Hill, 2008.

REFERENCES:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson Education, 2007.
3. Andries .P. Engelbrecht, "Computational Intelligence: An Introduction", Second Edition, John Wiley & Sons, 2012.
4. https://en.wikipedia.org/wiki/Wikipedia:Creating_a_bot.
5. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2014.

IT18602	AUTOMATA AND COMPILER DESIGN	L	T	P	C
		3	1	0	4

OBJECTIVES

- To learn the design principles and tools of the compiler.
- To learn the various analysis techniques
- To learn how to obtain specific object code from source language
- To learn how to optimize the code

UNIT I INTRODUCTION TO FINITE AUTOMATA 9+3

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

UNIT II LEXICAL AND SYNTAX ANALYSIS 9+3

Lexical Analysis-Translators -The Phasesof Compiler-Errors Encountered in Different Phases-compiler Construction Tools, Role of Lexical Analyzer-Specification and Recognition of Tokens-Thompson Construction –LEX.

Syntax Analysis-Role of the Parser- Top Down Parsing - Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-SLR Parser, YACC.

UNIT III SYNTAX DIRECTED TRANSLATION 9+3

Syntax Directed Definitions--Intermediate Code Generation-Representation and Implementation - Types And Declarations –-Type Checking –Control Flow Statements-Back Patching –Procedures.

UNIT IV CODE OPTIMIZATION AND RUN TIME ENVIRONMENT 9+3

Code Optimization -Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis.

Run-time Environment- Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables-Dynamic Storage Allocation

UNIT V CODE GENERATION 9+3

Issues -Design of Code Generator -Addresses in the Target Code -Basic Blocks in Flow Graph -Simple Code Generator -Peephole Optimization -Machine Independent Optimization

TOTAL :60(L:45+T:15) PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Examine the various deterministic and non-deterministic machines for a language processing system.
- Formulate the analysis phase of the compiler
- Choose the compiler construction tools for analysis and synthesis phase.
- Examine the various optimization techniques.
- Design code generators for the specified machine.

Text Books:

1. John. E. Hopcroft, Rajiv Motwani and Jeffrey D Ullman, “Introduction to Automata Theory, Languages and Computation”, Third Edition, Pearson Education, 2014.
2. Alfred Aho, Ravi Sethi and Jeffrey D Ullman, “Compilers Principles, Techniques and Tools”, Second Edition, Pearson Education, 2013.

References:

1. Alexander Meduna, Petr Zemek,” Regulated Grammars and Automata”, Springer, 2014.
2. Torben Mogensen, “Basics of Compiler Design”, Springer, 2010.

IT18603	INFORMATION SECURITY	L	T	P	C
		3	1	0	4

OBJECTIVES

- To give an insight into the key principles of information security.
- To learn about various threats facing organizations
- To understand key laws that shape the field of information security

UNIT I INTRODUCTION TO SECURITY AND CRYPTOGRAPHY 9+3

Introduction to Information security, Critical characteristics of information –Components of an information system –Balancing information security and access - The SDLC and Security SDLC- NIST – Need for Security. Foundations of Cryptography, Simple Substitution and Transposition Ciphers.

UNIT II LEGAL ETHICAL & PROFESSIONAL ISSUES 9+3

Law and Ethics in Information Security- International law and legal bodies, Ethical differences across cultures, ethics and education, deterring unethical and illegal behavior- codes of ethics at professional organization.

UNIT III CRYPTOGRAPHY AND DIGITAL SIGNATURES 9+3

Cryptographic Algorithms - Symmetric and Asymmetric encryption – Cryptographic tools – Digital Signature, Digital certificates, Hybrid cryptographic systems, Steganography, protocols for secure communication.

UNIT IV SECURITY TECHNOLOGY 9+3

Introduction- Access control- firewall, protecting remote connections- Intrusion Detection and Prevention system –Honey pots, Honey Nets and Padded cell systems, scanning and analysis tools, Digital forensics.

UNIT V BLOCK CHAIN AND BEYOND 9+3

Hashing – SHA – MD5 – Block chain: Basics – Contents of a Block – Hashchain to Blockchain - Digital Money to Distributed Ledgers , Design Primitives: Protocols, Security, Consensus, Permissions, Privacy - Basic consensus mechanisms Requirements for the consensus protocols, Proof of Work (PoW) – Crypto Currency.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Practice secure coding principles.
- Implement security controls.
- Examine the techniques specific to mitigating the occurrence of common software vulnerabilities.
- test and evaluate secure software
- Formulate policies and procedures to manage enterprise security risks.

TEXT BOOKS:

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, fifth edition, Cengage learning , 2015.
2. Melanie Swa, "Block chain: Blueprint for a new economy", First edition, O'Reilly, 2015

REFERENCES:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Prentice Hall, 2007.
2. Mark Rhodes- Ousley ,"Information Security: The complete Reference", Second Edition Mcgraw Hill, 2013.
3. William Stallings, "Cryptography and Network Security: Principles and Practices", Seventh Edition, Pearson Education, 2017.
4. Matt Bishop, "Computer Security: Art and Science", First Edition, Addison-Wesley Professional, 2003.

IT18611 AUTOMATA AND COMPILER DESIGN LABORATORY L T P C

0 0 3 2

OBJECTIVES

- To learn tools for compiler design
- To design the specification of language constructs
- To understand code generation

List of Experiments

1. Design Lexical Analyzer
2. Acceptance of a string using Regular Expression
3. Construction of NFA for a given Regular Expression
4. Construction of DFA for a given Regular Expression
5. Conversion of NFA to DFA
6. Implementation of Parser
7. Type checking
8. Intermediate Code Generation for a given expression
9. Implementation of DAG
10. Code Generation
11. Programs using LEX
12. Programs using YACC

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Investigate the various phases of compiler
- Design a lexical analyzer and use LEX tool
- Design different types of parser and use YACC tool
- Interpret the practical aspects of automata theory
- Generate an assembly language equivalent to a source language

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWAREREQUIREMENTS
Lex, Yacc.

HS18561	INTERVIEW AND CAREER SKILLS LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES

- To enable learners to build confidence and enhance their language proficiency.
- To expose learners to the use of professional English.
- To equip them with employability skills.
- To expose learners to build entrepreneurship skills.

UNIT I LISTENING AND SPEAKING SKILLS **12**

Conversation Skills – Types - Small Talk, Face-to-Face and Telephonic, Formal and Informal Conversations – Skills in presenting ideas and collating information during Conference Calls (one –to-one and technical group / team) – Academic and Workplace Situations – Conversing with Faculty/Visiting Faculty/Guests/Officials/Employers and Employees – Group Discussion – Etiquette and Dos and Don'ts, Turn-taking –Presentation Skills – Seminars and Projects using Digital Tools; Mock Interview – Etiquette and Dos and Don'ts – Audio-Visual interface for enhancement of Listening and Speaking Skills

UNIT II READING / SPEED READING, CRITICAL THINKING AND WRITING SKILLS 12

Reading Comprehension – General and Scientific Texts/Articles/Case Studies from different or relevant fields of study for analysis and critical thinking; Employability Skills – Writing Job Applications – Cover Letter accompanying Résumé – Types of Business Letters and Email Writing and Etiquette; Writing Reports – Statement of Purpose – Writing Articles for Publication Style and Format – Creating Blogs or Company Profiles – Speed Reading of Voluminous Reports / Documents and Exacting Necessary Information and Abstract Preparation including Dissemination

UNIT III ENGLISH FOR PROFESSIONAL EXAMINATIONS 12

Sentences, Paragraphs and Reading Comprehension – Vocabulary Building – General and Technical Terms – Contextual Meaning – Spelling – Subject-Specific Words – Usage and User-Specific Terminology

UNIT IV ENTREPRENEURSHIP SKILLS **9**

Introduction to Entrepreneurship; Developing Leadership Qualities and Team Work; Goal Setting and Real-Life Scenarios; Fundamentals of Entrepreneurial Skills – Marketing Strategies - Microcosmic and Macrocosmic Levels of Product Sales and Survey – Sector / Industry Appraisal and Appreciation (Review and Understanding State of the Nation / Economy / Environment / Sector Reports Published) - Interaction & Understanding Role of Multi-Lateral Financial / Institutional / Industrial Agencies such as World Bank, ADB, UNDP, CII etc.

TOTAL (P:45): 45PERIODS

TEACHING METHODS:

1. To be totally learner-centric with minimum teacher intervention as the course revolves around practice.
2. Suitable audio/video samples from Podcast/YouTube to be used for illustrative purposes.
3. Portfolio approach for writing to be followed. Learners are to be encouraged to blog, tweet, text and email employing appropriate language.
4. GD/Interview/Role Play/Debate could be conducted off the laboratory (in a regular classroom) but learners are to be exposed to telephonic interview and video conferencing.
5. Learners are to be assigned to read/write/listen/view materials outside the classroom as well for gaining proficiency and better participation in the class.
6. Learners to form team(s), select a module of external Industrial / Institutional interaction and prepare a shortthesis/project proposal.

OUTCOMES:

At the end of the course, the student should be able to:

- Take international examination such as IELTS and TOEFL
- Make presentations and Participate in Group Discussions.
- Successfully answer questions in interviews

REFERENCES:

1. Business English Certificate Materials, Cambridge UniversityPress.
2. Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College,London.
3. International English Language Testing System Practice Tests, Cambridge University Press.
4. Interactive Multimedia Programs on Managing Time andStress.
5. Personality Development (CD-ROM), Times Multimedia,Mumbai.

WEB SOURCES:

1. http://www.slideshare.net/rohitjsh/presentation-on-groupdiscussion
2. http://www.washington.edu/doit/TeamN/present_tips.html
   http://www.oxforddictionaries.com/words/writing-jobapplicationshttp://
3. www.kent.ac.uk/careers/cv/coveringletters.htm
4. http://www.mindtools.com/pages/article/newCDV_34.html

IT18612	INFORMATION SECURITY LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES

- To learn about secure coding practices.
- To implement security controls.
- To learn techniques specific to mitigating the occurrence of common software vulnerabilities.

LIST OF EXPERIMENTS

1.Perform Input Validation for an application on a trusted system.
2. Perform Output encoding
3. Perform Authentication and password management.
4. Manage Sessions.
5. Access Control.
6. Implementation of Cryptographic techniques.
7. Implementation of Error handling and logging.
8. Implementation ofEncryption and Decryption using Kelopatra tool.
9. Implement of Authentication and Digital Signature using Kelopatra tool.
10. IDS using Snort tool
11. Implement encryption for transmission of all sensitive information.
12. Secure File Management.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design Security solution by analysing the vulnerabilities
- Formulate security mechanisms using rigorous approaches by key ciphers and Hash functions.
- Use IPSec tool for secure data transfer
- Configure Firewall rules for access control
- Implement IDS using SNORT tool

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Java, C, C++ or any Open Source tool

REFERENCES:

1. OWASP SCP Quick Reference guide V 2

IT18701	CYBER FORENSICS	L	T	P	C
		3	1	0	4

OBJECTIVES

- To understand the fundamentals of Computer Forensics and computing Investigations.
- To recognize the legal underpinnings and critical laws affecting forensics
- To apply the tools and methods to uncover hidden information in digital systems.
- To learn about current licensing and certification requirements to build the career in digital forensic.

UNIT I INTRODUCTION 9+3

The Scope of Computer Forensics - Windows Operating and File Systems –Handling Computer Hardware –Anatomy of Digital Investigation.

UNIT II INVESTIGATIVE SMART PRACTICES 9+3

Forensics Investigative Smart Practices –Time and Forensics –Incident closure.

UNIT III LAWS AND PRIVACY CONCERNS 9+3

Laws Affecting Forensic Investigations –Search Warrants and Subpoenas–Legislated Privacy Concerns –The admissibility of Evidence –First Response and Digital Investigator.

UNIT IV DATA ACQUISITION AND REPORT WRITING 9+3

Data Acquisition –Finding Lost Files –Document Analysis –Case Management and Report Writing – Building a Forensics Workstation

.

UNIT V TOOLS AND CASE STUDIES 9+3

Tools of the Digital Investigator-Licensing and Certification –Case Studies: E-mail Forensics –Web Forensics –Searching the Network –Excavating a Cloud –Mobile device Forensics.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Relate the fundamentals of computer forensics, laws, report writing and tools in digital investigations.
- Assess the investigative smart practices and applicability of concerned laws & investigative tools.
- Inspect the acquired data, recover the deleted data and manage a case .
- Select the correct method to handle the digital evidence and acquire appropriate certification to build the career in digital forensics.
- Create a method for gathering, assessing and applying new and existing legislation specific to the practice of digital forensics.

TEXT BOOKS:

1. Michael Graves, “Digital Archaeology: The Art and Science of Digital Forensics”, Addison-Wesley Professional, 2014.
2. Darren R. Hayes, “Practical Guide to Computer Forensics Investigation”, Pearson, 2015.

REFERENCES:

1. Albert J. Marcella and FredericGuillossou, ―Cyber Forensics: From Data to Digital Evidence,Wiley, 2015.
2. Bill Nelson,Amelia Phillips and Christopher Steuart, ―Guide to Computer Forensics and Investigations,Fourth Edition, Cengage, 2013.

IT18702	BIG DATA ANALYTICS	L	T	P	C
		3	1	0	4

OBJECTIVES

- To understand the concept of big data.
- To learn about various practical data analytics with R and Hadoop.
- To learn about big data frameworks.

UNIT I INTRODUCTION TO BIG DATA 9+3

Introduction to Big Data Analytics – Challenges and limitations of big data analytics- Conventional Systems - Nature of Data, Evolution Of Analytic Scalability - Intelligent data analysis- Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II MINING DATA STREAMS 9+3

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III INTRODUCTION TO BIG DATA ANALYTICS & R PROGRAMMING 9+3

Analyzing, Visualization and Exploring the Data, Statistics for Model Building and Evaluation, Introduction to R and RStudio, Basic analysis in R, Intermediate R, Intermediate analysis in R, Advanced Analytics - K-means clustering, Association rules-Speedup, Linear Regression, Logistic Regression, Naïve Bayes, Decision Trees, Time Series Analysis, Text Analysis.

UNIT IV HADOOP 9+3

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop, Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features.

UNIT V FRAMEWORKS 9+3

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphereBigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Identify the characteristics of datasets and compare the trivial data and big data for various applications.
- Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
- Apply scaling up machine learning techniques and associated computing techniques and technologies.
- Integrate machine learning libraries and mathematical and statistical tools with modern technologies like hadoop and mapreduce.
- Investigate how Big Data is managed

TEXT BOOKS:

1. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing, 2014.
2. Stephan Kudyba, "Big Data, Mining, and Analytics: Components of Strategic Decision Making", First Edition, CRC Press, 2014.

REFERENCES:

1. Michael Minelli, Michele Chambers, AmbigaDhiraj,"Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
2. Dr. Mark Gardener, "Beginning R: The Statistical Programming Language" (Wrox), 2013
3. Anand Rajaraman and Jeffrey David Ullman,"Mining of Massive Datasets", Cambridge University Press, 2012.
4. Bill Franks,"Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
5. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
6. Zikopoulos, Paul, Chris Eaton, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", Tata McGraw Hill Publications, 2011.
7. Tom White," Hadoop: The Definitive Guide", Third Edition, O'reilly Media, 2012.
8. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.

IT18703	CLOUD COMPUTING	L	T	P	C
		3	1	0	4

OBJECTIVES

- To provide comprehensive knowledge of fundamental concepts of cloud computing
- To understand service models, deployment models and virtualization
- To learn programming and software environments of Cloud
- To shed light on the security issues in Cloud

UNIT I INTRODUCTION 9+3

Introduction – Scalable Computing over the Internet-System Models for Distributed and Cloud Computing – Design Principles of Computer Clusters-Cluster Job and Resource Management-Cloud Computing Architecture – The Cloud Reference Model – Cloud Characteristics – Cloud Deployment Models: Public, Private, Community, Hybrid Clouds - Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing.

UNIT II VIRTUALIZATION 9+3

Introduction, Virtualized Environment characteristics, Server Virtualization Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – Virtualization for data center automation - Virtualization Management- Storage Virtualization – Network Virtualization.

UNIT III CLOUD COMPUTING MECHANISM 9+3

Cloud Infrastructure Mechanism: Cloud Storage, Cloud Usage Monitor, Resource Replication – Specialized Cloud Mechanism: Load Balancer, SLA Monitor, Pay-per-use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi Device Broker, State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System, Billing Management System.

UNIT IV PROGRAMMING MODEL AND SECURITY 9+3

Main components and Programming model - Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, command line and java interface, dataflow of File read & File write. Security: Data Security and Storage - Cloud Infrastructure security: network, host and application level – Cloud Security Mechanisms (Encryption, PKI, SSO, IAM).

UNIT V CASE STUDIES &TOOLS 9+3

Case Studies of Top Supercomputer Systems – Virtualization : Xen, VMWare, Microsoft Hyper-V – Examples of Cloud Service Providers(SaaS,PaaS,IaaS)-Emerging Cloud software Environments: Open Source Eucalyptus and Nimbus - Open Nebula, Sector/Sphere and Open Stack.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Interpret various cloud service models and deployment models.
- Identify programming models for Virtualization.
- Explore the different Cloud Infrastructure Mechanisms.
- Analyze Big data scenario using HDFS

- Use and implement Cloud Software Environment tools.

TEXT BOOKS:

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
2. Thomas Erl , Ricardo Puttini, Zaigham Mahmood," Cloud Computing: Concepts, Technology & Architecture", First Edition, Prentice Hall,2013.

REFERENCES:

1. Jason Venner, "Pro Hadoop- Build Scalable, Distributed Applications in the Cloud", A Press, 2009
2. Tom White, "Hadoop The Definitive Guide", First Edition. O'Reilly, 2009.
3. Tim Master, Subra Kumaraswamy, Shahed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O' Reily Media, Sep 2009.

IT18712 BIG DATA MINING AND ANALYTICS LABORATORY L T P C

0 0 3 2

OBJECTIVES

1. Be familiar with the algorithms of data mining,
2. Be acquainted with the tools and techniques used for clustering and classification.
3. Be exposed to web mining and text mining

LIST OF EXPERIMENTS

1. Creation of Large data set
2. Load large dataset and visualize data in different dimensions
3. Perform preppprocessing on data set
4. Perform association rule mining on data set
5. Develop a knowledge flow layout for finding strong association rules by using Apriori,FPGrowth algorithms
6. Case Study on Text Mining or any commercial application.
7. Implement Linear Regression
8. Implement Logistic Regression
9. Implement SVM / Decision tree classification techniques
10. Implement clustering techniques
11. Visualize data using any plotting framework
12. Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Build a linear and logistic regression model and use the model for prediction
- Develop association rules for market basket analysis using FP growth and Apriori algorithm
- Construct rules with a help of Decision tree
- Use of different types graphical methods in data analysis
- Develop and evaluate real time applications using R

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE

Python/ R

HARDWARE

Standalone desktops 30 Nos

IT18713	CLOUD COMPUTING LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES

- Be exposed to tool kits for cloud environment.
- Learn to run virtual machines of different configuration.
- Learn to use Hadoop.

LIST OF EXPERIMENTS

Use Eucalyptus or Open Nebula or equivalent to set up the cloud and demonstrate.

1. Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
2. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
3. Install a C compiler in the virtual machine and execute a sample program.
4. Install Google App Engine. Create hello world app and other simple web applications using python/java.
5. Use GAE launcher to launch the web applications.
6. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
7. Find procedure to set up the one node Hadoop cluster.
8. Mount the one node Hadoop cluster using FUSE.
9. Write a program to use the API's of Hadoop to interact with it.
10. Programs to demonstrate the use of Hadoop Map Reduce, Pig and Hive.
11. Programs to demonstrate the use of SPARK for near-real time processing.
12. Analyze large data sets using various algorithms in Mahout.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Use Cloud open source Tools for managing cloud resources.
- Create virtual Machines using Eucalyptus
- Use GAE launcher and Google App Engine to launch Web applications.
- Develop sample Web applications using Hadoop MapReduce algorithms.
- Demonstrate different types of Hadoop framework for large datasets.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE
Eucalyptus or Open Nebula or equivalent
SPARK, Pig, Hive, Hadoop

HARDWARE
Standalone desktops 30 Nos

IT18714	CYBER SECURITY AND FORENSICS LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES

1. Be familiar with the tools for cyber security.
2. Be acquainted with the tools and techniques used for digital forensics.
3. Be exposed to application, web and network analysis.

LIST OF EXPERIMENTS

1. Analying Disk Structure And File Systems
2. The Sleuth Kit Tools
3. Search Word Filtering From Unallocated, Slack And Swap Space
4. Unix File Recovery – Data Unit Level
5. Review Of Unallocated Space And Extracting With Dls
6. File Recovery: Meta Data Layer
7. Find Meta Data Information For Evidence Found In A Search List
8. Keyword Searches, Timelines, Hidden Data
9. Data Mining For Digital Forensics
10. Encryption And Password Recovery
11. Steganography Detection
12. File Extension Renaming And Signaturing
13. Application Analysis
14. Client And Web Analysis
15. Network Analysis

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Choose the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Computer Forensics.
- Interrupt and investigate the threats in networks and security concepts.
- Make use the authentication applications in different networks using open source tools.
- Develop security services for Email and Internet access.
- Choose the best practices to collect evidence for incidence response.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE

Wireshark, Cisco Packet Tracer, Sleuth Kit, Snort

HARDWARE

Standalone desktops with 8GB RAM 30 Nos

IT18001	DEEP LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn feed forward deep networks
- To understand convolutional networks and sequence modeling
- To study probabilistic models and auto encoders
- To expose the students to various deep generative models
- To study the various applications of deep learning

UNIT I APPLIED MATH AND MACHINE LEARNING BASICS 9

Linear Algebra - Norms, Singular Value Decomposition, the Moore-Penrose Pseudoinverse, Probability and Information Theory, Machine Learning Basics

UNIT II INTRODUCTION TO DEEP NETWORKS: MODERN PRACTICES 9

Deep Feedforward Networks, Regularization for Deep Learning, optimization for Training Deep Models.

UNIT III MODERN PRACTICES 9

Convolutional Networks, SequenceModeling,: recurrent and recursive Nets, Practical methodology**,** Linear Factor Models, Autoencoders, Representation Learning, Monte Carlo methods, Confronting the partition function.

UNIT IV INTRODUCTION TO DEEP GENERATIVE MODELS 9

Approximate Inference, Deep Generative Models - Boltzmann Machines, Restricted Boltzmann Machines, Deep Belief Networks, Deep Boltzmann Machines, Convolutional Boltzmann Machines, Back-Propagation through Random Operations, Directed Generative Nets, Generative Stochastic Networks, Evaluating Generative Models.

UNIT V DEEP LEARNING FRAMEWORK AND APPLICATIONS 9

Introduction to TensorFlow, MXNET, TORCH, Applications of Deep Learning – TEXT, IMAGE, SPEECH.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Explore the basics for linear algebra for deep learning
- Interpret machine learning algorithms for various applications
- Identify programming models for deep networks
- Learn programming models for modern practices.
- Develop text and image based applications using deep generative models.
- Examine deep learning frameworks using different applications

TEXT BOOKS:

1. Ian Goodfellow, YoshuaBengio and Aaron Courville,"Deep Learning", MIT Press, 2016.

REFERENCES:

1. Li Deng, Dong Yu, "Deep Learning: Methods and Applications", Now publishers, 2014.
2. Special Issue on deep learning for speech and language processing, IEEE Transaction on Audio, Speech and Language Processing, vol. 20, iss. 1, pp. 7 – 54, 2012

IT18003	EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn the architecture and programming of ARM processor.
- To become familiar with the embedded computing platform design and analysis.
- To get thorough knowledge in interfacing concepts
- To design an embedded system and to develop programs

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS **9**

Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries – ARM Processor – CPU: programming input and output- supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN **9**

The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis – Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III SENSOR INTERFACING WITH AURDINO **9**

Basics of hardware design and functions of basic passive components-sensors and actuators-Arduino code – library file for sensor interfacing-construction of basic applications

UNIT IV EMBEDDED FIRMWARE **9**

Reset Circuit, Brown-out Protection Circuit-Oscillator Unit – Real Time Clock-Watchdog Timer – Embedded Firmware Design Approaches and Development Languages.

UNIT V EMBEDDED C PROGRAMMING **9**

Introduction-Creating ‗hardware delays' using Timer 0 and Timer 1-Reading switches-Adding Structure to the code-Generating a minimum and maximum delay-Example: Creating a portable hardware delay-Timeout mechanisms-Creating loop timeouts-Testing loop timeouts- hardware timeouts-Testing a hardware timeout..

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Describe the architecture and programming of ARM processor.
- Explain the concepts of embedded systems
- Understand the Concepts of peripherals and interfacing of sensors.
- Capable of using the system design techniques to develop firmware
- Illustrate the code for constructing a system

TEXT BOOKS:

1. Marilyn Wolf, ―Computers as Components – Principles of Embedded Computing System Design, Third Edition ―Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
2. .Michael J. Pont, ―Embedded C, 2 nd Edition, Pearson Education, 2008.(Unit IV & V)

REFERENCES:

1. Shibu K.V, ―Introduction to Embedded Systems, McGraw Hill.2014
2. Jonathan W.Valvano, ―Embedded Microcomputer Systems Real Time Interfacing, Third Edition Cengage Learning, 2012
3. Raj Kamal, ―Embedded Systems-Architecture,programming and design, 3 edition,TMH.2015
4. Lyla, ―Embedded Systems, Pearson , 2013 6. David E. Simon, ―An Embedded Software Primer‖, Pearson Education,2000.

IT18005	FREE AND OPEN SOURCE SOFTWARE	L	T	P	C
		3	0	0	3

OBJECTIVES

- To be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.
- To be familiar with participating in a FOSS project
- To learn scripting languages like Python or Perl
- To learn some important FOSS tools and techniques

UNIT I INTRODUCTION 9

Introduction to Open sources – Need of Open Sources, Advantages of Open Sources–FOSS usage, Free Software Movement, Certification courses issues -Global and Indian, Application of Open Sources, Commercial aspects of open source movement, Introduction to Open Source Hardware.

UNIT II SHELL SCRIPTING 9

Introduction to Linux Operating System -Kernel Mode- User Mode, Development with Linux: GNU products- Development tools, Kernel Operations, Processes: Basic Concepts- Basic System Calls- Scheduling – Personalities – Cloning, Signals: Sending Signals-signal Handling- Complementary System Calls.

UNIT III PYTHON 9

Python Basics- Python Objects – Numbers, Sequences: Strings, Lists and Tuples, Mapping and Set Types, Conditionals and loops. Files: Input and Output.

UNIT IV PERL 9

Perl backgrounder – Perl overview , Perl parsing rules – Variables and Data, Statements and Control structures – Subroutines, Packages, **CASE STUDY**: Government Policy toward Open Source (E-Governance).

UNIT V JSON 9

JSON Overview - Datatypes, Arrays, Objects, Schemas, Parsing, Stringify, JSONP, JSON with MongoDB

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Compare and contrast the context and operation of free and open source software and its applications
- Assess the functionalities of Linux operating system and its development tools.
- Build real-time applications using Python
- Develop web applications using PERL Scripting.
- Design data interchange applications using JSON.

TEXT BOOKS:

1. Remy Card, Eric Dumas and Frank Mevel, “The Linux Kernel Book”, Wiley Publications, 2003.
2. Wesley J. Chun, “Core Python Programming”, Second Edition, Pearson Education, 2007.

REFERENCES:

1. Alicia Gibb, “Building Open Source Hardware”, Addison Wesley, 2015.
2. w3schools.org
3. Martin C. Brown, “Perl: The Complete Reference”, Second Edition, McGrawHill, Indian Reprint 2009.

IT18007	FUNCTIONAL PROGRAMMING USING SCALA	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the principles of functional programming.
- To write purely functional programs using pattern matching and higher-order functions.
- To combine functional programming with objects and classes.
- To design immutable data structures.
- To understand generic types for functional programs.

UNIT I INTRODUCTION 9

Introduction to functional programming – Need for scala – Scala interpreter - Defining variables and functions - Writing scripts – Loops – Arrays – tuples- sets – maps – arrays – File manipulations – Case studies.

UNIT II CLASSES 9

Classes and Objects – Basic types and Operators –Wrappers – Functional objects – constructors – method overloading – implicit conversions - Case studies.

UNIT III INHERITANCE 9

Built-in Control Structures - Functions and Closures- Control Abstraction - Composition and Inheritance – Abstract classes – Overriding methods and fields – polymorphism and dynamic binding - Case studies.

UNIT IV HIERARCHY OF SCALA 9

Primitives – Bottom types – Traits- Thin vs rich interfaces – Packages and Imports- Putting code in packages - Access modifiers – Package imports - Assertions and Unit Testing - Case studies.

UNIT V PATTERN MATCHING 9

Pattern Matching – pattern guards – pattern overlaps - Sealed classes - Working with Lists – types, operations and pattern –Parallel programming: Collections – sequence and maps – mutable and immutable collections - Stateful Objects - Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Examine the principles of functional programming
- Design purely functional programs using pattern matching and higher-order functions
- Develop functional programs with objects and classes
- Design immutable data structures
- Explore the generic types for functional programs

TEXT BOOKS:

1. Martin Odersky, Lex Spoon and Bill Venners , “Programming in Scala, A comprehensive step-by-step guide”, Third Edition, Artima press, 2010.

REFERENCES:

1. Dean Wampler, Alex Payne , “Programming Scala, Scalability = Functional Programming + Objects”, 2nd Edition ,O'Reilly Media, 2014.
2. Paul Chiusano and Runar Bjarnason, “Functional Programming in Scala”, Manning, 2014.

IT18009	GRAPHICS AND MULTIMEDIA	L	T	P	C
		3	0	0	3

OBJECTIVES

- To explore the fundamental concepts in 2D and 3D computer graphic models.
- To understand 2D raster graphics techniques, 3D modeling, geometric transformations, 3D viewing and rendering.
- To learn about multimedia building blocks of text, images, sound, animation, and video.
- To develop an understanding of the process of developing multimedia.

UNIT I INTRODUCTION 9

Overview of graphics systems – Raster scan, Random scans, Output primitives –2D concepts- Points and Lines, Line drawing algorithms, Circle and Ellipse generating algorithms.

UNIT II TWO DIMENSIONAL TRANSFORMATION AND VIEWING 9

Two dimensional geometric transformations – Matrix representations and Homogeneous Coordinates, Composite transformations; Two dimensional viewing – Viewing pipeline, Viewing coordinate reference frame; Window-to-Viewport coordinate transformation, Clipping operations-Point, Line, Polygon, Curve and Text clipping.

UNIT III THREE DIMENSIONAL TRANSFORMATION AND VIEWING 9

Three dimensional concepts; Three dimensional object representations – Polygon surfaces-Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects, Splines. Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations, Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping. Color Models – RGB, YIQ, CMY, HSV.

UNIT IV MULTIMEDIA BASICS 9

Introduction: Definition, application, elements, Text, Image, Audio, Video –types, representations, standards, file formats.

UNIT V MULTIMEDIA DEVELOPMENT 9

Software Life cycle, Addie Model, Conceptualization, Content collection and processing, flow line, script, storyboard, implementation, Authoring metaphors, Testing and feedback, final delivery, Case Study: study of CBT on sound in multimedia.

TOTAL : 45 PERIODS

OUTCOMES:

Students should be able to:

- Develop different graphics systems and applications of computer graphics.
- Analyse various algorithms for scan conversion and filling of basic objects
- Develop application in composite form using geometric transformations on graphics objects
- Practice scene extraction with different clipping methods and its transformation to graphics display device.
- Analyse the structure and technologies needed in a multimedia system and to discriminate which technology may be more useful in order to best achieve the expected end result

TEXT BOOKS:

1. Donald Hearn, M.Pauline Baker, “Computer Graphics”, PHI, 2014.
2. Ranjan Parekh, “Principles of Multimedia”, Second Edition, Mcgraw Hill, 2012.

REFERENCES:

1. F .S. Hill, “Computer Graphics using OPENGL”, Second edition, Pearson Education 2014.
2. John F. Hughes , Andries van Dam, Morgan McGuire , David F. Sklar, James D. Foley , Steven K. Feiner , Kurt Akeley , “Computer Graphics: Principles and Practice”, 3rd Edition, Addison Welsey Professional, 2013.
3. Prabhat K Andleigh, Kiran Thakrar, “Multimedia systems design”, First Edition, PHI, 2015.
4. Ze-Nian Li and Mark S.Drew, “Fundamentals of Multimedia”, First Edition, Pearson Education, 2007.

IT18011	INFORMATION RETRIEVAL	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn the concepts behind IR
- To understand the operation of web search
- To learn the algorithms related to text classification, indexing and searching

UNIT I INTRODUCTION **9**

IR Model – Boolean Retrieval –The term Vocabulary and posting lists -Tokenization – Stop words – Stemming – Inverted index – Skip pointers – Phrase Queries- Dictionaries and tolerant retrieval.

UNIT II LANGUAGE MODELS AND INDEXING **9**

Language Models for IR – Index Construction – Index Compression –Scoring – Term weighing – vector space model – Computing scores in a complete search system

UNIT III EVALUATION **9**

Evaluation in Information Retrieval – Relevance Feedback and Query Expansion – XML Retrieval – Probabilistic Information Retrieval

UNIT IV CRAWLING AND LINK ANALYSIS **9**

Web Search basics – Search Advertising – Duplicate Detection - Web Crawling and Indices - Crawling architecture – Distributed Crawling - Link Analysis – Web as graph – Page Rank

UNIT V APPLICATIONS **9**

Information Extraction – Automatic Text Summarization - Question Answering Systems –Spam Filtering – Document Classification – Cross Lingual retrieval – Compound Term Processing

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Build an open source search engine framework and explore its capabilities
- Classify documents in different ways and discuss its effect on similarity calculations and on search
- Compare practical algorithms of textual document indexing, relevant ranking, web mining, text analytics and their performance evaluations.
- Develop the necessary experience to design, and implement applications using Information Retrieval systems
- Design and implement an innovative feature in a search engine

TEXT BOOKS:

1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval , Cambridge University Press, 2008.
2. “Natural Language Processing And Information Retrieval”, Tanveer Siddiqui and U. S. Tiwary, Oxford University Press.

REFERENCES:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, ―Modern Information Retrieval: The
2. Concepts and Technology behind Search‖, Second Edition, ACM Press Books, 2011.
3. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, ―Information Retrieval:
4. Implementing and Evaluating Search Engines‖, The MIT Press, 2010.

IT18013	DIGITAL FORENSIC TOOLS AND TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand evidence-handling procedures
- To comprehend the general rules of evidence
- To know the fundamental computer and mobile forensics concepts
- Locate forensic artifacts in various operating systems
- Analyze extracted evidence and properly report findings

UNIT I BASICS OF DIGITAL FORENSICS **9**

The Role of Digital Forensics - the history and purpose, criminal investigations and cybercrime, civil investigations and the nature of e-discovery , The role and challenges of digital forensic practitioners , case studies, Digital Forensics Environment – Nature of digital information, Operating systems , Describing and locating evidence in file systems , password security, encryption, and hidden files , linking the evidence to the user.

UNIT II INTRODUCTION TO DIGITAL EVIDENCE **9**

Digital evidence – Usage, Characteristics, technical complexities, determining the value and admissibility of digital evidence, Recovering and Preserving Digital Evidence - chain of custody, physical acquisition and safe keeping, Recovery - forensic imaging process, live recovery process.

UNIT III TOOLS **9**

Forensic Tools - Standards, Need, forensic imaging tools, Enhanced forensic tools - The Event Analysis tool ,The Cloud Analysis tool ,The Lead Analysis tool, Analyzing e-mail datasets ,Detecting scanned images ,Volume Shadow Copy analysis tools ,Timelines and other analysis tools, Case study : Interrogating large datasets , Selecting and Analyzing Digital Evidence- Structured processes to locate and select digital evidence ,Locating digital evidence, Selecting digital evidence , Case study : recovery of deleted evidence held in volume shadows.

UNIT IV EVIDENCE SOURCE AND EXAMINATION **9**

Sources of Evidence -The Windows Registry and system files and logs as resources of digital evidence , Apple and other operating system structures, Remote access and malware threats ,Case study – corroborating evidence using Windows Registry, Examining Evidence - Locating evidence from Internet browsing ,Messaging systems , E-mail analysis and the processing of large e-mail databases , evidence recovery from mobile phones and handheld devices Case study – mobile phone evidence in a bomb hoax.

UNIT V VALIDATING THE EVIDENCE **9**

The nature and problem of unsound digital evidence , Impartiality in selecting evidence ,The structured and balanced analysis of digital evidence ,Formalizing the validation of digital evidence ,The presentation of digital evidence, Ethical issues confronting digital forensics practitioners, Case study – presumed unauthorized use of intellectual property Solutions to the challenges posed by new hardware and software ,Challenges posed by communication media and the cloud , Mobile phone evidence recovery ,The cloud - convenient for users but problematic for practitioners ,The need for effective evidence processing and validation ,Contingency planning .

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Apply the fundamental computer theory in the context of computer forensics practices
- Appropriately apply the laws and procedures associated with identifying, acquiring, examining and presenting digital evidence.
- Examine the acquired data, recover the deleted data, use appropriate digital forensic tool and manage a case.
- Choose the correct method to collect, transport, preserve and examine the digital evidence
- Create a method for gathering, assessing and applying new and existing legislation and industry trends specific to the practice of digital forensics.

TEXT BOOKS:

1. Richard Boddington, ”Practical Digital Forensics”, Packt Publishing, 2016.

REFERENCES:

1. Cory Altheide and Harlan Carvey, “Digital Forensics with Open Source Tools”,Syngress, 2011.
2. Harlan Carvey, “Windows Forensic Analysis Toolkit: Advanced Analysis Techniques for Windows 7”, Syngress Publishing, 2012.

IT18015	STATISTICAL ANALYSIS USING R PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn data structures such as matrices, lists, factors, and data frames.
- To create a variety of graphic displays.
- To understand the concepts of probability and statistics.
- To build statistical models.

UNIT I INTRODUCTION **9**

Introduction to R-Basic Syntax-data Types-variables-Operators-Decision Making-Loops-Functions-Strings-Vectors-Lists-Matrices-Arrays-Factors-Data Frames-Packages-Data Reshaping.

UNIT II DATASET AND GRAPHICS **9**

Input and Output-Entering Data from the Keyboard-CSV file-Excel File-Binary File-XML file-JSON file-Web Data-Database-Graphics-Pie Charts-Bar Charts-Box Plots-Dot plots-Histograms-Line Graphs-Scatter plots-Kernel density plots-Writing plot to a file-Changing graphical parameters.

UNIT III PROBABILITY **9**

Introduction-Sample Space -Events-Counting Methods-Conditional probability -Independent Events-Bayes Rule-Random Variables-Probability distribution-Discrete and continuous Distribution-Multivariate Distribution.

UNIT IV STATISTICS **9**

Regression-Linear-Multiple-Logistic-Poisson-Analysis of Covariance-Time Series Analysis-Nonlinear Least Square-Decision Tree-Random Forest-Survival Analysis-t-Test-Chi Square Test,ANOVA.

UNIT V ADVANCED METHODS **9**

Advanced methods for missing data-Steps in dealing with missing data-Identifying missing values-Exploring missing value patterns-Understanding the sources and impact of missing data-rational Approaches for dealing with incomplete data-Lit wise deletion-Multiple Imputation-Advanced Graphics-Lattice Package-ggPlot2 Package-Interactive graphs.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of this course, the student will be able to:

- Experiment with the various data structures such as matrices, lists, factors, and data frames.
- Infer knowledge on various file formats and create various graphic displays
- Formulate and Solve the problems in probability distributions
- Choose statistical models for analyzing the data
- Investigate and handle missing data and infer knowledge on advanced graphics

TEXT BOOKS:

1. Paul Teetor, ”R Cookbook”, O’reily, 2011.

REFERENCES:

1. Robert I Kabacoff, “R in Action: Data Analysis and Graphics with R”, Manning Publications, 2015.
2. G. Jay Kerns,”Introduction to Probability and Statistics Using R”, First Edition, 2010.

IT18017	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn XML fundamentals and to build applications based on XML.
- To know the basic principles of Service Oriented Architecture, its components and techniques.
- Be familiar with the web service standards and elements for realizing SOA.
- To acquire knowledge on mapping of SOA and Cloud Computing.

UNIT I INTRODUCTION TO XML 9

XML document structure- Well formed and valid documents- Namespaces- DTD- XML Schema- X-Files- Parsing XML- XML Transformation and XSL.

UNIT II SOA BASICS 9

Roots of SOA – Characteristics of SOA – Comparing SOA to client-server and distributed Internet architectures – Anatomy of SOA- How components in an SOA interrelate – Principles of service orientation.

UNIT III WEB SERVICES AND SOA 9

Web services Architecture– Service descriptions – WSDL- Messaging with SOAP –Message exchange Patterns - Coordination –Atomic Transactions – Business activities – Orchestration – Choreography – Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer.

UNIT IV ENTERPRISE PLATFORMS AND SOA 9

Service Oriented Analysis- Service Oriented Design- Service Modeling- SOA platform basics- SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC) , RESTful web services, Web Services Interoperability Technologies (WSIT), SOA support in .NET – ASP.NET web services.

UNIT V RECENT TRENDS IN SOA 9

SOA business process design- WS-BPEL Language basics- WS-Policy, WS-Security- WS-coordination- Mapping of SOA and Cloud computing, Case Study: Travel Insurance

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TOTAL (L:45): 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Generate applications based on XML
- Examine the basic principles of Service Oriented Architecture, its components and techniques
- Group web service standards and elements for realizing SOA
- Solve enterprise problems using SOA
- Develop knowledge on mapping of SOA and Cloud Computing

TEXT BOOKS:

1. Ron Schmelzer et al. " XML and Web Services", Pearson Education, 2002.
2. Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2016.

REFERENCES:

1. David S.Linthicum, "Cloud Computing and SOA Convergence in Your Enterprise", Pearson Addison-Wesley Information Technology Series, 2010.
2. Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002.
3. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education,2005.
4. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004.
5. James McGovern,Sameer Tyagi, Michael E.Stevens, Sunil Mathew, "Java Web Services Architecture", Morgan Kaufmann Publishers, 2011.

IT18019	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
	(Common to CS & IT)	3	0	0	3

OBJECTIVES

- To understand the roles of the project manager
- To understand the threats and opportunities in project management
- To gain expertise in size, effort and cost estimation techniques
- To understand how to approach non-technical problems
- To appreciate management issues like team structure, group dynamics

UNIT I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9

Project Definition , Contract Management ,Activities Covered by Software Project Management, Plan, Methods and Methodologies, Ways of Categorizing Software Projects, Problems with Software Projects , Setting Objectives, Stakeholders, Management Control, Overview of Project Planning – Stepwise Project Planning.

UNIT II PROJECT EVALUATION 9

Programme Management, Managing the Allocation of Resources, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Benefits Management, Evaluation of Individual Projects, Technical Assessment – Cost Benefit Analysis – Cost Benefit Evaluation Techniques – Risk Evaluation –Cash Flow Forecasting –Software Effort Estimation.

UNIT III ACTIVITY PLANNING 9

Objectives of Activity Planning – Project Schedule – Project and Activities - Sequencing and Scheduling Activities – Network Planning Models – Formulating a Network Model – Adding the Time Dimension - Forward Pass – Backward Pass –Identifying Critical Path - Activity Float – Shortening Project Duration – Identifying Critical Activities - Activity on Arrow Networks – Risk Management – Categories -Risk - Framework – Identification – Assessment – Planning – Management – Evaluating Risk to the Schedule – PERT Technique – Monte Carlo Simulation – Resource Allocation – Nature Of Resources – Identifying Resource Requirements – Scheduling Resources – Creating Critical Paths – Counting the Cost - Publishing the Resource Schedule.

UNIT IV MONITORING AND CONTROL 9

Framework – Collecting the Data –Visualizing Progress – Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Getting Project Back to Target – Change Control – Managing Contracts – Introduction – The ISO 12207 Approach –Supply process –Types of Contract – Stages in Contract Placement – Typical Terms Of a Contract – Contract Management – Acceptance.

UNIT V MANAGING PEOPLE AND ORGANIZING TEAMS 9

Introduction – Understanding Behavior – Organizational Behavior - Selecting the Right Person for the Job – Instruction in the Best Methods – Motivation – The Oldham –Hackmann Job Characteristics Model – Working in Groups – Becoming a Team –Decision Making – Leadership – Organizational Structures – Stress – Health and Safety – Process Group view, Tools - web-based project management tool, Scrum-based task management board.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Select the software project management plan and its activities
- Appraise the individual project through cost, effort and risk
- Judge the various project activity plan through available resources
- Recognize project progress and its control
- Employ the ethics in handling a project team

TEXT BOOKS:

1. Bob Hughes, Mike Cotterell, ―Software Project Management, Fifth Edition, Tata McGraw Hill, 2011.

REFERENCES:

1. http://projectmanagementacademy.net/articles/five-traditional-process-groups/
2. Karen Brown, Nancy Lea Hyer, "Managing Projects: A Team-Based Approach", first edition, Tata Mcgraw Hill, 2013.
3. Andrew Stellman, Jennifer Greene - Head First PMP, 3rd Edition O'Reilly Media 2013.

IT18021	MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the need for machine learning for various problem solving
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- To understand the latest trends in machine learning
- To design appropriate machine learning algorithms for problem solving

UNIT I INTRODUCTION 9

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS 9

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING 9

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANT BASED LEARNING 9

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

UNIT V ADVANCED LEARNING 9

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course, the students will be able :

- Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
- Discuss the decision tree algorithm and identity and overcome the problem of overfitting
- Discuss and apply the back propagation algorithm and genetic algorithms to various problems
- Apply the Bayesian concepts to machine learning
- Analyze and suggest appropriate machine learning approaches for various types of problems

TEXT BOOKS:

1. Tom M. Mitchell, ―Machine Learning‖, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES:

1. EthemAlpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning)‖, The MIT Press 2004.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective‖, CRC Press, 2009.

CS18002	ADVANCED USER INTERFACE TECHNOLOGIES (COMMON TO CS & IT)	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the concepts and need of TypeScript
- To understand and practice Client-side JS Framework, Basics of ANGULAR 4.0
- To understand on Front-end application development and the React library
- To understand various React features including components and forms

UNIT I INTRODUCTION TO TYPESCRIPT **9**

TypeScript : Introduction to TypeScript – Features of TypeScript – Installation setup – Variables – Datatypes – Enum – Array – Tuples – Functions – OOP concepts – Interfaces – Generics – Modules – Namespaces – Decorators – Compiler options – Project Configuration

UNIT II INTRODUCTION TO CLIENT-SIDE JS FRAMEWORK – BASICS OF ANGULAR 4.0 **9**

Introduction to Angular 4.0 - Needs & Evolution – Features – Setup and Configuration – Components and Modules – Templates – Change Detection – Directives – Data Binding - Pipes – Nested Components

UNIT III INTRODUCTION TO CLIENT-SIDE JS FRAMEWORK – FORMS AND ROUTING IN ANGULAR 4.0 **9**

Template Driven Forms - Model Driven Forms or Reactive Forms - Custom Validators - Dependency Injection - Services - RxJS Observables - HTTP - Routing

UNIT IV INTRODUCTION TO REACT AND ITS ROUTER **9**

Introduction to React: Platforms and Frameworks tools – Hybrid frameworks versus Native – ReactEnvironment Setup – React internals – React JSX – React Components and its styling– React Router: Parameters – Designing single page applications using React Router

UNIT V INTRODUCTION TO REDUX AND CLIENT-SERVER COMMUNICATION **9**

Introduction to uncontrolled and controlled forms – Form validation in React applications – Overview of the Flux architecture - Introduction to Redux – React Redux Forms and its validation – Redux Actions and Combining Reducers – Client-Server Communication and Fetch , Building and Deploying the React Application

TOTAL (L:45): 45 PERIODS

OUTCOMES:

- Enumerate various Client-side JS Framework, Basics of ANGULAR 4.0.
- Review the various concepts and need of TypeScript.
- Demonstrate Front-end application development and the React library.
- Develop the various React features including components and forms.
- Demonstrate the functional front-end web application using React.

TEXT BOOKS:

1. Nate Murray, Felipe Coury, Ari Lerner and Carlos Taborda, “ng-book, The Complete Book on Angular 4”, First Edition, CREATESPACE Publishers, 2017.
2. Michele Bertoli, “React Design Patterns and Best Practices: Build easy to scale modular applications using the most powerful components and design patterns” , First Edition, Packt Publishing, 2017

REFERENCES:

1. Nathan Rozentals, “Mastering TypeScript”, Second Edition, Packt Publishing, 2017.
2. Matt Frisbie, “Angular 2 Cookbook”, First Edition, Packt Publishing, 2017.
3. Kirupa ChinnathambI, “Learning React: A Hands-On Guide to Building Web Applications Using React and Redux”, Second Edition, Pearson Education, 2018.

GE18051	INTELLECTUAL PROPERTY RIGHTS (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

OBJECTIVES:

To understand the process and need for protecting technology innovations through Intellectual Property Rights.

UNIT I TECHNOLOGICAL INNOVATIONS 10

The process of technological innovation - factors contributing to successful technological innovation - the need for creativity and innovation - problem solving and creativity through brain storming - different techniques - Selection criteria - screening ideas for new products - evaluation techniques. Protection of IP as a factor in R&D and few case studies.

UNIT II INTRODUCTION TO IPR & RELATED AGREEMENTS AND TREATIES 8

Types of IP: Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications. History of GATT & TRIPS Agreement; Madrid Agreement; Hague Agreement; WIPO Treaties; Budapest Treaty; PCT; Indian Patent Act 1970 & recent amendments.

UNIT III BASICSOFPATENTSANDCONCEPT OFPRIORART 10

Introduction to Patents; Types of patent applications: Ordinary, PCT, Conventional, Divisional and Patent of Addition; Specifications: Provisional and complete; Forms and fees Invention in context of "prior art"; Patent databases; Searching International Databases; Country-wise patent searches, USPTO, EPO, PATENTScope (WIPO), IPO, etc.)

UNIT IV PATENTFILINGPROCEDURES 9

National & PCT filing procedure; Time frame and cost; Status of the patent applications filed; Precautions while patenting – disclosure/non-disclosure; Financial assistance for patenting - introduction to existing schemes Patent licensing and agreement Patent infringement- meaning, scope, litigation, case studies

UNIT V PATENT RIGTS AND NEW DEVELOPMENTS IN IPR 8

Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System.

TOTAL: 45 PERIODS

OUTCOMES:

- Understand the process of problem solving through technological innovations.
- Selecting the appropriate IPR elements for protecting intellectual property.
- Understand the concept of prior art search and performing it.
- Understand the procedure for filing patent.
- Understand and apply the scope of patent rights for licensing and transfer of technology.

TEXT BOOKS:

1. Ramappa, T. “Intellectual Property Rights Under WTO”, S. Chand, 2008.
2. BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., 2007.
3. Adair, J. “Effective Innovation”, 1st Ed., Macmillan Publishing, 2003.

REFERENCES:

1. Robert P. Merges, Peter S. Menell and Mark A. Lemley, “Intellectual Property in New Technological A
   Aspen Publishers, 2016.
2. Kankanala C., “Genetic Patent Law & Strategy”, 1st Edition, Manupatra Information Solution Pvt. Ltd.
3. Nystrom, H.,“Creativity and Innovation”, 2nd Ed., John Wiley & Sons, 1996.

CS18004	AGILE METHODOLOGIES (COMMON TO CS & IT)	L	T	P	C
		3	0	0	3

OBJECTIVES

- To provide knowledge and understanding of agile software development approaches.
- To provide a good knowledge on Agile based software design.
- To do thorough analysis on agile development knowledge.
- To understand the agility and requirement management.
- To understand agile quality. Metrics and testing.

UNIT I AGILE METHODOLOGY **9**

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.

UNIT II AGILE PROCESSES **9**

Lean Production – SCRUM, Crystal, Feature Driven Development- Adaptive Software Development – Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT **9**

Agile Information Systems – Agile Decision Making – Earl S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING **9**

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE- Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE **9**

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development – Agile Approach in Global Software Development.

TOTAL (L:45): 45 PERIODS

OUTCOMES:

On the completion of the course the students will be able to

- Enumerate the importance of interaction with stakeholders in gathering the requirements for a software.
- Perform planning of agile iterative software development processes.
- Develop techniques and tools for improving agile process.
- Use agile knowledge management processes.
- Enumerate agile approaches, Metrics and quality.

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

REFERENCES:

1. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.
2. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.
3. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.

IT18002	PRINCIPLES OF DIGITAL IMAGE PROCESSING (Common to IT & CS)	L	T	P	C
		3	0	0	3

OBJECTIVES

- To get exposed to different image enhancement techniques
- To learn about image transformation and color image analysis
- To learn about image classification
- To study various applications of image processing

UNIT I INTRODUCTION 9

Introduction-Origins, Examples of Fields, fundamental steps, Components, Fundamentals-Elements of Visual Perception, Image Sensing & Acquisition, Sampling and Quantization, Relationship between Pixels, Mathematical Tools – Spatial , Vector and Matrix operations.

UNIT II IMAGE ENHANCEMENT 9

Histogram Processing, Fundamentals of Spatial Filtering- Smoothing, Sharpening, Frequency domain-Smoothing and Sharpening, Filters – Homo-morphic Filtering, Noise Models, Inverse filtering, Wiener filtering, Geometric Mean Filter.

UNIT III IMAGE TRANSFORMATION 9

Transforms: Matrix-based - correlation, Fourier related, Walsh- Hadamard, Slant, Haar, Wavelet, Color: Models, Transformations, Image smoothing and sharpening, Noise in color images.

UNIT IV MIDDLE &HIGH LEVEL IMAGE PROCESSING 9

Basic Morphological algorithms: Hole filling, Convex hull, Pruning, Edge Detection-Basic, Thresholding-Foundation and Segmentation - Region Growing and Region Splitting & Merging, Active contours- image segmentation using Snakes, Feature Extraction- Preprocessing, Feature descriptors - Boundary, Region and Principal components, Pattern classification: Statistical classifiers –Bayes classifier, Neural Networks and Deep learning: Multilayer Feedforward Neural Networks , Deep Convolutional Neural Networks.

UNIT V APPLICATIONS 9

Face Recognition, Finger print Recognition, Gait Recognition, Location of dark contaminants in cereals, recent developments in In-Vehicle Vision systems.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of this course, the student will be able to:

- Enumerate general terminology of digital image processing.
- Experiment various image processing operation
- Interpret image segmentation and representation techniques.
- Implement different feature extraction techniques for image analysis and recognition
- Develop real time image processing applications

TEXT BOOKS:

1. Rafael C.Gonzalez and Richard E.Woods, ―Digital Image Processing, Fourth Edition, Pearson Education, 2017.
2. E. R. Davies, “Computer & Machine Vision”, Fourth Edition, Academic Press, 2012.

REFERENCES:

1. S.Sridhar, “Digital Image Processing”, Oxford University Press, 2011.
2. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 2011.

IT18004	SOFTWARE TESTING & QUALITY ASSURANCE (Common to IT& CS)	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand mathematical foundations of software testing.
- To comprehend the phases of software testing
- To know the managerial aspects of software testing
- To understand software quality management process and quality management models
- To learn software quality metrics, assurance and various software standards

UNIT I INTRODUCTION TO SOFTWARE TESTING 9

Software testing lifecycle, software specifications, program correctness and verification, Failures, errors and faults, testing taxonomy.

UNIT II TEST DATA GENERATION 9

Test generation concepts, Functional and structural criteria, Test Oracle design, Test Driver design, Test outcome analysis.

UNIT III MANAGEMENT OF SOFTWARE TESTING 9

Metrics for software testing, tools – Scripting tools, record-and-replay tools, performance testing tools, oracle design tools, exception discovery, collaborative tools.

UNIT IV SOFTWARE QUALITY 9

Defining Software Quality, Software Quality factors, Components of software quality assurance system, pre project software quality components- Contract Review - Development and Quality Plans, integrating quality activities in project life cycle.

UNIT V STANDARDS, CERTIFICATION AND ASSESSMENT 9

Need for standards, SQA Standards – ISO9001 Certification , bootstrap methodology, SPICE project and process assessment, Organizing for Quality Assurance -Management and its Role in Quality Assurance - SQA Unit & other actors, introduction to Six Sigma.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course, the students will be able:

- Apply the knowledge of mathematics in software testing and test data generation techniques.
- Implement appropriate procedures, Tools and test data generation techniques
- Choose the suitable Software Testing Tools
- Examine the benefits of software quality management process
- Develop a software quality assurance plan for software projects

TEXT BOOKS:

1. Ali Mili, FairouzTchier , “Software Testing: Concepts and Operations”, John wiley& sons, 2015.
2. Daniel Galin, “Software Quality Assurance: From Theory to Implementation”, Pearson Addison-Wesley, Second Edition, 2012.

REFERENCES:

3. Jeff Tian, “Software Quality Engineering: Testing, Quality Assurance, and Quantifiable”, Wiley, 2006.
4. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2006.
5. Ron Patton, “Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007.

IT18006	ETHICAL HACKING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand numerous methods of real-world information intelligence
- To learn about vulnerability scanners
- To understand techniques used to sniff traffic across a network
- To familiarize with the methodologies that can be used to hack into a target
- To appreciate the wide variety of attacks that can be performed against a wireless network

UNIT I INTRODUCTION TO HACKING **9**

Terminologies, Categories of Penetration Test, Writing Reports, Structure of a Penetration Testing Report, Vulnerability Assessment Summary, Risk Assessment, Methodology, Linux Basics: File Structure, Cron Job, Users, Common Applications ,BackTrack, Services.

UNIT II INFORMATION GATHERING, TARGET ENUMERATION AND PORT SCANNING TECHNIQUES **9**

Active, Passive and Sources of information gathering, Copying Websites Locally, NeoTrace, Cheops-ng, Intercepting a Response, WhatWeb, Netcraft, Basic Parameters, Xcode Exploit Scanner, Interacting with DNS Servers, Fierce, Zone Transfer with Host Command and Automation, DNS Cache Snooping-Attack Scenario, Automating Attacks, SNMP - Problem, Sniffing Passwords,SolarWinds Toolset, sweep, Brute Force and Dictionary- Tools , Attack, Enumeration, Intelligence Gathering Using Shodan, Target enumeration and Port Scanning Techniques.

UNIT III VULNERABILITY ASSESSMENT & NETWORK SNIFFING **9**

Introduction to Vulnerability Assessment - Pros and Cons, NMap, Updation of database, Testing SCADA Environments with Nmap, Nessus, **Sniffing:** Types, Hubs versus Switches, Modes, MITM Attacks, ARP Protocol Basics- working, Attacks, DoS Attacks, Dsniff tool, Using ARP Spoof to Perform MITM Attacks, Sniffing the Traffic with Dsniff, Sniffing Pictures with Drifnet, Urlsnarf and Webspy, Sniffing with Wireshark, Ettercap- ARP Poisoning, Hijacking Session with MITM Attack, ARP Poisoning with Cain and Abel, Sniffing Session Cookies with Wireshark, Hijacking the Session, SSL Strip: Stripping HTTPS Traffic, Requirements, Automating Man in the Middle Attacks, DNS Spoofing, DHCP Spoofing.

UNIT IV BASICS OF EXPLOITATION **9**

Remote Exploitation : Understanding Network Protocols, Attacking Network Remote Services, Common Target Protocols, tools for cracking network remote services, Attacking SMTP, Attacking SQL Servers, Client Side Exploitation Methods: E-Mails Leading to Malicious Attachments & Malicious Links, Compromising Client Side Update, Malware Loaded on USB Sticks, **Postexploitation:** Acquiring Situation Awareness, Privilege Escalation, Maintaining Access, Data Mining, Identifying and Exploiting Further Targets, Windows Exploit Development Basics.

UNIT V WIRELESS & WEB HACKING **9**

Wireless Hacking : Requirements , Aircracking , Hidden SSIDs , Monitor Mode , Monitoring Tool-Beacon Frames on Wireshark ,Airodump-ng , Wireless Adapter in Monitor Mode , Determining the Target , Cracking a WPA/WPA2 Wireless Network Using Aircrack-ng , Capturing Packets and Four-Way Handshake.

Web Hacking : Attacking the Authentication , Brute Force and Dictionary Attacks , Types of Authentication , Crawling Restricted Links , Testing for the Vulnerability ,Authentication Bypass with Insecure Cookie Handling , SQL injection, XSS – DOM based,BeEF,CSRF, Bypassing CSRF and BeEF with XSS, Vulnerability in FCKeditor, efront.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Interpret the core concepts related to malware, hardware and software vulnerabilities and their causes
- Employ the ethics behind hacking and vulnerability disclosure
- Judge the vulnerabilities related to computer system and networks using state of the art tools and technologies
- Assess the strengths and weaknesses of general cyber security models
- Assess the possible consequences of misaligning enterprise strategy, security policy, and security plans

TEXT BOOKS:

1. Rafay Baloch ,"Ethical Hacking and Penetration Testing Guide", CRC Press, 2015.

REFERENCES:

1. Patrick Engebretson, "The Basics of Hacking and Penetration Testing : Ethical Hacking and Penetration Testing Made Easy", Syngress Media, Second Revised Edition, 2013.
2. Michael T. Simpson, Kent Backman, James E. Corley, "Hands On Ethical Hacking and Network Defense", Cengage Learning, 2012.

IT18008	INFORMATION SYSTEMS SECURITY ENGINEERING AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES

- To provide fundamental knowledge, skills, techniques, and tools required by IT security professionals
- To understand access control, physical security, cryptography, application security, and operations security.
- To facilitate the up-to-date understanding required to stay one step ahead of evolving threats, standards, and regulations.

UNIT I INTRODUCTION 9

Security Engineering, Protocols, Access control, Cryptography- the vingere, one-time pad, Block cipher, one way functions, asymmetric primitives, Random oracle model, symmetric crypto primitives, modes of operation, hash functions, asymmetric crypto primitives, Multilevel and multi lateral security.

UNIT II MANAGEMENT OF INFORMATION SECURITY 9

Principles of Information Security Management – Applying Project Management to Security – Project Management Tools – Planning for Security: The Role of Planning – Precursors to Planning – Strategic Planning – Information Security Governance – Information Security Policy, Standards, and Practices – Planning for Information Security Implementation.

UNIT III MANAGEMENT IN ORGANIZATION 9

Developing the Security Program: Organizing for Security – Placing Information Security within an Organization – Components of the Security Program – Information Security Roles and Titles – Implementing Security Education, Training and Awareness Program – Security Management Models: Blueprints, Frameworks, and Security Models – Access Control Models – Security Architecture Models – Security Management Models – Security Management Practices: – Benchmarking – Performance Measures in Information Security Management. – Personnel and Security: Staffing the Security Function – Information Security Professional Credentials – Security Considerations for Non employees – Employment Policies and Practices.

UNIT IV SECURITY MANAGEMENT CONCEPTS AND PRINCIPLES 9

Measuring ROI on security- Security patch management- Purposes of Information Security management- The building blocks of information security- Human side of information security- Security management- Securing new information technology.

UNIT V MANAGING THE DEVELOPMENT OF SECURE SYSTEMS 9

Managing security project, Methodology, Security requirement engineering, Risk management, Managing the team, System Evaluation and Assurance.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Explore techniques, and tools required to provide IT security
- Plan for Information Security Implementation.
- Implement access control, physical security, cryptography, application security, and operations security
- Appraise the evolving threats, standards, and regulations.
- Formulate Information Security Policy and Standards

TEXT BOOKS:

1. Micki Krause, Harold F.Tripton, "Information Security Management Handbook", Auerbach Publications, 2012.
2. Ross J. Anderson, "Security Engineering: A Guide to Building Dependable Distributed Systems", 2nd Edition, Wiley publications, 2008.

REFERENCES:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Prentice Hall, 2007.
2. Mark Rhodes- Ousley ,"Information Security: The complete Reference", Second Edition Mcgraw Hill, 2013.

IT18010	NEXT GENERATION CLOUD	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn specialized cloud architectures
- To understand Unikernels
- To study the basics of containers

UNIT I SPECIALIZED CLOUD ARCHITECTURES 9

Direct I/O Access Architecture , Direct LUN Access Architecture, Dynamic Data Normalization Architecture , Elastic Network Capacity Architecture , Cross-Storage Device Vertical Tiering Architecture , Intra-Storage Device Vertical Data Tiering Architecture , Load Balanced Virtual Switches Architecture , Multipath Resource Access Architecture , Persistent Virtual Network Configuration Architecture , Redundant Physical Connection for Virtual Servers Architecture , Storage Maintenance Window Architecture .

UNIT II UNIKERNELS 9

Dockerized containers, Unikernel application stack, MirageOS, HaLVM, LING, ClickOS, Rumprun,OSv, IncludeOS, Ecosystem elements, Limitations.

UNIT III CONTAINERS 9

Containers Vs VMs, Docker and Containers, Docker Fundamentals, Docker Architecture, Connecting Containers to the World , Linking Containers , Managing Data with Volumes and Data Containers, Common Docker Commands.

UNIT IV MICROSERVICES 9

Autonomous Services ,Small Services, Benefits- Independent Deployments, Continuous Innovation, Improved Scale and Resource Utilization , Technology Diversity , Small Focused Teams , Fault Isolation , Challenges, Encapsulation , DevOps Principles and Culture , Automation , Monitoring , Fault Tolerance.

UNIT V CONTAINERS ON AZURE - BASICS 9

VMs, Containers, and Processes , Containers on Azure , Creating an Azure VM with Docker, Service Orchestration and Connectivity- Orchestration, Provisioning , Scheduling and Cluster Management - Docker Swarm, Kubernetes, Apache Mesos, Using Apache Mesos to Run Diverse Workloads , Service Discovery - Service Registration, Service Lookup, Service Registry,Technologies, Application/API Gateway, Overlay Networking.

TOTAL (L:45): 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Examine the specialized cloud architectures
- Interpret the functionality of various UniKernels
- Demonstrate the concepts of containers
- Investigate the automation and fault tolerance managed by MicroServices
- Interpret the functionality of various UniKernels

TEXT BOOKS:

1. Zaigham Mahmood, Thomas Erl, Ricardo Puttini , “Cloud Computing: Concepts, Technology & Architecture”, Prentice Hall, 2013.
2. Russell Pavlicek,”UnikernelsBeyond Containers to theNext Generation of Cloud”, O’Reilly Media, 2017.

REFERENCES:

1. Adrian Mouat, “Using Docker, Developing and Deploying Software with Containers”, O'Reilly Media, 2015.
2. Daniel Fernandez, Trent Swanson, Boris Scholl, “Microservices with Docker on Microsoft Azure”, Addison-Wesley Professional, June 2016.

GE18054	PROFESSIONAL ETHICS (Common to CE, CS, IT, EE, EC & MR)	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES 10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management

UNIT II ENGINEERING ETHICS 9

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 III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES 8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

OUTCOMES:

On completing this course, the Students will be able to

- Understand the importance of human values at work place
- Develop a sense of engineering ethics through various theories
- Understand different laws related to ethics by experiments
- Understand the importance of safety, responsibilities and rights of an engineer at work place
- Get an overall knowledge of ethics in different domains of engineering

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2015.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2012.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2012
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2017
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2008.
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, ‘ Value Education’, Vethathiri publications, Erode, 2011.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

IT18012	SECURITY PRINCIPLES AND TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the fundamentals of computer security.
- To explore the principles of software security.
- To learn about OS & Database security.
- To learn the principles of mobile and cloud computing security.

UNIT I COMPUTER SECURITY TECHNOLOGY AND PRINCIPLES 9

Computer Security Concepts - Threats, Attacks, and Assets - Security Functional Requirements - Fundamental Security Design Principles - Attack Surfaces and Attack Trees - Computer Security Strategy , Cryptographic Tools - Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions , Public-Key Encryption , Digital Signatures and Key Management , Random and Pseudorandom Numbers Case study: Encryption of Stored Data.

UNIT II AUTHENTICATION AND ACCESS CONTROL 9

Electronic User Authentication Principles , Password-Based Authentication, Token-Based Authentication, Biometric Authentication , Remote User Authentication, Security Issues for User Authentication, Access Control Principles, Discretionary Access Control, Role-Based Access Control, Attribute-Based Access Control, Case study - Security Problems for ATM Systems, RBAC System for a Bank.

UNIT III SOFTWARE SECURITY 9

Malicious Software - Types of Malicious Software , Advanced Persistent Threat , Propagation – Infected Content - Viruses- Vulnerability Exploit - Worms- Social Engineering – SPAM E-Mail, Trojans – System Corruption – Attack Agent – Zombie, Bots – Information Theft – Keyloggers, Phishing, Spyware – Stealthing – Backdoors, Rootkits, Countermeasures, Writing safe code - Buffer Overflow - Stack Overflows - Defending Against Buffer Overflows , Software security issues - Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs.

UNIT IV OS AND DATABASE SECURITY 9

The Need for Database Security - SQL Injection Attacks ,Database Access Control, Inference, Database Encryption, Introduction to Operating System Security - System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/UNIX Security, Windows Security, Virtualization Security.

UNIT V MOBILE AND CLOUD COMPUTING SECURITY 9

Cloud Security Risks and Countermeasures, Data Protection in the Cloud, Cloud Security as a Service. GSM and UMTS-Security architecture & Attacks, Vulnerabilities in Cellular Services, Cellular Jamming, Attacks& Mitigation, Security in Cellular VoIP Services, Mobile application security.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Explore the approaches, trade-offs in security design principles.
- Design a secure operating system
- Design a secure database application
- Simulate the various platform security models in a mobile environment
- Identify the risks and Countermeasures in Cloud Security

TEXT BOOKS:

1. William Stallings, Lawrie Brown,"Computer Security: Principles and Practice", 3rdEdition Pearson, 2015.
2. S. Kami Makki, Peter Reiher, Kia Makki, Niki Pissinou, ShamilaMakki, "Mobile and Wireless Network Security and Privacy", Springer, 2007.

REFERENCES:

1. Noureddine Boudriga, "Security of Mobile Communications", CRC Press, 2010.
2. Mark Stamp, "Information Security: Principles and Practice", Second Edition, Wiley, 2011.
3. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Prentice Hall, 2007.
4. Sean Smith, John Marchesini, "The Craft of System Security", Addison-Wesley Professional, 2008.

IT18014	WEB TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES

- To create simple web pages and to learn about client side validation.
- To create dynamic web pages using server side scripting.
- To understand MVC concept using Strut, Hibernate and Spring.

UNIT I INTRODUCTION TO WORLD WIDE WEB 9

Introduction to WWW and WWW architecture, internet protocols, overview of HTTP, Generation of dynamic web pages, Java Fundamentals - Data types- Class - Object – I/O Streams - File handling concepts

UNIT II FEATURES OF JAVA 8

Interfaces - Packages - Threads - Exception handling - Applets - Swing Framework – Reflection – JDBC

UNIT III PROGRAMMING FOR USER INTERFACE 9

JavaScript Fundamentals - Evolution of AJAX - AJAX Framework - Web applications with AJAX - AJAX with PHP - AJAX with Databases – Angular JS.

UNIT IV SERVER SIDE PROGRAMMING 9

Servlet Overview - Life cycle of a Servlet - Handling HTTP request and response – Using Cookies - Session tracking - JDBC - Java Beans - Advantages - Enterprise Java Beans - EJB Architecture- Type of Beans - EJB Transactions

UNIT V APPLICATION DEVELOPMENT ENVIRONMENT 10

Overview of MVC architecture - Java Server Faces: Features - Components - Tags - Struts: Working principle of Struts - Building model components - View components - Controller components - Forms with Struts - Presentation tags - Developing Web applications - Hibernate: Configuration Settings - Mapping persistent classes - Working with persistent objects - Concurrency - Transactions - Caching - Queries for retrieval of objects - Spring: Framework- Controllers - Developing simple applications.

TOTAL : 45 PERIODS

OUTCOMES

Upon completion of this course, the students will be able to

- Design an interactive web site(s) with regard to
- Design web site by solving issues related to usability, accessibility and internationalization
- Enumerate the functions of clients and servers on the Web,
- Analyse the strengths and weaknesses of the client-server internet approaches to web design and implementation
- Design and implement a client-server internet application that accommodates specific requirements and constraints, based on analysis, modeling or requirements specification

TEXT BOOKS:

1. Deitel, Deitel, Goldberg. "Internet & World Wide Web How To Program". Fifth edition, Pearson Education, 2012.
2. Cay S. Horstmann, “Core Java Volume I—Fundamentals”, 10th Edition, Prentice Hall, 2015.

REFERENCES:

1. Marty Hall and Larry Brown, "Core Servlets AndJavaserver Pages", Second Edition, Pearson education.
2. Bryan Basham, Kathy Siegra, Bert Bates. "Head First Servlets & JSP", Second Edition, O’reily
3. Uttam K Roy, 'Web Technologies", Oxford University Press, 2011.

IT18016	BLOCKCHAIN FOR BUSINESS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand what Blockchain is and its importance.
- To understand the various layers of blockchain
- To understand components of blockchain
- To understand the working mechanism of Bitcoin
- To know how ethereum helps in creating business blockchain
- To build an ethereumDApp

UNIT I FOUNDATION ON BLOCKCHAIN 9

Introduction to Blockchain – Centralized Vs. Decentralized Systems – Layers of Blockchain – Need for Blockchain – Blockchain uses and Use Cases - Blockchain foundation – Cryptography – Game Theory – Merkle Trees – Properties of Blockchain solutions – Blockchain Transactions – Distributed Consensus Mechanisms – Blockchain Applications – Scaling Blockchain

UNIT II BITCOIN 8

History of Money – Dawn of Bitcoin – The Bitcoin Blockchain – The Bitcoin Network – Bitcoin Scripts – Full Nodes vs SPVs – Bitcoin Wallets

UNIT III ETHEREUM 9

From Bitcoin to Ethereum – Ethereum Blockchain – Merkle Patricia Tree – RLP Encoding – Ethereum Transaction and Message Structure – State Transaction Function – Gas and Transaction Cost – Smart Contracts – Ethereum Virtual Machine – Ethereum Ecosystem : Swarm – Whisper – DApp – Development Components.

UNIT IV ENTERPRISE BLOCKCHAIN 9

Blockchain Vs Distributed Databases, Viewing blockchain in an an enterprise, Types of blockchain technology, Blockchain for business – Business benefits of blockchain, Example use cases, Challenges in enterprise adoption, Hyperledger, Corda, Example Enterprise Applications.

UNIT V BUILDING ETHEREUM DAPP 10

DApp – Setting up a Private Ethereum Network: Install go-etherum – Create geth Data directory – Create a geth account – create genesis.json configuration File – Run the first Node of the Private Network – Run the second node of the Network – Creating Smart Contract –Deploying the Smart Contract – Client Application

TOTAL : 45 PERIODS

OUTCOMES

Upon completion of this course, the students will be able to

- Explore the components of blockchain
- Simulate the working mechanism of Bitcoin
- Develop business blockchain using ethereum
- Relate blockchain to various real-time use cases
- Build an ethereum DApp

TEXT BOOKS:

- Beginning Blockchain – A Beginner's Guide to Building Blockchain Solutions, Authors :Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda, Apress Publication

REFERENCES:

1. Blockchain for the Enterprise: The definitive guide to adoption of blockchain in the enterprise, Author &Publisher : Manav Gupta, ISBN-10: 1999387104
2. The Truth Machine – The Blockchain and the Future of Everything, Authors: Michael J. Casey and Paul Vigna, St.Martin's Press
3. Mastering Bitcoin – Programming the Open Blockchain, Author: Andreas M. Antonopoulos, O'Reilly Publication
4. Imran Bashir, "Mastering Blockchain", Packt Publishing 2017.
5. Melanie Swan, "Blockchain - Blueprint for a New Economy", O'Reilly Media, 2015

SE18001 **MATHEMATICS FOR AI & ML** **L P T**

3 0 0

OBJECTIVES

To familiarize with the mathematics that is required to understand various models and algorithms in AI and ML

UNITI Basics of Probability 9

Random Experiment, Sample space, Outcomes and Events, Axioms of Probability, Counting techniques, Conditional Probability, Independent Events, Bayes' Theorem, Random Variables, PMF, PDF, Joint and Marginal distributions, Expectation and Variance of Random Variables, IID Random Variables and their relation to ML training data

UNITII Probability Distributions 9

Discrete Uniform, Bernoulli, Binomial, Geometric, Negative Binomial, Poisson, Hyper geometric, Categorical, Multinomial distributions, Poisson as an approximation of theBinomial,ContinuousUniform,Exponential,Normal,Beta,Gammadistributions,Memoryless property of Geometric and Exponential distributions, Applications of distributions to AU and ML problems

UNITIII Limit Theorems and Sampling Distributions 9

Moment Generating functions, Probability Generating Function, Strong and Weak Law of Large Numbers, Central Limit Theorem, Sampling with and without Replacement, Statistic, Student's t, Chi-square, F distribution, Markov and Chebyshev In equality, Chern off Bound

UNITIV Statistical Inference 9

Method of Moments, Maximum Likelihood Estimation, Point Estimation, Confidence Intervals, Bias Variance properties of estimators, Consistency of estimators, Cramer Rao lower bound, Hypothesis Testing, Null and Alternative Hypothesis, Type I and Type II errors, p-value, Likelihood Ratio Tests

UNITV Linear Regression and Prediction 9

Simple Linear Regression model, Method of Least Squares, Matrix formulation, Projection to the Column Space, Normal Equations, Probabilistic framework of Linear Regression, Weighted Least Squares, Covariance and Correlation, Conditional Expectation and Variance, Algorithms for the Linear regression problem

Total:45Periods

Outcomes:

1) The student will have an in depth understanding of the various statistical concepts that are used in AI and ML.
2) This course will prepare the student to understand advanced mathematical models and algorithms in AI and ML.
3) Students will be able to mathematically formulate and study various engineering problems using statistical techniques.

Text Books:

1. R.V. Hogg, J. McKean and A.T. Craig, Introduction to Mathematical Statistics, Pearson Education Limited, 2014.
2. C.M.Bishop,PatternRecognitionandMachineLearning,Springer,2007.
3. O.C.Ibe,FundamentalsofAppliedProbabilityandRandomProcesses,Elsevier,2005.
4. S.M.Ross,ProbabilityModelsforComputerScience,Elsevier,2002.
5. S.M.Ross,AFirstCourseinProbability,6thedition,EnglewoodCliffsPrentice-Hall,2001.

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its applications, 7th edition. New York, McGrawHill, 2012.
2. David C. Lay, Judi J. McDonald and Steven R. Lay, Linear Algebra and its applications,5thedition, Pearson, 2015.
3. W. Feller, An Introduction to Probability Theory and Its Applications, 2nd edition, JohnWiley& SonsInc., 1957.
4. S.M.Ross,Simulation,5th edition,Elsevier,2013.
5. R. A. Johnson and D. W. Wichern, Applied Multivariate Statistical Analysis, 5th edition, PHI Learning Private Limited, 2009.

SE18002 **CORPORATE FINANCE** L P T
3 0 0

OBJECTIVES

This course is designed to help the students in understanding the basics of financial management decisions, management of working capital, cost of capital and valuation of securities, capital budgeting, techniques and applications etc.

UNITI Introduction to Corporate Finance 9

Goals and Functions of finance, Applications of Time Value of Money, Finding the Risk and Return of Securities– Ex-post and Exante, Risk and Return on a Portfolio-2 Security Case and 3 -Security Case: Capital Assets Pricing Model

UNITII Working Capital Management 9

Nature of Working Capital, Planning of Working Capital, Computation of Working Capital and Management the Constituents of Working Capital, Cash, Inventory and Receivables

UNITIII Cost of Capital and Valuation of Securities 9

Finding the Cost of Capital for various sources of finance, Weighted Cost of Capital: Book Value and market Value Proportions, Equity and Bond Valuation

UNITIV Capital Budgeting: Techniques and Applications 9

Determination of Relevant Cash Flows, Capital Budgeting Techniques and their application ,Capital Budgeting under conflicting situations, Capital Rationing, Investment Decision under Risk and Uncertainty

UNITV Capital Structure & Dividend Policy 9

Operating, Financial and Total Leverage FBIT-FPS Analysis, Capital Structure Theories, MM Hypothesis with and without taxes, Capital Structure Decision Making, Dividend Policy - Theories, Mechanics and Practices of Dividend Payment, Dividend Policy in India : Some Recent Evidence

Total : 45Periods

Outcomes:

- Understand the basics of financial management decisions,
- Understand the concepts of working capital
- Calculate cost of capital.
- Understand of capital budgeting and capital structure of an organization.

Text Book:

Fundamentals of Corporate Finance by Ross

Reference Books:

1. Corporate finance by Ahuja Narender L., Dawar Varun,et al.
2. Principles of Corporate Finance (SIE) | 12th Edition, by Richard A. Brealey, Stewart C. Myers, et al.

SE18003 **FINANCIAL STATEMENT ANALYSIS** **LPT**
3 0 0

OBJECTIVES

This course is designed to help the students in understanding the basics of Financial statements and to have a basic understanding about fundamental analysis. It also gives insights on various valuation methodologies

UNITI **Brushing up the Basics** 9

Concept of "Time value of Money" - Interest Rates and Discount Factors – Opportunity cost, Risk-Free Rate, Equity Risk Premium, The Beta, Risk Adjusted Return(Sharpe Ratio)

UNITII **Introduction to Financial Statement Analysis** 9

Where can one find financial statements– The Director's Report, The Auditor's Report, Financial Statements: Balance Sheet, Income Statements, Schedules and Notes to the Accounts, Cash Flow Statement

UNITIII **Financial Statement Analysis and Forensic Accounting** 9

Types of Financial Statement Analysis - Methods of Analyzing Financial Statements – Financial Statement Analysis and Forensic Accounting, Comparative and Common-size financial statements

UNITIV **Ratio Analysis** 9

Profitability Ratios - Activity Ratios Or Turnover Ratios - Financial Ratios – Market Test Ratios – Advantages Of Ratio Analysis-Limitations Of Ratio Analysis

UNITV **Valuation Of Stocks** 9

Source of Market and Intrinsic Value - Multiplier Approach to Share Valuation - VALUATION OFFIRMS

Total45Periods

Outcomes:

After completing this course, students should be able to:

- Understand the basic concepts of Time Value of Money
- Get the reports and statements from various sources
- Analyze financial statements
- Apply the knowledge in valuation methodologies while buying assets

Text Books:

NCFM-Fundamental Analysis Module, NSE

Reference Books:

1. ParagParikh(2016),*ValueInvestingandBehavioralFinance.Bangalore*,McGrawHillEducation
2. M.Y. Khan, P.K. Jain (2017), *Financial Management. Bangalore*: McGraw Hill Education
3. Raghu Palat(2016),*Fundamental Analysis for Investors*, New Delhi: Vision Books
4. AswathDamodaran(2012),*InvestmentValuation:ToolsandTechniquesforDeterminingthe Value of Any Asset,* New Delhi: Wiley India

SE18004 **MANAGERIAL ECONOMICS** L P T

3 0 0

OBJECTIVES

- To expose the students to a rigorous foundation in micro economics and its applications in planning and decision making of a firm.
- To develop students' capacity to analyse the economic environments in which business entities operate and understand how managerial decisions can vary under different constraints that each
- economic environment places on a manager's pursuit.
- Analysing the functioning of markets, the economic behavior of firms and other economic agents under various marketstructures, and the economic and social implications of the outcomes.

UNIT I ECONOMICS AND MANAGEMENT 9

Market Economy and Managerial Economics - Functions of Managerial Economics - Motivations to Study Microeconomics - Understanding Markets - Economic Cost, Opportunity Cost, Implicit Cost, and Explicit Cost; Economic Profit versus Accounting Profit

UNIT II PRODUCTION AND COST ANALYSIS 9

Production - Production function – Isoquant - Equilibrium production - Diminishing rates of return – Laws of production- Cost of Production: Fixed and Variable Costs-Which Costs Matter?
Short Run Costs curves: TC, TVC, TFC, MC, ATC, AVC, and AFC; Relation between SR and LR Costs –Economies of Scope-Learning Curves.

UNIT III MARKETS AND PRICING AND OUTPUT DECISIONS 9

Characteristics of Perfect Competition - Profit Maximization and Optimal Output Decision – Sources and Measurement of Monopoly Power - Monopolist's Output Decision and Pricing Rule - Characteristics of Monopolistic Competition - Short Run and Long Run Equilibrium in a Monopolistic Competition - Economic Efficiency of Monopolistic Competition - Characteristics of Oligopoly Collusive and non-collusive oligopoly.

UNIT IV NATIONAL INCOME 9

Introduction to National Income - National Income Concepts- National Income Determination -Business Cycles –Phases of Business Cycles

UNIT V ECONOMICMANAGEMENT 9

Money and Inflation - Fiscal and Monetary Policies - Public versus Private Sectors – Economic Transition in India - Liberalization, Privatization and Globalization - Business and Government Public - Private Participation(PPP) -Disinvestment-Foreign Direct Investment

Total 45Periods

Outcomes:

Learners' appreciation of the analytic strength and practical applicability of microeconomic theory in managerial uses of all types of entrepreneurs. The paper is accordingly scheduled with both theory and applications. The theory serves to construct a rigorous framework of principles and techniques, and the applications bring real aspects into the classroom through multiple cases and examples from every day sources.

Text Books:

1. Dwivedi D.N., Business & Economics, Vikas Publishing House
2. Dr. Atman and, Managerial Economics, Excel Books, Delhi.
3. R.L.Varshney,K.L.andMaheshwari,ManagerialEconomics,SultanChand&Sons

Reference Books:

1. Haynes, Moteand Paul, Managerial Economics —Analysis and Cases,
2. Vakils. Feffer and Simons Private Ltd., Bombay.
3. Hague, D.C., Managerial Economics.
4. Introduction to Managerial Economics, Hutch in son University Library.
5. Malcolm P. McNair and Richard S. Meriam, Problems in Business Economics, McGraw Hill BookCo., Inc.

SE18007 **PROJECT MANAGEMENT** L P T

3 0 0

OBJECTIVES

To understand the concepts of Project Management through Project Network Diagrams; Time, cost and Resource management and control, project cost control; project monitoring and information systems and implementation of projects.

UNITI Introduction 6

Projects:Definitionsandcharacteristics;dimensionsofprojectmanagement– project diagrams– networks– network techniques.

UNITII Project Time Management 12

Time management under certainty – CPM – slackness in projects – time management under uncertainty–PERT–event orientation -simulation

UNITIII Cost and Resource Management 9

Crashing of Projects – time-cost trade-off – projects with limited resources – resource allocation and leveling – project organisation.

UNITIV Cost Control and Information Systems 10

Project cost control – types of costs – cost codes – cost budgeting – cost control – project information systems : Project control, project monitoring – reports.

UNITV Projects Under Implementation 8

Implementation of projects – monitoring of projects and control – case studies – multi-project environment.

Total45Periods

Outcomes:

1. Understanding the concepts and dimensions of managing projects and the dynamics involved
2. Conceptualize a project and create networks.
3. Apply network techniques such as PERT/CPM for time management.
4. Apply cost and resource management principles.
5. Apply cost control techniques
6. Design an effective information system for managing projects.

Text Books:

1. Harold Kerzner, Project Management: A system approach to planning, scheduling, and controlling, CBS Publishers and Distributors
2. S.Choudhary, Project Management, Tata McGraw Hill

Reference Books:

1. JohnM. Nicholas, Project Management for Business and Technology, Prentice Hall of India.
2. PrasannaChandra,ProjectPlanning,Analysis,Selection,Implementation.TataMcGrawHill

SE18008 INTRODUCTION TO SECURITIES MARKET L PT

3 0 0

OBJECTIVES

This course is designed to help the students in understanding the various products, participants and the functions of the securities market. Also makes students understand the market design of Primary Market & Secondary Market and the government securities market.

UNITI Securities Market in India –An Overview 9

Securities market and financial system; Products, participants and functions; Primary market; Secondary market ; Derivatives market; Regulators; Exchanges; Depositories; Clearing corporations; Regulatory framework; Reforms

UNITII Primary Market 9

Book building; Credit rating; Merchant banking; On-line IPOs; Demat issues; Private placement; Virtual debt portals; ADRs/GDRs; Other regulations; Public issues; Euro issues; Debt issues; Collective investment vehicles viz., MFs, VCFs, CISs.

UNITIII Secondary Market 9

Membership; Listing; Trading and settlement mechanism; Technology; Trading rules-Insider Trading; Unfair trade practices; Takeovers; Buy back; Turn over; Market capitalization; Prices; Liquidity; Transaction costs; Risk management; Indices.

UNITIV Government Securities Market 9

Indian debt market; Primary market; Secondary market-NDS; NDS-OM; CCIL; Wholesale debt market (WDM)segment of NSE.

UNITV Derivatives Market 9

Products, Participants and functions; Trading mechanism; Membership; Contract specification; Clearing & Settlement; Open interest; Implied interest rate; Implied volatility; Risk management; Debt derivatives. Measures of central tendency; Return and Risk.

Total45Periods

Outcomes:

Students completing this course will be able to

- Define various constituents of Securities market
- Explain the basic concepts relating to different a venues of investment,
- Distinguish between the primary and the secondary market
- Gain knowledge related to derivatives market
- Analyze financial statement

Text Book:

1. NCFM-Securities Markets: Beginners Module, NSE

Reference Books:

1. H.R.Machiraju(2019).*IndianFinancialSystem*.NewDelhi:VikasPublishing
2. M.Y. Khan, P.K. Jain(2017),*Financial Management. Bangalore*: McGraw Hill Education
3. Joydeep Sen, Abhishek Apte (2013), *Fixed Income Markets in India*. Mumbai: Shroff Publishers & Distributors Pvt Ltd

OE18801 IT ESSENTIALS FOR ENGINEERS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce the concept of Internet, OS and its working principles.
- To know scripting languages.
- To understand various applications related to Information Technology.

UNIT I WEB ESSENTIALS **9**

Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server.

UNIT II SCRIPTING ESSENTIALS **9**

Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts.

UNIT III DATABASE ESSENTIALS **9**

Purpose of Database System -– Views of data – Data Models – Database System Architecture – Introduction to relational databases - Relational Model - Keys -- SQL fundamentals - Triggers- Embedded SQL– Dynamic SQL - Database connectivity.

UNIT IV OS ESSENTIALS **9**

Unix, Linux, windows 8 – Process Management, memory management , Input –Output management , File System.

UNIT V MOBILE COMMUNICATION ESSENTIALS **9**

Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies / architecture - Voice calls & SMS.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Design the web-sites for simple web applications
- Develop web based applications using suitable client side and server side web technologies.
- Examine the database connectivity with an appropriate database
- Distinguish the basic features of Unix, Linux and Windows OS
- Choose the suitable mobile communications technology for applications.

TEXT BOOKS:

1. V. Rajaraman, "Introduction to Information Technology", PHI Learning , Second Edition, 2013
2. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", Third Edition, O'REILLY, 2014.
3. James F. Kurose, ―Computer Networking: A Top-Down Approach‖, Sixth Edition, Pearson, 2012.

REFERENCES:

1. GottapuSasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012.
2. R. Kelly Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014.
3. it-ebooks.org

OE18803	INTERNET OF EVERYTHING	L	T	P	C
		3	0	0	3

OBJECTIVES

- Learn how the IoE turns information into action, creating unprecedented economic opportunity.
- Understand how the IoE brings together operational technology and information technology systems.

UNIT I INTRODUCTION TO IOE **9**

Introduction to IoT Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

UNIT II TRANSITIONING TO IOE **9**

Convergence between organization's operational technology (OT) and information technology (IT) systems , M2M, M2P, and P2P interactions, Business processes for evaluating a problem, architectural structure to implement an IoE solution, Security concerns.

UNIT III NETWORK & COMMUNICATION ASPECTS **9**

Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

UNIT IV DEVELOPING IOE APPLICATIONS **9**

Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python

UNIT V CASE STUDY **9**

Home automation, Industry applications, Surveillance applications, Other IoT applications

TOTAL : 45 PERIODS

OUTCOMES:

- Understand the key components that make up an IoT system
- Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack
- Apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis
- Understand where the IoT concept fits within the broader ICT industry and possible future trends
- Appreciate the role of big data, cloud computing and data analytics in a typical IoT system

TEXT BOOKS:

1. Adrian McEwen and Hakim Cassimally, "Internet of Things", Wiley, 2013
2. ArshdeepBhaga" Internet of Things, A hands on approach" VPT, first edition, 2014

REFERENCES:

1. Article/Journal: https:// cisco.netacad.net

OE18805	FOUNDATION ON MOBILE APP DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES

- Understand system requirements for mobile applications
- Generate suitable design using specific mobile development frameworks
- Generate mobile application design
- Implement the design using specific mobile development frameworks
- Deploy the mobile applications in marketplace for distribution

UNIT I INTRODUCTION **9**

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II BASIC DESIGN **9**

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – user interfaces for mobile applications – touch events and gestures

UNIT III ADVANCED DESIGN **9**

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV TECHNOLOGY I – ANDROID **9**

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V TECHNOLOGY II – IOS **9**

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

TOTAL : 45 PERIODS

OUTCOMES

On Completion of the course, the students should be able to:

- Describe the requirements for mobile applications
- Identify the challenges in mobile application design and development
- Design mobile applications for specific requirements
- Interpret an appropriate design using Android SDK
- Implement the design using Objective C and iOS
- Operate mobile applications in Android and iPhone marketplace for distribution

REFERENCES

1. http://developer.android.com/develop/index.html
2. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
3. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
4. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

OE18802	EMBEDDED AND REAL TIME SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES

- Develop an understanding of the technologies behind the embedded computing systems.
- To introduce students to the design issues of embedded systems.
- Enable students to analyze and develop software programs for embedded systems

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND PROCESSORS 9

Complex systems and micro processors – Embedded system design process – Design example: Model train controller - Instruction sets preliminaries – ARM Processor – CPU:

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN 9

Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III PROCESSES AND OPERATING SYSTEMS 9

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real-time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE.

UNIT IV SYSTEM DESIGN TECHNIQUES AND NETWORKS 9

Design methodologies- Design flows – Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques- Distributed embedded systems – MPSoCs and shared memory multiprocessors.

UNIT V CASE STUDY 9

Data compressor – Alarm Clock – Audio player – Software modem-Digital still camera – Telephone answering machine-Engine control unit – Video accelerator.

TOTAL : 45 PERIODS

OUTCOMES

- Identify the general computing system and the embedded system, also recognize the classification of embedded systems.
- Analyze the architecture of the processor and its programming aspects (assembly level).
- Explain the ability to interface external devices with micro controllers.
- Design real time embedded systems using the concepts of RTOS
- Design and implement microcontroller based embedded systems.

TEXT BOOK

1. Marilyn Wolf, "Computers as Components – Principles of Embedded Computing Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

REFERENCES

1. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition Cengage Learning, 2012.
2. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.
3. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dream Tech Press, 2005.
4. Sriram V Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", Tata Mc Graw Hill, 2004

OE18804	ETHICAL HACKING AND IT SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand numerous methods of real-world information intelligence
- To learn about vulnerability scanners
- To understand techniques used to sniff traffic across a network
- To familiarize with the methodologies that can be used to hack into a target
- To appreciate the wide variety of attacks that can be performed against a wireless network

UNIT I INTRODUCTION TO HACKING 9

Terminologies, Categories of Penetration Test, Writing Reports, Structure of a Penetration Testing Report, Vulnerability Assessment Summary, Risk Assessment, Methodology, Linux Basics: File Structure, Cron Job, Users, Common Applications ,BackTrack, Services

UNIT II INFORMATION GATHERING, TARGET ENUMERATION AND PORT SCANNING TECHNIQUES 9

Active, Passive and Sources of information gathering, Copying Websites Locally, NeoTrace, Cheops-ng, Intercepting a Response, WhatWeb, Netcraft, Basic Parameters, Xcode Exploit Scanner, Interacting with DNS Servers, Fierce, Zone Transfer with Host Command and Automation, DNS Cache Snooping-Attack Scenario, Automating Attacks, SNMP - Problem, Sniffing Passwords, SolarWinds Toolset, sweep, Brute Force and Dictionary- Tools , Attack, Enumeration, Intelligence Gathering Using Shodan, Target enumeration and Port Scanning Techniques.

UNIT III VULNERABILITY ASSESSMENT & NETWORK SNIFFING 9

Introduction to Vulnerability Assessment - Pros and Cons, NMap, Updation of database, Testing SCADA Environments with Nmap, Nessus, Sniffing: Types, Hubs versus Switches, Modes, MITM Attacks, ARP Protocol Basics- working, Attacks, DoS Attacks, Dsniff tool, Using ARP Spoof to Perform MITM Attacks, Sniffing the Traffic with Dsniff, Sniffing Pictures with Drifnet, Urlsnarf and Webspy, Sniffing with Wireshark, Ettercap- ARP Poisoning, Hijacking Session with MITM Attack, ARP Poisoning with Cain and Abel, Sniffing Session Cookies with Wireshark, Hijacking the Session, SSL Strip: Stripping HTTPS Traffic, Requirements, Automating Man in the Middle Attacks, DNS Spoofing, DHCP Spoofing.

UNIT IV PRINCIPLES OF CYBER SECURITY & MANAGEMENT 9

Threats, vulnerabilities, and consequences, Advanced persistent threats, The state of security today, DoD, Cybersecurity models, Security governance, Management models, roles, and functions, Information security roles and positions.

UNIT V RISK MANAGEMENT, SECURITY PLANS AND POLICIES 9

Strategy, Strategic planning and security strategy, The information security lifecycle, Architecting the enterprise, Levels of planning, Planning misalignment, The System Security Plan (SSP), Policy development and implementation, Principles of risk, Types of risk, Risk strategies, The Risk Management Framework (RMF).

TOTAL : 45 PERIODS

OUTCOMES

On Completion of the course, the students should be able to:

- Interpret the core concepts related to malware, hardware and software vulnerabilities and their causes
- Relate ethics behind hacking and vulnerability disclosure
- Judge the vulnerabilities related to computer system and networks using state of the art tools and technologies
- Assess the strengths and weaknesses of general cyber security models
- Assess the possible consequences of misaligning enterprise strategy, security policy, and security plans

TEXT BOOK

1.Rafay Baloch ,"Ethical Hacking and Penetration Testing Guide", CRC Press, 2015.

2. Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, . Information Security Management: Concepts and Practice. New York, McGraw-Hill, 2013.

REFERENCES

1. Patrick Engebretson, "The Basics of Hacking and Penetration Testing : Ethical Hacking and Penetration Testing Made Easy", Syngress Media, Second Revised Edition, 2013.
2. Michael T. Simpson, Kent Backman, James E. Corley, "Hands On Ethical Hacking and Network Defense", Cengage Learning, 2012.
3. Whitman, Michael E. and Herbert J. Mattord. Roadmap to Information Security for IT and Infosec Managers. Boston, MA: Course Technology, 2011.

OE18806	USER INTERFACE DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To Understand the Concepts and Architecture of the World Wide Web.
- To understand and practice HTML5.
- To understand the practice the styling of web pages.
- To understand and practice Client-side scripting.
- To understand and practice Server-side scripting.

UNIT I WEBSITE BASICS 9

Introduction to computer networks – Internet Standards – Introduction to WWW –WWW architecture – SMTP – POP3 – File Transfer Protocol – Overview of HTTP , HTTP request – response – Generation of dynamic web pages.

UNIT II INTRODUCTION TO HTML 5 9

HTML5: What is HTML5 – Features of HTML5 – Semantic Tags – New Input Elements and tags – Media tags(audio and video tags) – Designing Graphics using Canvas API – Drag and Drop features – Geolocation API – Web Storage (Session and local Storage).

UNIT III INTRODUCTION TO CSS3 9

CSS3: What is CSS3 – Features of CSS3 – Implementation of border radius ,box shadow, Image border, custom web font, backgrounds – Advanced text effects(shadow) – 2D and 3D Transformations – Transition to elements – Animations to text and elements

UNIT IV INTRODUCTION TO CLIENT-SIDE SCRIPTING 9

Introduction – Core features – Datatypes and Variables – Operators, Expressions and Statements – Functions & Scope – Objects – Array, Date and Math related Objects – Host Objects: Browsers and the DOM – Introduction to the Document Object Model, DOM History and Levels – Intrinsic Event Handling – Modifying Element Style – The Document Tree – DOM Event Handling – Accommodating Noncompliant Browsers Properties of window.

UNIT V INTRODUCTION TO SERVER-SIDE SCRIPTING 9

Server-Side Programming: Java Servlets – Architecture – Overview – A Servlet – Generating Dynamic Content – Life Cycle – Parameter Data-Sessions – Cookies – URL Rewriting – Other Capabilities – Data Storage Servlets and Concurrency – Databases and Java Servlets.

TOTAL : 45 PERIODS

OUTCOMES :

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

- Produce prototypes for software applications using industry standard design tools.
- Apply a user centered design process (design strategy development that provides solutions to meet business and user goals) in the creation of basic to complex software applications.
- Design and develop responsive layouts for multi-device, and multi-channel applications.

TEXT BOOKS:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education.

REFERENCES :

1. Thomas A Powell, Fritz Schneider, ―JavaScript: The Complete Reference‖, Third Edition Tata McGraw Hill, 2013.
2. David Flanagan, ―JavaScript: The Definitive Guide, Sixth Edition‖, O'Reilly Media, 2011.
3. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
4. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
5. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
6. Bates, "Developing Web Applications", Wiley, 2006.

OE18808	AI for ANDROID	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn search strategies
- To understand the concepts of game playing
- To employ AI for android in projects

UNIT I INTRODUCTION TO AI **9**

AI problems- Assumptions- Technique- Level of the model- criteria for success- Defining the problem as a state space-Production System- characteristics – problem characteristics

UNIT II GAME PLAYING **9**

Introduction-Minimax search procedure- adding alpha beta cutoffs-Additional Refinements- iterative Deepening

UNIT III ANDROID BASICS **9**

What is Android-Introduction-Architecture-Exploring the android SDK- Android Documentation-Android samples-Android tools-APIs- Application life cycle

UNIT IV DESIGNING APPLICATION **9**

Introduction- Exception Handling- Sending/Receiving broadcast message- Creating a response application- Monitoring the battery level- Formatting time and date display

UNIT V CASE STUDY **9**

Developing a chatbot – Attendance System – Smart city Traveler- Recommender systems

TOTAL : 45 PERIODS

OUTCOMES

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

- Identify appropriate AI methods to solve a given problem
- Implement AI for game playing concepts
- Recognize the basics of Android
- Construct an application using Android
- Employ AI for developing projects in Android

REFERENCES

1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill- 2008.
2. J.F. DiMarzio, “Android- A Programmer’s Guide", McGraw Hill- 2008.
3. Ian F.Darwin, “Android Cookbook”, O’Reilly, First Edition, 2011
4. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 3rd Edition, 2009
5. https://www.tutorialspoint.com/android/index.htm
6. https://nevonprojects.com/artificial-intelligence-projects

VD18801	DATA ANALYTICS USING R	L	T	P	C
		2	0	0	2

OBJECTIVES:

- Learn R. Programming language, data analytics, data visualisation and statistical model for data analytics.

UNIT I INTRODUCTION TO DATA ANALYSIS 6

Overview of Data Analytics, Need of Data Analytics, Nature of Data, Classification of Data: Structured, Semi-Structured, Unstructured, Characteristics of Data, Applications of Data Analytics.

UNIT II R PROGRAMMING BASICS 6

Overview of R programming, Environment setup with R Studio, R Commands, Variables and Data Types, Control Structures, Array, Matrix, Vectors, Factors, Functions, R packages.

UNIT III DATA VISUALIZATION USING R 6

Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms, Box plots,Bar Charts, Line Graphs, Scatter plots, Pie Charts

UNIT IV STATISTICS WITH R 6

Random Forest, Decision Tree, Normal and Binomial distributions, Time Series Analysis, Linear and Multiple Regression, Logistic Regression, Survival Analysis

UNIT V PRESCRIPTIVE ANALYTICS 6

Creating data for analytics through designed experiments, Creating data for analytics through active learning, Creating data for analytics through reinforcement learning

TOTAL (L:30): 30 Periods

OUTCOMES:

- Experiment with the various data structures such as matrices, lists, factors, and data frames.
- Infer knowledge on various file formats and create various graphic displays
- Formulate and Solve the problems in probability distributions
- Choose statistical models for analyzing the data
- Investigate and handle missing data and infer knowledge on advanced graphics.

REFERENCES

1.James (JD) Long, Paul Teetor, "R Cookbook" , 2nd edition*, O Reiley , 2019*

VD18802	BLOCKCHAIN TECHNOLOGY	L	T	P	C
		2	0	0	2

OBJECTIVES:

- Understand the cryptography basics of a blockchain
- Recognize the requirement of a simple blockchain application
- Study about the tools used for blockchain development
-

UNIT I CRYPTO FUNDAMENTALS FOR BLOCKCHAIN 6

Hash Functions – Digital Hash – Pre-image resistance – Second pre-image resistance – Message Digest – Secure Hash Algorithms – Distributed Hash Tables – Digital Signatures – Signcryption – Blind Signatures

UNIT II FEATURES OF BLOCKCHAIN 6

History of Blockchain – Decentralization – Generic Elements of Blockchain – Addresses – Transaction – Block – Contents of a Block – Block Header - State Machine – Nodes– Types of Blockchain

UNIT III CONSENSUS IN BLOCKCHAIN 6

Fault tolerance – Paxos – Consensus – Byzantine Agreement – Proof of Work – Proof of Stake – Proof of Elapsed Time – Proof of Importance – Practical Byzantine Fault Tolerance – CAP Theorem - Mining – How blockchain accumulates block

UNIT IV HYPERLEDGER FOR BLOCKCHAIN 6

Hyperledger as a protocol – Fabric – Sawtooth lake – Reference Architecture – Privacy and Confidentiality – Fabric Architecture – Components of the fabric – Blockchain services – API's and CLI's

UNIT V APPLICATIONS OF BLOCKCHAIN 6

Bitcoin – Cryptocurrency – Smart Contracts – Financial Applications – IoT Blockchain Applications – Government Applications – Blockchain Security

TOTAL (L:30): 30 Periods

OUTCOMES:

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

- Explore the components of blockchain
- Simulate the working mechanism of Bitcoin
- Develop simple blockchain application using ganache
- Implement Smart contract using ethereum
- Relate blockchain to various real-time use cases

REFERENCES

1. Imran Bashir, "Mastering Blockchain", Packt Publishing 2017.
2. Melanie Swan, "Blockchain - Blueprint for a New Economy", O'Reilly Media, 2015
3. Roger Wattenhofer, "The science of the blockchain", Inverted Forest Publishing, 2016
4. www.blockchain.org

VD18803	WEB DESIGN ESSENTIALS	L	T	P	C
		2	0	0	2

OBJECTIVES:

- Learn about basic network functions and Internet connections
- Learn to identify elements of a Web page, and will evaluate the aesthetics and functionality of Web sites
- Learn the steps in the Web design process, such as determining Web site purpose, goals and target audience, and planning the site content, structure and navigation
- Learn about Web hosting services, domain names, uploading files, implementation issues (bandwidth, compression, streaming) and collaboration tools (wikis, blogs)

UNIT I THE INTERNET AND THE WORLD WIDE WEB 6

Introduction to Internet - Cloud - How Data Travels - Connecting to the Internet - Internet Addressing - World Wide Web.

SUGGESTED ACTIVITIES

Internet Connections - TLD Matching - IP Addresses Hunt - How Browsers Work -Connecting to the Internet & Using a Browser -Domain Names Scavenger Hunt - Requirement to Connect to the Internet

UNIT II PRINCIPLES OF WEB DESIGN 6

Web Site Categories and Domains - Aesthetic Web Design - Functional and Usable Design - Multimedia and Interactivity

SUGGESTED ACTIVITIES

Matching Web Site Categories and Domains - Searching Web Site Categories and Domains -Evaluating CARP Principles - Exploring the Meaning of Color - Using a Color Scheme Generator - Writing Effective Web Content -Evaluating Web Site Accessibility -Evaluating Web Site Usability - Analyzing Multimedia and Interactivity

UNIT III PLANNING A WEB SITE 6

Web Site Planning Steps - Using an HTML Text Editor or GUI Web Editor - Using an Online Site Builder - Using an Offline Site Builder - Using a Content Management System (CMS)

SUGGESTED ACTIVITIES

Determining Web Site Purpose and Goals -Determining Target Audience -Creating a Mind Map - Describing Navigation Structures -Evaluating Web Tools -Reviewing Steps for Web Design Planning - Searching for Web Terms -Putting It All Together to Plan a Web site

UNIT IV CREATING A WEB SITE 6

The World Wide Web - Introduction to HTML - Elements of a Web Page - Multimedia and Interactivity - List of Basic HTML Tags - List of Basic HTML Attributes

SUGGESTED ACTIVITIES

Creating a Web page - Filling in the Missing Code – Advanced - Using Thimble to Create a Movie Poster - Creating an Animated Scrolling Text Box -Writing the Code Required to Insert a Video in a Web page - Creating a Video Tutorial - Creating a 3D Photo Slide Show

UNIT V PUBLISHING A WEB SITE 6

Collaboration - Blogs - Wikis - Preparing to Publish - Uploading Your Web Site

SUGGESTED ACTIVITIES

Reviewing and Posting to a Blog - Creating a Blog - Comparing Wikis and Blogs - Validating a Web Site's Code - Choosing a Domain Name - Encrypting and Decrypting Vocabulary Terms

TOTAL (L:30): 30 Periods

OUTCOMES:

- Design and implement an interactive web site(s) with regard to issues of usability, accessibility and internationalization
- Explain the functions of clients and servers on the Web, and describe the strengths and weaknesses of the client-server internet approaches to web design and implementation
- Design and implement a client-server internet application that accommodates specific requirements and constraints, based on analysis, modeling or requirements specification

REFERENCES

1. Terry Felke-Morris “Basics of Web Design: HTML5 & CSS”, 5th Edition,Pearson,2018
2. Jennifer Niederst Robbins, ”Web Design in a Nutshell: Quick Reference “, O Reiley , 2015

VD18804	PROGRAMMING FRAMEWORKS	L	T	P	C
		2	0	0	2

OBJECTIVES:

- Learn the nuances of programming Languages

UNIT I INTRODUCTION TO PROGRAMMING 6

The Role of Programming Languages: Why Study Programming Languages, Towards Higher-Level languages, Programming paradigms, Programming environments Language Description: Syntactic structure, language Translation Issues: Programming language Syntax, Stages in translation, Formal translation Models

UNIT II BASIC PROGRAMMING CONSTRUCTS 6

Names , variables , binding, type checking, scope, scope rules ,lifetime and garbage collection, primitive data types, strings, array types, associative arrays ,record types, union types, pointers and references , Arithmetic expressions , overloaded operators, type conversions , relational and boolean expressions, assignment statements, mixed mode assignments, control structures, selection ,iterations, branching, guarded statements

UNIT III SUBPROGRAMS AND IMPLEMENTATIONS 6

Subprograms ,design issues ,local referencing, parameter passing, overloaded methods, generic methods, design issues for functions , semantics of call and return ,implementing simple subprograms , stack and dynamic local variables, nested subprograms, , dynamic scoping.

UNIT IV OBJECT-ORIENTATION, CONCURRENCY, AND EVENT HANDLING 6

Grouping of data and Operations — Constructs for Programming Structures, abstraction Information Hiding, Program Design with Modules, Defined types, Object oriented programming — concept of Object, inheritance, Derived classes and Information hiding – Templates, Semaphores, Monitors, Message passing, Threads, statement level concurrency Exception handling (Using C++ and Java as example language).

UNIT V FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES: 6

Introduction to lambda calculus, fundamentals of functional programming languages, Programming with ML, Introduction to logic and logic programming.

TOTAL (L:30): 30 Periods

OUTCOMES:

- Evaluate syntactic, semantic, and pragmatic tradeoffs among the various programming paradigms and programming languages
- Summarize the history and continuing evolution of programming languages and the need to continuously learn new languages
- Demonstrate different forms of declaration, typing, binding, visibility, scoping, and lifetime management for various programming language constructs (e.g. variables, functions, data structures including objects, etc.)
- Develop and analyze programs written in the various Programming Paradigms
- Choose an appropriate programming language solution for a given programming task.

VC18005	Basics of Entrepreneurship Development	L	T	P	C
		1	0	2	2

OBJECTIVES :

- To provide Knowledge on Self-discovery and Problem identification.
- To provide Skill set on Identifying customer segment and Practice on Business Model.
- To understand the Market, Sales and support.

UNIT I Self-Discovery & Problem Identification 6

Orientation of Entrepreneurship – Case Study – activity – Effectuation – Principles of Effectuation – Identifying Entrepreneur skill.

Problem Identification – Design thinking – look for solution – activity – Brain storming.

UNIT II Customer & Business Model 6

Identifying customer segment, understanding the market – Product selection –activity – value proposition canvas.

Identify the Problem, Solution and Risk identification – Activity – Business model.

UNIT III Validation and Resources 6

Build a Minimum Viable Product (MVP) – validation and launching of MVP –activity – MVP Interview.

Cost – Revenue – Pricing – Profitability – Sources of finance – activity – Bootstrap Finance – Leadership – Identifying Co-founders and Hiring a Team – activity –Pitching about a venture

UNIT IV Market and sales 6

Positioning and branding – network and channels – sales planning – activity – selling skill.

UNIT V Support 6

Project Management – Project tracking – Basics of Business regulations – Activity – capstone project.

TOTAL : 30 PERIODS

OUTCOMES

- Acquire knowledge and Practice on Self Discovery and Problem identification.
- Understand the concept of Identifying the Customer and Business model.
- Acquire knowledge on various Resource and Practice on validation.
- Acquire knowledge on marketing and sales.
- Practice on Project management.

TEXT BOOKS:

1. S.S.Khanka, "Entrepreneurial Development" S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.

2. Donald F Kuratko, " Entreprenuership – Theory, Process and Practice", 9th edition, Cengage Learning 2014.

REFERENCES :

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.

2. Mathew J Manimala, "Entrepreneurship Theory at Cross Roads: paradigms and Praxis", 2nd Edition Dream Tech, 2005.

Web Resource:

https://learnwise.wfglobal.org/#/IN/en/courses

MC 18001	INDIAN CONSTITUTION AND SOCIETY	L	T	P	C
		0	0	0	0

OBJECTIVES

- To know about Indian constitution and fundamental rights.
- To know about central and state government functionalities in India.
- To know about Judicial system and Election commission of India.

UNIT I INTRODUCTION **11**

Historical Background – Philosophical foundations of the Indian Constitution – Preamble – Schedules – Amendments.

UNIT II FUNDAMENTAL RIGHTS AND FUNDAMENTAL DUTIES OF THE CITIZEN **8**

Union and Territories – Citizenship - Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Directive Principles of state policy.

UNIT III STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT **8**

Union Government – Structures of the Union Government and Functions – Powers of President, Vice President, Prime Minister – Cabinet ministers – Parliament.

UNIT IV STRUCTURE AND FUNCTION OF STATE GOVERNMENT **8**

State Government – Structure and Functions – Powers of Governor, Chief Minister, Cabinet ministers – State Legislature

UNIT V STRUCTURE OF JUDICIAL SYSTEM AND MAJOR FUNCTIONARIES **10**

Supreme Court of India - Judicial System in States – High Courts and other Subordinate Courts – Judicial Review – Case studies. Election Commission of India and its functions.

TOTAL (L:45): 45 PERIODS

OUTCOMES:

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

- Enhance human values, create awareness about law enactment and importance of Constitution
- Interpret the Fundamental Rights and Fundamental Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life and their social Responsibilities
- Summarize the powers and functions of Central Government.
- Identify the powers and functions of State Government
- Discuss the powers and functions of Judicial systems and Election commission of India

TEXT BOOKS:

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R. C. Agarwal, (1997) "Indian Political System", S. Chand and Company, New Delhi.
3. Maciver and Page, "Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4. K. L. Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. U. R. Gahai, "Indian Political System", New Academic Publishing House, Jalaendhar.
3. R. N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

XXXX **PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP**

L	T	P	C
0	0	6	3

OBJECTIVES:

- To empower students with overall Professional and Technical skills required to solve a real world problem.
- To mentor the students to approach a solution through various stages of Ideation, Research, Design Thinking, workflows, architecture and building a prototype in keeping with the end-user and client needs.
- To provide experiential learning to enhance the Entrepreneurship and employability skills of the students.

This course is a four months immersive program to keep up with the industry demand and to have critical thinking, team based project experience and timely delivery of modules in a project that solves world problems using emerging technologies.

To prepare the students with digital skills for the future, the Experiential Project Based Learning is introduced to give them hands-on experience using digital technologies on open-source platforms with an end-to-end journey to solve a problem. By the end of this course, the student understands the approach to solve a problem with team collaboration with mentoring from Industry and faculties. **This is an EEC category course offered as an elective, under the type, "Experiential Project Based Learning".**

Highlights of this course:

- Students undergo training on emerging technologies
- Students develop solutions for real-world use cases
- Students work with mentors to learn and use industry best practices
- Students access and use Self-Learning courses on various technologies, approaches and methodologies.
- Collaborate in teams with other students working on the same topic
- Have a dedicated mentor to guide

OUTCOMES:

On completion of the course, the students will be able to:

- Upskill in emerging technologies and apply to real industry-level use cases
- Understand agile development process
- Develop career readiness competencies, Team Skills / Leadership qualities
- Develop Time management, Project management skills and Communication Skills
- Use Critical Thinking for Innovative Problem Solving
- Develop entrepreneurship skills to independently work on products

The course will involve 40-50 hours of technical training, and 40-50 hours of project development. The activities involved in the project along with duration are given in Table 1.

TABLE 1: ACTIVITIES

Activity Name	Activity Description	Time (weeks)
Choosing a Project	Selecting a project from the list of projects categorized various technologies & business domains	2
Team Formation	Students shall form a team of 4 Members before enrolling to a project. Team members shall distribute the project activities among themselves.	1
Hands on Training	Students will be provided with hands-on training on selected technology in which they are going to develop the project.	2
Project Development	Project shall be developed in agile mode. The status of the project shall be updated to the mentors via appropriate platform	6
Code submission, Project Doc and Demo	Project deliverables must include the working code, project document and demonstration video. All the project deliverables are to be uploaded to cloud based repository such as GitHub.	3
Mentor Review and Approval	Mentor will be reviewing the project deliverables as per the milestone schedule and the feedback will be provided to the team.	1
Evaluation and scoring	Evaluators will be assigned to the team to evaluate the project deliverables, and the scoring will be provided based on the evaluation metrics	1
TOTAL		16 WEEKS

Essentially, it involves 15 weeks of learning and doing, and one week for evaluation. The evaluation will be carried out to assess technical and soft skills as given in Table 2.