B.Tech . INFORMATION TECHNOLOGY

Regulations 2019
Minimum credits to be earned: 160

Course Code	Course Title	Periods / week			Credits	CAT
		Lecture	Tutorial	Practical		
SEMESTER 1						
U19EGE01	Technical English	2	0	2	3	HS
U19MAT01	Engineering Mathematics - I	3	1	0	4	BS
U19PYE01	Engineering Physics	3	0	2	4	BS
U19MET02	Elements of Mechanical and Building Sciences	3	0	0	3	ES
U19CSE01	Problem Solving and Python Programming	3	0	2	4	ES
U19EEP01	Engineering Practices Laboratory	0	0	4	2	ES
U19MTA01	Induction Program*	0	0	0	0	MC
	Total 25 Periods	**14**	**1**	**10**	**20**	
SEMESTER 2						
U19EGE02	Communicative English	2	0	2	3	HS
U19MAT02	Engineering Mathematics - II	3	1	0	4	BS
U19CYE02	Engineering Chemistry	3	0	2	4	BS
U19ITE01	C Programming	3	0	2	4	ES
U19ECE01	Digital Principles and System Design	3	0	2	4	ES
U19MEP05	Engineering Drawing	0	0	4	2	ES
	Total 27 Periods	**14**	**1**	**12**	**21**	
SEMESTER 3						
U19MAT03	Discrete Mathematics	3	1	0	4	BS
U19ITT01	Information Technology Essentials	3	0	0	3	ES
U19ITE02	Data Structures	3	0	2	4	PC
U19ITE03	Object Oriented Programming with Java	3	0	2	4	PC
U19CST01	Computer Architecture	3	0	0	3	PC
U19ECT77	Principles of Communication	3	0	0	3	PC
	Total 23 Periods	**18**	**1**	**4**	**21**	

* As per norms

CAT - Category; BS - Basic Science; HS - Humanities and Social Science; ES - Engineering Science; PC - Professional Core; PE - Professional Electives; OE - Open Electives; EEC - Employability Enhancement Courses; MC – Mandatory Course.

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Regulations 2019
Minimum credits to be earned: 160

Course Code	Course Title	Periods / week			Credits	CAT
		Lecture	Tutorial	Practical		
SEMESTER 4						
U19MAT09	Probability and Statistics	3	1	0	4	BS
U19CSE02	Database Management Systems	3	0	2	4	PC
U19CSE03	Operating Systems	3	0	2	4	PC
U19ITT02	Design and Analysis of Algorithms	3	0	0	3	PC
U19ITE04	Computer Networks	3	0	2	4	PC
U19_____	Open Elective –I	3	0	0	3	OE
U19MTT01	Environmental Science*	2	0	0	0	MC
	Total 27Periods	**20**	**1**	**6**	**22**	
SEMESTER 5						
U19ITE05	Web Technology	3	0	2	4	PC
U19ITE06	Software Engineering Methodologies	3	0	2	4	PC
U19ITT03	Mobile and Pervasive Computing	3	0	0	3	PC
U19ECE09	Microprocessor and Microcontroller	3	0	2	4	PC
U19_____	Professional Elective I	3	0	0	3	PE
U19_____	Open Elective – II	3	0	0	3	OE
U19MTT02	Indian Constitution*	2	0	0	0	MC
	Total 26 Periods	**20**	**0**	**6**	**21**	
SEMESTER 6						
U19MGT01	Principles of Management and Ethics	3	0	0	3	HS
U19ITE07	Virtualization and Cloud Computing	3	0	2	4	PC
U19ITE08	Data mining and Analytics	3	0	2	4	PC
U19_____	Professional Elective II	3	0	0	3	PE
U19_____	Open Elective - III	3	0	0	3	OE
U19ITJ01	Mini Project	0	0	6	3	EEC
	Total 25 Periods	**15**	**0**	**10**	**20**	

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B.Tech . INFORMATION TECHNOLOGY

Regulations 2019
Minimum credits to be earned: 160

Course Code	Course Title	Periods / week			Credits	CAT
		Lecture	Tutorial	Practical		
SEMESTER 7						
U19MGT03	Engineering Economics and Financial Management	3	0	0	3	HS
U19ITE09	Cryptography and Network Security	3	0	2	4	PC
U19_____	Professional Elective III	3	0	0	3	PE
U19_____	Professional Elective IV	3	0	0	3	PE
U19_____	Open Elective – IV	3	0	0	3	OE
U19ITJ02	Project Work Phase I	0	0	8	4	EEC
	Total 25 Periods	**15**	**0**	**10**	**20**	
SEMESTER 8						
U19_____	Professional Elective V	3	0	0	3	PE
U19_____	Professional Elective VI	3	0	0	3	PE
U19ITJ03	Project Work Phase II	0	0	18	9	EEC
	Total 24 Periods	**6**	**0**	**18**	**15**	

* As per norms

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PROFESSIONAL ELECTIVES:

Course Code	Course Title
U19ITT51	Distributed Systems
U19ITT52	Programming Paradigms
U19ITT53	Business Intelligence
U19ITT54	Social Network Analysis
U19ITT55	Augmented and Virtual Reality
U19ITT56	Wireless Sensors and Ad-hoc Networks
U19ITT57	Soft Computing
U19ITT58	Natural Language Processing
U19ITT59	Formal Languages and Automata Theory
U19ITT60	Randomized Algorithms
U19ITT61	Information Storage Management
U19ITT62	Artificial Intelligence and Expert Systems
U19ITT63	Advanced Database Systems
U19ITT64	Free Open Source Software
U19ITT65	Service Oriented Architecture and Micro Services
U19ITT66	Software Architecture
U19ITT67	Information Technology for Health care
U19ITT68	Software Defined Networks
U19ITT69	Information Security
U19ITT70	Deep Learning
U19ITT71	Building Enterprise Applications
U19ITT72	Developing Web Applications in .NET
U19CST51	Full Stack Software Development
U19CST52	Software Project Management
U19CST53	Human Computer Interaction
U19CST54	Pattern Recognition
U19CST55	Machine Learning
U19CST56	Digital Image Processing
U19CST57	Game Programming
U19CST58	Blockchain Technology and Crypto Currency
U19CST68	Agile Software Development
U19CST69	Software Testing
U19CST70	Mobile Application Development

SUMMARY OF CREDIT DISTRIBUTION

CAT	Credits / Semester								Total Credits
	I	II	III	IV	V	VI	VII	VIII	
HS	3	3	0	0	0	3	3	0	**12**
BS	8	8	4	4	0	0	0	0	**24**
ES	9	10	3	0	0	0	0	0	**22**
PC	0	0	14	15	15	8	4	0	**56**
PE	0	0	0	0	3	3	6	6	**18**
OE	0	0	0	3	3	3	3	0	**12**
EEC	0	0	0	0	0	3	4	9	**16**
Total	**20**	**21**	**21**	**22**	**21**	**20**	**20**	**15**	**160**

CAT - Category; BS - Basic Science; HS - Humanities and Social Science; ES - Engineering Science; PC - Professional Core; PE - Professional Electives; OE - Open Electives; EEC - Employability Enhancement Courses; MC – Mandatory Course,

U19EGE01	TECHNICAL ENGLISH	L	T	P	C
	(Common to all Branches)	2	0	2	3

Pre-Requisites : None

Objectives:

To make the students to

- learn technical and non- technical vocabulary in speaking and writing.
- read and comprehend engineering and technical texts.
- learn the required format for business and official communication.
- familiarize technical communication portfolio.
- practice to speak and write in English.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : use more technical and non- technical vocabulary in speaking and writing.

CO2 : read and comprehend engineering and technical texts.

CO3 : the required format for business and official communication.

CO4 : apply technical communication portfolio wherever necessary.

CO5 : will be able to speak and write in English.

Unit I INTRODUCTION TO TECHNICAL ENGLISH 6

Listening: Listening to scientific and technical talks. Speaking: Self Introduction, introducing others. Reading: Skimming and scanning the text and finding the answers for the given questions. Writing: Parts of speech, word Formation- prefix and suffix, One word Substitutes, , Synonyms & Antonyms, Countable and Uncountable Nouns, technical Paragraph Writing, short essays related to various fields of engineering.

Unit II WORDS AND SENTENCES 6

Listening: Listening to longer technical talks and completing exercises based on that. Speaking: Describing a process, Reading: Note making on the given text. Writing: Matching words and phrases, Different forms of words, Types of sentences, Direct and Indirect Speech. instructions, Recommendations

Unit III ENGLISH FOR BUSINESS COMMUNICATION 6

Listening: Listening to talks on latest technology. Speaking: Giving summary of an article. Reading; Reading technical texts Journals/ Articles. Writing; - tenses, question tags. Writing reports, report on various projects, Formal Letter- business letter- calling for quotation, placing orders.

Unit IV TECHNICAL COMMUNICATION PORTFOLIO 6

Listening: Listening to documentaries. Speaking: Discussion on the documentaries related to the documentaries listened. Reading: Reading for technical information and comprehending. Writing: Gerund, Technical vocabulary, 'If' conditionals, Expansion of compound nouns, writing notice, e-mails, Agenda & Minutes of Meeting.

Unit V ESSENTIAL SOFTSKILLS FOR ENGINEERS 6

Listening: Listening to TED talks. Speaking: Group Discussion. Reading; Pre Reading and post reading and answering comprehension questions. Writing: Gap fillers, Punctuation for effective writing, collocations, Active and Passive voice, Formal Letter- official letter Article Writing for journals

Total Periods: 30

List of Exercise:

1. Listening to scientific and technical talks
2. Speaking: Self Introduction, introducing other
3. Listening to longer technical talks and completing exercises based on that.
4. Speaking: Describing a process,
5. Listening to talks on latest technology.
6. Speaking: Giving summary of an article
7. Listening to documentaries
8. Speaking: Discussion on the documentaries related to the documentaries listened.
9. Listening to TED talks
10. Speaking: Group Discussion.

Total Periods: 30

TextBooks:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jawahar Jewelcy and Dr. Ratna P	Technical English	VRB	2013

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mccarthy	Cambridge Grammar of English	Cambridge University press	2010
2.	Peck, J. and Coyle, M.	'The student's guide to writing'	Macmillan	2005
3.	Thornbury, S	Uncovering grammar	Macmillan Education	2005

Web URL(s):

1. https://www.google.com/search?client=ubuntu&channel=fs&q=ted+talk&ie=utf-8&oe=utf-8

U19MAT01	ENGINEERING MATHEMATICS - I	L	T	P	C
	(Common to all Branches)	3	1	0	4

Pre-Requisites : Concepts of basic matrices, differentiation and integration

Objectives:

To make the students to

- learn technical and non- technical vocabulary in speaking and writing.
- read and comprehend engineering and technical texts.
- learn the required format for business and official communication.
- familiarize technical communication portfolio.
- practice to speak and write in English.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Apply the knowledge of matrices to solve the problems for respective areas of specialization.

CO2 : Implement the various differentiation and integral techniques in solving the system.

CO3 : Apply the knowledge of calculus that are essential for engineering and technology.

CO4 : Explore the basic concepts of integration methods through geometrical representation.

CO5 : Evaluate the functions to get the surface area and volume using multiple integrals.

Unit I MATRICES 9+3

Linear Independence and dependence, Determinant, Gramer's rule. Eigen values and eigenvectors of a real matrix, Properties of eigenvalues and eigenvectors, Cayley – Hamilton theorem (statement), Orthogonal matrices, Application-Elastic Membrane.

Unit II FUNCTIONS OF SEVERAL VARIABLES 9+3

Limits and Continuity(Geometrical interpretations) –Properties of continuous function – Partial derivatives- Total derivatives- Jacobians - Taylor's series for two variables.

Unit III DIFFERENTIAL CALCULUS 9+3

Curvature of a curve (Cartesian co-ordinates) , centre and radius of curvature , circle of Curvature, Cartesian co-ordinates -Evolutes, Envelopes of family of curves.

Unit IV INTEGRATION METHODS 9+3

Basic integration formulae for algebraic and transcendental functions- Integration by special devices: Integration by parts – rationalizing substitution or trigonometric substitution-partial fraction – reduction formula's – Improper integrals.

Unit V MULTIPLE INTEGRALS 9+3

Double integration(Cartesian coordinates)-Region of integration, Triple integration in Cartesian Coordinates-Meaning and Application.

Total Periods: 45+15

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.S.Grewal	Higher Engineering Mathematics	Khanna Publishers,43rd Edition Delhi	2015
2.	E.Kreyszig	Advanced Engineering Mathematics	John Wiley and Sons (Asia) Ltd, Tenth Edition. Singapore	2015

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Glyn James	Advanced Modern Engineering Mathematics	Wiley India	2014
2.	Samantha Pal, Subodha .C.Bhunia	Engineering Mathematics	Oxford University	2015
3.	C.Ray. Wylie, Loui'sC. Barrett	Advanced Engineering Mathematics, 6^{th} edition	McGrawhill, 6^{th}edition, NewDelhi	2014

U19PYE01	ENGINEERING PHYSICS	L	T	P	C
	(Common to CSE, IT, EEE and ECE)	3	0	2	4

Pre-Requisites : Nil

Objectives:

To make the students

- Study the conductivity of materials using free electron theory.
- Aware about intrinsic, extrinsic semiconductors and diodes.
- Know about the various types of polarizations and its applications.
- Comprehend the knowledge of types of laser and optical fibers.
- Learn the principles of quantum physics.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Explain the density of states in metals using solar panel components.

CO2 : Explain the types of semiconductors and its applications in electronic devices.

CO3 : Identify the dielectric materials for manufacturing of capacitors.

CO4 : Explain the types of laser, optical fiber and apply them in optical communication.

CO5 : Apply the concept of quantum physics in electron microscope.

Unit I CONDUCTING MATERIALS 9

Electrical and thermal conductivity of metals - classical free electron theory of metals-Wiedemann Franz law - Quantum theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals**.**

Unit II SEMI CONDUCTING MATERIALS 9

Elemental and compound semiconductors - intrinsic semiconductors: carrier concentration – electrical conductivity-band gap. Extrinsic semiconductors: carrier concentration - variation of Fermi level. Hall effect: theory and experimental determination -applications of Hall effect**,** Light emitting diode, Photo diode.

Unit III DIELECTRIC MATERIALS 9

Polarization - Types of polarization: electronic, ionic, orientation and space charge polarization mechanisms - Langevin-Debye equation - frequency and temperature effects on polarization - dielectric strength and loss - dielectric breakdown mechanisms - active dielectric materials and Ferro electricity - applications.

Unit IV QUANTUM PHYSICS 9

Black body radiation(quantitative) – Compton effect: theory and experimental verification- matter waves - properties of matter waves- Davisson germer experimental method –concept of wave function and its physical significance – Schrodinger's wave equation – time independent and time dependent equations –particle in a one-dimensional rigid box. Electron microscope- Scanning electron microscope.

Unit V PHOTONICS AND FIBER OPTICS 9

Lasers principles - Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers - homo junction and hetero junction.

Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibers (material, refractive index, mode). Fiber optic communication.

Total Periods : 45

List of Experiments:

1. (a) Determination of Wavelength, and particle size using Laser.

   (b) Determination of acceptance angle in an optical fiber.
2. Determination of Young's modulus by uniform bending method.
3. Determination of thickness of a thin wire by Air wedge method.
4. Determination of thermal conductivity of a bad conductor–Lee's Disc method.
5. Determination of wavelength of mercury spectrum–spectrometer grating.
6. Determination of band gap of a semiconductor.

Total Periods : 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Pillai. S.O	Solid State Physics, Eighth edition	New Age International Publication, New Delhi.	2018
2.	Wahab. M.A	Solid state Physics structural and properties of materials, Third edition	Narosa publising house private limited,	2016

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.G.Senthil Kumar	Engineering Physics II, Revised edition,	VRB Publications, Chennai.	2016
2.	Donald A.Neamen	Fundamentals of Acoustics, Fourth edition Semiconductor Physics and devices Basic principles	Tata Mgrow Hill publising company limited	2010
3.	Vanchna singh, Sheetal kumar	Engineering Physics	Cengage Learning India Private Limited	2010

Web URL(s):

1. https://tekobooks.com/download/Solid%20state%20physics%206th%20edition%20so%20pillai/
2. http://s1.nonlinear.ir/epublish/book/Semiconductor_Physics_and_Devices_Basic_Principles_0073529583.pdf

U19MET02	ELEMENTS OF MECHANICAL AND BUILDING SCIENCES	L	T	P	C
	(Common to CSE, IT, EEE and ECE)	3	0	0	3

Pre-Requisites : None

Objectives:

- To impart basic knowledge of construction material.
- To understand the working of water supply and sewage disposal system.
- To enable the students to distinguish the components and working principle of manufacturing processes.
- To familiarize working principle of IC engines, Refrigeration and Air Conditioning system.
- To impart basic knowledge on various power plants and industrial safety.

Course Outcomes:
At the end of this course students will demonstrate the ability to

CO1 : Explain the usage of construction material and selection.

CO2 : Explain the water supply and function of sewage disposal system.

CO3 : Explain the manufacturing processes such as casting, forming, joining, and machining

CO4 : Elaborate the components of IC engine, refrigeration and Air conditioning system.

CO5 : Describe the working of power plants and various safety precautions in industries.

Unit I BUILDING MATERIALS AND COMPONENTS 9

Introduction to Civil Engineering – Materials: Bricks and Aggregates – composition – classifications – properties – uses. Cement and Steel – grades – types – properties – uses – market forms. Concrete – grade designation – properties – uses. Building – classification – Components. Foundations – functions – classification. Flooring – requirements – selection–types.

Unit II SURVEYING, TRANSPORTATION AND WATER SUPPLY 9

Objectives – classification – principles of survey. Transportation – classification – cross section and components, classification of roads. Railway – cross section and components of permanent way. Water supply – objectives – quantity of water – sources – standards of drinking water. Sewage – classification – technical terms.

Unit III MANUFACTURING PROCESSES 9

Manufacturing Processes – Casting processes – Types and operations – Metal joining processes – Arc welding and Gas welding – Shearing and forming processes – Metal removal processes – Theory of metal cutting – Lathe – Specifications, types and operations –Milling machine - Specifications, types and operations – Surface finishing processes.

Unit IV INTERNAL COMBUSTION ENGINE AND REFRIGERATION 9

Internal Combustion Engine- working of two stroke and four stroke petrol, diesel engines, Domestic refrigerator – Vapour compression Refrigeration – Air conditioning system – window, split and central air conditioning systems.

Unit V POWER PLANTS AND INDUSTRIAL SAFETY 9

Energy Sources – Conventional and non-conventional- Layout of power plants- steam, gas, diesel, nuclear and hydro power plants- solar PV power plants and horizontal axis wind mills
Industrial Safety practice & Protective Devices - General requirements- Eye and face protection. – Respiratory Protection - Head protection - Foot protection – Hand Protection.

Total Periods: 45

TextBooks:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Shanmugam G and Palanichamy M S	Basic Civil and Mechanical Engineering	Tata McGraw Hill Publishing Co., New Delhi	1996
2.	Hajra Choudhury. S.K, Hajra Choudhury. A.K, Nirjhar Roy	Elements of Workshop Technology	Media Promoters,	2009

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	RamamruthamS.	Basic Civil Engineering	Dhanpat Rai Publishing Co.(P) Ltd	1999
2.	Shantha Kumar SRJ	Basic Mechanical Engineering	Hi-tech Publications	2000
3.	Venugopal K. and Prahu Raja V.	Basic Mechanical Engineering	Anuradha Publishers, Kumbakonam,	2000

U19CSE01	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
	(Common to all Branches)	3	0	2	4

Pre-Requisites : Nil

Objectives:

- To know the basics of algorithmic problem solving.
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

Course Outcomes:
At the end of this course students will demonstrate the ability to

CO1 : Develop algorithmic solutions to simple computational problems.

CO2 : Read, write, execute by hand simple Python programs.

CO3 : Structure simple Python programs for solving problems.

CO4 : Decompose a Python program into functions.

CO5 : Represent compound data using Python lists, tuples, and dictionaries.

Unit I PROBLEM SOLVING TECHNIQUES 9

General problem Solving concepts-: Algorithm, Pseudo-code and Flowchart Problem Solving with Sequential Logic Structure - Problem Solving with Decisions - Problem Solving with Loops. **Case Study:** Raptor and Scratch Tools.

Unit II BASICS OF PYTHON PROGRAMMING 8

Features of Python, History of Python, The Future of Python, Literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Indentation, Operators and Expressions, Expressions in Python, Operations on Strings, Other Data Types, Type Conversion, String-String functions and methods

Unit III DECISION CONTROL STATEMENTS 9

Introduction to Decision Control, Selection/Conditional Branching Statements, Basic Loop Structures/ Iterative Statements, Nested Loops, The break Statement, The continue Statement ,The pass Statement, The else Statement used with Loops. Case Study: Simple Calculator, Generating a Calendar

Unit IV LISTS, TUPLES, DICTIONARIES 10

Sequence, Lists- Access Values in Lists, Updating Values in Lists, Nested Lists, Cloning Lists, Basic List Operations , List Methods , Looping in Lists , Tuple- Creating Tuple , Accessing Values in a Tuple , Basic Tuple Operations , Tuple Assignment ,Sets, dictionaries- Creating a Dictionary, Accessing Values, Adding and Modifying an Item in a Dictionary, Modifying an Entry, Deleting Items, Sorting Items in a Dictionary, Looping over a Dictionary, Nested Dictionaries

Unit V FUNCTIONS, MODULES AND PACKAGES 9

Introduction, Function Definition, Function Call, Variable Scope and Lifetime, The return statement, Recursive Functions, Modules, Packages in Python, Standard Library modules. Case Study: Tower of Hanoi, Shuffling a Deck of Cards

Total Periods: 45

List of Experiments:

1. Draw Flowchart using Raptor Tool
   a. Simple Flow Chart
   b. Decision Making
   c. Looping[Pre test & Post test]
2. Create Animation / Gaming /Application using Scratch Tool
3. Programs on Operators and expressions.
4. Program using Decision Making Statement
5. Programs using Looping Statements
6. Programs on List (Searching , Sorting)
7. Programs on Tuple
8. Program on Dictionaries
9. Programs using Strings Operations
10. Program using Functions
11. Programs using Modules and Packages

Total Periods : 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	M. Sprankle	Problem Solving and Programming Concepts	Pearson Education	2011
2.	Reema Thareja	Python Programming using problem solving	Oxford University	2017

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Allen B. Downey	Think Python	O'Reilly Media	2012
2.	Mark Lutz.	Learning Python	O'Reilly Media	2013
3.	Alex	Python in a Nutshell	O'Reilly Media	2006

Web URL(s):

1. https://docs.python.org/3/tutorial/
2. https://www.tutorialspoint.com/python/
3. https://nptel.ac.in/courses/106106182/
4. https://scipy-lectures.org/intro/language/python_language.html

U19EEP01	ENGINEERING PRACTICES LABORATORY	L	T	P	C
	(Common to all Branches)	0	0	4	2

Pre-Requisites : None

Objectives:

To make the students to

- To know about the usage of appropriate tools and equipment's used in plumbing and carpentry
- To acquaint metal joining process
- To understand working methodologies in lathe and sheet metal.
- To impart knowledge in electrical wiring concepts for house hold and calculations of power and energy.
- To familiarize with various electronic components and equipments.
- To learn the basic skills of soldering electronic components and wires

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Use proper tools for plumbing and carpentry.

CO2 : Join metals using arc welding.

CO3 : Create models in sheet metal and perform basic machining operations in lathe.

CO4 : Carry out basic home electrical works and measure electrical quantities.

CO5 : Possess the knowledge on various electronics components and equipments.

CO6 : Elaborate on soldering practices.

List of Exercise:

MECHANICAL AND CIVIL EENGINEERING PRACTICES

1. Study of plumbing and carpentry components of residential and industrial building
2. Hands-on-exercise: Wood work, joints by sawing, planning and cutting
3. Preparation of butt joints, lap joints and T- joints by metal arc welding
4. Study of Lathe, centrifugal pump and air conditioner
5. Hands-on-exercise: Simple Turning, Taper Turning and Drilling Practice
6. Sheet Metal Works: Model making – Trays and funnels

ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICES

1. Residential house wiring and staircase wiring.
2. Measurement of power and energy
3. Measurement of earth resistance
4. Study of different types of electronic components resistors, capacitors, inductors, function generator and DC power supply.
5. Study of CRO and measurement of AC signal parameter (peak-peak, rms period, frequency).
6. Soldering practice using general purpose PCB

Total Periods: 60

TextBooks:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jawahar Jewelcy and Dr. Ratna P	Technical English	VRB	2013

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mccarthy	Cambridge Grammar of English	Cambridge University press	2010
2.	Peck, J. and Coyle, M.	'The student's guide to writing'	Macmillan	2005
3.	Thornbury, S	Uncovering grammar	Macmillan Education	2005

Web URL(s):

1. https://www.google.com/search?client=ubuntu&channel=fs&q=ted+talk&ie=utf-8&oe=utf-8

U19EGE02	COMMUNICATIVE ENGLISH	L	T	P	C
	(Common to all Branches)	2	0	2	3

Pre-Requisites : None

Objectives:

To make the students to

- know the importance of listening skill for effective communication
- practice conversation and public speaking in English
- prepare for competitive examinations
- comprehend the format of business communication
- gain knowledge on communication abilities and language skills

Course Outcomes:
At the end of this course students will demonstrate the ability to

CO1 : communicate effectively

CO2 : do public speaking

CO3 : take up competitive examinations

CO4 : communicate officially

CO5 : master the language

Unit I INTRODUCTION TO COMMUNICATIVE ENGLISH 6

Listening: Listening to longer texts and filling up the table. Speaking: Describing a product. Reading: Reading Biography/ Autobiography of Scientists/ eminent personalities and answering the questions. Writing: simple, Compound and Complex sentences, One word Substitutes, Essay Writing.

Unit II ENGLISH FOR COMPETITIVE EXAMS 6

Listening: listening to personal information. Speaking: Sharing personal information (likes and dislikes), Reading: Reading scientific blogs- projects related to engineering. Writing; Sample questions from International English Language Testing System (IELTS), Test of English as foreign language (TOEFL) & Civil Service (Language related)

Unit III FORMAL COMMUNICATION 6

Listening: Listening to formal conversation, Speaking: Role- play. Reading: Cloze Reading. Writing: Preposition, Phrasal Verbs, Singular or Plural Words, Degrees of Comparison, Job Application- Cover letter and Resume, Writing Circulars

Unit IV VERBAL AND NON- VERBAL COMMUNICATION 6

Listening; Listening to Mock Group Discussion and evaluating. Speaking: Making Presentation on the given topic Reading; Interpreting pictures and graphs- pie chart, flow chart, bar diagram and line graph. Writing: Infinitives and Gerunds, Regular and Irregular Verbs, Indefinite and Definite Articles

Unit V LANGUAGE SKILLS 6

Listening to Interviews. Speaking: Discussing company information/ describing the given data, trends and sales, Problem Solving techniques, Reading: Reading essays on global warming and other prevailing social issues. Writing: Contractions, Conjunctions or 'Joining Words, Subject -Verb Agreement, Proposal writing, Poster making

Total Periods: 30

List of Experiments:

1. Listening to longer texts and filling up the table.
2. Speaking: Describing a product.
3. Listening to personal information.
4. Speaking: Sharing personal information (likes and dislikes)
5. Listening to formal conversation
6. Speaking: Role- play.
7. Listening to Mock Group Discussion and evaluating.
8. Speaking: Making Presentation on the given topic
9. Listening to Interviews.
10. Speaking: Discussing company information/ describing the given data, trends and sales, Problem Solving techniques

Total Periods: 30

TextBooks:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dhanavel.S. N	English and Communication Skills	Orient LongSwan	2013
2.	LakshmanaPerumal. N	Communicative English	Sri Krishna	2018

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mccarthy	Cambridge Grammar of English	Cambridge University press	2010
2.	Rayadu, C.S	Communication	Himalaya Publishing House	2007
3.	Murphy, R. and Smalzer, W. R	Grammar in use	Cambridge University Press	2000

Web URL(s):

1. https://www.google.com/search?client=ubuntu&channel=fs&q=ted+talk&ie=utf-8&oe=utf-8

U19MAT02	ENGINEERING MATHEMATICS - II	L	T	P	C
	(Common to all Branches)	3	1	0	4

Pre-Requisites : Concepts of Differentiation and Integration

Objectives:

- Understand the concepts of gradient, divergence and curl through vector differentiation.
- Distinguish line integral, double integral, triple integral using vector integration.
- Interpret the solution of second order differential equation.
- Exemplify the concept of Laplace transforms that converts time domain to frequency domain**.**
- Represent the concept of inverse Laplace transform for engineering problems.

Course Outcomes:
At the end of this course students will demonstrate the ability to

CO1 : Compute gradient, curl and divergence using vector differentiation.

CO2 : Evaluate line integral, double integral and volume integral using vector integration.

CO3 : Analyze and model the real time problems using differential equations.

CO4 : Apply the knowledge of Laplace transforms for periodic functions.

CO5 : Analyze and model the differential equations using Laplace transform.

Unit I VECTOR DIFFERENTIATION 9+3

Vector of scalar fields, directional derivative, gradient of a scalar field, surfaces, scalar potential, divergence and curl-Line integrals and independent of path, conservative vector fields-work done by a force.

Unit II VECTOR INTEGRATION 9+3

Double integrals, surface integral-flux, Green’s theorem, triple integral- Gauss divergence theorem-Stoke’s theorem

Unit III LINEAR DIFFERENTIAL EQUATION OF SECOND ORDER 9+3

Linear equations of second order with constant and variable coefficients (Euler,Cauchy's and Legendre's), Method of variation of parameter-Applications:electric circuit.

Unit IV LAPLACE TRANSFORM 9+3

Laplace transform: Linearity, shifting, transform of derivatives and integrals, Periodic function.

Unit V INVERSE LAPLACE TRANSFORM 9+3

Inverse linear transform: Convolution theorem(Statement only) ,partial fraction ,unit step and impulse function, Initial and Final value theorem,(Statements) Applications: differential equations .

Total Periods: 45+15

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.S.Grewal	Higher Engineering Mathematics	Khanna Publishers, 43rd Edition Delhi	2015
2.	E.Kreyszig	Advanced Engineering Mathematics	John Wiley and Sons (Asia) Ltd, Tenth Edition. Singapore	2015

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Glyn James	Advanced Modern Engineering Mathematics	Wiley India	2014
2.	Samantha Pal, Subodha .C. Bhunia	Engineering Mathematics	Oxford University	2015
3.	C.Ray. Wylie, Loui's C. Barrett	Advanced Engineering Mathematics,6 thedition	McGrawhill, 6thedition, NewDelhi	2014

U19CYE02	ENGINEERING CHEMISTRY	L	T	P	C
	(Common to CSE, IT, ECE and EEE)	3	0	2	4

Pre-Requisites : None

Objectives:

To make the students to

- Understand the requirements of Boiler feed water, its problems and water treatment methods.
- Conversant with the principles of Electrochemistry, Corrosion and its prevention.
- Learn the principles and generation of energy in solar cells, fuel cells and batteries.
- Familiar with the preparation, properties and uses of polymers.
- Develop an understanding about nanomaterials and its applications.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Explain the various water treatment process, which make it fit for industrial and domestic purpose.

CO2 : Apply suitable corrosion prevention techniques that can be adopted in their field of work.

CO3 : Analyses various sources of energy and its storage in different batteries, which find its application in society including engineering fields.

CO4 : Select polymers for various engineering applications and their characterization.

CO5 : Explain methods involved in the synthesis of nanomaterials.

Unit I WATER TECHNOLOGY 9

Hardness of water-types -expression-units-estimation of hardness of water by EDTA-numerical problems-boiler feed water-disadvantages of hard water in boilers-boiler troubles (scale & sludge, boiler corrosion)-water treatment- zeolite process, Ion exchange process-desalination-reverse osmosis-instrumental methods for water analysis-AAS, flame emission spectroscopy and photocolorimetry.

Unit II ELECTROCHEMISTRY AND CORROSION 9

Electrochemical cell-reversible and irreversible cell-electrode potential-electrochemical series-Nernst equation (derivation and problems)-reference electrode-calomel electrode, ion selective electrode-glass electrode-emf - measurement of emf of a cell. Corrosion-types-chemical, electrochemical corrosion (galvanic, differential aeration)-corrosion control-sacrificial anodic method and impressed current cathodic protection method. Protective coatings -electroplating of copper and electroless plating of nickel-paints-constituents and functions.

Unit III ENERGY SOURCES AND STORAGE DEVICES 9

Energy sources-types-nuclear energy-nuclear fission-controlled nuclear fission-nuclear fusion-nuclear reactor power generator-breeder reactor-solar energy-solar energy conversion-wind energy-Batteries - primary (alkaline battery) - Secondary (lead storage battery, NICAD battery and lithium ion battery)-Fuel cells (H2-O2 , direct methanol and solid oxide)-super capacitors.

Unit IV POLYMERS 9

Polymers: functionality, degree of polymerisation, molecular weight Mn and Mw-classification-types of polymerisation-glass transition temperature-factors affecting Tg- industrially important polymers-preparation, properties and uses of PE, PET, PU, Nylon, epoxy resin – conducting polymers (intrinsic and extrinsic). Organic electronic materials (introduction only)-applications.

Unit V NANO MATERIALS 9

Nano Chemistry: Basics-distinction between molecules, nanoparticles and bulk materials-preparation of nanoparticles by sol-gel-preparation of nanowires by electro spinning-preparation of carbon nanotube by chemical vapour deposition-quantum dots-synthesis by colloidal process-applications.

Total Periods: 45

List of Experiments:

1. Estimation of Total, Temporary and Permanent Hardness of Water Sample by EDTA method.
2. Determination of DO content in Water by Winkler's method.
3. Determination of strength of acids in a mixture using conductivity meter.
4. Determination of strength of an acid using pH meter.
5. Estimation of iron content of the given solution using potentiometer
6. Determination of molecular weight and degree of polymerisation of a polymer (PVA) by viscometric method
7. Estimation of Iron in a given sample by photocolorimetry

Total Periods: 30

TextBooks:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jain P.C. and Monica Jain	Engineering Chemistry, 16th edition	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2017
2.	O.G.Palanna	Engineering Chemistry, 2nd edition	McGraw Hill Education (India) Pvt. Ltd., Chennai.	2017

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dara S.S Umare S.S	Engineering Chemistry, 12th edition	S.Chand & Company Ltd., New Delhi.	2013
2.	V.R.Gowarikar N.V.Viswanathan Jayadev Sreedhar	Polymer Science, 2nd edition	New Age International Publisher	2015
3.	Charles P Poole Jr Frank J Owens	Introduction to Nanotechnology	A.John Wiley & Sons, Inc., Publication, New Jersey	2010

Web URL(s):

1. http://www.erforum.net/2016/01/engineering-chemistry-by-jain-and-jain-pdf-free-ebook.html
2. https://www.mhhe.com/palanna/ec2e

U19ITE01	C PROGRAMMING	L	T	P	C
		3	0	2	4

Pre-Requisites **:** NIL

Objectives:

- Understand the basics of C primitives operators ,expressions, Loops
- Impart Knowledge about structural Programming Concepts
- Construct programs using Array and Strings
- Write program using Function and Pointers
- To gain knowledge about structures and pointer to structures and unions.
- To do input/output and File handling in C

Course Outcomes:
At the end of this course students will demonstrate the ability to

CO1 : Explore the basic C programming concepts.

CO2 : Develop programs using control statements.

CO3 : Exemplify the concepts of Arrays and strings in C.

CO4 : Implement the concepts of functions and pointers in C.

CO5 : Explore the concepts of structures, unions and files in C.

Unit I BASICS OF C PROGRAMMING 9

Introduction to programming paradigms - Structure of C program – Compilation Process- Executing a C program- Data Types – Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions – Input and output statements, Assignment statements – Decision making statements - Switch statement - Looping statements

Unit II ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One dimensional array – Operations on Arrays-Two dimensional arrays –Operations-Applications -Strings: Defining a String – Null Character– Initialization of a String- Character arrays – Reading String Input- String Library functions- operations: length, compare, concatenate, copy – Arrays of Strings

Unit III FUNCTIONS AND POINTERS 9

Introduction to functions: Function prototype, function definition, function call, Return values and their types- Nesting of functions-Passing arrays and strings to functions- Built-in functions – Recursion : Pointers – Pointer operations –Null Pointer- Pointer arithmetic – Pointer to a pointer – Pointer to an Array – Pointers and Strings - Parameter passing: Pass by value, Pass by reference

Unit IV STRUCTURES AND UNIONS 9

Structure - Nested structures – typedef declaration- Operations on structures- Pointer and Structures – Array of structures — Functions and Structures -Self-referential structures – Dynamic memory allocation :Union - Definition – Declaration- Operations on unions –Arrays of Union variables – Union inside Structure- Enumerations – Bit Fields

Unit V PREPROCESSOR DIRECTIVES AND FILE PROCESSING 9

Preprocessor Directives – Types – Macros- File Inclusion – Conditional Compilation Directives-Files – Streams - I/O using streams –File types – File Operations - Command line arguments

Total Periods: 45

List of Experiments:

1. Programs to process data types, operators, format input/Output, Evaluate an expression.
2. Programs using Decision making statements and Looping statements
3. Programs using arrays and passing.
4. Program for String manipulation.
5. Program using Functions and Recursion
6. Programs using Pointers.
7. Programs using Structure and Union.
8. Program using Preprocessor Directives and Macros
9. Programs on basic File operations.
10. Programs using Command Line arguments

Total Periods: 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ajay Mittal	Programming in C- A Practical Approach	Pearson Education	2015
2.	Reema Thareja	Programming in C	Oxford University Press	2016

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Herbert Schildt	C –The complete Reference	Tata McGraw-Hill	2013
2.	E.Balagurusamy	Programming in ANSI-C	Tata McGraw-Hill	2012
3.	Byron Gottfried	Programming with C	Tata Mcgraw-Hill	2013

Web URL(s):

1. https://swayam.gov.in/nd1_noc_19_cs42/preview
2. https://swayam.gov.in/nd1_noc_19_cs43/preview

U19ECE01	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	C
		3	0	2	4

Pre-Requisites : None

Objectives:

- To present the Digital fundamentals and Boolean algebra.
- To familiarize with the design of various combinational digital circuits using logic gates.
- To outline the procedures for the analysis and design of sequential circuits.
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of Hardware Description Language.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand different methods used for the simplification of Boolean functions.

CO2 : Design and analysis combinational circuits.

CO3: Design and analysis synchronous sequential circuits.

CO4: Design and analysis asynchronous sequential circuits.

CO5 : Study the fundamentals of Verilog HDL.

Unit I BOOLEAN ALGEBRA AND LOGIC GATES 9

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

Unit II COMBINATIONAL CIRCUITS 9

Combinational circuits – Analysis and design procedures –Adder and Subtractor, Decoders and Encoders – Multiplexers and Demultiplexers – Code Converters - Magnitude comparator

Unit III SEQUENTIAL CIRCUITS 9

Sequential circuits – Flip flops – Analysis and design procedures - State reduction and state assignment - Shiftregisters – Counters – Introduction to Asynchronous sequential circuits

Unit IV MEMORY DEVICES 9

Read Only Memory, Read Access Memory, Programmable Logic Array, Programmable Array Logic, Introduction to FPGA

Unit V HARDWARE DESCRIPTION LANGUAGE 9

Types of Modeling – Combination Circuits –Adder and Subtractor, Decoder and Encoder, Multiplexer and Demultiplexer – Sequential Ciruits –Flipflops, Counters, Registers – Finite State Machine

Total Periods: 45

List of Experiments:

1. Realization of Logic gates
2. Implementation of Adder and Subtractor
3. Implementation of Multiplexer and Demultiplexer
4. Implementation of Encoder and Decoder
5. Implementation of Code Converter using logic gates
6. Realization of Flipflops
7. Implementation of Counter
8. Implementation of Shift Register
9. Combinational circuits using HDL
10. Sequential circuits using HDL

Total Periods: 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	M. Morris R. Mano, Michael D. Ciletti	Digital Design: With an Introduction to the Verilog HDL,VHDL and System Verilog	Pearson Education	2017
2.	Donald P.Leach and Albert Paul Malvino	Digital Principles and Applications	TMH	2014

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Charles H.Roth, Larry L Kinney	Fundamentals of Logic Design	Cengage Learning	2013
2.	Donald D.Givone	Digital Principles and Design	Tata McGraw-Hill	2007
3.	John F.Wakerly	Digital Design	Pearson/PHI	2008

Web URL(s):

1. https://nptel.ac.in/courses/117106086/
2. https://nptel.ac.in/courses/106108099/Digital%20Systems.pdf
3. http://www.asic-world.com/digital/index.html

U19MEP05	ENGINEERING DRAWING	L	T	P	C
	(Common to CSE, IT, EEE and ECE)	0	0	4	2

Pre – Requisites : None

Objectives:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 **:** Perform free hand sketching of basic geometrical constructions and multiple views of objects.

CO2 **:** Do orthographic projection of lines and plane surfaces

CO3 **:** Draw projections and solids and development of surfaces

CO4 **:** Prepare isometric and perspective sections of simple solids.

CO5 **:** Demonstrate computer aided drafting

Unit I **PROJECTION OF POINTS, LINES AND PLANE SURFACES** **12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Unit II **PROJECTION OF SOLIDS** **12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method

Unit III **PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES** **12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

Unit IV **FREEHAND SKETCHING** **12**

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects.

Unit V **ISOMETRIC AND PERSPECTIVE PROJECTIONS** **12**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and conversion of orthographic views to isometric. Introduction to perspective projection of simple solids- Prisms, pyramids and cylinders.

Total Periods: 60

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Venugopal K. and Prabhu Raja V	"Engineering Graphics"	New Age International (P) Limited	2008.
2.	Natrajan K.V.,	A text book of Engineering Graphics	Dhanalakshmi Publishers Chennai,	2009

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bhatt N.D. and Panchal V.M	Engineering Drawing	Charotar Publishing House 50th Edition,	2010.
2.	Gopalakrishna K.R.,	"Engineering Drawing" (Vol. I&II combined),	Subhas Stores Bangalore	2007
3.	Luzzader, Warren.J . and Duff, John M	"Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production	Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi.	2005

U19MAT03	DISCRETE MATHEMATICS	L	T	P	C
	(Common to CSE & IT)	3	1	0	4

Pre-Requisites : Concepts of Logic and group theory

Objectives:

To make the students

- Equip the students to solve the problems using Logic
- Understand the concepts of permutation , combination and Pigeonhole Principle and apply it to scenario based problems
- Represent the concepts of groups for engineering problems
- Exemplify the concepts of lattices and Boolean algebra in real world.
- Interpret the concepts of graph theory in the field of computer science.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Construct simple mathematical proofs and have substantial experience to comprehend formal logical arguments. Have knowledge of the concepts needed to test the logic of a program.

CO2: Apply basic counting techniques to solve combinatorial problems. Have an understanding in identifying structures on many levels.

CO3: Understand the importance of algebraic properties with regard to working within various number systems. Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.

CO4: Understand the homomorphism between the Lattice and Boolean Algebra and application of switching circuits. Be aware of the counting principles.

CO5: Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

Unit I LOGIC 12(9+3=12)

Statements, Truth Tables, connectives, Normal forms, predicate Calculus, Inference theory for statement calculus and Predicate Calculus.

Unit II COMBINATORICS 12(9+3=12)

Review of Permutation and combination, Mathematical Induction, Pigeon hole principle, Principle of inclusion and exclusion, generating function, Recurrence relations.

Unit III ALGEBRAIC SYSTEMS 12(9+3=12)

Semi groups, monoids, groups, permutation group, Cosets, Lagrange's theorem, Group homomorphism, Kernal, Rings and Fields (definition and Examples only).

Unit IV LATTICES AND BOOLEAN ALGEBRA 12(9+3=12)

Partial ordering, Posets, Hasse diagram, Lattices, properties of Lattices, Sub Lattices, Special Lattices, Boolean Algebra- Application with simple logic circuits

Unit V GRAPHS 12(9+3=12)

Introduction to Graphs, Graph terminology, Directed and Undirected Graphs, Matrix representation of graphs, Graph Isomorphism, connectivity – Euler and Hamilton Paths- application-Dijkstra's shortest path algorithm

Total Periods 45+15=60

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kenneth H.Rosen	Discrete Mathematics and its applications	7th edition,Tata Mcgraw Hill Pub . Co,Ltd.,New Delhi	Special edition, 2011.
2.	P.Ralph,Grimaldi	Discrete and Combinatorial Mathematics	Addison –Wesley Publishing company	Reprinted 2003

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Thomas Koshy	Discrete Mathematics with applications	7th edition, Tata Mcgraw Hill Pub . Co,Ltd., New Delhi	Special edition, 2011.
2.	James Strayer	Elementary number theory	Waveland Press	2002
3.	Tremblay J.P & R.Manohar	Discrete mathematical structures with applications to computer science	Tata McGraw – Hill Publishing Company Limited, second reprint, New Delhi	2012

U19ITT01	INFORMATION TECHNOLOGY ESSENTIALS	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- Introduce the concept of Internet and its working principles and design web-applications using open source technologies such as HTML and CSS.
- Validate the Web pages using Java script.
- Develop the applications with databases using Server side scripting.
- To know about XML
- To understand various applications related to Information Technology.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Create simple Web applications

CO2 : Validate the Webpages using JavaScript.

CO3 : Develop web applications with databases using PHP.

CO4 : Represent Web data using XML.

CO5 : Describe the applications of Web Technology in Information systems.

Unit I WEB ESSENTIALS 9

Basics of WWW, Web browser, Web server, Web page: Types -Issues, Concepts of Tiers, Plug-ins– Browser fundamentals – Authoring tools – Types of servers: Application Server – Web Server – Database Server – Need for Scripting languages – Types - HTML : Basics –Linking- Images – Text and Block formatting – Lists- Tables – Forms- Frames – CSS - Creating simple web applications.

Unit II CLIENT SIDE SCRIPTING 9

JAVA Script – Syntax- Variables and Data Types – Operators - Decision Making Control Statements – Functions – Arrays –Objects (Math, String, Boolean, Date, Number) - Events – Error Handling – Forms- Validation – Applications .

Unit III SERVER SIDE SCRIPTING 9

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 REPRESENTING WEB DATA 9

XML-Documents and Vocabularies-Versions and Declaration- Namespaces- Document Type Definition: Types - DOM based XML processing - Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers

Unit V APPLICATIONS ESSENTIALS 9

Creation of simple interactive applications – Simple database applications – Multimedia applications – Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Robin Nixon	Learning PHP, MySQL, JavaScript, CSS & HTML 5	O'REILLY	2014
2.	R.Kelly Rainer,Casey G.Cegielski, Brad Prince	Introduction to Information Systems	Wiley Publication	2014
3.	Kogent Learning Solutions Inc.,	Web Technologies: HTML, CSS, Javascript, ASP.NET, Servlets, JSP, PHP, ADO.NET, JDBC and XML	Dreamtech Press	2013

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Paul J Deitel , Harvey M.Deitel , Abbey Deitel	Internet and Worldwide web: How to Program	PH Professional Business	2012

Web URL(s):

1. it-ebooks.org 3 4 5
2. https://nptel.ac.in/courses/106105084/

COs	POs												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3				2	2	3	2	3	2	1
CO2	3		2	3	3				3	2	3	3	2		
CO3	3	3	3	3	3				3	2	3	2	3	2	
CO4	3	3	3	2	3				3	2	3	1	3	2	
CO5	3	2	3	1	3				3	2	3	2	3	2	1
1- Reasonably agreed 2 - Moderately agreed 3 - Strongly agreed3															

U19ITE02	DATA STRUCTURES	L	T	P	C
	(Common to CSE and IT)	3	0	2	4

Pre-Requisites : U19ITE01

Objectives:

- To understand the concepts of ADTs.
- To explore Linear Data Structures – Lists, Stacks, Queues.
- To understand Non –Linear Data Structures such as Trees, Graphs.
- To understand Sorting, Searching and Hashing Algorithms.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Apply linear data structure to solve various problems.

CO2 : Develop programs using Stacks and Queues for given applications.

CO3 : Implement Complex data structures such as Trees.

CO4 : Understand and Apply Graph data structures in different scenarios.

CO5 : Apply suitable Sorting and Hashing Techniques for a given scenario.

Unit I LINEAR DATA STRUCTURES –LIST 9

Introduction to Data Structures – Classifications - Abstract Data Types (ADTs) – The List ADT – Array Implementation- Linked list implementation – Singly Linked List – Doubly Linked List – Circularly Linked List – Applications of Lists – Polynomial Manipulation- Operations.

Unit II LINEAR DATA STRUCTURES – STACKS AND QUEUES 9

Stack ADT - Operations – Applications – Evaluating Arithmetic Expressions – Conversion of Infix to Postfix Expression – Queue ADT – Operations – Circular Queue – Priority Queue – deQueue - Applications of Queues.

Unit III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – Tree Traversals – Binary Tree ADT – Expression Trees – Applications of Trees – Binary Search Tree ADT – AVL Trees – B- Tree – B+ Tree – Heap.

Unit IV NON LINEAR DATA STRUCTURES – GRAPHS 9

Definition – Representation of Graph – Types of Graph – Breadth First Traversal – Depth First Traversal – Minimum Spanning Tree: Prims Algorithm – Kruskal's Algorithm - Topological Sort - Shortest Paths: Unweighted shortest paths-Dijkstra's algorithm – Bi-connectivity – Cut Vertex - Euler Circuit – Applications of graphs.

Unit V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching : Linear Search – Binary Search – Sorting : Bubble sort – Selection sort – Insertion sort – Merge sort- Shell sort – Radix sort – Heap sort - Hashing : Basic Concepts - Hash Functions – Collision Resolution Techniques – Applications

Total Periods: 45

List of Experiments

1. Array based implementation of ADT
    a. List
    b. Stack
    c. Queue
2. Linked List implementation
    a. List
        i) Singly Linked List
        ii) Doubly Linked List
        iii) Circularly Linked List
    b. Stack
    c. Queue
3. Implementation of Tree Data structures
    a. Tree Traversal
    b. Binary Tree and its operations
    c. Binary Search Trees
    d. AVL trees
4. Implementation of Graph
    a. Breadth First Search
    b. Depth First Search
    c. Prim's Algorithm
    d. Dijkstra's Algorithm
5. Implementation of Sorting and Searching algorithms
    a. Linear Search
    b. Binary Search
    c. Any Two sorting Techniques
6. Implementation of Hashing – Any two collision Techniques

Total Periods: 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mark Allen Weiss	Data Structures and Algorithm Analysis in C	Pearson Education	2015
2.	Reema Thareja	Data Structures using C	Oxford University Press	2011

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Thomas H.Cormen, Charles E.Leisorson, Ronald L.Riverst and Clifford Stein	Introduction to Algorithms	PHI Learning Private Limited	2014
2.	Aho , HopCraft and Ullman	Data Structures and Algorithms	Pearson Education	2002
3.	Ellis Horowitz , Sartaj Sahni , Sushan Anderson Freed	Fundamentals of Data Structures in C	University Press	2008

Web URL(s):

1. https://nptel.ac.in/courses/106102064/
2. https://www.coursera.org/specializations/data-structures-algorithms

COs	POs														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PEO1**	**PEO2**	**PEO3**
CO1	2	3	1	2	1				1			1			
CO2	3	2	1	2	1										
CO3	3	3	3	3	3	3			3		3	3			
CO4	3	3	3	3	3	3			3		3	3			
CO5	3	3	3	3	3	3			3		3	3			
1- Reasonably agreed 2 - Moderately agreed 3 - Strongly agreed															

U19ITE03	OBJECT ORIENTED PROGRAMMING WITH JAVA	L	T	P	C
	(Common to CSE and IT)	3	0	2	4

Pre-Requisites : NIL

Objectives:

- To understand Object Oriented Programming concepts and basic characteristics of Java.
- To introduce the principles of packages, inheritance and interfaces, collections.
- To introduce the concepts of I/O and Strings.
- To understand Exception handling and Multithreading.
- To design and build simple Graphical User Interfaces.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Solve real world problems using OOP techniques.

CO2 : Apply the concepts of packages, inheritance and interfaces to write simple Java applications.

CO3 : Explore the importance of strings and stream classes.

CO4 : Develop Java applications with Exception handling and Multithreading.

CO5 : Design GUI based applications.

Unit I Introduction to OOP and JAVA Fundamentals 8

Introduction to OOP - Concepts of OOP - Java Fundamentals - An overview of Java - Characteristics, Java buzzword - Java Environment - Fundamental programming structure in Java - Defining classes – methods – constructors - Access specifiers – comments - static members - Data types - variables - operators - Control flow statements - Arrays.

Unit II Packages, Inheritance, Interface and Collections 9

Packages- Defining a Package, CLASSPATH, Access protection, importing packages : Inheritance –Super class, sub class- Types of inheritance- Method overriding- Polymorphism- Method overloading- Constructor overloading -Abstract class and methods - final class and methods :Interfaces – implementing and extending interfaces- Object cloning - Collections- ArrayList, Stack, Priority Queue.

Unit III I/O and Strings 9

I/O basics - Byte streams and Character streams - Reading console Input and Writing Console Output- File class - Reading and writing Files - Random access file operations - The Console class - Serialization. String handling – String operations – String methods – Wrapper classes.

Unit IV Exception Handling and Multithreading 10

Fundamentals of exception handling- Exception types- Uncaught exceptions- using try and catch- multiple catch clauses- nested try statements- throw- throws and finally- built- in exceptions- creating own exception sub classes. Multithreading- Differences between thread-based multitasking and process-based multitasking- Java thread model- creating threads- thread priorities- synchronizing threads- inter thread communication- Generic Programming -Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

Unit V GUI Programming with Swing 9

Introduction, limitations of AWT- MVC architecture- components- containers. Understanding Layout Managers- Flow Layout- Border Layout- Grid Layout- Card Layout- Grid Bag Layout. Event Handling- The Delegation event model- Events- Event sources- Event Listeners- Event classes- Handling mouse and keyboard events- Adapter classes- Inner classes- Anonymous Inner classes. A Simple Swing Application- Applets – Applets and HTML- Security Issues- Applets and Applications- passing parameters to applets. Creating a Swing Applet- Painting in Swing- A Paint example- Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons- JButton- JToggle Button- JCheck Box- JRadio Button- JTabbed Pane- JScroll Pane- JList- JCombo Box- Swing Menus, Dialogs.

Total Periods: 45

List of Experiments:

1. Basic Java programs.
2. Programs on Packages.
3. Programs on Inheritance.
4. Programs on Interfaces.
5. Programs on ArrayList, Stack and Priority Queue.
6. Programs on File Handling.
7. Programs on String Handling.
8. Programs on Exception Handling.
9. Programs in Multithreading.
10. Event driven Programming.

Total Periods: 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Herbert Schildt	Java The complete reference, 11th Edition.	McGraw Hill Education (India) Pvt. Ltd.	2019
2.	Cay S. Horstmann, Gary cornell	Core Java Volume –I Fundamentals", 9th Edition.	Prentice Hall.	2013

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Paul Deitel, Harvey Deitel	Java SE 8 for programmers, 3rd Edition	Pearson,	2015
2.	Steven Holzner	Java 2 Black book	Dreamtech press	2011
3.	Deitel and Deitel	Java: How to Program", Ninth Edition.	Prentice Hall,10th Edition	2014
4.	Bruce Eckel	Thinking in Java", Fourth Edition.	Pearson Education	2006

Web URL(s)

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://onlinecourses.nptel.ac.in/noc19_cs84

U19CST01	COMPUTER ARCHITECTURE	L	T	P	C
	(Common to CSE and IT)	3	0	0	3

Pre-Requisites : NIL

Objectives:

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To learn the basics of pipelined execution.
- To understand the memory hierarchies, cache memories and virtual memories.
- To understand parallelism and multi-core processors.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Identify the basic structure of a digital computer and instruction sets with addressing modes

CO2 : Comprehend the arithmetic operations of binary number system.

CO3 : Recognize the organization of the basic processing unit and examine the basic concepts of pipelining

CO4 : Explicate the standard I/O interfaces and peripheral devices

CO5 : Determine the performance of different types of memory

Unit I BASIC STRUCTURE OF A COMPUTER SYSTEM 9

Introduction to computer systems - Overview of Organization and Architecture - Functional units-Basic operational concepts- Registers and register files - Bus structures-Software-performance-Memory locations and addresses- Memory operations- Instruction and Instruction sequencing- Addressing modes- Basic I/O operations

Unit II ARITHMETIC OPERATIONS 9

Fixed point representation of numbers - Addition and subtraction of signed numbers- Design of fast adders-Multiplication of positive numbers- Signed operand multiplication and fast multiplication-Integer division - Floating point representation with IEEE standards

Unit III BASIC PROCESSING UNIT 11

Fundamental concepts - Execution of a complete instruction - Single cycle Data path design-Introduction to multi cycle data path-Multi cycle Instruction execution - Multiple bus organization-Hardwired control- Micro programmed control-Pipelining: Basic concepts-Data hazards-Instruction hazards-Influence on Instruction sets-Data path and control consideration-Superscalar operation

Unit IV MEMORY SYSTEM & I/O ORGANIZATION 8

Memory Hierarchy – memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB‘s – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits – USB.

Unit V ADVANCED COMPUTER ARCHITECTURE 8

Parallel processing challenges – Flynn‘s classification – SISD, MIMD, SIMD, MISD, and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky	Computer Organization	Mc Graw-Hill Education India Pvt Ltd	2014
2.	David A. Patterson and John L. Hennessey	Computer organization and design	Morgan Kauffman / Elsevier, Fifth edition	2011

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Computer Organization and Architecture	Seventh Edition, Pearson Education	2006
2.	Vincent P. Heuring, Harry F. Jordan,	Computer System Architecture	Second Edition, Pearson Education	2015

Web URL(s):

1. https://swayam.gov.in/nd1_noc20_cs25/preview

U19ECT77	PRINCIPLES OF COMMUNICATION	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- Understand Analog and Digital communication techniques.
- Learn data and pulse communication techniques.
- Be familiarized with source and Error control coding.
- Gain knowledge on multi-user radio communication

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Apply analog and digital communication techniques.

CO2 : Use data and pulse communication techniques.

CO3 : Give brief description of evolution of data communication.

CO4 : Analyze Source and Error control coding.

CO5 : Utilize multi-user radio communication.

Unit I ANALOG COMMUNICATION 9

Introduction to Communication Systems - Modulation – Types - Need for Modulation –Basics of Amplitude Modulation –DSB, SSB, VSB – Basics of Frequency and Phase Modulation – Comparison of Analog Communication Systems (AM – FM – PM).

Unit II DIGITAL COMMUNICATION 9

Introduction- Shannon limit for information capacity- bits- bit rate –baud - Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK)–Phase Shift Keying (PSK) – BPSK – QPSK – Quadrature Amplitude Modulation (QAM),PCM-

Unit III DATA COMMUNICATIONS 9

History of Data communications – Network architecture- Standards Organizations for Data Communication-Data Communication Circuits- Data Communication Codes- Data communication Hardware - Serial and Parallel interfaces- Data modems-Asynchronous modem- Synchronous modem.

Unit IV SOURCE AND ERROR CONTROL CODING 9

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes

Unit V MULTIPLE ACCESS TECHNIQUES 9

Advanced Mobile Phone System (AMPS) – Global System for Mobile Communications (GSM) – Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse – Channel Assignment and Hand – Overview of Multiple Access Schemes – Satellite Communication – Bluetooth.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Wayne Tomasi	Advanced Electronic Communication Systems	Pearson Education	2007
2.	Simon Haykin	Communication Systems	John Wiley & Sons	2001

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	H.Taub,D L Schilling, G Saha	Principles of Communication	Mc Graw Hill	2007
2.	B.P.Lathi	Modern Analog And Digital Communication systems	Oxford University Press	2007
3.	Blake	Electronic Communication Systems	Thomson Delmar Publications	2002
4	Martin S.Roden	Analog and Digital Communication System	PHI	2002
5	B.Sklar	Digital Communication Fundamentals and Applications	Pearson Education	2007

Web URL:

1. https://nptel.ac.in/courses/108/104/108104091/
2. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ee08/

Bloom's Taxonomy Level

K1- Remember (Re), K2 – understand (Un), K3- Apply (Ap), K4- Analyse (An),K5- Evaluate (Ev), K6 – Create (Cr)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	1	2	-	-	-	-	-	-	-	2	2	-
CO2	3	-	2	1	2	-	-	-	-	-	-	-	2	2	-
CO3	3	1	1	1	1	-	-	-	-	-	-	-	2	2	-
CO4	3	1	2	1	2	-	-	-	-	-	-	-	1	1	-
CO5	3	1	2	1	2	-	-	-	-	-	-	-	2	2	-
1 - Reasonably agreed						2 - Moderately agreed							3 - Strongly agreed		

U19MAT09	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

Pre-Requisites : Concepts of Probability

Objectives:

To make the students

- To provide necessary basic concepts in probability
- To understand the basic concepts of probability, one dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of probability and two dimensional random variables.
- It helps the students to have a clear perception of the power of statistical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering
- To understand the concept of Design of experiments.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Understand the fundamental knowledge of the concepts of probability.
CO2: Have knowledge of standard distributions which can describe real life phenomenon.
CO3: Understand the basic concepts of two dimensional random variables and apply in engineering applications.
CO4: Demonstrate the testing hypothesis in the real life.
CO5: Explain how to find the solution of industrial and agriculture problems using design of experiments.

Unit I PROBABILITY AND RANDOM VARIABLES 9+3

Probability – Axioms of probability – Conditional probability –Baye's theorem- Discrete and continuous random variables – Moments – Moment generating functions- Binomial, Poisson and Normal distributions .

Unit II TWO – DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables-central limit theorem.

Unit III MARKOV PROCESSES 9+3

Classification – Stationary process – Markov process - Markov chain - Poisson process.

Unit IV TESTING OF HYPOTHESIS 9+3

Large sample test based on Normal distribution for single mean and difference of means – Tests based on t, chi-square and F distributions for testing means and variances –Contingency table (Test for Independency) - Goodness of fit.

Unit V DESIGN OF EXPERIMENTS 9+3

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design**.**

Total Periods 45+15

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Douglas.C.Montgomery and George.C.Runger	Applied Statistics and Probability for Engineers	John Wiley and Sons, 5th Edition	2011
2.	Hwei Hsu	Schaum‟s Outline of Theory and Problems of Probability, Random Variables and Random Processes	Tata McGraw Hill, 4th Edition, New Delhi	2004

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Trivedi.K.S	Probability and Statistics with Reliability, Queueing and Computer Science Applications	John Wiley and Sons, 2nd Edition	2002
2.	Miller. S.L. and Childers. D.G.	Probability and Random Processes with Applications to Signal Processing and Communications	Academic Press	2004
3.	Yates. R.D. and Goodman. D.J	Probability and Stochastic Processes	Wiley India Pvt. Ltd, Bangalore, 2nd Edition	2012

U19CSE02	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
	(Common to CSE and IT)	3	0	2	4

Pre-Requisites : NIL

Objectives:

- To expose the students to the fundamentals of Database Management Systems and relational model.
- To familiarize the students with ER diagrams and relational database design.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure
- To familiarize the students with the different types of databases.

Course Outcomes:

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

CO1 : Classify the modern and futuristic database applications based on size and complexity.

CO2 : Map ER model to Relational model to perform database design effectively.

CO3 : Write queries using normalization criteria and optimize queries.

CO4 : Compare and contrast various indexing strategies in different database systems.

CO5 : Appraise how advanced databases differ from traditional databases

Unit I INTRODUCTION 9

Purpose of database system – Views of Data – Database Languages – Data storage and Querying – Database Architecture – Database users and administrators - The Database System Environment– Centralized and Client/Server Architectures for DBMSs– Classification of database management systems - Introduction to Relational Model – Database schema and Instances– Three-Schema Architecture and Data Independence - Keys – Relational Algebra

Unit II DATABASE DESIGN 9

Entity Relationship model – ER Diagrams – Enhanced ER Model – ER to Relational Mapping – Functional Dependencies – 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 DATA STORAGE AND QUERYING 9

RAID – File Organization – Organization of records in files – Indexing and Hashing –Ordered Indices – B+ tree IndexFiles – B tree Index Files – Static Hashing – Dynamic Hashing – Query processing Overview – Query optimization using Heuristics and Cost Estimation

Unit IV TRANSACTIONS 9

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase locking – Deadlock – Transaction Recovery - Save Points – Isolation levels – SQL Facilities for Concurrency and Recovery

Unit V ADVANCED TOPICS 9

Introduction, Need of NoSQL, CAP Theorem, different NoSQL data models: Key-value stores, Column families, Document databases, Graph databases - Parallel Database - Multimedia Database - Mobile Database - Web Database - Multidimensional Database- Data Warehouse - OLTP Vs OLAP

Total Periods: 45

List of Experiments:

1. Conceptual Database design using E-R Diagram
2. Implementation of SQL commands DDL, DML, DCL and TCL
3. Queries to demonstrate implementation of Integrity Constraints
4. Implementation of Join and Nested Queries AND Set operators
5. Implementation of virtual tables using Views
6. Practice of PL/SQL - (Cursors, Stored Procedures, Stored Function, Triggers).
7. Mini Project (Application Development using front end tools)

Total Periods: 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Abraham Silberschatz, Henry F. Korth, S. Sudharshan	Database System Concepts	Tata McGraw Hill	2015
2.	Ramez Elmasri, Shamkant B. Navathe	Fundamentals of Database Systems	Pearson Education	2011

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	C.J.Date, A.Kannan, S.Swamynathan	An Introduction to Database Systems	Pearson Education	2006
2.	Raghu Ramakrishnan	Database Management Systems	McGraw-Hill College Publications	2015
3.	G.K.Gupta	Database Management Systems	Tata McGraw Hil	2011

Web URL(s):

1. https://swayam.gov.in/nd1_noc19_cs46/preview
2. https://www.coursera.org/learn/database-management
3. https://www.udemy.com/database-management-system

U19CSE03	OPERATING SYSTEMS	L	T	P	C
	(Common to CSE and IT)	3	0	2	4

Pre-Requisites **:** NIL

Objectives:

- Design and implementation issues of contemporary operating systems.
- Detailed analysis of process, multithreading, symmetric multiprocessing and micro kernels.
- Memory management techniques, including virtual memory.
- Various approaches to process scheduling.
- Operating system control of Input/ Output
- Various approaches to disk scheduling and File management

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Describe the evolution and Working of OS.

CO2 : Categorize various process management concepts.

CO3 : Analyze the activities of process synchronization and deadlocks.

CO4 : Describes the concepts of memory management.

CO5 : Suggest an appropriate file system and disk organizations methods.

Unit I INTRODUCTION 9

Introduction to Operating Systems - Evolution of OS– Computer-System Architecture- Operating System Structures – OS Operations– Process Management–Storage Management– Memory Management- Protection & Security– Open source OS- OS Services: – System Calls – System Programs

Unit II PROCESS MANAGEMENT 9

Processes: Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes –Interprocess Communication – Multi Threaded Programming- Threads: Multi-Threading Models – Threading Issues- Process Scheduling : CPU Scheduling: Scheduling Criteria – Scheduling Algorithms

Unit III PROCESS COORDINATION 9

Process Synchronization: The Critical-Section Problem – Synchronization Hardware – Semaphores – Monitors- Classical problems of synchronization- Deadlocks – System model – Deadlock characterization – Methods for handling deadlock- Deadlock prevention – Deadlock avoidance – Deadlock detection- Recovery from deadlock

Unit IV MEMORY MANAGEMENT 9

Memory Management: Background – Swapping – Contiguous Memory Allocation – Paging –Segmentation – Segmentation with Paging. Virtual Memory: Background –Demand Paging – Page Replacement – Allocation of Frames –Thrashing. Case Study: Memory Management in Linux.

Unit V STORAGE MANAGEMENT 9

File Concept – Access Methods – Directory and disk structure – File system mounting- File Sharing & Protection: File-System Implementation: File system structure - Directory Implementation –Allocation Methods – Free-Space Management – Secondary Storage structure- Disk structure – Disk Attachment- Disk scheduling – Disk Management

Total Periods: 45

List of Experiments:

1. Basics of UNIX commands
2. Programs for system calls
3. Simple Shell Programs
4. Implementation of Interprocess Communication
5. Creation of Threads
6. Implementation of various CPU Scheduling Algorithms
7. Demonstration of Semaphores
8. Implementation of Bankers Algorithm for Deadlock Avoidance
9. Implementation of the Memory Allocation Methods for fixed partition
10. Implementation of Paging Technique of Memory Management
11. Implementation of the Page Replacement Algorithms
12. Implementation of the File Allocation Strategies

Total Periods: 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne	Operating System Concepts	John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition	2016.
2.	Andrew S. Tanenbaum	Modern Operating Systems	Fourth Edition, Prentice Hall of India Pvt.Ltd	2014

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Operating System	Seventh Edition Prentice Hall of India	2012
2.	Harvey M. Deitel M	Operating Systems	Pearson Education Pvt. Ltd	2007

Web URL(s):

1. https://swayam.gov.in/nd1_noc20_cs04/preview
2. https://swayam.gov.in/nd2_cec20_cs06/preview

U19ITT02	DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE and IT)	L	T	P	C
		3	0	0	3

Pre-Requisites : U19ITE02

Objectives:

- Apply the fundamental principles of algorithm analysis.
- Critically analyze the efficiency of alternative algorithmic solutions for the same problem.
- Understand different algorithm design techniques.
- Compare on the different algorithmic solutions.
- Understand the limitations of the algorithmic power and apply the concept of computational intractability.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Identify and apply the fundamental principles of algorithm analysis for the given recursive and non-recursive problems.

CO2 : Identify and develop algorithms for real life problems using various design techniques.

CO3 : Compare the efficiencies of different algorithmic solutions to the given problem.

CO4 : Apply backtracking problem solving technique to solve the given problems.

CO5 : Apply branch and bound technique to solve the problems and analyze P, NP Hard and NP Complete problems.

Unit I ANALYSIS OF ALGORITHMS 9

Introduction - Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Space Complexity – Time Complexity – Asymptotic notations and its properties- Mathematical analysis for Recursive and Non recursive algorithms.

Unit II BRUTE FORCE AND DIVIDE - AND – CONQUER 9

Brute force -Sequential search – String matching - Exhaustive search – Travelling salesman problem- Knapsack problem- Assignment problem - Divide and Conquer - General method – Binary search – Merge sort – Quick sort – Multiplications of large integers – Strassen's Matrix multiplication

Unit III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

Dynamic programming – The General method – Multistage graphs – Computing Binomial coefficient- Warshall's Algorithm – Floyd's algorithm – Optimal Binary search tree- The Knapsack problem- Greedy technique – The General method – Prim's algorithm- Kruskal's algorithm – Dijkstra's algorithm - Huffman trees

Unit IV BACKTRACKING 9

Backtracking- The General method- 8 queen's problem- N queen's problem – Sum of subsets – Graph colouring – Hamiltonian cycles- Knapsack problem

Unit V BRANCH AND BOUND TECHNIQUES 9

The General method- FIFO branch and bound- LC branch and bound - 0/1 knapsack problem – Travelling salesman problem – Assignment problem – Limitations of Algorithm power – Introduction to P, NP Hard and NP Complete problems.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Anany Levitin	Introduction to the Design and Analysis of Algorithms	Pearson Education	2012
2.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran	Fundamentals of Computer Algorithms	Galgotia publications	2013

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein,	Introduction to Algorithms	PHI Learning Private Limited	2012
2.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman	Data Structures and Algorithms	Pearson Education	2006
3.	Harsh Bhasin	Algorithms Design and Analysis	Oxford university press	2016
4.	S. Sridhar	Design and Analysis of Algorithms	Oxford university press	2014

Web URL(s):

1. https://nptel.ac.in/courses/106/101/106101060/
2. https://www.coursera.org/learn/analysis-of-algorithms

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	3	3	3	3				3	3	3	3
CO2	3	3	3	3	3			3	3		3	3
CO3	3	3	3	1					1		1	1
CO4	3	3	3	2							1	1
CO5	3	3	3	2							1	1
1 - Reasonably agreed 2 - Moderately agreed 3 - Strongly agreed												

U19ITE04	COMPUTER NETWORKS (Common to CSE and IT)	L	T	P	C
		3	0	2	4

Pre-Requisites **:** NIL

Objectives:

- To study the basic concepts of networks and functions of different layers of ISO/OSI Reference model
- To understand the Error detection and correction techniques and types of LANs.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the transport layer.
- To study the working of various Application layer protocols

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand the basic layers and its functions in computer networks.

CO2 : Practice the various Error detection and correction techniques and understand the Data link layer services.

CO3 : Describe the network layer services and apply the suitable routing algorithms for the given network.

CO4 : Understand the principles and services of Transport Layer.

CO5 : Describe the functionalities of Application layer protocols.

Unit I FOUNDATIONS OF NETWORKS AND PHYSICAL LAYER 9

Data communications - Networks – Network Types – Protocol Layering –- The OSI Model - TCP/IP Protocol Suite - Internet Standards – Physical layer -Transmission media – Switching

Unit II DATA LINK LAYER 9

Link layer addressing - Error Detection and Correction – Block Coding – Cyclic codes- Checksum – Datalink control : Data link Control Services – Data link layer protocols –HDLC- Point to Point Protocol- Ethernet : IEEE 802.3 – Wireless LANs- IEEE802.11

Unit III NETWORK LAYER 9

Network Layer Services - Packet Switching - IPV4 Addresses - Forwarding of IP Packets - Network Layer Protocols: IP, ICMPv4, Mobile IP - Routing Algorithms- Unicast Routing Protocols - Next Generation IP: IPv6 Addressing, IPv6 Protocol.

Unit IV TRANSPORT LAYER 9

Introduction – Transport layer protocols: Simple Protocol, Stop-and-Wait Protocol, Go-Back-N Protocol, Selective-Repeat Protocol, Bidirectional Protocols: Piggybacking - User Datagram Protocol - Transmission Control Protocol – Congestion control- SCTP

Unit V APPLICATION LAYER 9

World Wide Web - Hyper Text Transfer Protocol –FTP- Electronic Mail - Domain Name System –Telnet- Simple Network Management Protocol

Total Periods: 45

LIST OF EXPERIMENTS:

The following experiments are to be implemented in JAVA or simulated using Network simulator protocols.

1. Network Topology configuration.
2. Packet capturing and Analyzing.
3. Implementation of Error detection and correction techniques.
4. Implementation on IP addresses classification and network address translation.
5. Configuration of Router and Switch.
6. Performance analysis of Routing Protocols.
7. TCP Socket Programming.
8. UDP Socket programming.
9. Implementation of HTTP and SNMP.

Total Periods: 30

TextBooks:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Behrouz A. Forouzan	Data Communication and Networking	McGraw Hill Education (India) Private Limited	2013
2.	William Stallings	Data and Computer Communications	Prentice Hall	2013

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Andrew S Tanenbaum and David J Wetherall	Computer Networks	Pearson Education	2011
2.	Larry L Peterson and Bruce S Davie	Computer Networks: A Systems Approach	Elsevier	2011
3.	James F Kurose and Keith W Ross	Computer Networking: A Top-Down Approach Featuring the Internet	Addison-Wesley	2013

Web URL(s):

1. http://nptel.ac.in/courses/106105082/
2. **https://nptel.ac.in/courses/106/105/106105183/**

U19MTT01	ENVIRONMENTAL SCIENCE	L	T	P	C
	(Common to all Branches)	2	0	0	0

Pre-Requisites : Applied Chemistry

Objectives:

- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

Course Outcomes:

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

CO1 : To study the nature and facts about environment.

CO2 : To finding and implementing scientific, technological, economic and political solutions to environmental problems.

CO3 : To study the interrelationship between living organism and environment.

CO4 : To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

CO5 : To study the dynamic processes and understand the features of the earth's interior and surface.

Unit I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition - scope of environment - concept of an ecosystem - structure and function of an ecosystem - producers, consumers and decomposers - ecological succession processes - Introduction, types, characteristic features, structure and function of the various ecosystems. Introduction to biodiversity- definition: genetic, species and ecosystem diversity - threats to biodiversity - 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 overutilization of surface and ground water - 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 as a resource, land degradation, man induced landslides, soil erosion and desertification.

Unit III ENVIRONMENTAL POLLUTION 10

Definition – Sources, causes, effects and control measures of Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters - physical, chemical and biological; absorption of heavy metals- Air pollution - Chemical and photochemical reactions in the atmosphere - Control of particulate and gaseous emission, Control of SOX, NOX, CO and HC- Soil pollution - causes, effects and control measures- Marine pollution- Noise pollution- Thermal pollution-Nuclear hazards-role of an individual in prevention of pollution.

Unit IV SOCIAL ISSUES AND THE ENVIRONMENTAL LEGISLATION 9

From unsustainable to sustainable development - urban problems related to energy - water conservation, rain water harvesting, water shed management - resettlement and rehabilitation of people; its problems and concerns- role of non-governmental organization- environmental ethics: Issues and possible solutions. Environment protection act - Air act - Water act - Wildlife protection act - Forest conservation act -The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Eco mark). Disaster management: floods, earthquake, cyclone and landslides.

Unit V ENVIRONMENT IMPACT ASSESSMENT 7

Environmental impact analysis (EIA) - Environmental Impact Statement (EIS) - Legal and Regulatory aspects in India – Types and limitations of EIA - Terms of Reference in EIA- Issues in EIA - national – cross sectoral - social and cultural - Case studies of EIA of developmental projects.

Total Periods: 45

Text Books:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Benny Joseph	Environmental Science and Engineering	Tata McGraw Hill, New Delhi	2006
2.	Gilbert M.Masters	Introduction to Environmental Engineering and Science	2nd edition, Pearson Education	2004

Reference Books:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Cunningham W.P.Cooper., T.H.Gorhani	Environmental Encyclopedia	Jaico Publishing House, Mumbai	2001
2.	Dharmendra S. Sengar	Environmental law	Prentice hall of India PVT LTD, New Delhi,	2007
3.	Rajagopalan R	Environmental Studies - From Crisis to Cure	Oxford University Press	2005
4.	Petts. J	Handbook of Environmental Impact Assessment Vol. I and II	Blackwell cience	2009

Web URL(s):

1. https://nptel.ac.in/noc/courses/noc19

U19ITE05	WEB TECHNOLOGY	L	T	P	C
		3	0	2	4

Pre-Requisites : U19ITT01, U19ITE03, U19CSE01

Objectives:

- To understand the basic concepts of data communication and AJAX.
- To develop applications using database connectivity and server side programming in Java environment
- To understand, analyze and build dynamic and interactive web sites.
- To understand web development framework environment and methodology.
- To develop smart device based web application and deploy in different platforms.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand the working principles of Internet and to develop web applications using JavaScript and Ajax.

CO2 : Apply dynamic page functionality in web pages using Servlets.

CO3 : Develop JSP applications with Model View Control architecture.

CO4 : Demonstrate use of front end framework in developing interactive web applications.

CO5 : Demonstrate use of back end framework in developing interactive web applications

Unit I CLIENT/SERVER COMMUNICATION 9

Web development framework basics- The World Wide Web - HTTP- Request/Response Model- HTTP Methods- RESTful APIs-AJAX-AJAX with JSON

Unit II SERVLETS 9

Overview of Servlet – Life Cycle of Servlet - Servlet features - Servlet Overview Architecture - Three Tier Applications - Servlet package and API - Configuring Servlet - Handling HTTP Request - Get and post request - Redirecting request- Running Servlet with Database Connectivity-Session Tracking and Cookies.

Unit III JAVA SERVER PAGES 9

Introduction - JSP architecture - Life cycle - JSP Tags and Implicit objects - JSTL - Core Tags – SQL Tags - Formatting Tags - JDBC - Accessing database-Java Server Faces – Multitier Application Architecture – MVC Architecture of JSF Apps – JSF Components – Session Tracking – Developing Dynamic Data Driven Websites.

Unit IV FRONTEND FRAMEWORK 9

Welcome to Node.js - Organizing and Reusing Node Functionality - Asynchronous Programming Techniques - Sequencing Asynchronous Logic - Building Node Web Applications: HTTP Server Fundamentals - Building a RESTful Web Service - Serving Static Files - Accepting User Input - Securing the Application - Storing Node Application Data

Unit V BACKEND FRAMEWORK 9

Introduction to Django - Projects and Apps - Creating a Model to Add Database Service - The Django Administration App - Creating the Blog's User Interface - Improving the Output - Working with User Input - Forms and Model Forms - Spring Boot: Getting Started with Spring Boot - Putting Spring Boot to Work - Starter Dependencies - Automatic Configuration - Overriding Spring Boot Auto-Configuration

Total Periods: 45

LIST OF EXPERIMENTS:

1. Basics of markup languages – HTM L & CSS
2. JAVA SCRIPT
3. PHP
4. XML – XSD,XPath
5. JSP, Servlet –JDBC
6. Programming: Python (DJANGO)
7. Backend Framework
8. Frontend Framework

Total Periods: 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Paul Deitel, Harvey Deitel and Abbey Deitel	Internet and World Wide Web How To Program	Pearson Education	2012
2.	Mike Cantelon Marc Harter T.J.Holowaychuk Nathan Rajlich	Node.js in Action	Manning	2014
3.	Wesley J.Chun	Core Python Applications Programming	Prentice Hall	2012
4.	Craig Walls	Spring Boot in Action	Manning	2014

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Jeffrey C.Jackson	Web Technologies--A Computer Science Perspective	Pearson Education	2011
2.	UttamK.Roy	Web Technologies	Oxford University Press	2011
3.	Brad Dayley Brendan Dayley Caleb Dayley	Node.js, MongoDB and Angular Web Development	Pearson Education	2017
4.	Andrew Mead	Advanced Node.js Development: Master Node.js by building real-world applications	Packt Publishing Limited	2018

Web URL(s):

1. https://nptel.ac.in/courses/106/105/106105084/
2. https://www.coursera.org/learn/web-app
3. https://www.coursera.org/learn/server-side-nodejs
4. https://www.coursera.org/specializations/django
5. https://www.coursera.org/learn/django-build-web-apps

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1		3	3		3			3	3	3		3
CO2	3	1	2		2				1			2
CO3	2	1	2		3		1		1			1
CO4		2	1		2		1		2	2		1
CO5		2	1		2		1		2			1
1 - Reasonably agreed 2 - Moderately agreed 3 - Strongly agreed												

U19ITE06	SOFTWARE ENGINEERING METHODOLOGIES	L	T	P	C
		3	0	2	4

Pre-Requisites : NIL

Objectives:

- To gain knowledge about various software development lifecycle (SDLC) models.
- To learn how to elicit and formulate requirements.
- To be aware of designing a software considering the various perspectives of end user.
- To learn to develop a software component using coding standards and facilitate code reuse.
- To analyze the software using metrics and measurement and predict the complexity and the risk associated.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Obtain an insight into the concepts of software engineering.

CO2 : Able to elicit requirements for a software product and translate these into a documented design.

CO3 : Identify appropriate design strategies and analyze the requirement specifications for any software system.

CO4 : Characterize various software testing techniques and analyze the given software requirements to determine appropriate testing techniques in commercial software environments.

CO5 : Analyze and Apply project management techniques for a case study.

Unit I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering, Software Process, Prescriptive and Specialized Process Models - Introduction to Agility-Agile process-Extreme programming

Unit II SOFTWARE REQUIREMENTS 9

Functional and non-functional requirements - User requirements - System requirements - Interface specification - The software requirements document - Requirements engineering process: Feasibility studies - requirements elicitation and analysis -Requirements validation - Requirements management - System models: Context models, behavioural models, data models, object models, structured methods.

Unit III DESIGN ENGINEERING 9

Design process and Design quality - Design concepts - The design model- Creating an architectural design: software architecture, data design, architectural styles and patterns- Architectural design - Conceptual model of UML- Basic structural modelling- Class diagrams-Sequence diagrams- Collaboration diagrams-Use case diagrams-Component diagrams.

Unit IV SOFTWARE CODING AND TESTING 9

Coding standards, Styles and Guidelines, Software testing fundamentals - White box testing - Basis path testing - Control structure testing - Black box testing - Unit Testing – Integration Testing - Validation Testing - System Testing and Debugging.

Unit V SOFTWARE PROJECT MANAGAMENT 9

Software Project Management Concepts – Process and Project Metrics – Estimation for Software Projects – Project Scheduling – Risk Management – Software Configuration Management – Software Process Improvements (SPI) – The SPI Process – Capability Machine Model Integration (CMMI) – Other SPI Frameworks.

Total Periods: 45

LIST OF EXPERIMENTS:

Do the following steps for any five projects given in the list of sample projects or any other projects:

- Choosing Project Scenario. – Development of problem statement
- Requirement Analysis - using Rational Requisite Pro or Agro UML
- Logical Design - using Rational Rose or Agro UML
- Testing of Errors and Memory Leaks - Using Rational Purifier/ Any open source Tools
- Test case Design - using Rational Test Manager/Any open source Tools
- Manual Testing and Management - Using Rational Test Manager and Quantifier/Any open source Tools
- Automated Testing - using Rational Robot and QTP/Any open source tools
- Automated Report Generation - using Rational SODA/ Any open source tools

Sample Projects:

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system

Total Periods: 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Roger S Pressman	Software Engineering: A Practitioner Approach	Tata McGraw Hill, 8th Edition	2015
2.	Ian Sommerville	Software Engineering	Addison Wesley, 9th Edition	2011
3.	Len Bass, Ingo Weber and Liming Zhu	DevOps: A Software Architect's Perspective	Pearson Education	2016

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Rajib Mall	Fundamentals of Software Engineering	PHI Learning Pvt. Ltd, 3rd Edition	2009
2.	Stephen Schach	Object Oriented and Classical Software Engineering	McGraw-Hill,7th Edition	2020
3.	James S Peters, Witold Pedrycz	Software Engineering An Engineering Approach	Wiley India Edition	2011
4.	Richard Fairley	Software Engineering Concepts	Tata McGraw Hill	2008

Web URL(s):

1. https://nptel.ac.in/courses/106/105/106105182
2. https://nptel.ac.in/courses/106/105/106105087/
3. https://nptel.ac.in/courses/106/101/106101061/

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

CO4	3	3	2		3			1		3	2	2
CO5	3	3	3		3			1		2	3	1
1 - Reasonably agreed 2 - Moderately agreed 3 - Strongly agreed												

U19ITT03	MOBILE AND PERVASIVE COMPUTING	L	T	P	C
		3	0	0	3

Pre-Requisites : U19ITE04

Objectives:

- To understand the basic concepts of mobile computing.
- To explore various protocols that support mobility at network layer and transport layer.
- To understand mobile databases and operating systems.
- To introduce the broad perspective of pervasive concepts and management.
- To apply the pervasive concepts in mobile environment.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Develop a strong grounding in the fundamentals of mobile Networks

CO2 : Deploy various protocols that support mobility at network layer and transport layer

CO3 : Discuss various mobile databases and operating systems.

CO4 : Understand the fundamental theoretical concepts in pervasive computing.

CO5 : Work on the pervasive concepts in mobile environment.

Unit I MOBILE COMPUTING - INTRODUCTION 9

Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application – GSM- GPRS- UMTS- SDR- MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes

Unit II MOBILITY SUPPORT IN IP AND TCP 9

Mobile IP- Packet delivery- Overview of mobile IP- Features- Mechanism- Route optimization- DHCP- TCP/IP: Overview - Terminologies - Architecture - Operation - Application Layer Protocols - Adaptation of TCP Window - Improvement in TCP Performance

Unit III MOBILE DATABASES AND OPERATING SYSTEMS 9

Transaction Processing Environment - Data Dissemination - Transaction Processing in Mobile Environment - Data Replication - Mobile Transaction models -Rollback - Two-Phase Commit Protocol - Query Processing - Recovery - Operating Systems: Basic Concepts - Constraints & Requirements - Commercial Mobile OS - OS for Sensor Networks - Android Application Development - Mobile Payment Systems - Security Issues

Unit IV PERVASIVE COMPUTING - INTRODUCTION 9

Perspectives of Pervasive computing - Challenges - Technology – The structure and element of Pervasive computing systems - Context Collection - User Tracking - Context Reasoning

Unit V PERVASIVE MOBILE TRANSACTIONS 9

Introduction to Pervasive Transactions - Pervasive Transaction Processing Framework - Context-Aware Pervasive Transaction Model - Context Model for Pervasive Transaction Processing - Dynamic Transaction Management - Context-Aware Transaction Coordination Mechanism - Coordination Algorithm for Pervasive Transactions - Participant Discovery - Formal Transaction Verification - Petri Net with Selective Transition.

Total Periods: 45

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	3		3							
CO2	3	3	3		3				2			

CO3	3	3	3	3	3							
CO4	3	3	3	3	3					1		
CO5	3	3	3	3	3				1			2
1 - Reasonably agreed 2 - Moderately agreed 3 - Strongly agreed												

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Prasant Kumar Pattnaik Rajib Mall	Fundamentals of Mobile Computing	PHI Learning Private Limited	2016
2.	MinyiGuo Jingyu Zhou Feilong Tang Yao Shen	Pervasive Computing: Concepts, Technologies and Applications	CRC Press	2017

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Jochen H. Schiller	Mobile Communications	Pearson Education	2009
2.	Kumkum Garg	Mobile Computing	Pearson Education	2010
3.	Obaidat Mohammad S. Mieso Denko Isaac Woungang, eds.	Pervasive computing and networking.	John Wiley & Sons	2011
4.	Guruduth S. Banavar, Norman H. Cohen, Chandra Narayanaswami	Pervasive Computing: An Application Based Approach,	Wiley Interscience	2012

Web URL(s):

1.https://nptel.ac.in/courses/106/106/106106147/
2.https://www.coursera.org/learn/android-programming

U19ECE09	MICROPROCESSOR AND MICROCONTROLLER	L	T	P	C
	(Common to CSE, IT, ECE, EEE and MCT)	3	0	2	4

Pre-Requisites : Nil.

Objectives:

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a microcontroller-based system

Course Outcomes:

CO1 : Understand and execute programs based on 8086 microprocessors.

CO2 : Study of microprocessor configurations.

CO3 : Interface memory and I/O circuits with 8086.

CO4 : Design and implement 8051 microcontroller-based systems.

CO5 : Design and interface I/O circuits with 8051.

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 – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, closely coupled and loosely Coupled configurations – Introduction to advanced processors

Unit III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – Timer –Interrupt controller – DMA controller – Interfacing with DAC, ADC and A/D Keyboard /display controller

Unit IV MICROCONTROLLER 9

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

Unit V INTERFACING MICROCONTROLLER 9

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

Total Periods: 45

List of Experiments:

8086 Microprocessor

1. Basic arithmetic and Logical operations
2. Code conversion
3. String manipulations
4. Sorting and searching
5. DAC/ADC Interface
6. Serial and Parallel interface

8051 Microcontroller

7. Basic arithmetic and Logical operations
8. Square and Cube program, Find 2‘s complement of a number
9. Unpacked BCD to ASCII
10. Interfacing Stepper Motor.

Total Periods: 30

Text/ Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
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 Gillispie Mazidi, Rolin McKinlay	The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition	Pearson Education	2011
3.	DoughlasV.Hall	Microprocessors and Interfacing, Programming and Hardware	TMH	2012
4.	Walter A Triebel and Avtar Singh	. The 8088 and 8086 Microprocessors – Programming, Interfacing, software, Hardware and Applications.	Pearson Education, New Delhi	2009

Web URL(s):

1. https://nptel.ac.in/courses/106/108/106108100/
2. https://nptel.ac.in/courses/108/103/108103157/

U19MCT02	INDIAN CONSTITUTION	L	T	P	C
	(Common to all Branches)	2	0	0	0

Pre-Requisites : NIL

Objective:

Students will be able to

- Understand the historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, central and state relation, the local Administration and about the functions of Election commission.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand the emergence and evolution of Indian Constitution.

CO2 : Acquire knowledge about the structure and composition of Indian Constitution

CO3 : Understand and analyze federalism in the Indian context

CO4 : Analyse Panchayat Raj institutions as a medium of decentralization

CO5 : Acquire knowledge about the Indian election commission

Unit I THE CONSTITUTION - INTRODUCTION 6

The History of the Making of the Indian Constitution -Preamble and the Basic Structure, and its interpretation -Fundamental Rights and Duties and their interpretation -State Policy Principles

Unit II UNION GOVERNMENT 6

Structure of the Indian Union -President – Role and Power-Prime Minister and Council of Ministers -Lok Sabha and Rajya Sabha

Unit III STATE GOVERNMENT 6

Governor – Role and Power -Chief Minister and Council of Ministers -State Secretariat

Unit IV LOCAL ADMINISTRATION 6

District Administration -Municipal Corporation -Zila Panchayat

Unit V ELECTION COMMISSION 6

Role and Functioning -Chief Election Commissioner -State Election Commission

Total Periods: 30

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	DD Basu	Introduction to the Constitution of India	Lexis Nexis	2018
2.	Rajeev Bhargava	Ethics and Politics of the Indian Constitution	Oxford University Press, New Delhi	2009
3.	Dr.B.L. Fadia	The Constitution of India	Sahitya Bhawan	2017

Web URL(s):

1. https://www.constitution.org/cons/india/const.html
2. http://www.legislative.gov.in/constitution-of-india
3. https://www.sci.gov.in/constitution
4. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/
5. https://nptel.ac.in/courses/129/106/129106002/

U19MGT01	PRINCIPLES OF MANAGEMENT AND ETHICS	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To help the students gain understanding of the functions and responsibilities of managers.
- To provide them tools and techniques to be used in the performance of the managerial job.
- To enable them to analyze and understand the environment of the organization.
- 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.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Describe the basic of management and its types, skills, management roles, types of business organization and current trends in business.

CO2 : Explain the nature and purpose of planning, objectives of planning and decision process. Compare the different organization structures, human resource management and training and development

CO3 : Estimate the individual and group behavior, motivation, job satisfaction types and theories of leadership, Apply the knowledge using the various system and process of controlling, budgetary and non-budgetary control techniques.

CO4 : Understanding basic purpose of profession, professional ethics and various moral and social issues.

CO5 : Acquiring knowledge of various roles of Engineer In applying ethical principles at various professional levels

Unit I INTRODUCTION TO MANAGEMENT 6

Definition and functions of Management – types of managers – managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches.

Unit II PLANNING AND ORGANISING 10

Nature and purpose of planning – planning process – types of planning – Planning Tools and Techniques – MBO – Decision making steps and process – organizing process – organization structure – Departmentation – Human Resource Management – HR Planning, Recruitment, selection, Training and Development.

Unit III DIRECTING AND CONTROLLING 10

Motivation – motivation theories – motivational techniques – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication System – budgetary and non-budgetary control techniques – use of computers and IT in Management control – direct and preventive control.

Unit IV 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 V 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.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stephen P. Robbins & Mary Coulter	Management	Prentice Hall (India) Pvt. Ltd.	2018
2.	Mike W. Martin and Roland Schinzinger .	Ethics in Engineering	Tata McGraw Hill	2017

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stephen A. Robbins & David A. Decenzo & Mary Coulter	Fundamentals of Management	Pearson Education	2011
2.	Harold Koontz & Heinz Weihrich	Essentials of Management	Tata McGraw Hill	2012
3.	Laura P. Hartman and Joe Desjardins	Business Ethics: Decision Making for Personal Integrity and Social Responsibility"	Mc Graw Hill education, India Pvt. Ltd	2013
4	Charles B. Fleddermann	Engineering Ethics	Pearson Prentice Hall	2011

U19ITE07	VIRTUALIZATION AND CLOUD COMPUTING	L	T	P	C
		3	0	2	4

Pre-Requisites : U19CSE03, U19ITE04

Objectives:

- To impart the fundamentals and essentials of Cloud Computing.
- To study about virtualization and cloud resource management.
- To provide a sound foundation of the Cloud Computing Services and tools
- To be aware of different cloud platforms.
- To study the core issues of cloud security and to understand various cloud applications.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Articulate the main concepts, key technologies, strengths and limitations of cloud computing.

CO2 : Explain the concept of cloud resource virtualization.

CO3 : Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.

CO4 : Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud

CO5 : Create and deploy cloud applications.

Unit I INTRODUCTION 9

Introduction - Overview of Computing Paradigms - The Cloud Computing reference model - Benefits and Characteristics of Cloud- Challenges - Cloud Computing Architecture - Cloud computing stack Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service- Deployment Models: Public cloud, Private cloud, Hybrid cloud – Challenges

Unit II CLOUD RESOURCE VIRTUALIZATION 9

Introduction to virtualization - Characteristics of virtualized environments- Taxonomy of virtualization techniques- Virtualization and cloud computing- Pros and cons of virtualization - Examples - Virtual Machine Provisioning and Manageability - VM Migration-Management of VM: Anatomy of cloud infrastructures - Scheduling techniques.

Unit III CLOUD PLATFORM ARCHITECTURES OVER VIRTUALIZED DATA CENTERS 9

Data-Center design and Interconnection networks - Architectural Design of Compute and Storage Clouds - Public Cloud Platforms, GAE, AWS, Azure - Inter-cloud Resource Management - Cloud Security and Trust Management.

Unit IV CLOUD PROGRAMMING AND SOFTWARE ENVIRONMENTS 9

Features of Cloud and Grid Platforms - Parallel and Distributed Programming Paradigms - Programming Support of Google App Engine - Programming on Amazon AWS and Microsoft Azure - Emerging Cloud Software Environments.Case Studies: Open stack, Heroku, and Docker Containers –Amazon EC2, Google Compute Engine.

Unit V CLOUD SECURITY & APPLICATIONS 9

Cloud Security Risks, Trust, Operating System Security, VM Security, Security of Virtualization, Security Risks Posted by Shared Images, Security Risks Posted by Management OS, Data privacy and security issues, Identity and Access Management , Access Control , Authentication in cloud computing - Applications: Scientific Applications - Business and Consumer Applications

Total Periods: 45

Lab Experiments :

1. Install Virtual box/VMware Workstation with different flavours of Linux or Windows OS on top of windows7 or 8.
2. Implement the following using Open Stack/ Eucalyptus
   - Creation of Virtual machines
   - Installing applications and Executing simple programs.
   - Implement IaaS using your resources.
   - Simulate identity management in your private cloud.
3. Hands on virtualization using XenServer
4. Explore Storage as a Service for remote file access using owncloud.
5. Implement Software as a Service using Ulteo.
6. Cloud Security using ownCloud
7. Deployment and Configuration options in Amazon (AWS)
8. Deployment and Configuration options in Google Cloud
9. Deployment and Configuration options in Microsoft Azure.
10. Hands on containerisation using Docker

Total Periods: 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	RajkumarBuyya Christian Vecchiola, S. ThamaraiSelvi	Mastering Cloud Computing	Tata McGraw Hill	2013
2.	Kai Hwang, Geoffrey C. Fox Jack G. Dongarra,	Distributed and Cloud Computing, From Parallel Processing to the Internet of Things	Elsevier	2012
3.	Rajkumar Buyya, James Broberg, Andrzej Goscinski	CLOUD COMPUTING: Principles and Paradigms	Wiley	2011

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dan C.Marinescu	Cloud Computing Theory and Practice	Elsevier	2013
2.	Toby Velte, Anthony Velte Robert Elsenpeter	Cloud Computing - A Practical Approach	Tata McGraw Hill	2009
3.	George Reese	Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice	O'Reilly	2009
4.	John W. Rittinghouse, James F. Ransome	Cloud Computing: Implementation, Management, and Security	CRC Press	2009

Web URL(s):

1.https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2.https://www.coursera.org/specializations/cloud-computing
3.https://nptel.ac.in/courses/106/105/106105167/
4.https://nptel.ac.in/courses/106/104/106104182/

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3							3			

CO2	3		1		2							
CO3	3	2	1		2	3	2	3	1		2	3
CO4	3	3	3	3	3	3	3	3	3		3	3
CO5	3	3	3	3		3			3	3		3
1 - Reasonably agreed 2 - Moderately agreed 3 - Strongly agreed												

U19ITE08	DATA MINING AND ANALYTICS	L	T	P	C
		3	0	2	4

Pre-Requisites : U19CSE02

Objectives:

- To understand the basic functionalities of Data Mining.
- To learn various Association and classification algorithms.
- To understand the various clustering algorithms and its application on data.
- To gain in-depth knowledge on descriptive data analytical techniques.
- To develop programming skills using required libraries and packages to perform data analysis in Python.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Analyze various data pre-processing techniques for efficient data mining.

CO2 : Apply association rule mining for finding hidden and interesting patterns in data and to predict the accurate class of the data using classification techniques.

CO3 : Understand the concepts of cluster analysis and outlier detection.

CO4 : Apply data analysis techniques to find the solutions for real word problems

CO5 : Perform data analytics and visualization using Python

Unit I INTRODUCTION TO DATA MINING 9

Data Mining – KDD versus data mining - Stages of the Data Mining Process – Types of data – Mining patterns- Technologies used – Data Preprocessing: Overview - Cleaning - Integration - Reduction - Transformation and Discretization

Unit II ASSOCIATION AND CLASSIFICATION 9

Association Rules- Association rule Mining -Mining frequent patterns association- Apriori Algorithm - correlation – Classification - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Associative -Classification – Lazy Learners – Other Classification Methods

Unit III CLUSTER ANALYSIS AND OUTLIER DETECTION 9

Cluster Analysis - Partitioning Methods -k-means Clustering- Hierarchical methods - Distance based agglomerative and divisible clustering - Density-Based Methods - Grid-Based Methods - Evaluation of Clustering - Outliers and Outliers Analysis - Outlier Detection Methods - Statistical Approaches - Proximity-Based Approaches - Clustering-Based Approaches - Classification-Based Approaches - Outlier Detection in High-Dimensional Data.

Unit IV DESCRIPTIVE ANALYTICS 9

Big Data and Data Science - Big Data Architecture - Data - Taxonomy - Example - Types of Data – Mean, Median and Mode – Standard Deviation and Variance – Probability – Probability Density Function – Types of Data Distribution – Percentiles and Moments – Correlation and Covariance – Conditional Probability – Bayes' Theorem

Unit V PREDICTIVE MODELING AND TEXT ANALYTICS 9

Linear Regression – Polynomial Regression – Multivariate Regression – Multi Level Models- Process of text analytics – Collecting raw text, representing text, TFIDF, categorization using topics , determining sentiments-Data loading storage and file formats- Data Wrangling- Plotting and Visualization - Time series Analysis –Applications

Total Periods: 45

LIST OF EXPERIMENTS :

1. Implementation of data preprocessing techniques
2. Implementation of Association algorithms
3. Implementation of classification algorithms
4. Implementation of data clustering algorithms
5. Download, install and explore the features of NumPy, SciPy, and Pandas packages.
   - **(i)** Reading data from text file, Excel and the web.
   - **(ii)** Exploring various commands for doing descriptive analytics on Iris data set.
6. Apply and explore various plotting functions on any data sets.
7. Visualize data using any plotting framework.
8. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
   - **(i)** Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, skewness and Kurtosis.
   - **(ii)** Bivariate analysis: Linear and logistic regression modeling
   - **(iii)** Multiple Regression analysis

Total Periods: 30

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jiawei Han Micheline Kamber, Jian Pei	Data Mining Concepts and Techniques	Elsevier	2012
2.	Frank Pane	Hands On Data Science and Python Machine Learning	Packt Publishers	2017

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Anand Rajaraman Jeffrey David Ullman	Mining of Massive Datasets	Cambridge University Press	2014
2.	Seema Acharya Subhashini Chellapan	Big Data and Analytics	Wiley	2015
3.	Joao Moreira, Andre Carvalho, Tomas Horvath	A General Introduction to Data Analytics	Wiley	2019

Web URL(s):

1.https://nptel.ac.in/courses/106/105/106105174/
2.https://nptel.ac.in/courses/106/107/106107220/
3.https://www.coursera.org/specializations/data-mining
4.https://bedford-computing.co.uk/learning/wp-content/uploads/2015/10/Python-for-Data-Analysis.pdf

3	**POs**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	3	3	2	1			1			1	
CO2	3	3	3	2	3				1			
CO3	3	3	3	1	2						2	1
CO4	3	3	3	2	2	1					1	
CO5	3	3	3	2	3				2		2	
1 - Reasonably agreed 2 - Moderately agreed 3 - Strongly agreed												

U19ITJ01		L	T	P	C
	MINI PROJECT				
		0	**0**	**6**	**3**

This course involves preparing students to think innovatively and find out the solutions for industry oriented / real time problems.

U19MGT03	ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To learn the fundamental of Economics.
- To understand different methods of depreciation use for calculation
- To know the various method of comparison used in economic
- To understand how funds are managed in an organization.
- To know the different methods of production and marketing adopted in an industry.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Learn the basic concepts of economics.

CO2 : Understand the various types depreciation used.

CO3 : Learn the different comparison technique used in industries.

CO4 : Learn the fund flow in the industries.

CO5 : Understand the different Production and Marketing techniques used in the industries.

Unit I MICRO AND MACRO ECONOMICS AND ITS APPLICATIONS 9

Introduction – Micro Economics – Macro Economics – Economic decisions and Technical Decisions – Demand and Supply Concepts – Elasticity of Demand – Cost of Products – Price of products – Break-Even Analysis – Nature of Functioning of Money –Notional Income – GNP and Savings – Inflation and Deflation Concepts

Unit II METHODS OF DEPRECIATION 9

Straight line method of Depreciation- Declining Balance Method of Depreciation-Sum of the Years Digits Method of Depreciation-Sinking Fund Method of Depreciation- Service-output Method of Depreciation.

Unit III METHODS OF COMPARISON OF ALTERNATIVES 9

Introduction – Elementary Economic Analysis – Interest Formulas and their Applications Comparisons – Present Worth Method – Future Worth Method – Annual Equivalent Method – Rate of Return Method.

Unit IV FINANCIAL MANAGEMENT 9

Sources of finance, internal and external-preparation of balance sheet and profit and loss statements, Types of accounting and significance of each type, interest formulas and their applications.

Unit V PRODUCTION & MARKETING MANAGEMENT 9

Types of Production; process of planning, scheduling, Routing, material control; product concept concepts of productivity, Core concepts of Marketing- Needs, Wants, Demand- Marketing Vs Selling- Products and Markets- Pricing and its related factors- Channels of Distribution- Promotion- Advertising- Market Research- Sales Forecasting

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	O.P. Khanna	Industrial Engineering and Management	Dhanpat Rai	2018
2.	R. Pannerselvam	Engineering Economics	Prentice Hall of India Pvt. Ltd,	2014

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S.K. Jain	Applied Economics for Engineers and Managers	Vikas Publications House	1997
2.	Mote Paul, Gupta	Managerial Economics	Tata Mc Graw Hill	1987
3.	Joseph L. Massie	Essentials of Management	Prentice-Hall of India	1979

Web URL(s):

3. **https://nptel.ac.in/courses/105103023**
4. **https://nptel.ac.in/courses/112107209**
5. **https://nptel.ac.in/courses/110101005**
6. **https://www.coursera.org/lecture/faecalsludge/4-7-engineering-economics-KoVa9**
7. **https://www.udemy.com/course/fundamentals-of-engineering-economics/**

U19ITE09	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	2	4

Pre-Requisites : U19ITE04

Objectives:

- To understand the fundamentals of cryptography and number theory.
- To understand and use the standard security algorithms.
- To provide confidentiality, integrity and authentication of any applications.
- To understand the importance of system security and its applications.
- To learn the configuration and manage firewall and WLAN security.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand various cryptographic techniques.

CO2 : Apply the different cryptographic operations of symmetric cryptographic algorithms.

CO3 : Apply the different cryptographic operations of public key cryptography and various authentication schemes to simulate different applications.

CO4 : Identify any network security issues and resolve the issues.

CO5 : Ability to understand the current legal issues towards network security.

Unit I INTRODUCTION 9

Groups-Euclidean Algorithm – Extended Euclidean Algorithm – Fermat's and Euler's Theorem – Security Services – Threat Model – Security Attacks – Characteristics of Good Ciphers – Shannon Ciphers and Perfect Secrecy – Cryptanalysis: Linear and Differential Cryptanalysis

Unit II SYMMETRIC CIPHERS 9

Substitution Ciphers – Transposition Ciphers – Symmetric Versus Asymmetric Techniques – Block Versus Stream Ciphers – Symmetric Cipher Model – Data Encryption Standard – Advanced Encryption Standard – Block Cipher Modes of Operation – Use of Random Numbers – Pseudorandom Number Generators - Stream Ciphers – RC5

Unit III ASYMMETRIC CIPHERS AND DATA INTEGRITY 9

Principles of Public-Key Cryptosystems – Encryption – Key Exchange – RSA - Diffie-Hellman – Fields and Finite Fields - Elgamal - Elliptic Curve Cryptography- Hash functions: Requirements and Applications – Secure Hash Algorithm – Authentication Requirements – Authentication Functions – Message Authentication Codes – Hash Based MAC – Block Cipher Based MAC: Data Authentication Algorithm and Cipher-based Message Authentication Code - Digital Signatures – Elgamal Digital Signature Scheme

Unit IV SECURITY APPLICATIONS 9

Digital Signatures Schemes– Digital Certificate – Key Management – Kerberos – Key Agreement and Distribution – PKI – X.509 Certificate – E-Mail Security – PGP – S/MIME – IP security – Virtual Private Network (VPN) – Web Security – Secure Socket Layer (SSL) – Transport Layer Security – Secure Electronic Transaction (SET) – Blockchain.

Unit V FIREWALL & WIRELESS SECURITY 9

Buffer Overflow and Malicious Software – Password Management – Introduction to Firewall – Firewall Generations – Intrusion Detection System – Types of IDS – Intrusion Prevention System – Wireless LAN – Wireless LAN Security – Network Access Control and Cloud Security.

Total Periods: 45

LIST OF EXPERIMENTS

1. To perform encryption and decryption using the following algorithms Caesar Cipher
2. Affine Cipher Hill Cipher
3. Transposition Cipher
4. Perform cryptographic attack on the cipher-text generated using any of the algorithms implemented in Exercise 1
5. Demonstrate symmetric key encryption process using DES and AES algorithm
6. Implement RSA algorithm and demonstrate the key generation and encryption process.
7. Generate message digest for the given message using the SHA/MD5 algorithm and verify the integrity of message.
8. Sign and verify a document using DSA algorithm.
9. Demonstrate IP security and configure VPN connection
10. Demonstrate Intrusion Detection System using Snort tool
11. Implement Diffie Hellman key exchange algorithm for encryption and decryption.
12. Defeating malware – Rootkit hunter
13.

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Cryptography and Network Security: Principles and Practice	Pearson Education	2018
2.	Behrouz A.Foruzan Debdeep Mukhopadhay	Cryptography and Network Security	Tata McGraw Hill	2017

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Charles P. Pfleeger, Shari Lawrence Pfleeger Jonathan Margulies	Security in computing	Pearson Education	2015
2.	Atul Kahate	Cryptography and Network Security	Tata McGraw Hill	2011

Web URL(s):

1. **https://nptel.ac.in/courses/106/105/106105162/**
2. **https://www.coursera.org/lecture/managing-network-cybersecurity/cryptography-and-network-security-w9SuJ**

PROFESSIONAL ELECTIVES

U19ITT51	DISTRIBUTED SYSTEMS	L	T	P	C
		3	0	0	3

Pre-Requisites : U19CSE03, U19ITE04

Objectives:

- To know the various distributed computing system strategies.
- To explore the issues in communications in distributed systems.
- To expose students to both the abstraction and details of file systems.
- To design and implement various distributed algorithms.
- To be aware of the transaction models and deadlocks.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Demonstrate the knowledge of fundamental elements and concepts related to distributed system technologies.

CO2 : Analyze the core architectural concepts to meet the challenges in implementing the distributed systems

CO3 : Have Sufficient knowledge about file access and applications targeted for internet.

CO4 : Design and evaluate algorithms for various distributed systems.

CO5 : Use and apply important methods in distributed systems to support scalability and faulttolerance.

Unit I INTRODUCTION 9

Characterization of Distributed Systems- Examples of distributed systems - Challenges-System Models-Physical models-Architectural models - Fundamental models

Unit II REMOTE INVOCATION AND DISTRIBUTED OBJECTS 9

Remote Invocation: Introduction - Request-reply Protocols - Remote Procedure Call -Remote Method Invocation - Case Study: Java RMI - Distributed Objects: Introduction - Distributed objects - Case Study: CORBA - From objects to components - Case Studies: Enterprise Java Beans and Fractal.

Unit III DISTRIBUTED FILE SYSTEM AND NAME SERVICES 9

Introduction to Distributed File System - File service architecture - Sun network file system - The Andrew File System- Introduction to Name Services- Name services and DNS - Directory and directory services Practical : The Global Name Service - The X.500 Directory Service

Unit IV DISTRIBUTED ALGORITHMS 9

Time and Global States: Introduction - Clocks, Event and Process states - Clock synchronization - Event ordering - Logical time and logical clocks - Coordination and Agreement: Distributed Mutual Exclusion, Election algorithms, Consensus problems.

Unit V TRANSACTIONS, CONCURRENCY CONTROL AND DISTRIBUTED TRANSACTIONS 9

Introduction - Transactions – Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to Distributed Transactions - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery - Distributed Shared Memory

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	George Coulouris Jean Dollimore, Tim Kindberg	Distributed Systems Concepts and Design	Addison Wesley	2012

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	A.S.Tanenbaum, M.Van Steen	Distributed system	Pearson Education	2017
2.	MukeshSingha	Advanced Concepts In Operating Systems	McGraw-Hill	2011

Web URL(s):

1. https://nptel.ac.in/courses/106/106/106106168/
2. https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-cs42/ 3. https://nptel.ac.in/courses/106/106/106106107/

U19ITT52	PROGRAMMING PARADIGMS	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To learn the basic constructs that underlie all programming languages.
- To introduce the basics of programming language design and implementation.
- To understand object orientation in programming languages.
- To acquire knowledge about functional programming paradigms.
- To learn the basics of logic and concurrent programming.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand the basic building blocks of programming Languages.

CO2 : Analyze control flow structures and various data representations used in programming languages.

CO3 : Understand object oriented constructs in different programming languages.

CO4 : Apply the concepts that form the basis of functional programming paradigms.

CO5 : Solve a given problem scenario using appropriate programming paradigm.

Unit I FOUNDATIONS 9

Introduction to Programming Languages - Compilation and Interpretation - Compilation Overview - Describing Syntax and Semantics: Introduction - General Problem - Formal Methods - Attribute Grammars - Dynamic Semantics - Names, Bindings and Scopes: Introduction - Names - Variables - Binding - Scope - Referencing Environments

Unit II IMPERATIVE PROGRAMMING 9

Structured Programming: Syntax-Directed Control Flow - Design Considerations Syntax - Loops - Programming with Invariants - Data Representation: Basic Types - Arrays - Records - Unions and Variant Records - Sets - Pointers - Two String Tables - Error Checking - Procedure Activations: Introduction - Parameter Passing Methods.

Unit III OBJECT ORIENTED PROGRAMMING 9

Constructs - Information Hiding - Program Design with Modules - Defined Types - Class Declarations - Dynamic Allocation - Templates - Object - Object Oriented Thinking - Inheritance - Derived Classes and Information Hiding

Unit IV FUNCTIONAL PROGRAMMING 9

Types: Values And Operations - Expression Evaluation - Lexical Scope - Type Checking - Lists - Function Declaration By Cases - Functions as First-Class Values - ML: Implicit Types – Data Types -Exception Handling In ML - Scheme: Structure of Lists, List Manipulation, Simplification of Expressions

Unit V LOGIC AND CONCURRENT PROGRAMMING 9

Logic Programming: Computing With Relations - Prolog: Data Structures - Programming Techniques - Control -Cuts - Concurrent Programming: Parallelism in Hardware, Streams: Implicit Synchronization - Concurrency as Interleaving - Liveness Properties - Safe Access To Shared Data - Concurrency in ADA

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ravi Sethi, K.V.Viswanatha	Programming Languages: Concepts and Constructs	Pearson Education	2007
2.	Scott M L	Programming Language Pragmatics	Morgan Kaufmann Publishers	2016
3.	R W Sebesta	Concepts of Programming Languages	Pearson Education	2015

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Harper R	Practical Foundations for Programming Languages	Cambridge University Press	2012
2.	Friedman D P Wan D M	Essentials of Programming Languages	The MIT Press	2008

Web URL(s):

1. https://nptel.ac.in/courses/106/102/106102067/

U19ITT53	BUSINESS INTELLIGENCE	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To be exposed with the basic rudiments of business intelligence systems.
- To learn the basics concepts of data mining and its applications.
- To understand the modeling aspects behind Business Intelligence.
- To understand of the business intelligence life cycle and the techniques used in it.
- To be exposed with different data analysis tools and techniques.

Course Outcomes:
At the end of this course students will demonstrate the ability to

CO1 : Explain the fundamentals of business intelligence.

CO2 : Use data mining concepts for predictive analysis in business intelligence.

CO3 : Apply various modeling techniques.

CO4 : Apply business intelligence methods to various situations.

CO5 : Get a view of future trends of business intelligence

Unit I COMPONENTS OF THE DECISION-MAKING PROCESS 9

Business Intelligence: Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures– Ethics and business intelligence - Decision support systems: Definition of system - Representation of the decision-making process - Evolution of information systems - Definition of DSS - Development of DSS - Data Warehousing: Definition - Architecture - Cubes and Multidimensional Analysis.

Unit II DATA MINING 9

Data Mining- Data Mining Concepts and Applications- Data Mining Applications- Data Mining Process,-Data Mining Methods- Data Mining Software Tools- Data Mining Privacy Issues - Myths, and Blunders - Text and Web Analytics, Text Analytics and Text Mining Overview- Natural Language Processing -Text Mining Applications - Text Mining Process - Sentiment Analysis -Web Mining Overview - Search Engines - Web Usage Mining (Web Analytics)- Social Analytics.

Unit III BUSINESS INTELLIGENCE APPLICATIONS 9

Marketing Models: Relational Marketing - Salesforce Management - Logistic and production models: Supply chain optimization - Optimization models for logistics planning - Revenue management systems - Data envelopment analysis: Efficiency measures - Efficient frontier - The CCR model - Identification of good operating practices - Other Models.

Unit IV EXPERT SYSTEMS AND KNOWLEDGE MANAGEMENT 9

Automated Decision Systems - Artificial Intelligence Field - Basic Concept of Expert Systems - Applications - Structure - Knowledge Engineering - Problem Areas - Development - Introduction to Knowledge Management - Approaches to Knowledge Management - Information Technology (IT) In Knowledge Management - Making Decisions in Groups - Supporting Groupwork with Computerized systems - Tools for Indirect Support of decision Making - Direct Computerized Support for Decision Making

Unit V BIG DATA ANALYTICS AND FUTURE IMPACTS 9

Definition of Big Data - Fundamentals - Big Data Technologies - Big Data Vendors - Stream Analytics -Applications - Location Based Analytics for Organizations - Recommendation Engines - Web 2.0 and Online Social Networking - Cloud Computing and BI - Impacts of Analytics in Organizations - Issues of Legality, Privacy and Ethics - Overview of the Analytics Ecosystem.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Carlo Vercellis	Business Intelligence: Data Mining and Optimization for Decision Making	Wiley Publications	2011
2	Efraim Turban, Ramesh Sharda, DursunDelen	Decision Support and Business Intelligence Systems	Pearson Education	2015

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	David Loshin Morgan Kaufman	Business Intelligence: The Savvy Manager's Guide	Morgan Kaufmann Publishers	2012
2.	Cindi Howson	Successful Business Intelligence: Secrets to Making BI a Killer App	McGraw Hill	2007
3.	Larissa T. Moss, S. Atre	Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making	Addison Wesley	2003

Web URL(s):

1.https://nptel.ac.in/courses/110/107/110107092/
2.https://www.coursera.org/learn/business-intelligence-tools
3.https://www.coursera.org/specializations/data-warehousing

U19ITT54	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To recognize the concept of semantic web and related applications
- To study about the semantic technologies for social network analysis
- To gain knowledge about social network analysis software for characterizing the network structure.
- To apply data mining techniques on social networks.
- To gain knowledge on visualization of social networks and its applications

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Develop semantic web related applications.

CO2 : Understand the basic principles of social network analysis

CO3 : Model and represent knowledge for social semantic Web

CO4 : Recognize human behavior in social web and related communities

CO5 : Develop personalized visualization for Social networks.

Unit I INTRODUCTION 9

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks .

Unit II SOCIAL NETWORK ANALYSIS 9

Introduction to Social Networks Profiles – Types of Commercial Social Network Profiles (CSNP) – Quantitative and Qualitative Analysis of CSNP – Analysis of Social Networks Extracted from Log Files – Data Mining Methods Related to SNA and Log Mining – Clustering Techniques – Case Study.

Unit III MODELING, AGGREGATING AND KNOWLEDGE REPRESENTATION 10

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations

Unit IV SOCIAL NETWORK MINING 8

Detecting and Discovering Communities in Social Network: Evaluating Communities – Methods for Community Detection – Applications of Community Mining Algorithms –Ethical Practices in Social Network Mining – Understanding and Predicting Human Behavior for Social Communities – Decentralized Online Social Networks – Multi-Relational Characterization of Dynamic Social Network Communities – Inferential Methods in Social Network Analysis

Unit V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS 9

Visualization of Social Networks Node-Edge Diagrams – Random Layout – Force-Directed Layout – Tree Layout – Matrix Representations –Matrix and Node-Link Diagrams – Hybrid Representations – Visualizing Online Social Networks – Applications – Covert Networks – Community Welfare – Collaboration Networks – Co-Citation Networks – Data Privacy in Social Networks

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Peter Mika	Social Networks and the Semantic Web	Springer	2007
2.	BorkoFurht	Handbook of Social Network Technologies and Applications	Springer	2010
3.	Song Yang Franziska B. Keller Lu Zheng	Social Network Analysis: Methods andExamples	Sage Publication	2016

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Guandong Xu Yanchun Zhang Lin Li	Web Mining and Social Networking – Techniques and applications	Springer	2011
2.	Max Chevalier Christine Julien Chantal Soulé-Dupuy	Collaborative and Social Information Retrieval and Access: Techniques for Improved User Modelling	IGI Global	2009
3.	John G. Breslin Alexandre Passant Stefan Decker	The Social Semantic Web	Springer	2009
4.	John Scott Peter J. Carrington	The SAGE Handbook of Social Network Analysis	Sage Publication	2011

Web URL(s):

1. **https://nptel.ac.in/courses/106/106/106106169/**
2. **https://www.coursera.org/lecture/social-economic-networks/1-1-introduction-C3wqk**
3. **https://nasrinword.wordpress.com/2018/07/09/cp5074-social-network-analysis/**

U19ITT55	AUGMENTED AND VIRTUAL REALITY	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To understand the basic concept and framework of augmented reality.
- To understand the techniques of Augmented Reality
- To understand visual computation in computer graphics
- To know basic concepts of virtual reality
- To know application of Virtual reality in Digital Entertainment

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Summarize the Augmented Reality basic Concepts.

CO2 : Classify the Augmented Reality Methods and the components of it.

CO3 : Ability to develop 3D virtual environments and to develop 3D interaction techniques.

CO4 : Summarize visual computation in computer graphics.

CO5 : Ability to develop immersive virtual reality applications.

Unit I INTRODUCTION 9

Augmented Reality- Difference between Augmented Reality and Virtual Reality and Mixed Reality - History of Augmented Reality-characteristics of Augmented Reality systems-Issues & Challenges in Augmented Reality–The SDK's and Tool's used to build Augmented Reality applications -Advantages and Disadvantages of AR.-Future scope of Augmented Reality.

Unit II CONCEPTS OF AUGMENTED REALITY 9

Concepts of Augmented Reality-Scene Capture, Scene Identification-Scene visualization-visualization techniques for augmented reality- Components of Augmented Reality architecture - Augmented Reality systems and functionality-Techniques of Augmented Reality -Augmented reality working planes- infinite carving planes-laser carving- laser colouring- texture map capture -surface of revolution.

Unit III INTRODUCTION OF VIRTUAL REALITY 9

Fundamental Concept and Components of Virtual Reality - Primary Features and Present Development on Virtual Reality - Multiple Models of Input and Output Interface in Virtual Reality: Input- Tracker - Sensor - Digital Glove - Movement Capture - Video-based Input - 3D Menus & 3DScanner – Output -Visual /Auditory / Haptic Devices.

Unit IV VISUAL COMPUTATION IN VIRTUAL REALITY 9

Fundamentals of Computer Graphics - Software and HardwareTechnology on Stereoscopic Display - Advanced Techniques in CG: Management of Large Scale Environments &Real Time Rendering.

Unit V INTERACTIVE TECHNIQUES IN VIRTUAL REALITY 9

Body Track - Hand Gesture - 3D Manus - Object Grasp.Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega - MultiGen - Virtools. - Application of VR in Digital Entertainment: VR Technology in Film & TV Production - VR Technology in Physical Exercises and Games

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Burdea G. C, Coiffet P	Virtual Reality Technology	Wiley & Sons, Second Ed	2003
2.	William R. Sherman, Alan Craig	Understanding Virtual Reality: Interface, Application, and Design	Morgan Kaufmann Publishers	2003
3.	John Vince	Virtual Reality Systems	Pearson Education	1995
4.	Alan B. Craig	Understanding Augmented Reality, Concepts and Applications	Morgan Kaufmann	2013

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Rikk Carey, Gavin Bell	The Annotated VRML 2.0 Reference Manual	AddisonWesley	1997
2.	Alan Craig, William Sherman, Jeffrey Will	Developing Virtual Reality Applications, Foundations of Effective Design	Morgan Kaufmann	2009
3.	John Vince	Introduction to Virtual Reality	Springer	2004

Web URL(s):

1.https://nptel.ac.in/courses/106/106/106106138/

U19ITT56	WIRELESS SENSOR AND AD-HOC NETWORKS	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To learn Ad hoc network and Sensor Network fundamentals.
- To have an in-depth knowledge on MAC protocols for Ad-Hoc Wireless networks.
- To study the various protocols at various layers and its differences with traditional protocols.
- To understand the basic concepts of wireless sensor networks and to assess the performance limits, coverage and best network configuration.
- To understand the issues pertaining to sensor networks and the challenges involved in managing a sensor network.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand the under lying technologies of wireless networks.

CO2 : Describe the MAC protocol issues of ad hoc networks.

CO3 : Describe routing protocols for ad hoc wireless networks with respect to TCP design issues.

CO4 : Explain the concepts of network architecture and MAC layer protocol for WSN.

Unit I INTRODUCTION 9

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -Mobile Ad-hoc networks (MANETs) and wireless sensor networks (WSNs):concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks

Unit II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS 9

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11.

Unit III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS 9

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

Unit IV WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS 9

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

Unit V WSN ROUTING, LOCALIZATION & QOS 9

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

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	C. Siva Ram Murthy B. S. Manoj	Ad hoc Wireless Networks: Architectures and Protocols	Prentice Hall Professional Technical Reference	2016
2.	Subir Kumar Sarkar, et al	Wireless Ad hoc Mobile Wireless Networks — Principles, Protocols and Applications,	Auerbach Publications, Taylor & Francis Group	2018

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Fei Hu Xiaojun Cao An Auerbach book	Wireless Sensor Networks — Principles and Practice	CRC Press, Taylor & Francis Group	2017
2.	Carlos Corderlo Dharma R Aggarwal	Ad Hoc and Sensor Networks — Theory and Applications	World Scientific Publications Cambridge University Press	2018
3.	Feng Zhao Leonidas Guibas	Wireless Sensor Networks: An Information Processing Approach	Elsevier Science imprint, Morgan Kauffman Publishers	2017
4.	C.Siva Ram Murthy B.S.Murthy	Wireless Ad hoc Mobile Wireless Networks — Principles, Protocols and Applications	Pearson Education	2016

Web URL(s):

1.https://nptel.ac.in/courses/106/105/106105160/
2.https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/
3.https://www.youtube.com/watch?v=2Yw0gXHHiww

U19ITT57	SOFT COMPUTING	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To give students knowledge of soft computing theories and fundamentals.
- To design a soft computing system required to address a computational task and use heuristics based on human experience.
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- To understand fuzzy sets and fuzzy logic for problem solving.
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.

Course Outcomes:
At the end of this course students will demonstrate the ability to

CO1 : Identify the essential components of soft computing.

CO2 : Describe and understand the concepts of Back propagation networks.

CO3 : Demonstrate various unsupervised learning techniques.

CO4 : Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.

CO5 : Apply genetic algorithms to optimization problems.

Unit I OVERVIEW OF SOFT COMPUTING 9

Overview of Soft Computing- Difference between Soft and Hard computing - Brief descriptions of different components of soft computing including Artificial intelligence systems, Neural networks, fuzzy logic, genetic algorithms. Artificial neural networks Vs Biological neural networks- ANN architecture- Basic building block of an artificial neuron- Activation functions- Introduction to Early ANN architectures- Basics-McCulloch & Pitts model, Perceptron, ADALINE, and MADALINE.

Unit II ARTIFICIAL NEURAL NETWORKS: SUPERVISED LEARNING 9

Introduction - How brain works- Neuron as a simple computing element - The perceptron - Backpropagation networks: architecture - multilayer perceptron, Back propagation learning- Input layer, accelerated learning in multilayer perceptron - The Hopfield network - Bidirectional associative memories (BAM)- RBF Neural Network.

Unit III ARTIFICIAL NEURAL NETWORKS: UNSUPERVISED LEARNING 9

Hebbian Learning, Generalized Hebbian learning algorithm, Competitive learning, Self- Organizing Computational Maps: Kohonen Network.

Unit IV FUZZY COMPUTING 9

Basic Concepts of Fuzzy Logic – Fuzzy Sets and Crisp Sets – Fuzzy Set Theory and Operations – Properties of Fuzzy Sets – Fuzzy and Crisp Relations – Fuzzy to Crisp Conversion – Fuzzy Logic – Fuzzy rules and Fuzzy reasoning – Fuzzy inference systems.

Unit V GENETIC ALGORITHMS 9

Basic concepts – Encoding- Fitness function- Reproduction-Roulette wheel, Boltzmann- tournament, rank, and steady state selections, Convergence of GA- Applications of GA case studies. Introduction to genetic programming- Basic concepts

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Michael Negnevitsky	Artificial Intelligence: A Guide to Intelligent Systems	Pearson	2002

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	S. Rajasekaran, G. A. Vijayalakshmi pai	Neural networks, fuzzy logic and genetic algorithm Synthesis and applications	PHI Learning	2004
2.	L. Fausett	Fundamentals of Neural Networks	Prentice Hall	2006
3.	T. Ross	Fuzzy Logic with Engineering Applications	Tata McGraw Hill	2016
4.	D. E. Goldberg	Genetic Algorithms in Search, Optimisation, and Machine Learning	Addison-Wesley	2006

Web URL(s):

1. https://nptel.ac.in/courses/106/105/106105173/
2. https://cse.iitkgp.ac.in/~dsamanta/courses/sca/index.html
3. https://nptel.ac.in/courses/117/105/117105084/
4. https://nptel.ac.in/courses/108/104/108104157/

U19ITT58	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To get introduced to language processing technologies for processing the text data.
- To acquire knowledge on text data analytics using language models.
- To understand the role of Information Retrieval and Information Extraction in Text Analytics.
- To analyze the text content to provide predictions related to a specific domain using language models.
- To understand the basics of NLP Tools.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Process the text data at syntactic and semantic level.

CO2 : Extract the key information from Text data.

CO3 : Understand the process of Information retrieval and extraction.

CO4 : Analyze the text content to provide predictions related to a specific domain using language models.

CO5 : Work with various tools of NLP

Unit I INTRODUCTION 9

Natural Language Processing – Linguistic Background -– Mathematical Foundations -Morphological Analysis-Tokenization- Stemming-Lemmatization – Boundary Determination.

Unit II TEXT DATA REPRESENTATION 9

Reading unstructured data - Representing text data - Part of speech tagging – Syntactic representation - Text similarity - WordNet based similarity- Shallow parsing –Semantic representation.

Unit III INFORMATION RETRIEVAL AND EXTRACTION 9

Information retrieval and Information extraction - Named Entity Recognition – Relation Identification-Template filling.

Unit IV LANGUAGE MODELS 9

Language model - Probabilistic Models - n-gram language models- Hidden Markov Model- Topic Modelling - Graph Models -Feature Selection and classifiers -Rule-based Classifiers - Maximum entropy classifier – Clustering-Word and Phrase-based Clustering.

Unit V NLP TOOL KIT 9

Tools – Natural Language Tool kit, Apache Open NLP. Applications of Text Analytics – Applications in Social media - Life science - Legal Text–Visualization -Case studies.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Christopher D. Manning and Hinrich Schutze	Foundations of Statistical Natural Language Processing	MIT Press	1999
2.	Steven Struhl	Practical Text Analytics: Interpreting Text and Unstructured Data for Business Intelligence	Kogan Page	2015
3.	Matthew A. Russell	Mining the Social Web	O'Reilly Media	2013
4.	Steven Bird, Ewan Klein Edward Loper	Natural Language Processing with Python	O'Reilly Media	2009

References Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jurafsky Martin	Speech and Language Processing	Pearson Prentice Hall, Second Edition,	2008
2.	Stevan Bird	Natural Language Processing with Python	Shroff	2009
3.	Nitin Indurkhya, Fred J. Damerau	Handbook of Natural Language Processing	Chapman & Hall, Second Edition	2010

Web URL(s):

1. https://nptel.ac.in/courses/106/105/106105158/
2. https://nptel.ac.in/courses/106/106/106106211/

U19ITT59	FORMAL LANGUAGES AND AUTOMATA THEORY	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To understand the language hierarchy
- To construct automata for any pattern and find its equivalent regular expressions.
- To design a context free grammar for any given language
- To understand Turing machines and their capability
- To understand undecidable problems.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Construct automata for any pattern.

CO2 : Demonstrate an understanding of regular expressions and languages.

CO3 : Construct a context free grammar for various languages.

CO4 : Develop a view on the importance of computational theory.

CO5 : Design Turing machine for any language.

Unit I INTRODUCTION 9

Introduction- Alphabets, Strings and Languages; Automata and Grammars - Introduction to formal proof – Inductive proofs –Finite Automata (FA): Deterministic finite Automata-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata, Language of an NFA, Equivalence of NFA and DFA , Finite Automata with epsilon transition

Unit II REGULAR EXPRESSION AND LANGUAGES 9

Regular Expression –Definition- Operators of regular expression and their precedence - Finite automata and Regular expressions- Applications of Regular Expressions - Algebraic Laws for Regular Expression - Non Regular Languages: Pumping Lemma for Regular Languages- Application of Pumping Lemma - Closure properties of Regular Languages - Decision properties of Regular Languages - Equivalence and Minimization of Automata.

Unit III CONTEXT FREE GRAMMAR AND LANGUAGES 9

Context Free Grammars- Parse trees -Applications of Context Free Grammars- Ambiguity in Grammars and Languages- Normal forms for CFGs- Pumping lemma for CFLs - Closure properties of CFLs - Decision Properties of CFLs

Unit IV PUSH DOWN AUTOMATA 9

Definition - Language of PDA - Equivalence of PDA's and CFG's - Deterministic Pushdown Automata

Unit V TURING MACHINES 9

The Turing Machine - Programming Techniques for Turing Machines - Extensions to the Basic Turing Machine - Restricted Turing Machines - Turing Machines and Computers - Undecidability - Undecidable problems about TMs - Post's correspondence problem (PCP) - Other Undecidable Problems.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	John Hopcroft, Rajeev Motwani Jeffrey Ullman	Introduction to Automata Theory, Languages and Computation	Pearson Education	2014

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	John Hopcroft, Jeffrey Ullman	Introduction to Automata Theory, Languages and Computation	Narosa Publishing House	2002
2.	Peter Linz	An Introduction to Formal Language and Automata	Narosa Pub. House	2011

Web URL(s):

1.https://nptel.ac.in/courses/106/103/106103070/
2.https://nptel.ac.in/courses/111/103/111103016/
3.https://nptel.ac.in/courses/106/106/106106049/
4.https://nptel.ac.in/courses/106/105/106105196/

U19ITT60	RANDOMIZED ALGORITHMS	L	T	P	C
		3	0	0	3

Pre-Requisites : U19ITT02

Objectives:

- To introduce the concept of randomized algorithms
- To apply the concepts of probabilistic analysis of algorithms
- To derive good upper bounds for the expected running time of simple randomized algorithm
- To analyze the performance of randomized algorithms
- To design simple randomized algorithm that run faster or return correct output with high probability

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Learn the mathematical foundations emphasizing the design and analysis of randomized algorithm

CO2 : Apply basics of probability theory in the analysis of algorithms

CO3 : Comprehend randomized algorithms and its advantages to traditional algorithm

CO4 : Design and implement randomized techniques in solving real world problems

CO5 : Design randomized algorithms and analyze their performance

Unit I PROBABILITY AND COMPUTING 9

Elements Of Probability Theory - Verification Of Strings - Poly Identities - Matrix Multiplication - Las Vegas And Monte Carlo Algorithms - Expectations - Jensen's Inequality - Coupon Collector's Problem - Geometric Distribution

Unit II EXPECTATIONS, MOMENTS AND INEQUALITIES 9

Randomized Quick Sort And Its Expected Run-Time - Variance And Moments - Chebyshev's Inequality - Coupon Collector's Problem - Randomized Median Finding - Analysis - Moment Generating Functions

Unit III CHERNOFF'S BOUNDS AND ITS APPLICATIONS 9

Derivation And Application Of Chernoff's Bounds - Sum Of Poisson Trials - Coin Flips - Set Balancing - Packet Routing In Sparse Networks - Permutation Routing On The Hypercube - Butterfly

Unit IV BALLS, BINS AND RANDOM GRAPHS 9

Birthday Paradox - Balls And Bins Model - Application To Bucket Sort - Poisson Distribution - Application To Hashing - Random Graph Models - Hamiltonian Cycles In Random Graphs

Unit V MARKOV CHAINS AND RANDOM WALKS 9

Markov Chains - Representations - Randomized Algorithm For 2-Satisfiability And 3-Satisfiability - Classification Of States - Gambler's Ruin - Random Walks On Undirected Graphs - s-t Connectivity Algorithm.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Micheal Mitzenmacher Eli Upfal	Probability and Computing: Randomization Algorithms and Probabilistic Analysis	Cambridge	2005

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars	Computational Geometry: Algorithms and Applications	Springer-Verlag	2008
2.	NogaAlon, Joel H Spencer	The Probabilistic Method	Wiley-Interscience	2016
3.	Rajeev Motwani PrabhakarRaghavan	Randomized Algorithms	Cambridge University Press	1995

Web URL(s):

1. https://nptel.ac.in/courses/106/103/106103187/
2. https://www.coursera.org/learn/algorithms-divide-conquer

U19ITT61	INFORMATION STORAGE MANAGEMENT	L	T	P	C
		3	0	0	3

Pre-Requisites : U19CSE02

Objectives:

- To understand the basic components of Storage System Environment.
- To understand the logic in usage of RAID for data protection for effective storage management.
- To understand the Storage Area Network Characteristics and Components.
- To describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.
- To understand the local and remote replication technologies.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand the logical and physical components of a Storage infrastructure.

CO2 : Illustrate the use of RAID and Intelligent storage systems.

CO3 : Interpret various storage networking architectures.

CO4 : Describe the different role in providing disaster recovery and business continuity capabilities.

CO5 : Infer the security needs and security measures to be employed in information storage management

Unit I STORAGE SYSTEM 9

Introduction to Information Storage: Information Storage - Evolution of Storage Technology and Architecture - Data Centre Infrastructure - Virtualization and Cloud Computing –Storage System Environment- Components of a storage system environment- Disk drive components - Disk drive performance .Storage Design Based on Application Requirements and Disk Performance

Unit II DATA PROTECTION USING RAID AND INTELLIGENT STORAGE SYSTEMS 9

Data Protection RAID: RAID Implementation Methods - RAID Array Components - RAID Techniques - RAID Levels - RAID Impact on Disk Performance - RAID Comparison - Hot Spares - Intelligent Storage Systems: Components - Storage Provisioning – Types of Intelligent Storage Systems

Unit III STORAGE NETWORKING TECHNOLOGIES 9

Fibre Channel Overview -SAN and its Evolution - Components of FC SAN -FC Connectivity, Switched Fabric Ports - Fibre Channel Architecture - Fabric Services - Switched Fabric Login Types - Zoning - FC Topologies - Virtualization in SAN - Network Attached Storage: Benefits of NAS - File Systems and Network File Sharing -Components of NAS - NAS I/O Operations - NAS Implementations - NAS File Sharing Protocols - Factors Affecting NAS Performance - File-level Virtualization

Unit IV BACKUP, ARCHIVE AND REPLICATION 12

Introduction to Business Continuity- Backup architecture - Backup targets and methods - Data deduplication- Cloud-based and mobile device backup- Data archive- Uses of replication and its characteristics- Host-based- storage-based, and network-based replication- Data migration- Disaster Recovery as a Service (DRaaS)

Unit V SECURING STORAGE INFRASTRUCTURE 6

Information security Framework - Storage security domains - Threats to a storage infrastructure- Security controls to protect a storage infrastructure – Governance- risk and compliance

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	EMC Corporation	Information Storage and Management	Wiley	2012

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Somasundaram Gnanasundaram, Alok Shrivastava	Information Storage and Management	Wiley Publishing Inc.	2012
2.	Robert Spalding	Storage Networks: The Complete Reference	Tata McGraw Hill	2003
3.	Meeta Gupta	Storage Area Networks Fundamentals	Pearson Education Limited	2002

Web URL(s):

1.https://nptel.ac.in/courses/111/103/111103016/
2.https://nptel.ac.in/courses/106/106/106106049/
3.https://nptel.ac.in/courses/106/105/106105196/

U19ITT62	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To know the underlying structure behind intelligence mathematically.
- To study the techniques of knowledge representation.
- To explore the uncertainty involves in reasoning systems.
- To understand the learning techniques.
- To understand the concepts of expert systems.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Apply the Intelligent techniques for problem solving.

CO2 : Suggest appropriate knowledge representation technique for any problem

CO3 : Explain about AI techniques for knowledge representation and uncertainty management.

CO4 : Improve problem solving skills using the acquired knowledge in the areas of reasoning, natural language understanding.

CO5 : Have knowledgeable about the tools and the processes used for the creation of an expert system..

Unit I INTRODUCTION 9

Introduction to AI - History, Intelligent agents, Agents and environments, Structure of agents- Problem-Solving Agents - Searching for solutions - Uniformed search strategies - Informed search strategies - Constraint satisfaction problems

Unit II KNOWLEDGE, REASONING AND PLANNING 9

Logical Agents: Knowledge-Based Agents - Proportional Logic - First-Order Logic: Syntax and Semantics - Using First-Order Logic - Inference in First-Order Logic - Definition of Classic Planning - Algorithms for Planning as State-Space Search.

Unit III UNCERTAIN KNOWLEDGE AND REASONING 9

Quantifying Uncertainty: Acting under uncertainty - Basic probability notation - Baye's rule – Probabilistic reasoning – Making simple decisions - Making Complex Decisions: Value Iteration and Policy Iteration.

Unit IV LEARNING AGENTS 9

Forms of Learning -Supervised Learning - Learning decision trees - Knowledge in learning – Neural networks – Reinforcement learning: Passive and active -Natural Language Processing

Unit V EXPERT SYSTEMS 9

Definition – Features of an expert system – Programming language and Expert system tools- Knowledge Representation in expert systems – Logic – Rules- Probabilistic Reasoning

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stuart Russel, Peter Norvig	Artificial Intelligence A Modern Approach	Pearson Education	2010
2.	Frank Puppe	Systematic Introduction to Expert systems : Knowledge representation and Problem solving methods	Springer-verlog	2012

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	W. Patterson	Introduction to Artificial Intelligence and Expert Systems	Prentice Hall of India	2006
2.	Patrick H.Winston	Artificial Intelligence	Pearson Education	2006
3.	Elain Rich and Kevin Knight	Artificial Intelligence	Tata McGraw Hill	2010

Web URL(s):

1. https://nptel.ac.in/courses/106/102/106102220/
2. https://www.coursera.org/learn/ai-for-everyone
3. https://www.coursera.org/specializations/ai-foundations-for-everyone
4. https://nptel.ac.in/courses/106/105/106105077/
5. https://nptel.ac.in/courses/106/106/106106126/

U19ITT63	ADVANCED DATABASE SYSTEMS	L	T	P	C
		3	0	0	3

Pre-Requisites : U19CSE02

Objectives:

- To learn the fundamentals of data modeling and design in advanced databases.
- To acquire knowledge on distributed and object oriented databases and its applications.
- To learn the various NoSQL techniques.
- To understand the basics of spatial, temporal and mobile databases and their applications.
- To learn the information retrieval concepts on web databases.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand about different Database System Architectures and Parallel Databases.

CO2 : Identify the various Databases such as Distributed and Object Oriented Databases.

CO3 : Use NoSQL database systems and manipulate the data associated with it.

CO4 : Have knowledge of advanced database system concepts.

CO5 : Apply knowledge of information retrieval concepts on web databases.

Unit I DATABASE-SYSTEM ARCHITECTURE AND PARALLEL DATABASES 9

Database System Architectures: Centralized and Client-Server Architectures – Parallel Systems – Distributed Systems – Network Types - Parallel Databases: Inter and Intra Query Parallelism – Inter and Intra Operation Parallelism – Design of Parallel Systems - Recovery: Failure Classification - Storage - Recovery and Atomicity - Recovery Algorithm - Buffer Management

Unit II DISTRIBUTED AND OBJECT ORIENTED DATABASES 9

Distributed Database Concepts: Homogeneous and Heterogeneous Databases – Distributed Data Storage –Distributed Transactions – Commit Protocols - Concurrency Control - Distributed Query Processing - Overview of Object Databases Concepts – Object Database Extension to SQL - ODMG Model – Object Definition Language – Object Database Conceptual Design - Object Query Language.

Unit III NOSQL DATABASES 9

NoSQL –Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding, Deployment – Using MongoDB with PHP / JAVA – Advanced MongoDB Features – Cassandra: Data Model, Key Space, Table Operations, CURD Operations, CQL Types – HIVE: Data types, Database Operations, Partitioning – HiveQL – OrientDB Graph database – OrientDB Features.

Unit IV ADVANCED DATABASE SYSTEMS 9

Spatial Databases: Spatial Data Types, Spatial Relationships, Spatial Data Structures, Spatial Access Methods – Temporal Databases: Overview – Active Databases – Deductive Databases – Recursive Queries in SQL – Mobile Databases: Location and Handoff Management, Mobile Transaction Models, Concurrency – Transaction Commit Protocols – Multimedia Databases.

Unit V INFORMATION RETRIEVAL AND WEB SEARCH 9

IR concepts – Retrieval Models – Queries in IR system – Text Preprocessing – Inverted Indexing – Evaluation Measures – Web Search and Analytics – Current trends.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Abraham Silberschatz Henry F Korth, S. Sudharshan	Database System Concepts	McGraw Hill	2011
2.	R. Elmasri, S.B. Navathe	Fundamentals of Database Systems	Pearson Education	2016

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Thomas Connolly, Carlolyn Begg	Database Systems, A Practical Approach to Design, Implementation and Management	Pearson Education	2015
2.	Peter Rob, Carlos Coronel	Data base Systems design, Implementation, and Management	CENGAGE Learning,	2014
3.	Raghu Ramakrishnan	Database Management System	McGraw Hill	2014
4.	C.J.Date	Introduction to Database Systems	Pearson Education	2009

Web URL(s):

1. https://nptel.ac.in/courses/106/106/106106093/
2. https://www.coursera.org/learn/introduction-to-nosql-databases

U19ITT64	FREE OPEN SOURCE SOFTWARE	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To understand the basics of open source software.
- To gain the knowledge of working with Linux platform and database.
- To understand the concepts Open Source programming languages
- To be familiar with open source tools and techniques
- To acquire the knowledge of open source databases

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Analyze the components of Linux operating system with the basic commands

CO2 : Configure open source server and tools.

CO3 : Develop applications using PERL.

CO4 : Describe the existing open source tools and techniques.

CO5 : Understand the concepts of open source databases.

Unit I INTRODUCTION 8

Introduction to Open Source – Open Source vs. Commercial Software –Introduction to Linux Operating System - Basic UNIX Commands - File Filters: File Related Commands - Piping -Joining, awk and backup Commands - Processes in Linux: User Process and Terminal Handling.

Unit II SERVER CONFIGURATION 10

Debian Linux Installation - Installing Apache: The Web Server - Samba Installation and Configuration: File Sharing - Compiling from Sources -Installing - NFS - Installing SMTP Mail Server - Installing Common Unix printing System.

Unit III OPEN SOURCE PROGRAMMING LANGUAGES 10

Introduction to Open Source Programming and Scripting Languages Execution Environment - Programming in Web Environment –PERL: Introduction - Program Structure - Variables - Loops and Conditionals - Files - Subroutines - die-exit on error - Pattern Matching and Extraction

Unit IV OPEN SOURCE TOOLS AND TECHNIQUES 8

Design Tools: Argo UML, Version Control Systems: Git - Integrated Development Environment for Development and Testing: Eclipse - Text Processing Tools - E-Learning Tools - Moodle, EFrontLearningVersion Control tools – Bazaar, Content Management Tools - WordPress, Parallel and System Programming Tools - FastFlow - Virtualization and Cloud Computing - Social Network Engine - Introduction to R Programming

Unit V OPEN SOURCE DATABASES 9

MySQL: Introduction - Setting up account - Starting, Terminating and Writing your own SQL Programs - Record Selection Technology - Working with Strings - Date and Time - Sorting Query Results - Generating Summary - Working with Metadata - Using Sequences - MySQL and Web

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	N. B. Venkateshwarlu	Introduction to Linux: Installation and Programming	B S Publishers	2014
2.	W. J. Gilmore	Beginning PHP and MySQL: From Novice to Professional	APress	2010

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Roderick W Smith	Linux Essentials	Wiley Publications	2012
2.	Ellen Siever, Stephen Figgins Robert Love Arnold Robbins	Linux in a Nutshell	OReilly Media	2009
3.	Martin C. Brown	Perl: The Complete Reference	Tata McGrawHill	2009
4.	Joseph Feller, Brian FitzGerald	Understanding Open Source Software Development	Pearson Education Limited	2001
5.	MySQL: The Complete Reference	VikramVaswani	McGraw Hill	2003

Web URL(s):

1.https://nptel.ac.in/courses/117/106/117106113/
2.https://www.coursera.org/learn/open-source-software-development-methods
3.http://www.tldp.org/LDP/intro-linux/intro-linux.pdf

U19ITT65	SERVICE ORIENTED ARCHITECTURE AND MICROSERVICES	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To understand the basic principles of service orientation.
- To analyze various software architectures.
- To introduce service-oriented and micro-services architecture.
- To analyze and implement web service based applications.
- To understand the technology underlying service design and micro-services applications.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand the various methodologies in software engineering.

CO2 : Analyze and design SOA based solutions.

CO3 : Analyze and implement a web service based applications.

CO4 : Understand the technology underlying service design.

CO5 : Implement SOA with Micro Services applications.

Unit I SOFTWARE ENGINEERING PRACTICES 9

Software Engineering Principles – SDLC – Agile Development Methodologies – Emergence of Devops Architecture – Need for Software Architecture – Types of IT Architecture – Pattern & Style – Architecting Process for Software Applications – High Level Architecture – Solution Architecture – Software Platforms – Enterprise Applications – Custom Software Applications – Cloud Computing Platforms.

Unit II SOA AND MICROSERVICE ARCHITECTURE BASICS 9

SOA and MSA – Basics – Evolution of SOA & MSA – Drivers for SOA – Dimensions, Standards and Guidelines for SOA – Emergence of MSA – Enterprise-wide SOA –Strawman and SOA Reference Architecture – OOAD Process & SOAD Process – Service Oriented Application – Composite Application Programming Model.

Unit III WEB SERVICES 9

XML – DOM and SAX Processors – SOAP – WSDL – UDDI – JSON – WS – Security – Web Services Standards – Java, .NET, Python Web Services – RESTful Web Services – Middleware Services for IoT – Mobile Services.

Unit IV SERVICE ORIENTED ANALYSIS AND DESIGN 9

Principles of Service Design – Design of Activity, Data, Client, Business Process Services – Resilience Services – Technologies for SOA – Service Enablement – Integration – Orchestration – SOA Governance – Design Time and Run Time Governance – SOA Best Practices – EA and SOA for IT Alignment.

Unit V MICROSERVICE BASED APPLICATIONS 9

Implementing Microservices with Python – Microservice Discovery Framework – Coding, Testing & Documenting Microservices – Interacting with Other Services – Monitoring and Securing the Services – Containerized Services – Deploying on Cloud – Case studies :Kubernates - Docker Tool

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Shankar Kambhampaty	Service-oriented Architecture & Microservice Architecture: For Enterprise, Cloud, Big Data and Mobile	Wiley	2018
2.	Tarek Ziadé	Python Microservices Development	O'REILLY publication	2017

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Thomas Erl	Service Oriented Architecture Concepts Technology & Design	Pearson Education Limited	2005
2.	Ron Schmelzeret.al	XML and Web Services	Pearson Education	2002
3.	Leonard Richardson Sam Ruby	RESTFUL Web Services	O'REILLY publication	2007
4.	Nicolai M. Josuttis	SOA in Design- The Art of Distributed system Design	O'REILLY publication	2007
5.	Raj Balasubramanian Benjamin Carlyle Thomas Erl, Cesare Pautasso	SOA with REST –Principles, Patterns & Constraints for Building Enterprise Solutions with REST	Prentice Hall	2013

Web URL(s):

1. https://www.coursera.org/learn/service-oriented-architecture

U19ITT66	SOFTWARE ARCHITECTURE	L	T	P	C
		3	0	0	3

Pre-Requisites : U19ITE06

Objectives:

- To understand the software architectural requirements and drivers.
- To learn about the quality attributes for software architecture.
- To be exposed to architectural styles and views.
- To understand how to develop architectural documentation.
- To be familiar with architectures for emerging technologies.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Explain influence of software architecture on business and technical activities.

CO2 : Understand the quality Attributes for software architecture.

CO3 : Ability to understand, identify the key architectural structures and to use the views to specify architecture.

CO4 : Ability to use and evaluate the styles to specify architecture.

CO5 : Design document for a given architecture.

Unit I INTRODUCTION 9

What is Software Architecture? - Definitions - Architectural Structures and Views - What makes a Good Architecture? - Why is Software Architecture Important? - Architecture in a Technical Context - Architecture in a Project Life-Cycle Context- Architecture in a Business & Professional Context - Stakeholder - How is Architecture Influenced? - What do Architectures Influence? - Understanding Quality Attributes

Unit II QUALITY ATTRIBUTES 9

Availability - Interoperability - Modifiability - Performance - Security - Testability - Usability - Software Quality Attributes and System Quality Attributes - Architectural Patterns -Relationships between Tactics and Patterns

Unit III ARCHITECTURE IN AGILE PROJECTS, REQUIREMENTS AND DESIGN 9

How much Architecture? - Agility and Architecture Methods - Example - Guidelines for the Agile Architect - Architecture and Requirements: Gathering AS Rs from Requirements Documents - By Interviewing Stakeholders - By Understanding Business Goals - Capturing AS Rs in a Utility Tree - Tying the Methods Together - Design Strategy - The Attribute-Driven Design Method - Steps of ADD

Unit IV DOCUMENTATION, IMPLEMENTATION AND TESTING 9

Documenting Software Architectures: Uses and Audiences - Notations - Views - Choosing the Views - Combining the Views - Building the Documentation Package - Documenting Behavior - Architecture Documentation and Quality Attributes - Documenting Architectures in an Agile Development Project - Architecture and Implementation - Architecture and Testing.

Unit V ARCHITECTURE RECONSTRUCTION, EVALUATION AND MANAGEMENT 9

Architecture Reconstruction Process - Raw View Extraction - Database Construction - View Fusion - Evaluation Factors - Architecture Tradeoff Analysis Method - Lightweight Architecture Evaluation - Planning - Organizing - Implementing - Measuring – Governance

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Len Bass, Paul Clements Rick Kazman	Software Architecture in Practice	Addison-Wesley	2015

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Anthony J Lattanze	Architecting Software Intensive System. A Practitioner's Guide	Auerbach Publications	2013
2.	Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord, Judith Stafford	Documenting Software Architectures. Views and Beyond	Addison-Wesley	2012
3.	David Garlan and Mary Shaw	Software architecture: Perspectives on an emerging discipline	Prentice Hall	2011

Web URL(s):

1. https://www.udemy.com/course/how-to-become-an-outstanding-solution-architect/
2. https://www.coursera.org/learn/software-architecture

U19ITT67	INFORMATION TECHNOLOGY FOR HEALTH CARE	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To understand health informatics and role of InformationTechnology in Health care.
- To learn about electronic health records and consumer Health Informatics.
- To understand how to apply informatics in genomics.
- To apply analytical and visualization skills to datasets.
- To know about the ethical and diversity issues in health informatics

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Explore about health informatics and role of Information Technology in Health care.

CO2 : Develop knowledge about problems and challenges that health informatics addresses.

CO3 : Apply informatics in genomics and other aspects of molecular biology.

CO4 : Perform visualization and simple analysis of a data set.

CO5 : Analyze the ethical and diversity issues in health informatics.

Unit I HEALTH INFORMATICS- AN INTRODUCTION 9

Health Information Technology and Health Informatics - Language of biomedical informatics:- Resources - Converting Data to Information to Knowledge - Healthcare Data Analytics: Terminology - Challenges - Application - Role of Informatics Language

Unit II ELECTRONIC HEALTH RECORDS AND CONSUMER HEALTH INFORMATICS 9

EHR: Introduction - Need - Components -Clinical Decision Support System - Design and Implementation Issues, Decision Rules and Expressions, Guidelines and Workflow Models- Electronic Prescribing - Adoption - Challenges - Hitech Act - Examples - Implementing an EHR - Consumer Health Informatics: Introduction - Origin - Classification - Health Education - Home Telemedicine Devices - Patient Web Portals - PHRS - Physician Communication

Unit III INFORMATION RETRIEVAL AND BIOINFORMATICS 9

Online Medical Resources - Medical Web Sites - Patient Education Sites - Free & Subscription Resources - Google - Pubmed Search Engine - Genomic Primer - Projects and Centers - Personal Genomics - Genomic Information Integrated with EHRS - Public Health Information Network - Public Health Data Tools and Statistics - Global Public Health Informatics

Unit IV DATA SCIENCE IN HEALTHCARE 9

Data science in Healthcare, Characteristics of Big Data, Benefits of Data Science for Clinical Research, Approached to Analyses, Knowledge discovery and Mining: Dataset Retrieval, Preprocessing clinical, text and structured data, Sampling and Partitioning, Model Evaluation, Model Deployment.

Unit V ETHICAL ISSUES IN HEALTH INFORMATICS 9

Legal Issues, Federal Regulations and Accreditation, Billing Issues related to EHR use, Importance of Information Security, Current Security Vulnerabilities and Challenges: Internal, External Events, Managing Security Risks: Administrative, Technical, Physical Control.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hoyt R.E, Yoshihashi A.K. Bailey N.J	Medical informatics: A practical guide for healthcare and informatics technology professionals	Informatics Education, 6th Edition	2014
2.	Nelson, Ramona Nancy Staggers	Health Informatics - E-Book: An Interprofessional Approach	Elsevier Health Sciences, 2nd Edition	2016

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Shortliffe E. H. Cimino, J. J	Biomedical Informatics: Computer Applications in Health Care and Biomedicine	Health Informatics", 4th Edition	2014
2.	Greenes Robert A	Clinical decision support: the road to broad adoption	Academic Press, 2nd Edition	2014

Web URL(s):

1. https://www.coursera.org/learn/intro-to-healthcare
2. https://www.coursera.org/lecture/the-socio-technical-health-informatics-context/health-information-technology-for-patients-6MXuR

U19ITT68	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To learn about Software Defined concepts, architectures, protocols and applications.
- To describe and understand the concepts of minimize Layer and maximize Network Resources.
- To evaluate and understand the Faster Time to Revenue for New Applications.
- To Memorize Data center and its usage.
- To understand the functionality of Network function virtualization.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Comprehend Software Defined Networks.

CO2 : Understand advanced and emerging networking technologies.

CO3 : Design and implement software defined network.

CO4 : Gain an in-depth coverage of various networking topologies.

CO5 : Design algorithm for virtualization and big data analytics.

Unit I INTRODUCTION 9

Introduction - Control Plane - Data Plane - Distributed Control Planes - IP and MPLS - Creating the IP Underlay - Convergence Time - Load Balancing High Availability - Creating the MPLS Overlay - Replication – Centralized Control Planes – Logical Versus Litera - ATM/LANE - Route Servers - Wire Protocol - FAWG - Config and Extensibility - Architecture.

Unit II INTERFACE 9

VMWare - Nicira - Mininet - NOX/POX - Trema - Ryu - Big Switch Networks/Floodlight - Layer 3 Centric - L3VPN - Path Computation Element Server - Plexxi Affinity - Cisco OnePK - Management Interface – Network Divide.

Unit III DATA CENTER 9

Multitenant Data Center - Virtualized Multitenant Data Center - SDN Solutions for Data Center Network - VLANs - EVPN - VxLan - NVGRE - Virtualization and Data Plane I/O - Services Engineered Path – Service Locations and Chaining.

Unit IV TOPOLOGY 9

Network Topology - Traditional Methods - LLDP - BGP-TE/LS - ALTO - I2RS - Build Code First - The Juniper SDN Framework(s) - Open Daylight Controller/Framework.

Unit V TECHNOLOGY 9

Bandwidth Scheduling - Manipulation - Calendaring - Bandwidth Calendaring - Big Data and Application Hyper - Virtualization for Instant CSPF - Expanding Technology - Big Data - Network Function Virtualization - Data Center Orchestration - Puppet - Network Function Virtualization - Optimized Big Data - Firewall as Service - Network Access Control Replacement - Virtual Firewall - Feed Back and Optimization.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Thomas D. Nandeau Ken Gray	Software Defined Networks	O‟ Reilly Media Inc.	2013
2.	Fei Hu	Network Innovation through OpenFlow and SDN: Principles and Design	CRC Press, Taylor & Francis Group	2014

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Azodolmolky Siamak	Software Defined Networking with OpenFlow	Packt Publishing Ltd.,	2013
2.	Nadeau, Thomas D Ken Gray	SDN: Software Defined Networks: An Authoritative Review of Network Programmability Technologies	O'Reilly Media Inc.,	2013
3.	Dillinger Markus, Kambiz Madani, Nancy Alonistioti	Software Defined Radio: Architectures, Systems and Functions	John Wiley & Sons	2005.
4.	Goransson, Paul Chuck Black, Timothy Culver	Software Defined Networks: A Comprehensive Approach”	Morgan Kaufmann	2016

Web URL(s):

1.https://www.coursera.org/learn/sdn

U19ITT69	INFORMATION SECURITY	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To understand the basics of Information Security.
- To know the legal, ethical and professional issues in Information Security.
- To know the aspects of risk management.
- To become aware of various standards in this area.
- To know the technological aspects of Information Security.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Discuss the basics of information security.

CO2 : Illustrate the legal, ethical and professional issues in information security.

CO3 : Demonstrate the aspects of risk management.

CO4 : Become aware of various standards in the Information Security System.

CO5 : Design and implement Security Techniques.

Unit I INTRODUCTION **9**

History - Critical Characteristics of Information - NSTISSC Security Model - Components of an Information System - Securing the Components - Balancing Security and Access - The SDLC - The Security SDLC.

Unit II SECURITY INVESTIGATION **9**

Need for Security - Business Needs - Threats - Attacks - Legal - Ethical and Professional Issues in Information Security

Unit III RISK MANAGEMENT **9**

Risk Identification - Risk Assessment - Risk Control Strategies - Selecting a Risk Control

Unit IV STANDARDS AND PRACTICES **9**

Blueprint for Security - Information Security Policy - Standards and Practices - ISO17799/BS 7799 - NIST Models - Design of Security Architecture - Continuity Strategies

Unit V PHYSICAL DESIGN **9**

Security Technology - IDS - Scanning and Analysis Tools - Cryptographic Algorithms and Tools - Physical Security - Implementing Information Security - security and Personnel - Information Security Maintenance - Digital Forensics

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Michael E Whitman Herbert J Mattord	Principles of Information Security	Cengage Learning Inc	2017

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Micki Krause, Harold F Tipton	Handbook of Information Security Management	CRC Press	2007
2.	Ritendra Goel, Praveen Kumar Shukla Surya Prakash Tripathi	Introduction to Information Security and Cyber Laws	Kogent Learning Solutions Inc	2014
3.	V. K. Pachghare	Cryptography and Information Security	PHI Learning Private Limited	2015

Web URL(s):

1. https://nptel.ac.in/courses/106/106/106106129/
2. https://nptel.ac.in/courses/106/106/106106141/
3. https://www.coursera.org/learn/information-security-data

U19ITT70	DEEP LEARNING	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To understand and apply Optimization on Deep Models and Networks.
- To explore the tuning of deep networks.
- To design and implement Convolutional Neural Networks.
- To learn deep generative models.
- To use Python for Deep Learning.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Explore the Basic fundamentals of Machine Learning Algorithms.

CO2 : Elucidate the Deep Networks.

CO3 : Analyze and Design the Convolutional Neural Network model.

CO4 : Understand the basics of Deep generative models.

CO5 : Develop Deep Learning techniques using Python.

Unit I INTRODUCTION 8

Motivation for deep learning, Machine learning Basics: Learning algorithms - Capacity, Overfitting and Underfitting – Hyperparameters and Validation Sets - Estimators, Bias and Variance - Supervised and Unsupervised Machine Learning Algorithms - Building a Machine Learning Algorithm - Challenges in Machine Learning

Unit II DEEP NETWORKS 10

Deep feed forward Networks- Learning XOR- : Gradient based learning - Hidden Units - Back Propagation algorithms - Regularization for deep learning

Unit III CONVOLUTIONAL NETWORKS 9

Convolution operation - Motivation - Pooling - Convolution and Pooling as strong prior - Efficient convolution algorithms - Unsupervised features - Sequence Modeling: Recurrent and Recursive Nets - LSTM Networks - Applications - Computer Vision - Speech Recognition - Natural Language Processing.

Unit IV DEEP GENERATIVE MODELS 9

Learning in Unsupervised Setting - Principal Component Analysis - Autoencoders: Sparse, Denoising - Generative Models - VariationalAutoencoder - Generative Adversial Networks.

Unit V DEEP LEARNING WITH PYTHON 9

Introduction to Keras and Tensorflow - Deep Learning for computer vision - convnets - Deep Learning for Text and Sequences - Generative Deep Learning - Text Generation with LSTM - DeepDream - Neural Style Transfer - Generating images with variationalautoencoders - Generative Adversarial Networks (GAN).

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ian Goodfellow, Yoshua Bengio, Aaron Courville	Deep Learning	MIT Press	2016
2.	Francois Chollet	Deep Learning using Python	Manning Publications	2017

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Hastie, T., Tibshirani, R an Friedman, J	The Elements of Statistical Learning	Springer	2001
2.	Daniel Graupe	Deep Learning Neural Networks: Design and Case Studies	World Scientific Publishing	2016
3.	Yu and Li Deng	Deep Learning: Methods and Applications	Now Publishers Inc,	2014

Web URL(s):

1. https://nptel.ac.in/courses/106/106/106106184/
2. https://onlinecourses.nptel.ac.in/noc20_cs62/preview

U19ITT71	BUILDING ENTERPRISE APPLICATIONS	L	T	P	C
		3	0	0	3

Pre-Requisites : U19ITE03, U19CSE02

Objectives:

- To understand the basics of enterprise applications.
- To gain the knowledge of enterprise analysis and modeling.
- To design and document the application architecture
- To construct and develop different solution layers
- To acquire the knowledge of various methods and levels of testing an enterprise application

Course Outcomes:
At the end of this course students will demonstrate the ability to

CO1 : Familiarize with concept of Enterprise Analysis and Business Modeling.

CO2 : Understand requirements validation, planning and estimation.

CO3 : Understand the importance of application framework and designing other application components.

CO4 : Perform Code review, Code analysis, build process.

CO5 : Understand different testing involved with enterprise application and the process of rolling out an enterprise application.

Unit I INTRODUCTION 6

Introduction to enterprise applications and their types, software engineering methodologies, life cycle of raising an enterprise application, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise applications

Unit II INCEPTING ENTERPRISE APPLICATIONS 9

Inception of enterprise applications, enterprise analysis, business modeling, requirements elicitation, use case modeling, prototyping, non-functional requirements, requirements validation, planning and estimation

Unit III ARCHITECTING AND DESIGNING ENTERPRISE APPLICATIONS 12

Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design

Unit IV CONSTRUCTING ENTERPRISE APPLICATIONS 9

Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage

Unit V TESTING AND ROLLING OUT ENTERPRISE APPLICATIONS 9

Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Anubhav Pradhan Satheesha B. Nanjappa Senthil K. Nallasamy Veerakumar Esakimuthu	Raising Enterprise Applications	John Wiley	2010
2.	Brett McLaughlin	Building Java Enterprise Applications	O'Reilly Media	2002

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Soren Lauesen	Software Requirements: Styles and Techniques	Addison-Wesley	2002
2.	Brian Berenbach, Daniel J.Paulish, Juergen Kazmeier, Arnold Rudorfer	Software Systems Requirements Engineering: In Practice	Tata McGraw-Hill	2009
3.	Dean Leffingwell, Don Widrig	Managing Software Requirements: A Use Case Approach	Pearson publications	2003
4.	Varma Vasudeva	Software Architecture: A Case Based Approach	Pearson publications	2009
5.	Srinivasan Desikan Gopalaswamy Ramesh	Software Testing Principles and Practices	Pearson publications	2006

Web URL(s):

1. http://java.sun.com/blueprints/guidelines/designing_enterprise_applications_2e/

U19ITT72	DEVELOPING WEB APPLICATIONS IN .NET	L	T	P	C
		3	0	0	3

Pre-Requisites : U19ITT01, U19CSE02, U19ITE03

Objectives:

- To understand the complexity of the real-world objects
- To learn the object oriented concepts using C Sharp
- To learn the best practices for designing Web applications and Usability Reviews
- To understand the Principles behind the design and construction of Web applications.
- To understand various scripting languages for web application development.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Classify the .Net framework with its development platform.

CO2 : Outline the advanced concepts in object oriented programming using C Sharp.

CO3 : Design the databases using structure query language server.

CO4 : Explain the data accessing using ADO.NET for application development.

CO5 : Develop and deploy an web application.

Unit I INTRODUCTION TO .NET FRAMEWORK 5

Introduction to .NET framework: Knowledge of .NET framework, .NET features and .NET development platform. Understanding advantages of .NET framework

Unit II OBJECTED ORIENTED CONCEPTS USING C SHARP LANGUAGE 12

Objected oriented concepts using C Sharp Language– object oriented programming (review only) — advanced concept in OOP – relationship – inheritance – abstract classes – polymorphism – Object Oriented design methodology – approach – best practices. UML class diagrams – interface – common base class

Unit III DESIGN AND DEVELOP DATABASE USING SQL SERVER 2008 8

To introduce features and architecture of MS – SQL Server 2008, Introduction to Database Engine and storage Engine, to enable students to create Tables, temporary tables, and Integrity rules. Ability to code in Batches, Write Stored Procedures/Functions. Ability to handle errors, Transaction in SQL server

Unit IV DATA ACCESS PROGRAMMING USING ADO.NET 8

Understanding of challenges, with respect to data access, associated in building internet applications and concept of common data access programming model, Ability to use ADO.NET components for application development, configuring and executing various objects. Understanding connected and disconnected models for data access.

Unit V WEB APPLICATION DEVELOPMENT USING ASP.NET 12

Recap on HTML- JavaScript- CSS- Basics of ASP.NET- Page Object and Dynamic Compilation Model- ASP.NET controls- Understand Data Binding and various Data Sources in ASP.NET-Understand the creation of Master Pages and themes- To understand configuration of web applications- IIS configurations-State management in ASP.NET.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Andrew Troelsen	C# and the .Net Platform	Apress	2003
2.	Rebecca M. Riordan	Microsoft® ADO.NET 2.0 Step by Step	Microsoft Press	2005
3.	Michael Lee, Gentry Bieker	Mastering Microsoft SQL SERVER 2008	Wiley	2009
4.	Ullman Sussman, Kauffman Hart Meharry	Beginning ASP.NET 3.5	Wrox Publications	-

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Tom Archer	Inside C#	Wrox Publications	2001
2.	John	Microsoft Visual C# 2005	Microsoft	2005
3.	Bryan Syverson	Murach's SQLSERVER 2008 for developers	Shroff Publishers	2008
4.	Davis Sceppa	Programming Microsoft® ADO.NET 2.0 Core Reference	Microsoft Press	2006

Web URL(s):

1. http://msdn2.microsoft.com/en-us/vstudio/default.aspx
2. http://www.c-sharpcorner.com/
3. http://gotdotnet.com/
4. http://www.microsoft.com/net
5. http://www.netfx3.com
6. http://msdn2.microsoft.com/en-us/netframework/default.aspx
7. http://www.gotdotnet.com
8. http://www.asp.net/

U19CST51	FULL STACK SOFTWARE DEVELOPMENT	L	T	P	C
	(Common to CSE & IT)	3	0	0	3

Pre-Requisites : Problem Solving and Python Programming

Objectives:

- To get an overview of the full stack software and web development.
- To understand the object oriented structure and user interface programming through Python.
- To gain knowledge of web development using Flask Framework.
- To learn the web application deployment in real time scenarios.
- To learn to deploy the software in Linux and Windows platforms.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand the object oriented approach in Python.

CO2 : Develop GUI applications with Python.

CO3 : Use the collaborative version control system, git.

CO4 : Package the developed code in Linux and Windows environment.

CO5 : Deploy the developed web application using Flask in real time scenarios such as AWS.

Unit I OBJECT ORIENTED APPROACH IN PYTHON 9

Classes – Class Coding Basics: Instances – Behavior Methods – Operator Overloading – Customizing Behavior Methods – Constructors – Polymorphism – Inheritance.

Unit II USER INTERFACE APPLICATIONS IN PYTHON AND VERSION CONTROL SYSTEM 9

Wxpython installation – Menus and Toolbars – Layout Management – Wxpython Events – Wxpython Dialogs – Widgets – Graphics – Collaborative Version Control Systems – Git Commands – Real Time Usage of Git Commands.

Unit III FLASK FRAMEWORK FOR WEB DEVELOPMENT 9

Flask Basics – Routes – Templates – Control Flow – Inheritance – Forms – Modules – Connection with Databases – Relational Database versus NoSQL – Modeling – Mapping Classes to Mongodb – Building Data Layer with Mongo Engine.

Unit IV REAL TIME DEPLOYMENT OF WEB APPLICATION 9

Deploy Web Applications with Flask and MongoDB – Example Applications – Blogs – Forums – Auto Evaluation of Student Assignments – Deployment Using AWS or Google Cloud or Heroku.

Unit V DEPLOYMENT OF SOFTWARE IN LINUX AND WINDOWS PLATFORM 9

Deployment in Ubuntu Distribution – Creation of .Deb Executable File – Deployment in Windows – Creation of Standalone Executable – Test Cases.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mark Lutz	Learning Python	O' Reilly	2013
2.	Scott Chacon and Ben Straub	Pro Git	Apress	2016
3.	Miguel Grinberg	Flask Web Development Developing Web Applications with Python	OReilly	2014

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Karl Seguin	The Little Mongo DB Book	Syncfusion Ltd	2006
2.	Gareth Dwyer	Flask by Example	Packt Publishers	2016

Web URL(s):

1. http://zetcode.com/wxpython/
2. https://github.com/karlseguin/the-littlemongodb-book.
3. https://aws.amazon.com/education/awseducate/
4. http://packaging.ubuntu.com/html/packaging-new-software.html
5. http://www.pyinstaller.org/
6. https://pypi.org/project/py2exe/0.9.2.0/

U19CST52	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
	(Common to CSE & IT)	3	0	0	3

Pre-Requisites : Software Engineering and Modeling

Objectives:

- To develop an awareness of the need for project planning and management.
- To know about software effort estimation and activity planning.
- To explore risk and people management.
- To learn about project monitoring and control mechanisms.
- To know about software quality management.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Differentiate between various software process models.

CO2 : Prepare project planning documents.

CO3 : Estimate the software cost for projects.

CO4 : Perform effective activity planning.

CO5 : Perform software quality management activities.

Unit I INTRODUCTION 9

Project – Software Projects versus Other Types of Project – Contract Management and Technical Project Management – Activities – Plans, Methods and Methodologies – Requirement Specification – Management Control – Overview of Project Planning – Introduction to Step Wise Project Planning – Programme Management and Project Evaluation.

Unit II SOFTWARE EFFORT ESTIMATION AND ACTIVITY PLANNING 9

Software Effort Estimation: Problems with Over and Under Estimates – Basis of Software Estimating – Techniques – Expert Judgment – Cosmic Full Function Points – A Procedural Code Oriented Approach – COCOMO: A Parametric Model – Activity Planning: Objectives – Project Schedules – Projects and Activities – Sequencing and Scheduling Activities – Network Planning Models – Formulating A Network Model – Identifying Critical Path – Shortening the Project Duration – Identifying Critical Activities – Activity-on-arrow Networks.

Unit III SOFTWARE RISK AND PEOPLE MANAGEMENT 9

Categories of Risk – Framework for Dealing with Risk – Risk Identification – Risk Assessment – Risk Planning – Risk Management – Evaluating Risks to the Schedule – Applying the PERT Technique – Monte Carlo Simulation – Critical Chain Concepts – Resource Allocation: Nature of Resources – Identifying Resource Requirements – Scheduling Resources – Creating Critical Paths – Counting the Cost – Cost Schedules – Scheduling Sequence.

Unit IV SOFTWARE PROJECT MONITORING AND CONTROL 9

Creating the Framework – Collecting the Data: Partial Completion Reporting – Risk Reporting – Visualizing Progress: Gantt chart – Slip chart – Ball Charts – The Timeline – Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Getting the Project Back to Target – Change Control.

Unit V SOFTWARE QUALITY MANAGEMENT 9

Managing Contracts: The ISO 12207 Approach, Supply Process, Types, Stages, Contract Management Managing People and Organizing Teams: Understanding Behaviour, Organizational Behaviour, Motivation, The Oldham–Hackman Job Characteristics Model, Decision Making, Leadership, Dispersed And Virtual Teams, Software Quality – Importance, Defining Software Quality, ISO 9126, Software Quality Measures, Product Versus Process Quality Management, External Standards, Quality Plans.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bob Hughes, Mike Cotterell and Rajib Mall	Software Project Management	Tata McGraw Hill	2012
2.	Walker Royce	Software Project Management	Pearson	2005

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S. A. Kelkar	Software Project Management: A Concise Study Paperback	Prentice Hall of India	2013
2..	Ramesh Gopalaswamy	Managing Global Software Projects	Tata McGraw Hill	2001
3.	Ashfaque Ahmed	Software Project Management Process Driven Approach	Auerbach Publications	2011

Web URL(s):

1. https://nptel.ac.in/courses/106/105/106105218/
2. https://freevideolectures.com/course/4071/nptel-software-project-management/1

U19CST53	HUMAN COMPUTER INTERACTION	L	T	P	C
	(Common to CSE & IT)	3	0	0	3

Pre-Requisites : Nil

Objectives:

- Co-relate the Human input-output channels and identify the suitable methods and devices for Human Computer Interaction.
- Develop the models for interaction design for an application.
- Apply the software engineering principles for Human Computer Interaction.
- Apply the concept of implementation support and design the evaluation techniques for Interactions.
- Analyze the cognitive models and explicate the concept of cognitive architecture.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Analyze capabilities of human and computer in terms of human information processing.

CO2 : Develop the models for interaction design for an application.

CO3 : Apply the software engineering principles for Human Computer Interaction.

CO4 : Apply the concept of implementation support and design the evaluation techniques for Interactions.

CO5 : Analyze the cognitive models and explicate the concept of cognitive architecture

Unit I HCI FOUNDATIONS 9

HCI Foundations: Input–output channels - Human memory - Thinking: reasoning and problem solving - Emotion - Individual differences - Psychology and the design of interactive systems - Text entry devices - Positioning - pointing and drawing - Display devices - Devices for virtual reality and 3D interaction - Physical controls - sensors and special devices - Paper: printing and scanning.

Unit II INTERACTION 9

Designing - Programming Interactive systems - Models of interaction - Frameworks and HCI - Ergonomics - Interaction styles - Elements of the WIMP interface - The context of the interaction - Experience - engagement and fun - Paradigms for interaction. Cantered Design and testing - Interaction design basics - The process of design - User focus - Scenarios - Navigation design - Screen design and layout, Iteration and prototyping.

Unit III SOFTWARE PROCESS AND IMPLEMENTATION SUPPORT 9

HCI in the software process - Iterative design and prototyping - Design rules - Principles to support usability - Standards and Guidelines - Golden rules and heuristics - HCI patterns. Implementation support - Elements of windowing systems - Programming the application - Using toolkits - User interface management systems.

Unit IV EVALUATION TECHNIQUES 9

Evaluation techniques - Evaluation through expert analysis - Evaluation through user participation - Universal design - User support. Models and Theories - Cognitive models - Goal and task hierarchies - Linguistic models - The challenge of display-based systems - Physical and device models - Cognitive architectures.

Unit V MODELS AND THEORIES 9

Collaboration and communication - Face-to-face communication - Conversation - Text-based communication - Group working - Dialog design notations - Diagrammatic notations - Textual dialog notations - Dialog semantics - Dialog analysis and design Human factors and security - Groupware - Meeting and decision support systems - Shared applications and artifacts - Frameworks for groupware - Implementing synchronous groupware - Mixed - Augmented and Virtual Reality.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Alan Dix, Janet Finlay, G D Abowd and Russel Beale	Human Computer Interaction	Pearson Education	2008.
2.	Shneiderman, Plaisant, Cohen, Jacobs	Designing the User Interface: Strategies for Effective Human Computer Interaction	Pearson Publishers	2010

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ben Shneiderman,	Designing the user interface	Addison Wesley	1998
2.	Wilbent. O. Galitz	The Essential Guide To User Interface Design	John Wiley& Sons	2001
3.	Faulkner Christine	The Essence of Human Computer Interaction	Pearson Education, First Impression	2011

Web URL(s):

1. https://nptel.ac.in/courses/106/103/106103115/
2. https://nptel.ac.in/courses/106/106/106106177/

U19CST54	PATTERN RECOGNITION	L	T	P	C
	(Common to CSE & IT)	3	0	0	3

Pre-Requisites : Data Mining

Objectives:

- To provide basic knowledge about the fundamentals of pattern recognition and its applications.
- To understand about unsupervised algorithms suitable for pattern classification.
- To familiarize with the feature selection algorithms and methods of implementing them in applications.
- To learn about the basis of algorithms used for training and testing the dataset.
- To learn basic fuzzy system and neural network architectures, for applications in pattern recognition, image processing, and computer vision.

Course Outcomes:
At the end of this course students will demonstrate the ability to

CO1 : Implement basic pattern classifier algorithms.

CO2 : Have knowledge about the working principle of unsupervised algorithms.

CO3 : Have knowledge about functionality of classifiers.

CO4 : Apply SVM and HMM algorithms for real time applications.

CO5 : Implement advanced methodologies over image processing applications.

Unit I PATTERN CLASSIFIER 9

Overview of Pattern Recognition – Discriminant Functions – Supervised Learning – Parametric Estimation – Maximum Likelihood Estimation – Bayes Theorem – Bayesian Belief Network, Naive Bayesian Classifier.

Unit II CLUSTERING 9

Clustering Concept – Hierarchical Clustering Procedures – Partitional Clustering – Clustering of Large Data Sets – EM Algorithm – Grid Based Clustering – Density Based Clustering.

Unit III FEATURE EXTRACTION AND SELECTION 9

Entropy Minimization – Karhunen Loeve Transformation – Feature Selection Through Functions Approximation – Binary Feature Selection – K-NN.

Unit IV HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINES 9

State Machines – Hidden Markov Models: Maximum Likelihood for the HMM, The Forward and Backward Algorithm, Sum-Product Algorithm for the HMM, Scaling Factors, The Viterbi Algorithm, Extensions Of The Hidden Markov Model – Support Vector Machines: Maximum Margin Classifiers, Relevance Vector Machines.

Unit V RECENT ADVANCES 9

Fuzzy Classification: Fuzzy Set Theory, Fuzzy And Crisp Classification, Fuzzy Clustering, Fuzzy Pattern Recognition – Introduction to Neural Networks: Elementary Neural Network For Pattern Recognition, Hebbnet, Perceptron, ADALINE, Back Propagation.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Andrew Webb	Statistical Pattern Recognition	Arnold publishers	1999
2.	Duda R. O., Hart P. E. and Stork D. G	Pattern Classification	John Wiley	2003

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bishop C. M	Pattern Recognition and Machine Learning	Springer	2006
2.	S.Theodoridis and K.Koutroumbas	Pattern Recognition	Academic Press	2009
3.	Menahem Friedman, Abraham Kandel	Introduction to Pattern Recognition Statistical, Structural, Neural and Fuzzy Logic Approaches	World Scientific publishing Co. Ltd	2000

Web URL(s):

1. https://nptel.ac.in/courses/106/106/106106046/
2. https://nptel.ac.in/courses/106/108/106108057/

U19CST55	MACHINE LEARNING	L	T	P	C
	(Common to CSE & IT)	3	0	0	3

Pre-Requisites : Data Warehousing and Data Mining

Objectives:

- To understand the basic concepts of machine learning and probability theory.
- To appreciate supervised learning and their applications.
- To understand unsupervised learning like clustering and EM algorithms.
- To understand the theoretical and practical aspects of probabilistic graphical models.
- To learn other learning aspects such as reinforcement learning, representation learning, deep learning, neural networks and other technologies.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Choose and implement classification or regression algorithms for an application using an open source tool.

CO2 : Implement probabilistic discriminative and generative algorithms for an application and analyze the results.

CO3 : Use a tool to implement typical clustering algorithms for different types of applications.

CO4 : Design and implement an HMM for a sequence model type of application.

CO5 : Implement appropriate learning algorithms for any real time application using an open source tool.

Unit I INTRODUCTION **9**

Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – Testing Machine Learning Algorithms – A Brief Review of Probability Theory – Turning Data into Probabilities – The Bias-Variance Tradeoff.

Unit II SUPERVISED LEARNING **9**

Linear Models for Regression – Linear Basis Function Models – The Bias-Variance Decomposition – Bayesian Linear Regression – Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression – Linear Models for Classification – Discriminant Functions – Probabilistic Generative Models – Probabilistic Discriminative Models – Laplace Approximation – Bayesian Logistic Regression – Common Classification Algorithms – k-Nearest Neighbors – Decision Trees – Random Forest model – Support Vector Machines.

Unit III UNSUPERVISED LEARNING **9**

Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models – Spectral Clustering – Hierarchical Clustering – The Curse of Dimensionality – Dimensionality Reduction – Principal Component Analysis – Latent Variable Models(LVM) – Latent Dirichlet Allocation (LDA).

Unit IV GRAPHICAL MODELS **9**

Bayesian Networks – Conditional Independence – Markov Random Fields – Learning – Naive Bayes Classifiers – Markov Model – Hidden Markov Model.

Unit V ADVANCED LEARNING **9**

Reinforcement Learning – Representation Learning – Neural Networks – Active Learning – Ensemble Learning – Bootstrap Aggregation – Boosting – Gradient Boosting Machines – Deep Learning.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ethem Alpaydin	Introduction to Machine Learning	Prentice Hall of India	2015
2.	Kevin P. Murphy	Machine Learning: A Probabilistic Perspective	MIT Press	2012
3	Tom Mitchell	Machine Learning	McGraw-Hill	2017

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stephen Marsland	Machine Learning – An Algorithmic Perspective	CRC Press	2014
2.	Fabio Nelli	Python Data Analytics with Pandas, Numpy, and Matplotlib	Apress	2018

Web URL(s):

1. https://nptel.ac.in/courses/106/106/106106139/
2. https://onlinecourses.nptel.ac.in/noc21_cs24/preview

U19CST56	DIGITAL IMAGE PROCESSING	L	T	P	C
	(Common to CSE & IT)	3	0	0	3

Pre-Requisites : Nil

Objectives:

- To understand the image processing concepts and analysis
- To get exposed to simple image transformation techniques
- To learn concepts of Spatial and Frequency domain and restoration techniques
- To study the image segmentation and representation techniques.
- To become familiar with image construction and projection methods

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, and quantization.

CO2 : Understand the concept of 2D-transforms in image processing.

CO3 : Operate on images using the techniques of smoothing, sharpening and enhancement.

CO4 : Learn the basics of segmentation, features extraction, compression and recognition methods for color models.

CO5 : Understand the use of image reconstruction and projection for image analysis

Unit I Fundamentals of Image Processing **9**

Introduction- Need for Image Processing- Steps involved in image processing- Elements of visual perception - Image sensing and Acquisition – Image Sampling and Quantization – Imaging geometry, discrete image mathematical characterization.

Unit II Image Transformation **9**

Two-dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse FFT, Discrete cosine transform and KL transform-Discrete Short time Fourier Transform- Wavelet Transform- Discrete wavelet Transform- and its application in Compression

Unit III Image Enhancement-Restoration **9**

Spatial Domain: Basic relationship between pixels- Basic Gray level Transformations – Histogram Processing – Smoothing - Sharpening spatial filters. Frequency Domain: Filtering-smoothening and sharpening frequency domain filters-Hormonic Filtering. Overview of Degradation models –Unconstrained and constrained restorations-Inverse Filtering, Wiener Filter.

Unit IV Image Segmentation and Morphology **9**

Detection of discontinuities – Edge linking and Boundary detection- Thresholding- -Edge based segmentation- Region based Segmentation- matching-Advanced optimal border and surface detection- Use of motion in segmentation. Image Morphology – Boundary descriptors- Regional descriptors.

Unit V Image Reconstruction and Projections **9**

Need- Radon Transform – Back projection operator- Projection Theorem- Inverse Radon Transform.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rafael C.Gonzalez & Richard E.Woods	Digital Image Processing	Pearson Education	2004
2.	Anil.K.Jain	Fundamentals of Digital Image Processing	Pearson Education	2003

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	B.Chanda & D.Dutta Majumder	Digital Image Processing and Analysis	Prentice Hall of India	2002
2.	William K. Pratt	Digital Image Processing	John Wiley & Sons	2004

Web URL(s):

1. https://nptel.ac.in/courses/117/105/117105079/
2. https://nptel.ac.in/courses/106/105/106105032/

U19CST57	GAME PROGRAMMING	L	T	P	C
	(Common to CSE & IT)	3	0	0	3

Pre-Requisites : Nil

Objectives:

- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of game engine.
- To survey the gaming development environment and toolkits.
- To learn and develop simple games using Pygame environment.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Have knowledge on the concepts of 2D and 3D graphics.

CO2 : Know about games and their genres with their origin and history.

CO3 : Prepare game design documents.

CO4 : Understand the implementation of gaming engines.

CO5 : Survey gaming environments and frameworks.

Unit I 3D GRAPHICS FOR GAME PROGRAMMING 9

Game – Definition – Genres of Games, Basics of 2D and 3D Graphics, Game Objects Design – 2D and 3D Transformations – Projections – Colour Models – Illumination and Shader Models – Animation – Controller based Animation.

Unit II GAME DESIGN PRINCIPLES 9

Character Development, Storyboard Development for Gaming – Script Design – Script Narration –Game Balancing –Core Mechanics – Principles of Level Design – Proposals – Writing for Pre-production, Production and Post-Production.

Unit III GAME ENGINE DESIGN 9

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine – Collision Detection – Game Logic – Game AI – Path Finding.

Unit IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS 9

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity – Single player and Multi-Player games.

Unit V GAME DEVELOPMENT USING PYGAME 9

Developing 2D and3D Interactive Games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating Music and Sound – Asset Creations – Game Physics Algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based Games – Overview of Puzzle Games.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Sanjay Madhav	Game Programming Algorithms and Techniques: A Platform Agnostic Approach	Addison-Wesley Professional	2013

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Will McGugan	Beginning Game Development with Python and Pygame: From Novice to Professiona	Apress Publishers	2007
2.	Paul Craven	Python Arcade games	Apress Publishers	2018
3.	David H. Eberly,	3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics	CRC Press	2006
4.	Jung Hyun Han	3D Graphics for Game Programming	Chapman and Hall/CRC	2011

Web URL(s):

1. https://nptel.ac.in/courses/110/104/110104063/
2. https://nptel.ac.in/courses/110/101/110101133/

U19CST58	BLOCKCHAIN TECHNOLOGY AND CRYPTOCURRENCY	L	T	P	C
		3	0	0	3

Pre-Requisites : NIL

Objectives:

- To understand the concept of Block chain
- To learn about Bitcoin, Cryptocurrency
- To Explore the concepts of Ethereum
- To learn about Hyper Ledger Fabric model and its architecture
- To integrate ideas from blockchain technologies into projects.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand the basic concepts of Block chain.

CO2 : Explain the functional / Operational aspects of Cryptocurrency Ecosystem

CO3 : Developing application using Ethereum.

CO4 : Build model for Block Chain Technology.

CO5 : Integrate idea of creating Hyperledger using web 3.

Unit I Introduction **9**

Block Chain - History of Blockchain - Types of Block Chain - Consensus - CAP Theorem and Block Chain - Decentralization using Blockchain - Block Chain and Full Ecosystem Decentralization - Platform for Decentralization

Unit II Blockchain Basics **9**

Bitcoin blockchain, the challenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use.

Unit III Introduction to Cryptocurrency **9**

Bitcoin - Digital keys and addresses - Transitions - Mining - Bitcoin Network and Payments - Wallets-Bitcoin Payment Alternative coins- Theatrical Foundations- Bitcoin limitation – Name coin-Lite coin-Prime coin- Zcash-Smart contracts-Ricardian contracts

Unit IV Smart Contracts and Ethereum **9**

Smart Contracts: Definition, Ricardian contracts - Introduction -Ethereum network -Components of the Ethereum ecosystem -Programming Languages- Ethereum Development Environment - Development Tools and Frameworks Illustrative: Setup the Ethereum development environment

Unit V Web3 and Hyperledger **9**

Introduction to Web3 - Contract Deployment - Development Frameworks - Hyper Ledger as a protocol - Reference Architecture – Hyper Fabic – Sawtooth Lake - Corda. Illustrative: Creating and deploying a business network on Hyper ledger composer playground, Implementation of business network on Hyper ledger composer playground, Implementation of Business network in Blockchain using Hyper Ledger Fabric.

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	.AImran Bashir	Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart	Kindle	2018

		Contracts Explained", Second Edition		
2.	Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder	"Bitcoin and Cryptocurrency Technologies: A comprehensive Introduction "	Princeton University Press	2016

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Shukla, M. Dhawan, S. Sharma, S. Venkatesan	'Blockchain Technology: Cryptocurrency and Applications'	Oxford University Press	2019
2.	Josh Thompson	'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming'	Create Space Independent Publishing Platform	2017
3.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder	Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction	Princeton University Press	2016

Web URL(s):

1. https://nptel.ac.in/courses/106/104/106104220/
2. https://nptel.ac.in/courses/106/105/106105184/

U19CST68	AGILE SOFTWARE DEVELOPMENT	L	T	P	C
	(Common to CSE & IT)	3	0	0	3

Pre-Requisites : Software Engineering and Modelling

Objectives:

- To develop an understanding on agile software development
- To learn about the principles, planning and requirement in agile software development
- To understand the testing methodologies in agile software development
- To explore the metrics and measurement in agile software development

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Apply design principles and refactoring to achieve Agility.

CO2 : Analyze automated build tools, version control and continuous integration.

CO3 : Perform testing activities within an Agile project.

CO4 : Finding initial product backlog items as user stories, order your product backlog.

CO5 : Choose the size of the backlog items and perform sprint planning.

Unit I FUNDAMENTALS OF AGILE 9

The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools

Unit II AGILE SCRUM FRAMEWORK 9

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management.

Unit III AGILE TESTING 8

The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), Unit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester

Unit IV AGILE SOFTWARE DESIGN AND DEVELOPMENT 10

Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control

Unit V AGILE INDUSTRY TRENDS 9

Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David J. Anderson and Eli Schragenheim	Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results	Prentice Hall	2003
2.	Hazza and Dubinsky	Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖	Springer	2009

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Craig Larman,	Agile and Iterative Development: A Managers Guide	Addison-Wesley	2004
2.	Kevin C. Desouza	Agile Information Systems: Conceptualization, Construction, and Management‖	Butterworth-Heinemann	2007

Web URL(s):

1. www.it-ebooks.info/tag/agile
2. http://martinfowler.com/agile.html

U19CST69	SOFTWARE TESTING	L	T	P	C
	(Common to CSE & IT)	3	0	0	3

Pre-Requisites : Software Engineering Concepts, Programming using Java

Objectives:

- To learn software testing life cycle and its process.
- Understand the process of static testing and test design techniques.
- Know in details about risk and defect management techniques.
- Understand the importance of test data Management in Excel.
- To learn practically about automated tools used for software testing.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1 : Understand complete software testing life cycle and Demonstrate understanding of various terms and technologies used in testing domain.

CO2 : Demonstrate understanding of generating test plan and designing test cases.

CO3 : Demonstrate understanding of defect management life cycle and ability to use an open source tool for defect management.

CO4 : Demonstrate understanding of test management process. Given a business scenario, identify and write the test plan, design test cases, document test cases using an open source test management tool.

CO5 : Demonstrate understanding of automation testing. Given an web application for testing, create test script and execute automated tests using an open source automation testing tool.

Unit I Introduction To Testing – Software Testing Life cycle 9

Introduction to Testing – Need of Testing –Testing Principle- Role of Tester, Psychology of Testing and Quality-Verification and validation. Overview of STLC-V-Model- SDLC vs STLC, different stages in STLC, document templates generated in different phases of STLC, Levels of testing –Component testing –integration testing-System testing-acceptance testing- Test types-functional –nonfunctional-structural testing

Unit II Static Testing and Test Design Techniques 9

Static testing and dynamic testing, reviews-roles and responsibilities –types of review walkthroughs-Technical review-Inspection –Static analysis tools. Various test categories, test design techniques for different categories of tests-White box –black box-Experienced based testing Designing test cases using MS-Excel.

Unit III Test and Defect Management 9

Test plan –Estimate and Strategies-Risk-level of risk –product risk –project risk-Incident Management. Documenting test plan and test case, effort estimation, configuration management, project progress management. Use of Testopia for test case documentation and test management. Test Execution, logging defects, defect lifecycle, fixing / closing defects. Use of Bugzilla for logging and tracing defects

Unit IV Test Data Management 7

Test Data Management –Overview, Why Test Data Management, Test Data Types, and Need for Test Data Setup, Test Data Setup Stages, and Test data management Challenges. Creating sample test data using MS-Excel

Unit V Automation testing 11

Introduction to automation testing, why automation, what to automate, tools available for automation testing. Introduction to Selenium, using Selenium IDE for automation testing, using Selenium Web driver for automation testing, understanding TestNG framework with Selenium Web driver for automation testing

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rex Black	Managing the Testing Process (2nd edition)	John Wiley & Sons	2001
2	Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black	Foundations of software testing	Cengage	2018
3	Elfriede Dustin	Implementing Automated Software Testing: How to Save Time and Lower Costs While Raising Quality	Pearson	2009

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	M.G.Limaye	Software Testing – Principles, Techniques and Tools	Tata McGraw-Hill	2009
2.	Paul C. Jorgensen	Software Testing – A Craftsman's approach	Third edition, Auerbach Publications	2010.
3.	Rahul Shende	Software Automation Testing Tools for Beginners	Shroff Publishers and Distributors	2012

Web URL(s):

1. http://docs.seleniumhq.org/docs/
2. http://www.seleniumhq.org/download/

U19CST70	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

Pre-Requisites : Programming in Java

Objectives:

- Describing the mobile and android platform and its architecture
- Create basic user interface of Android app and compose tablet UI using Fragments and action bar
- Design and implement long-running tasks using Threads, AsyncTask, and Services, Design and implement components that respond to system events.
- Design apps that adapt to multiple screen densities and sizes, Apply graphics and animation capabilities to an app
- Identify the app features that need to be tested and Validated, Prepare an app for publishing, package, sign, optimize and Distribute the app on online app stores

Course Outcomes:
At the end of this course students will demonstrate the ability to

CO1 : Appreciate the Mobility landscape

CO2 : Familiarize with Mobile apps development aspects

CO3 : Design and develop mobile apps, using Android as development platform, with key focus on user experience design, native data handling and background tasks and notifications.

CO4 : Appreciation of nuances such as native hardware play, location awareness, graphics, and multimedia.

CO5 : Perform testing, signing, packaging and distribution of mobile apps

Unit I GETTING STARTED WITH MOBILITY AND ANDROID 9

Introduction, Mobility panorama, landscape, Mobile platforms, App development approaches, Overview of Android platform, setting up the mobile app development environment along with an emulator, Learning with an application, a case study on Mobile app development, Mobile app development challenges

Unit II BUILDING BLOCKS OF MOBILE APP 9

App User Interface- Activity states, Life cycle methods, User interface resources – Layout, string and image resources, UI Elements and Events – Event handling paradigm, UI elements, Interaction Among Activities, Navigating Between Activities, Fraction and Action Bar

Unit III APP FUNCTIONALITY 9

App Functionality – Beyond UI, Threads, Async task, Service, States and Life cycle method., Persistence and access of app data - Flat files, Native data handling – on-device file I/O, Shared preferences, Relational Data, Data sharing Across Apps, Enterprise data

Unit IV SPRUCING UP 9

Graphics and Animation – Android Graphics, Android animation, Multimedia – Audio, Video and Images, Playback, capture and storage – Built in app and In app mechanism, Location Services – tracking and locating the users, Retrieving the location address, Maps – adding and making maps interactive, Sensors- Sensors in android, Identifying and monitoring sensors, Motion, position and environmental sensors

Unit V TESTING AND MOVING THE APPS TO THE MARKET 9

Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps, JUnit for Android, Robotium, Publishing apps - Versioning, signing and packaging mobile apps, distributing apps on mobile market place

Total Periods: 45

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Composing Mobile Apps, Learn, Explore, Apply using android	Anubhav Pradhan, Anil V Deshpande	Wiley India Pvt Ltd	2013

Reference Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Barry Burd, John Paul Mueller	Android Application Development All in one for Dummies	Wiley India Pvt Ltd	2020
2.	Carmen Delessio, Lauren Darcey, Shane Conder	Android Application Development in 24 Hours	Sams; 4th edition	2015

Web URL(s):

1. https://sempercon.com/mobile-app-development-resource-guide/