R.V.R & J.C.COLLEGE OF ENGINEERING (Autonomous)

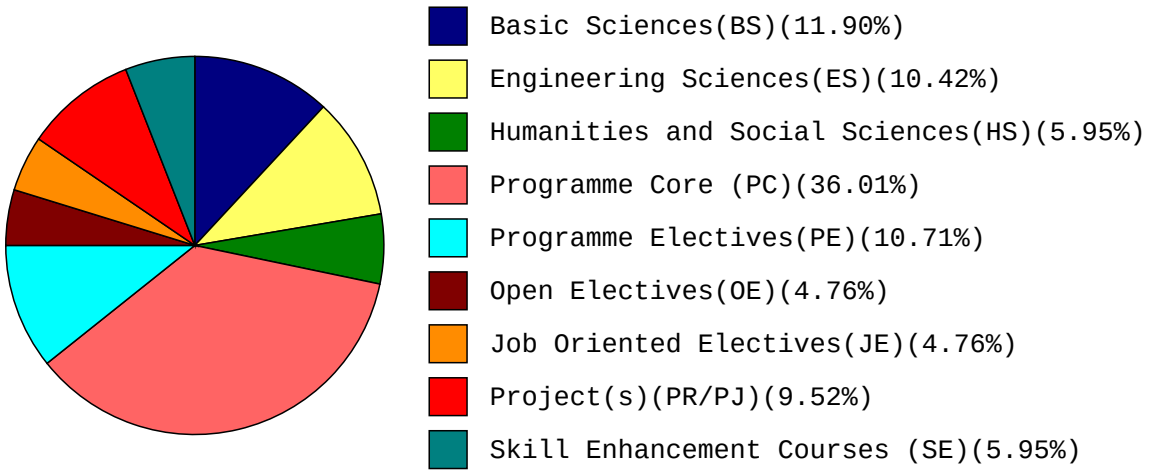
DEPARTMENT OF INFORMATION TCHNOLOGY

B.TECH. INFORMATION TCHNOLOGY

(w.e.f. the batch of students admitted from the academic year 2024-2025)

Programme curriculum (R24) grouping based on course components

Course Component	Curriculum Content (% of total number of credits in programme)	Total number of contact hours	Total number of credits
Basic Sciences (BS)	12.5	23	20
Engineering Sciences (ES)	10.94	22	17.5
Humanities and / Social Sciences (HS)	6.25	12	10
Professional Core (PC)	37.81	76	60.5
Professional Elective(s) (PE)	11.25	17	18
Open Elective(s) (OE)	5	6	8
Job Oriented Elective(s) (JE)	0		0
Project(s) (PR/PJ)	10	22	16
Skill Enhancement Course(s) (SEC)	6.25	17	10
Mandatory Course(s) (MC)	--	6	--
Total number of Credits			160



R.V.R & J.C.COLLEGE OF ENGINEERING (Autonomous)

B.TECH. INFORMATION TCHNOLOGY

Course Structure, Scheme of Instruction (R24) and Examination

(w.e.f. the batch of students admitted from the academic year 2024-2025)

Three Weeks Orientation Programme is Mandatory before starting Semester I [First Year]

Semester I [First Year] **COURSE STRUCTURE**

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category Code
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	
			L	T	P	SES	EXT		
1	IT/CD/CM/ CO/CS111	Linear Algebra, Calculus and Differential Equations	3	-	-	30	70	3.0	BS
2	IT/CD/CO/ CS112	Engineering Physics	3	-	-	30	70	3.0	BS
3	IT/CD/CM/ CO/CS113	Basic Electrical and Electronics Engineering	3	-	-	30	70	3.0	ES
4	IT/CD/CM/ CO/CS/EC114	Programming for Problem Solving	4	-	-	30	70	4.0	ES
5	IT151	Engineering Physics Lab	-	-	2	30	70	1.0	BS
6	IT152	Basic Electrical and Electronics Engineering Lab	-	-	2	30	70	1.0	ES
7	IT153	Programming for Problem Solving Lab	-	-	3	30	70	1.5	ES
8	IT/CD/CM/ CO/CS154	Engineering Graphics	1	-	2	30	70	2.0	ES
9	IT/CB/CO/ CM/CD/CS155	NSS / NCC / Community Service	-	-	1	30	70	0.5	BS
		TOTAL	**14**	**0**	**10**	270	630	**19**	TPW-24

Semester II [First Year] **COURSE STRUCTURE**

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category Code
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	
			L	T	P	SES	EXT		
1	IT/CD/CM/ CO/CS121	Integral caliculus and Transforms	3	-	-	30	70	3.0	BS
2	IT/CD/CO/ CS122	Engineering Chemistry	2	-	-	30	70	2.0	BS
3	IT/CD/CM/ CO/CS123	Communicative English	2	-	-	30	70	2.0	HS
4	IT/CD/CO/ CM/CS124	Digital Logic Design	3	-	-	30	70	3.0	ES
5	IT/CB/CM/ CO/CS125	Python Programming	2	-	-	30	70	2.0	ES
6	IT/CD/CO/ CS126	Data Structures	4	-	-	30	70	4.0	PC
7	IT161	Engineering Chemistry Lab	-	-	2	30	70	1.0	BS
8	IT162	Communicative English Lab	-	-	2	30	70	1.0	HS
9	IT163	Python Programming Lab	-	-	2	30	70	1.0	ES
10	IT164	Data Structures Lab	-	-	3	30	70	1.5	PC
11	IT/CB/CD/ CO/CS165	Health and Wellness, Yoga and Sports	-	-	1	30	70	0.5	BS
		TOTAL	**16**	**0**	**10**	330	770	**21**	TPW-26

Semester III [Second Year] **COURSE STRUCTURE**

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category Code
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	
			L	T	P	SES	EXT		
1	IT/CD/CM/ CO/CS211	Probability, Statistics & Complex Analysis	3	-	-	30	70	3.0	BS
2	IT/CB/CD/ CM/CO/CS212	Universal Human Values-II Understanding Harmony	2	-	-	30	70	2.0	HS
3	IT/CD/CM/ CO/CS213	Discrete Mathematical Structures	3	-	-	30	70	3.0	PC
4	IT/CD/CM/ CO/CS214	Computer Organization	3	-	-	30	70	3.0	PC
5	IT/CB/CM/ CO/CS215	Design and Analysis of Algorithms	3	-	-	30	70	3.0	PC
6	IT/CB/CD/ CM/CO/CS216	Object Oriented Programming	3	-	-	30	70	3.0	PC
7	IT251	Skill Enhancement Course-1	-	-	4	30	70	2.0	SEC
8	IT252	Design and Analysis of Algorithms Lab	-	-	3	30	70	1.0	PC
9	IT253	Object Oriented Programming Lab	-	-	3	30	70	1.0	PC
10	MC1	Constitution of India	2	-	-	100	-	0.0	MC
		TOTAL	**19**	**0**	**10**	370	630	**21**	TPW-29

Semester IV [Second Year] **COURSE STRUCTURE**

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category Code
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	
			L	T	P	SES	EXT		
1	IT/CM/CO/ CS221	Computational Statistics	3	-	-	30	70	3.0	BS
2	IT/CB/CD/ CM/CS222	Artificial Intelligence	3	-	-	30	70	3.0	PC
3	IT/CB/CD/ CM/CO/CS223	Database Management Systems	3	-	-	30	70	3.0	PC
4	IT/CB/CD/ CM/CO/CS224	Operating Systems	3	-	-	30	70	3.0	PC
5	IT/CB/CD/ CS225	Software Engineering	3	-	-	30	70	3.0	PC
6	IT261	Skill Enhancement Course-2	-	-	4	30	70	2.0	SEC
7	IT/CB/CD/ CM/CO/CS262	Design Thinking and Innovation	1	-	2	30	70	2.0	HS
8	IT263	Artificial Intelligence Lab	-	-	3	30	70	1.0	PC
9	IT264	Database Management Systems Lab	-	-	3	30	70	1.0	PC
10	MC2	Environmental Science	2	-	-	100	-	0.0	MC
		TOTAL	**18**	**0**	**12**	370	630	**21**	TPW-30
Internship 2 weeks (Mandatory) during summer vacation (to be evaluated during next semester)									
Honors/Minor course (Maximum Two courses can be registered)			**3**	**-**	**-**	**30**	**70**	**3**	HR/MR

Semester V [Third Year] **COURSE STRUCTURE**

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category Code
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	
			L	T	P	SES	EXT		
1	IT/CS311	Automata Theory and Formal Languages	3	-	-	30	70	3.0	PC
2	IT/CB/CD/ CS312	Computer Networks	3	-	-	30	70	3.0	PC
3	IT313	Professional Elective-I	3	-	-	30	70	3.0	PE
4	IT314	Professional Elective-II	3	-	-	30	70	3.0	PE
5	IT315	Open Elective-I	3	-	-	30	70	3.0	OE
6	IT/CS316	Web Technologies	3	-	-	30	70	3.0	PC
7	IT351	Skill Enhancement Course-3 (Isp Coding-I)	-	1	2	30	70	2.0	SEC
8	IT352	Summer Internship	-	-	-	30	70	1.0	PJ
9	IT353	Tinkering Lab	-	-	2	30	70	1.0	PC
10	IT354	Web Technologies Lab	-	-	2	30	70	1.0	PC
11	IT355	Data Analysis Lab	-	-	2	30	70	1.0	PC
		TOTAL	**18**	**1**	**8**	330	770	**24**	TPW-27
Honors/Minor course (Maximum Two courses can be registered)			**3**	**-**	**-**	**30**	**70**	**3**	HR/MR

Semester VI [Third Year] **COURSE STRUCTURE**

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category Code
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	
			L	T	P	SES	EXT		
1	IT/CB/CM/ CS321	Cryptography and Network Security	3	-	-	30	70	3.0	PC
2	IT/CS322	Full Stack	3	-	-	30	70	3.0	PC
3	IT323	Machine Learning	3	-	-	30	70	3.0	PC
4	IT324	Professional Elective-III	3	-	-	30	70	3.0	PE
5	IT325	Professional Elective-IV	3	-	-	30	70	3.0	PE
6	IT326	Open Elective-II	3	-	-	30	70	3.0	OE
7	IT361	Skill Enhancement Course-4 (Isp Coding-2)	-	1	2	30	70	2.0	SEC
8	IT362	Full Stack Lab	-	-	2	30	70	1.0	PC
9	IT363	Machine Learning Lab	-	-	2	30	70	1.0	PC
10	MC3	Technical Paper Writing and IPR	-	-	2	100	-	0.0	MC
		TOTAL	**18**	**1**	**8**	370	630	**22**	TPW-27
Internship 4 weeks (Mandatory) during summer vacation (to be evaluated during next semester)									
Honors/Minor course (Maximum Two courses can be registered)			**3**	**-**	**-**	**30**	**70**	**3**	HR/MR

Semester VII [Fourth Year] **COURSE STRUCTURE**

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category Code
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	
			L	T	P	SES	EXT		
1	IT411	Humanities Elective	3	-	-	30	70	3.0	HS
2	IT/CS412	Compiler Design	3	-	-	30	70	3.0	PC
3	IT413	Professional Elective-V	3	-	-	30	70	3.0	PE
4	IT414	Professional Elective-VI (MOOCs)	-	-	-	-	100	2.0	PE
5	IT415	Open Elective-III (MOOCs)	-	-	-	-	100	2.0	OE
6	IT451	Skill Enhancement Course-5	-	1	2	30	70	2.0	SEC
7	IT452	Summer Internship-2	-	-	-	30	70	2.0	PJ
8	IT453	IoT Lab	-	-	2	30	70	1.0	PC
9	IT454	Professional Elective-IV Lab	-	-	2	30	70	1.0	PE
10	IT455	Term Paper	-	-	2	100	-	1.0	PJ
		TOTAL	**9**	**1**	**8**	310	690	**20**	TPW-18
Honors/Minor course (Maximum Two courses can be registered)			**3**	**-**	**-**	**30**	**70**	**3**	HR/MR

Semester VIII [Fourth Year] **COURSE STRUCTURE**

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category Code
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	
			L	T	P	SES	EXT		
1	IT461	Internship and Project	-	-	20	30	70	12.0	PJ
		TOTAL	**0**	**0**	**20**	30	70	**12**	TPW-20

Professional Elective Courses

Code No.	Subject Name	Code No.	Subject Name
ITPE11	Interactive Computer Graphics	ITPE12	Agile Software Development
ITPE13	Introduction to Quantum Computing	ITPE14	Advanced Java Programming
ITPE21	Generative AI	ITPE22	Big-Data Analytics
ITPE23	Cyber Security	ITPE24	Parallel Algorithms
ITPE31	Digital Image Processing	ITPE32	Mobile Computing
ITPE33	Software Testing	ITPE34	Devops
ITPE41	Virtual and Augmented Reality	ITPE42	Natural Language Processing
ITPE43	Quantum AI	ITPE44	Soft Computing
ITPE51	Internet of Things	ITPE52	Cloud Computing
ITPE53	Deep Learning	ITPE54	Industry Recommended Elective

Skill Courses

Code No.	Subject Name	Code No.	Subject Name
ITSL1	Employability Skills-I	ITSL2	Employability Skills-II
ITSL3	Industry Standard Coding Practice-I	ITSL4	Industry Standard Coding Practice-II
ITSL7	Skill Orientation Course		

Science & Humanities Elective Courses

Code No.	Subject Name	Code No.	Subject Name

HSEL1	Industrial Management & Entrepreneurship	HSEL2	Economics for Engineers
HSEL3	Introduction to Industrial Management	HSEL4	Project Management & Entrepreneurship

Honors Courses

Note : 1. The subjects opted for Honors should be Advanced type which are not covered in regular curriculum

2. Students has to acquire 12 credits with minimum one subject from each pool.

3. Compulsory MOOC/NPTEL Courses for 06 credits (02 courses@ 3 credits each)

Pool 1

Code No.	Subject Name	Code No.	Subject Name

Pool 2

Code No.	Subject Name	Code No.	Subject Name

Pool 3

Code No.	Subject Name	Code No.	Subject Name

Pool 4

Code No.	Subject Name	Code No.	Subject Name

Open Elective Courses (Offered by other Departments)

Code No.	Subject Name	Code No.	Subject Name
CEOE1	Fundamentals of Building Planning	CEOE2	Remote Sensing and Gis
CEOE3	Disaster Management	CHOE1	Sustainable Engineering
CHOE2	Biofuels	ECOE1	Applied Electronics
ECOE2	Microprocessors & Interfacing	EEOE1	Renewable Energy Sources
EEOE2	Utilization of Electrical Energy	MEOE1	Operations Research
MEOE2	Elements of Robotics		

General Minor Courses (Offered by other Department)

Note : 1. A student can opt any 4 subjects from each pool @ 3 credits per subject.
2. Compulsory MOOC/NPTEL Courses for 06 credits (02 courses@ 3 credits each)

Offered by Civil Engineering

Code No.	Subject Name	Code No.	Subject Name
CEMR1	Geomatics (Survey, GIS & GPS)	CEMR2	Construction Engineering & Management
CEMR3	Fundamentals of Structural Engineering	CEMR4	Water Resource Engineering
CEMR5	Environmental Engineering	CEMR6	Geotechnical Engineering
CEMR7	Transportation Engineering		

Offered by Electronics & Communication Engineering

Code No.	Subject Name	Code No.	Subject Name
ECMR1	Electronics Devices & Circuits	ECMR2	Digital Logic Design
ECMR3	Network Analysis	ECMR4	Electronic Circuit Analysis
ECMR5	Signals and Systems	ECMR6	Microprocessors & Interfacing

Offered by Mechanical Engineering

Code No.	Subject Name	Code No.	Subject Name
MEMR1	Engineering Mechanics	MEMR2	Strength of Materials and Fluid Mechanics
MEMR3	Manufacturing Processes	MEMR4	Concepts of Thermal Engineering
MEMR5	Concepts of Mechanical Design	MEMR6	Computer Aided Design & Manufacturing
MEMR7	Additive Manufacturing		

Industry Track - Minor Courses

Note : 1. A student can opt any 4 subjects from each Track @ 3 credits per subject.
2. Compulsory MOOC/NPTEL Courses for 06 credits (02 courses@ 3 credits each)

Minor in Industrial Automation & Robotics (Offered by Mechanical Engineering)

Code No.	Subject Name	Code No.	Subject Name
ARMR1	Robotic Engineering	ARMR2	Mechatronics and Microcontrollers
ARMR3	Mechanics of Robots	ARMR4	Industrial Automation
ARMR5	Computer Integrated Manufacturing	ARMR6	3D Printing

Minor in Full Stack Development (Offered by Computer Science & Business Systems)

Code No.	Subject Name	Code No.	Subject Name
FSMR1	Client Side Scripting	FSMR2	React Js
FSMR3	C# (.Net Framework)	FSMR4	MEAN stack (MongoDB, Express JS, Angular JS, Node JS)
FSMR5	Web Application Development using Asp		

Minor in VLSI (Offered by Electronics & Communication Engineering)

Code No.	Subject Name	Code No.	Subject Name
VLMR1	HDL Programming	VLMR2	System Verilog and UVM
VLMR3	Physical Design Fundamentals	VLMR4	Low Power VLSI Design
VLMR5	Synthesis and Formal Verification	VLMR6	Advanced Physical Design

Minor in Electric Vehicles (Offered by Electrical & Electronics Engineering)

Code No.	Subject Name	Code No.	Subject Name
EVMR1	Energy Systems and Electrical Machines	EVMR2	Hybrid Electric Vehicles
EVMR3	Plug-in Electric vehicles	EVMR4	Electric Vehicle Power Train
EVMR5	Autotronics	EVMR6	BMS & Charging stations

Minor in Quantum Technolgies (Offered by Computer Science & Business Systems)

Code No.	Subject Name	Code No.	Subject Name
QTMR1	Fundamentals of Quantum Computing	QTMR2	Foundations of Quantum Technologies
QTMR3	Basic Programming Lab	QTMR4	Basic Laboratory Course for Quantum Technologies
QTMR5	Introduction to Quantum Computation	QTMR6A	Introduction to Quantum Communication
QTMR6B	Engineering Foundation of Quantum Technologies	QTMR7	Introduction to Quantum Sensing
QTMR8	Introduction to Quantum Materials		

Department of INFORMATION TCHNOLOGY

Open Electives (Offered to other Departments)

Code No.	Subject Name	Code No.	Subject Name
ITOE1	Data Structures and Algorithms	ITOE2	Web Technologies

IT/CD/CM/ CO/CS111	LINEAR ALGEBRA, CALCULUS AND DIFFERENTIAL EQUATIONS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester I [First Year]

COURSE OBJECTIVES:

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. solve given system of equations using rank method.
2. compute eigen values and eigen vectors of a given matrix.
3. examine given function of two variables for the extreme values using partial differentiation.
4. determine the solution of a given first and higher order differential equations.

UNIT I [CO:1] **(12)**

Vector Space: Definition, subspace; Linear dependence and independence of vectors; Linear Transformations; Rank of a matrix by echelon form, normal form. Consistency of system of linear equations-Homogeneous and Non-Homogeneous equations.

UNIT II [CO:2] **(12)**

Eigenvalues, Eigenvectors of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem. Diagonal form, Reduction of Quadratic form to canonical form by Orthogonal Transformation. Properties of complex matrices - Hermitian, skew Hermitian and Unitary matrices.

UNIT III [CO:3] **(12)**

Differential Calculus: Taylor's and Maclaurin's series expansion of functions of single variable. Partial differentiation, Euler's theorem on homogeneous functions, total derivative, change of variables, Maxima and minima of two variables, Lagrange method of multipliers.

UNIT IV [CO:4] **(12)**

Ordinary Differential Equations: Solution of first order ODE-exact equations and equations reducible to exact form, orthogonal trajectories. Higher order linear differential equations with constant coefficients - homogenous and non-homogenous: e^{ax}, sin(ax+b), cos(ax+b), Wronskian, Method of variation of parameters, Cauchy's differential equations.

LEARNING RESOURCES:

TEXT BOOK:

B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.

REFERENCE BOOK(s):

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2018.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 5th Edition 2016.

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/

IT/CD/CO/ CS112	ENGINEERING PHYSICS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester I [First Year]

COURSE OBJECTIVES:

1. To understand the concept of wave and particle nature of matter and the basics of semiconductors.
2. Enlightening the modern optics such as lasers and optical fibers.
3. Identifying optoelectronic devices and low dimensional structures for various applications.
4. Explain the novel concepts of Sensors and its applications.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. familiarize the Quantum Mechanical concepts, semiconductors and their uses.
2. Identify and illustrate types of lasers, optical fibers and thier applications.
3. demonstrate various optoelectronic devices, importance of low dimensional structures, their resistivity measurements.
4. summarize various sensing technologies and their applications in computer science.

UNIT I *Text Book - 1* [CO:1] **(12)**

Quantum Physics: Wave particle duality, debroglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle, experimental verification (diffraction- single slit), Schrodinger's time independent wave equation, Physical significance of , particle in a one dimensional infinite potential well.

Semiconductors: Types of semiconductors: intrinsic and extrinsic semiconductors, temperature and concentration effects on fermi level (qualitative), Drift and diffusion currents, Formation of PN junction, Hall effect and its applications.

UNIT II *Text Book - 1* [CO:2] **(12)**

Lasers : Interaction of radiation with matter, spontaneous and stimulated emissions, characteristics of lasers, basic requirements for the construction of lasers (Pumping, population inversion and optical resonant cavity), construction and working of He-Ne, Nd: YAG and semiconductor (GaAs) laser (Homo junction), applications of lasers.

Fiber optics : principle, basic structure, Numerical aperture & acceptance angle, classification (propagation of light in various fibers based on refractive index), Light wave communication through optical fibers, applications of optical fibers.

UNIT III *Text Book - 1* [CO:3] **(12)**

Optoelectronic devices: Direct & Indirect band gap Semiconductors, Photo diode, Light Emitting diode (LED) (construction & working), applications of LED, Solar cell (working principle and characteristics).

Low dimensional structures: Surface to volume ratio, Physical properties, classification of low dimension structures (quantum well, quantum wire and quantum dot), resistivity and its measurements by four point probe and vander pauv methods, hot-point probe method.

UNIT IV *Text Book - 2* [CO:4] **(12)**

Introduction to Sensors and Sensing Technologies : Introduction, Human Body as a Sensor System, Passive and Active sensors, the sensor as part of a measurement system, sensor properties, Classification of Sensors: Piezoelectric Sensors (principle, mechanical force & pressure sensors), Thermal Sensors (metal & semiconductor based thermometers), Quantum Sensors (difference between classical & quantum sensors, over view of common types & applications).

LEARNING RESOURCES:

TEXT BOOK(s):

1. A Text book of Engineering Physics, M. N. Avadhanulu & TVS Arun Murthy, S. Chand Publications, 1st Edition 2024.
2. John Vetelino and Aravind Reghu, Introduction to Sensors, CRC Press, 1st Edition, 2010.

REFERENCE BOOK(s):

1. Engineering Physics, D.K.Bhattacharya & Poonam Tandon, Oxford University Press, 2015.
2. B.K.Pandey, S.Chaturvedi, Engineering Physics - Cengage Publications, 2012.
3. J.Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc., 1995.
4. Hand book of Modern Sensors, Jacob Fraden, 4th edition, Springer, 2010.

WEB RESOURCES:

1. Online course: Semiconductor Opto electronics by M R Shenoy on NPTEL.
2. Online course: Optoelectronic Materials and Devices by Monica Katiyar and Deepak Gupta on NPTEL.
3. http://nptel.iitm.ac.in/courses/
4. Course relevant website : www.rvrjcce.ac.in/moodle

IT/CD/CM/ CO/CS113	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester I [First Year]

COURSE OBJECTIVES:

At the end of the course, the student will understand the

1. To introduce fundamental laws, basic electrical elements, sources and their characteristics.
2. To develop the ability to apply circuit analysis to AC circuits
3. To know the principle of operation and characteristics of Diode and transistors.
4. To acquire knowledge on feedback topologies and oscillators.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. describe fundamentals of electrical and electronics circuits.
2. demonstrate the concepts of electrical and electronics circuits.
3. apply mathematical tools and fundamental concepts to derive various equations related to electrical and electronics circuits.
4. calculate and solve the problems of electrical and electronics circuits.

UNIT I *Text Book - 1,2* [CO:1] **(12)**

Batteries: Lead-acid, Nickel-iron, Nickel-Cadmium batteries (Operation only).

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources- ideal and practical sources, Energy stored in inductor and capacitor, Kirchhoff current and voltage laws, Mesh and nodal analysis of simple dc circuits.

UNIT II *Text Book - 1,2* [CO:2] **(12)**

Theorems to DC circuits: Superposition, Thevenin and Norton Theorems.

AC Circuits: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor and peak factor. Analysis of single-phase ac circuits consisting of R, L, C and their series combinations, real power, reactive power, apparent power, power factor.

UNIT III *Text Book - 2* [CO:3] **(12)**

Semiconductor Diodes: Semiconductor diode, Zener diode, Half-Wave Rectifier, Full-Wave rectifier, Clippers and Clampers (no bias/reference voltage).

Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitter configuration, Common collector configuration.

UNIT IV *Text Book - 2* [CO:4] **(12)**

Amplifiers: Need of biasing, Types of biasing-fixed bias, collector base bias, self-bias.

Feedback and Oscillator Circuits: Feedback concepts, types of Feedback, Barkhausen criteria, RC Phase-Shift oscillator, Hartley oscillator, Colpitts oscillator.

LEARNING RESOURCES:

TEXT BOOK(s):

1. A.Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", 5th Edition, TMH, 2017.

2. T.K.Nagasarkar and M.S.Sukhija, "Basic Electrical & Electronics Engineering", 3rd Edition Oxford press, 2017.

REFERENCE BOOK(s):

1. V.K. Mehta, "Principles of Electrical Engineering and Electronics", S.Chand, 2019.
2. Mahmood Nahvi and Joseph Edminister, "Electric Circuits", 5th Edition, Schaum's outline series, TMH, 2017.
3. S. Salivahanan, A.Vallavaraj, "Electronic Devices and Circuits", TMH, 2011.
4. Robert Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson, 2010.

WEB RESOURCES:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076
3. https://nptel.ac.in/courses/108101091

IT/CD/CM/ CO/CS/EC114	PROGRAMMING FOR PROBLEM SOLVING	L	T	P	C	Int	Ext
		4	-	-	4.0	30	70

Semester I [First Year]

COURSE OBJECTIVES:

At the end of the course, the student will understand the

1. basic problem solving process using Flow Charts and algorithms.
2. basic concepts of control structures in C.
3. concepts of arrays, functions, pointers and Dynamic memory allocation in C.
4. concepts of structures, unions, files and command line arguments in C.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. illustrate flow charts and algorithms for simple problems.
2. choose suitable control structures for developing code in C.
3. apply modular programming concepts for developing code in C.
4. develop code for complex applications.

UNIT I [CO:1] **(15)**

Introductory Concepts: Block Diagram of Computer, Computer Characteristics, Hardware vs Software, how to Develop a Program, Structured Programming, Types of Programming Languages. Introduction to C program, Program Characteristics.

Introduction to C Programming: Character set, Identifiers and Keywords, Data types, Constants, type qualifiers, Declaration and Initialization of variables.

Operators & Expressions: Arithmetic Operators, Unary Operators, Relational and Logical Operators, Assignment Operators, Conditional Operator, Data Input and Output.

UNIT II [CO:2] **(15)**

Control Statements: Branching, Looping, Nested Control Structures, Switch Statement, Break Statement, continue Statement, and Goto Statement.

Array: Defining an Array, Processing an Array, Multidimensional Arrays & Strings.

UNIT III [CO:3] **(15)**

Functions: Defining a Function, Accessing a Function, Function prototypes, Passing Arguments to a Function, Passing Arrays to Functions, Recursion, Storage Classes.

Pointers: Fundamentals, Pointer Declarations, Passing Pointers to a Function, Pointers and Arrays, Dynamic memory allocation, Operations on Pointers, Pointers and Multi Dimensional Arrays, Arrays of Pointers.

UNIT IV [CO:4] **(15)**

Structures and Unions: Defining a Structure, Processing a Structure, User-Defined Data Types, Structures and Pointers, Passing Structures to Functions, Self-Referential Structures, Unions.

File Handling: Opening and Closing a Data File, Reading and Writing a Data File, Processing a Data File, Unformatted Data Files, Accessing the File Randomly. Command line arguments, The C-preprocessor.

LEARNING RESOURCES:

TEXT BOOK:

Programming with C (Schaum's Outlines) by Byron Gottfried, Third Edition, Tata McGraw-Hill.

REFERENCE BOOK(s):

1. Programming in C by Stephen G. Kochan, Fourth Edition, Pearson
2. C Complete Reference, Herbert Sheildt, TMH., 2000.
3. Programming with C by K R Venugopal & Sudeep R Prasad, TMH., 1997.
4. The C programming Language by Brian W. Kernighan & Dennis M. Ritchie, Second Edition, Prentice Hall.
5. A Structured Programming Approach Using C by Behrouz A.Forouzan, Richard F.Gilberg, Third Edition, Cengage 2007.

WEB RESOURCES:

1. http://cprogramminglanguage.net/
2. http://lectures-c.blogspot.com/
3. http://www.coronadoenterprises.com/tutorials/c/c_intro.htm
4. http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf

IT151	ENGINEERING PHYSICS LAB	L	T	P	C	Int	Ext
		-	-	2	1.0	30	70

Semester I [First Year]

COURSE OBJECTIVES:

1. To familiarize the experiments to verify physics concepts such as interference, diffraction on light matter interaction.
2. To perform experiments to estimate the materials properties and to check their stability in science and engineering.
3. To analyze physics concepts and to design/problem solving skills, experimental set up for better and accurate measurements.
4. To understand and apply knowledge to measure and verify the values of certain constants in physics.

COURSE OUTCOMES:

After the successful completion of the course, students are able to

1. demonstrate the principle of interference, diffraction, light propagation in optical fibers and light matter interaction using lasers and conventional light sources.
2. calibrate and operate Function generator, CRO for making measurements.
3. Acquire knowledge of electricity, magnetism and mechanics to estimate fundamental constants in physics.
4. Draw conclusions from data and develop skills in experimental design.

EXPERIMENTS:

1. Lissajous' Figures - Calibration of a given audio oscillator.
2. Determination of A.C. supply frequency using Sonometer.
3. Variation of magnetic field along the axis of a circular current carrying coil.
4. Determination of Quality factor of a given Series resonance LCR circuit.
5. Characteristic curves of a given Photocell and measurement of Stopping Potential.
6. Determination of Fill factor of a given Photovoltaic cell.
7. Calculation of radius of curvature of a given Plano-convex lens by NewtonÃ¢â‚¬â„¢s Rings experiment.
8. Determination of wavelength of a given laser source using diffraction grating.
9. Determination of Young's Modulus of a material - Non Uniform Bending.
10. Determination of Rigidity modulus of a wire using Torsional pendulum
11. Compound Pendulum - Determination of Acceleration due to Gravity.
12. Determination of Acceptance angle and Numerical Aperture (NA) of a given optical fiber.
13. Measurement of resistivity and energy band gap of a Semiconductor using Four-Probe method.
14. Interference fringes - Measurement of thickness of a given paper foil - wedge method.

Note:**

A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

LEARNING RESOURCES:

TEXT BOOK:

Physics Lab Manual: RVR & JCCE, Guntur.

REFERENCE BOOK(s):

1. Engineering Physics Lab Manual, Dr. C.V.Madhusudhana Rao, V. Vasanth Kumar 3rd edition, Scitech publications(India) Pvt. Ltd. Chennai.

2. Engineering Physics Practicals, Dr.B. Srinivasa Rao, V.K.V.Krishna, K.S.Rudramamba, University Science Press, Daryaganj, NewDelhi.

IT152	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB	L	T	P	C	Int	Ext
		-	-	2	1.0	30	70

Semester I [First Year]

COURSE OBJECTIVES:

The main objectives of this lab course are

1. To conduct experiments on electrical circuits and theorems.
2. To learn Diode characteristics, and basic diode applications as rectifiers and regulators.
3. To learn BJT characteristics and Oscillators.

COURSE OUTCOMES:

After the successful completion of the course, students are able to

1. Identify & testing of various electrical and electronic components and measuring instruments.
2. Verification of fundamental laws and determination of parameters of electrical systems.
3. Verification of the network theorems.
4. Plot and discuss the characteristics of various electronics devices.

EXPERIMENTS:

1. Basic safety precautions. Introduction and use of measuring instruments - voltmeter, ammeter, wattmeter, multi-meter, oscilloscope, Power Supplies, Familiarization of Electrical Installations and Electrical Testing Equipment: Fuses, Types of Wires, Wire Gauges, continuity test.
2. Familiarization / Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, Bread board etc.) . Functionality, type, size, colour coding package, symbols.
3. Verification of KVL and KCL.
4. Verification of Superposition Theorem.
5. Verification of Thevenin's Theorem.
6. Verification of Norton's Theorem.
7. Determination of choke coil parameters.
8. Characteristics of Silicon, Germanium diodes
9. Characteristics of Zener diode.
10. Half Wave Rectifier and Full Wave Rectifier.
11. Transistor Characteristics in CE configuration.
12. Characteristics of FET.
13. Self-Bias circuit.
14. Hartley oscillator.
15. Colpitt's Oscillator.

Note:**

A minimum of 10(Ten) experiments have to be Performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

IT153	PROGRAMMING FOR PROBLEM SOLVING LAB	L	T	P	C	Int	Ext
		-	-	3	1.5	30	70

Semester I [First Year]

COURSE OBJECTIVES:

The objectives of the course are, to make the student understand:

1. basic problem solving process using Flow Charts and algorithms.
2. basic concepts of control structures in C.
3. concepts of arrays, functions, pointers and Dynamic memory allocation in C.
4. concepts of structures, unions, files and command line arguments in C.

COURSE OUTCOMES:

After the successful completion of the course, students are able to

1. read, understand and trace the execution of programs written in C language.
2. write the C code for a given algorithm.
3. implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
4. write programs that perform operations using derived data types.

EXPERIMENTS:

1. Simple computational problems using arithmetic expressions.
2. Problems involving if-then-else & switch.
3. Iterative problems.
4. 1D Array manipulation.
5. Problems on 2D arrays and Strings.
6. Function calling mechanisms (Call by value).
7. Function calling mechanisms (Call by reference).
8. Recursive functions.
9. Dynamic memory allocation.
10. Structures and unions.
11. File operations.
12. Command line arguments.

Note:**

A minimum of 10(Ten) experiments have to be Performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

IT/CD/CM/ CO/CS154	ENGINEERING GRAPHICS	L	T	P	C	Int	Ext
		1	-	2	2.0	30	70

Semester I [First Year]

COURSE OBJECTIVES:

1. To learn basic engineering graphic communication skills & concept.
2. To apply basic concept to draw, edit, dimension, hatching etc. to develop 2D & 3D Modelling.
3. To gain the capability of designing 3D objects with isometric principles by using computer aided sketches
4. To know the conversion of Orthographic Views to isometric Views and isometric to Orthographic views

COURSE OUTCOMES:

After the successful completion of the course,students are able to

1. Demonstrate basic concepts of the AutoCAD software and apply basic concepts to develop construction (drawing) techniques
2. Understand and demonstrate dimensioning concepts and techniques
3. Manipulate drawings through editing and plotting techniques
4. Produce 2D Orthographic Projections and 3D isometric views
5. Become familiar with Solid Modeling concepts and conversion of isometric to orthographic views

EXPERIMENTS:

1. Introduction to Engineering graphics, Drawing Instruments and their uses, BIS conventions, lettering, Dimensioning & free hand practicing.
   Introduction to AUTOCAD software, importance, environment settings
2. Introduction to Draw toolbar.
3. Introduction to Modify toolbar.
4. Introduction to conics-I: Ellipse General method
5. Introduction to conics-II: Ellipse-Oblong and concentric circle method
6. Introduction to engineering curves-I: Cycloid.
7. Introduction to engineering curves-II: Epicycloid, Hypocycloid, involute
8. 2D Sketches of Mechanical Components practice-I.
9. 2D Sketches of Mechanical Components practice-II.
10. Introduction to isometric views-importance-Environment settings.
11. Practice of Isometric views for various mechanical components
12. Introduction to 3D tool bars in AUTOCAD.
13. 3D modelling of basic components / castings.
14. Conversion of Isometric Views to Orthographic Views.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Engineering Drawing, N. D. Butt, Chariot Publications
2. "Engineering Graphics with AUTOCAD", Dhanunajy M. Kulakarni, A.P.Rastogl, Ashoke K. Sarkar, 2009, PHI Learning Private Ltd., New Delhi

REFERENCE BOOK(s):

1. Computer Aided Engineering Drawing - S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition-2006.

2. Engineering Graphics - K.R. Gopalkrishna, 32nd edition, 2005- Subash Publishers Bangalore

IT155	NSS / NCC / COMMUNITY SERVICE	L	T	P	C	Int	Ext
	(Common to branches IT/CSE/CSB/CSD/CSO)	-	-	1	0.5	30	70

Semester I [First Year]

COURSE OBJECTIVES:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. understand the importance of discipline, character and service motto.
2. solve some societal issues by applying acquired knowledge, facts, and techniques.
3. explore human relationships by analyzing social problems.
4. determine to extend their help for the fellow beings and downtrodden people.
5. develop leadership skills and civic responsibilities.

UNIT I

Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.>

Activities:

i) Conducting -ice breaking sessions-expectations from the course-knowing personal talents and skills

ii) Conducting orientations programs for the students - future plans-activities-releasing road map etc.

iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.

iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II

Nature & Care Activities:

i) Best out of waste competition.

ii) Poster and signs making competition to spread environmental awareness.

iii) Recycling and environmental pollution article writing competition.

iv) Organising Zero-waste day.

v) Digital Environmental awareness activity via various social media platforms.

vi) Virtual demonstration of different eco-friendly approaches for sustainable living.

vii) Write a summary on any book related to environmental issues.

UNIT III

Community Service Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders-Survey in the village, identification of problems- helping them to solve via media-authorities- experts-etc.

ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS.

iii) Conducting consumer Awareness. Explaining various legal provisions etc.

iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.

v) Any other programmes in collaboration with local charities, NGOs etc.

IT/CD/CM/ CO/CS121	INTEGRAL CALICULUS AND TRANSFORMS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

1. To enlighten the learners in the concept of transforms and multivariable calculus.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Evaluate double and triple integrals.
2. Apply the concepts of gradient, divergence and curl to formulate engineering problems
3. Find Laplace and inverse Laplace transform of given functions
4. Solve Fourier and inverse Fourier transform problems

UNIT I [CO:1] **(12)**

Integral Calculus

Evaluation of double integrals in Cartesian, change of order of integration, Evaluation of double integrals in polar, Change of variables Cartesian to polar, Finding areas by double integrals. Triple integrals and volume by triple integrals.

UNIT II [CO:2] **(12)**

Vector Calculus

Vector Differentiation: Scalar and vector point functions, vector operator Del, Gradient, Directional derivative, Divergence and Curl, vector identities (without proofs).

Vector Integration: Line integral-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof).

UNIT III [CO:3] **(12)**

Laplace Transforms

Definition, Properties of Laplace transforms transforms of derivatives, transforms of integrals, multiplication by ,nt division by t, evaluation of integrals. Laplace transform of periodic function. Inverse Laplace transforms-method of partial fractions, other method of finding inverse transforms: t f(t)=L^-1[-d/ds*F(s)],Convolution theorem.

UNIT IV [CO:4] **(12)**

Fourier Transforms

Definition, Fourier transform, Fourier sine and cosine transforms. Inverse Fourier transform Inverse Fourier sine and cosine transforms.

LEARNING RESOURCES:

TEXT BOOK:

B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thedition, 2017.

REFERENCE BOOK(s):

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2018.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 5thEdition2016.

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/

IT/CD/CO/ CS122	ENGINEERING CHEMISTRY	L	T	P	C	Int	Ext
		2	-	-	2.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

1. To familiarize chemistry and its engineering applications
2. To train the students on the principles and applications of electrochemistry and polymers.
3. To introduce instrumental methods and advanced engineering materials.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Understand the structural aspects of molecules and Quality of water for domestic and industrial purpose.
2. compare the materials of construction for battery and electro chemical sensors.
3. explain the preparation, properties, and applications of thermoplastics, thermosetting, elastomers and conducting polymers.
4. summarize the concepts of instrumental methods.

UNIT I [CO:1] **(8)**

Water Technology, Molecular orbital theory

Water Technology: Soft and hard water, Temporary hardness and Permanent hardness, WHO Standards, Municipal Treatment for domestic purpose, Desalination of Brackish water - Reverse Osmosis.

Molecular orbital theory - bonding in homo - and hetero nuclear diatomic molecules - energy level diagrams of O2 and CO.

UNIT II [CO:2] **(8)**

Electrochemistry and its Applications Electrochemical cell, Nernst equation - derivation and numerical problems.Electrochemical sensors - potentiometric sensors with examples, amperometric sensors with examples. Primary cells - Zinc-air battery, Secondary cells - Lithium-ion batteries - working of the batteries including cell reactions, Fuel cells, hydrogen - oxygen fuel cell

UNIT III [CO:3] **(8)**

Polymer Chemistry Introduction to polymers, Functionality, Degree of polymerization, Tacticity, Types of polymerization, with specific examples and mechanism - Free radical polymerizationPlastics - Thermo and Thermosetting plastics, Preparation, properties and applications of - PVC, Teflon, Bakelite, Nylon - 6,6.Conducting polymers - polyacetylene, polyaniline - mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Poly Lactic Acid (PLA).

UNIT IV [CO:4] **(8)**

Instrumental Methods: Electromagnetic spectrum. Absorption of radiation: Beer - Lamberts law. UV-Visible Spectroscopy, electronic transition, Chromophore, Auxochrome, Bathochromic, Hypsochromic Hypochromic and Hyperchromic shifts, Instrumentation and general applications. IR spectroscopy - Basic Principles, Application to H2O & CO2, Instrumentation and general applications.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.

2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOK(s):

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

IT/CD/CM/ CO/CS123	COMMUNICATIVE ENGLISH	L	T	P	C	Int	Ext
		2	-	-	2.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

1. Enhance students' language skills to effectively communicate in both spoken and written English.
2. Develop critical thinking and analytical skills through the interpretation and analysis of various texts and case studies.
3. Cultivate professional communication skills necessary for academic and professional success.
4. Integrate language learning with practical employability skills to prepare students for real-world situations.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. utilize English language proficiently in both oral and written communication across diverse contexts.
2. analyze and interpret texts and case studies, demonstrating comprehension and critical thinking abilities.
3. demonstrate effective professional communication skills, including formal writing, presentation techniques, and non-verbal communication.
4. apply language and employability skills in practical scenarios, such as report writing, job applications, and biographical writing, to achieve academic and professional goals.

UNIT I [CO:1] **(6)**

* Root words, prefixes and suffixes

* Paragraph Writing: Desciption & Narration

* Grammar: Verb- Tense and Voice

* Communication Skills - Forms of Communication

UNIT II [CO:2] **(6)**

* Commonly Confused words and analogies

* E-mail Writing

* Grammar: Preposition and Articles

* Case studies

UNIT III [CO:3] **(6)**

* Acronyms & standard abbreviations

* Letter-writing, Complaints, Leave, Job application letter

* Grammer: Subject - Verb Agreement and Question tags

* Note making and Note taking

UNIT IV [CO:4] **(6)**

* One-word substitutes and Eponyms

* Report writing : Project, feasible and informtion related

* Jumbled sentences and Redundancy

* Biographical writing : Kanuru Lakshman Rao (K.L Rao), Ratan Tata, Kalpana Chawla.

LEARNING RESOURCES:

TEXT BOOK:

Communication Skills, Sanjay Kumar and Pushpa Lata, Oxford University Press.

REFERENCE BOOK(s):

1. Murphy, "English Grammar with CD", Cambridge University Press, New Delhi, 2004.
2. Rizvi Asheaf M, "Effective Technical Communication", Tata McGraw Hill, New Delhi, 2008.
3. Meenakshi Raman & Sangeeta Sharma, "Technical Communication - Principles and Practice", Third Edition, Oxford University Press, New Delhi, 2015.

WEB RESOURCES:

1. https://www.grammarbook.com
2. https://listenaminute.com
3. https://www.englishclub.com
4. https://www.indiabix.com

IT/CD/CO/ CM/CS124	DIGITAL LOGIC DESIGN	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

The main objectives of this course are to:

1. know the concepts of different number systems, conversions and functionality of logicgates.
2. To analyse and design combinational logic circuits.
3. To analyse and design sequential logic circuits.
4. understand programmable logic devices.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. demonstrate the knowledge in number systems, Boolean algebra, Combinational, sequential circuits, Programmable logic devices and Logic families
2. analyse and design various combinational circuits.
3. analyse and design various sequential circuits.
4. implement combinational circuit functionality with programmable logic devices.

UNIT I [CO:1,2,3] **(12)**

Digital Systems: Digital Systems, Binary Numbers, Number-Base Conversions, Octal and Hexadecimal Numbers, complements, signed binary Numbers. Codes: BCD, excess - 3, Gray.

Boolean Algebra & Logic Gates: Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic theorems and Properties of Boolean Algebra, Boolean functions, Canonical and Standard Forms, Digital Logic gates.

Gate-Level Minimization: The Map Method, Four-Variable K-Map, Five-Variable K-Map, Product of sums simplification, Don't-Care conditions, NAND and NOR implementation.

UNIT II [CO:1,2] **(12)**

Combinational Logic: Combinational Circuits, Analysis Procedure, Design procedure, Half adder, Full adder, Half subtractor, Full subtractor, Carry look ahead adder, Magnitude comparator, Encoders, Decoders, Multiplexers, Demultiplexers.

UNIT III [CO:1,3] **(12)**

Synchronous and sequential Logic: Sequential circuits, Latches, Flip-Fops, Analysis of clocked Sequential circuits, State Reduction and Assignment, Design Procedure.

UNIT IV [CO:1,4] **(12)**

Registers and Counters: Registers, Shift Registers, Ripple Counters, Synchronous Counters.

Programmable Logic Devices: Programmable Read-Only Memory, Programmable Logic Array, Programmable Array Logic.

LEARNING RESOURCES:

TEXT BOOK:

M.Morris Mano, Digital Design, 3rdEdition, Pearson Education, 2009

REFERENCE BOOK(s):

1. A.Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. R.P.Jain, "Modern Digital Electronics", Mc Graw Hill Education, 2009.

WEB RESOURCES:

1. http://nptel.ac.in/courses/117105080/3
2. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-111-introductory

IT/CB/CM/ CO/CS125	PYTHON PROGRAMMING	L	T	P	C	Int	Ext
		2	-	-	2.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

1. To introduce features of Python programming language.
2. To teach students processing of mutable and immutable data types.
3. To impart knowledge of general coding techniques and exception handling.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Illustrate essential programming skills in basic python programming concepts.
2. Solve coding tasks using conditional execution, loops and functions.
3. Manipulate the data structures lists, tuples, sets and dictionaries.
4. Use the concepts of exception handling, files and recursion to solve problems.

UNIT I [CO:1] **(8)**

Introduction to Python: The History of Python, Getting Started with Python, Programming Style and Documentation, Programming Errors.

Elementary Programming: Introduction, writing a Simple Program, Reading Input from the Console, Identifiers, Variables, Assignment Statements, and Expressions, Simultaneous Assignments, Named Constants, Numeric Data Types and Operators, Evaluating Expressions and Operator Precedence, Augmented Assignment Operators, Type Conversions and Rounding.

Mathematical Functions, Strings and Objects: Introduction, Common Python Functions, Strings andCharacters, Introduction to Objects and Methods, Formatting Numbers and Strings.

Selections: Introduction, Boolean Types, Values, and Expressions, Generating Random Numbers,if Statements, Two-Way if-else Statements, Nested if and Multi-Way if-elif-else Statements, CommonErrors in Selection Statements, Logical Operators, Conditional Expressions.

UNIT II [CO:2] **(8)**

Loops: Introduction, The while Loop, The for Loop, Nested Loops, Minimizing Numerical Errors,Keywords break and continue

Functions: Introduction, Defining a Function, Calling a Function, Functions with/without Return Values, Positional and Keyword Arguments, Passing Arguments by Reference Values, ModularizingCode, The Scope of Variables, Default Arguments, Returning Multiple Values, Function Abstraction andStepwise Refinement.

UNIT III [CO:3] **(8)**

Lists: Introduction, List Basics, Copying Lists, Passing Lists to Functions, returning a List from a Function, Searching Lists.

Tuples, Sets, and Dictionaries: Introduction, Tuples, Sets, Comparing the Performance of Sets and Lists, Dictionaries.

UNIT IV [CO:4] **(8)**

Files and Exception Handling: Introduction, Text Input and Output, File Dialogs, Retrieving Data from the Web, Exception Handling, Raising Exceptions, Processing Exceptions Using Exception Objects.

Recursion: Introduction, Problem Solving Using Recursion, Recursive Helper Functions, Recursion vs.

Iteration, Tail Recursion.

LEARNING RESOURCES:

TEXT BOOK:

Introduction to Programming using Python, Y.Daniel Liang, Pearson Publications.2013.

REFERENCE BOOK(s):

1. Introduction to Computer Science Using Python: A Computational Problem-Solving Focus by Dierbach, Wiley.
2. Fundamentals of Python Programming: Richard L. Halterman by Southern Adventist University.

IT/CD/CO/	DATA STRUCTURES	L	T	P	C	Int	Ext
CS126		4	-	-	4.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

The main objectives of this course are to:

1. To illustrate operations of linear and non-linear data structure
2. To demonstrate computational problems using suitable data structures

COURSE OUTCOMES:

After successful completion of the course, the students are able to:

1. Analyze the performance of algorithms to evaluate their efficiency.
2. Apply searching, sorting and hashing techniques to organize and retrieve data efficiently.
3. Develop Liner a structures to manipulate sequential data and solve computational problems.
4. Implement Non-Linear data structures to solve real world problems.

UNIT I [CO:1] **(15)**

Introduction: Basic Concepts-Algorithm Specification, Data Abstraction, Performance Analysis-Time complexity, Space complexity, Asymptotic Notations.

Searching and sorting: Linear Search, Binary Search, insertion sort, selection sort. Abstract Data Type, Array ADT, Dynamic memory allocation.

UNIT II [CO:2] **(15)**

Lists: Singly Linked Lists, Double linked list, Circular Linked Lists: Operations & their algorithms, Polynomials: Addition, Multiplication.

Hashing: Static Hashing-HashTables, Hashing Functions, Over flow Handling.

UNIT III [CO:3] **(16)**

Stacks and Queues: Stack ADT, Queue ADT, Stack applications, Multiple Stacks and Queues, Dynamically Linked Stacks and Queues.

UNIT IV [CO:4] **(14)**

Trees: Introduction, binary trees, Binary Tree Traversals, Binary Search Trees, AVL Trees, Heaps, Heap sort, B- Trees and B+ Trees.

Graphs: The Graph Abstract Data Type, representations of graphs, Elementary Graph Operations **DepthFirstSearch,BreadthFirstSearch,ConnectedComponents.**

LEARNING RESOURCES:

TEXT BOOK:

Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.

REFERENCE BOOK(s):

1. Mark Allen Weiss,"Data Structures and Algorithm Analysis in C", 2ndEdition,Pearson Education, 1997.
2. Y. Langsam, M.J.Augeustein and A.M. Tenenbaum, Data Structures Using C,Pearson Education Asia, 2004.

3. Aho, Hopcroft and Ullman," Data Structures and Algorithms", PearsonEducation,1983. Jean Paul Trembly and P.G .Sorenson, An Introduction of Data Structures with Applications.

IT161	ENGINEERING CHEMISTRY LAB	L	T	P	C	Int	Ext
		-	-	2	1.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

Verify the fundamental concepts with experiments.

COURSE OUTCOMES:

After the successful completion of the course, students are able to

1. Analyze samples using spectroscopic techniques.
2. Prepare advanced materials like Bakelite and nanomaterials.
3. Measure the strength of an acid from different sources.
4. Determine properties/characteristics of liquids like hardness, surface tension and Viscosity.

EXPERIMENTS:

1. Determination of Hardness of water using EDTA method.
2. Estimation of Mohrs salt by Dichrometry
3. Preparation of Bakelite
4. Determination on strength of NaOH using HCI conductometrically
5. Verification of Lambert - Beers law
6. Determination of Strength of an acid in Pb - Acid battery
7. Determination of cell constant and conductance of solutions.
8. Potentiometry - Determination of Fe (II) strength
9. Determination of surface tension.
10. Determination of Viscosity.
11. Wavelength measurement of sample through UV-Visible Spectroscopy
12. Identification of simple organic compounds by IR
13. Preparation of nanomaterials by precipitation method

IT162	COMMUNICATIVE ENGLISH LAB	L	T	P	C	Int	Ext
		-	-	2	1.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

1. Enhance students' ability to analyse spoken discourse, including identifying speaker's purpose, tone, and underlying content.
2. Familiarize students with Standard English pronunciation, stress, and intonation patterns, particularly focusing on Received Pronunciation (RP).
3. Develop language production skills essential for effective communication in social and professional contexts.
4. Cultivate professional communication etiquette and presentation dynamics to enhance students' proficiency in professional settings.

COURSE OUTCOMES:

After the successful completion of the course, students are able to

1. demonstrate proficiency in comprehending and analysing spoken discourse, including making inferences and predictions about speaker's intentions.
2. speak English with a reasonable level of accuracy in pronunciation, stress, and intonation, adhering to Standard English norms.
3. exhibit effective communication strategies and social graces necessary for successful interactions in diverse settings.
4. master communication and presentation skills, enabling successful engagement in interviews and professional presentations, demonstrating language proficiency and confidence.

EXPERIMENTS:

1. Acoustic Proficiency: Listening Comprehension, Pronunciation
2. Real-World Discourse: Everyday Situations / Literary Scene Enactments.
3. Group Discussions.
4. Exploring Visual and Textual Meaning : Newspaper and Picture Analysis.
5. Formal Presentations.
6. Exploring Texts : The Art of Extensive Reading and Comprehension.

LEARNING RESOURCES:

REFERENCE BOOK(s):

1. Communication Skills by Sanjay Kumar and Pushpa Lata. Oxford University Press.
2. Practical English Usage by Michael Swan, Oxford University Press,1995

WEB RESOURCES:

1. https://agendaweb.org
2. https://listenaminute.com

IT163	PYTHON PROGRAMMING LAB	L	T	P	C	Int	Ext
		-	-	2	1.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

1. To introduce the fundamentals of creation and execution of Python scripts in an IDE.
2. To demonstrate the usage of data types and operators.
3. To create awareness on mutable and immutable data types.
4. To impart knowledge of files and Exception handling techniques in Python.

COURSE OUTCOMES:

After the successful completion of the course, students are able to

1. solve problems using basic concepts of Python programming language.
2. solve problems using built-in functions and user defined functions.
3. write programs to manipulate the data structures lists, tuples, sets and dictionaries.
4. use the concepts of files, recursion and exception handling.

EXPERIMENTS:

1. Programs to demonstrate Input - Output operations.
2. Programs to demonstrate behaviour and use of various expressions & operators.
3. Programs to emphasize the usage of conditional control statements.
4. Programs to emphasize the usage of iterative control statements.
5. Programs on the usage of built-in functions
6. Programs to demonstrate the creation and usage of User Defined Functions.
7. Programs on List processing (Sorting, Searching & Permutations).
8. Programs on Tuples and Sets.
9. Programs on Dictionary processing.
10. Programs to demonstrate Recursion.
11. Programs to demonstrate Exception Handling.
12. Programs to demonstrate file processing.

Note:**

A minimum of 10(Ten) experiments should be performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

IT164	DATA STRUCTURES LAB	L	T	P	C	Int	Ext
		-	-	3	1.5	30	70

Semester II [First Year]

COURSE OBJECTIVES:

1. To illustrate operations of linear and non-linear data structure.
2. To demonstrate computational problems using suitable data structures
3. To familiarize searching and sorting techniques .

COURSE OUTCOMES:

After the successful completion of the course,students are able to

1. Develop solutions using the fundamental algorithms for searching, sorting, and hashing to solve computational problems effectively.
2. Implement linked list operations to manage dynamic data structures effectively.
3. Apply stack-k and queue-based data structures to handle applications like expression evaluation, syntax checking, and sequential data processing.
4. Construct tree and graph structures to organize, search, and traverse data inhierarchical and networked representations.

EXPERIMENTS:

1. List ADT.
2. Applications of List.
3. Single Circular List ADT.
4. Doubly LinkedListADT.
5. Stack ADT.
6. Application son Stack.
7. Queue ADT.
8. Applications of Queue.
9. Double Ended Queue ADT.
10. BST ADT.
11. Priority Queue ADT.
12. Searching and Sorting Techniques.
13. Graph traversal techniques.
14. Hashing Techniques.

IT165	HEALTH AND WELLNESS, YOGA AND SPORTS	L	T	P	C	Int	Ext
	(Common to branches IT/CSE//CSB/CSD/CSO)	-	-	1	0.5	30	70

Semester II [First Year]

COURSE OBJECTIVES:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. understand the importance of yoga and sports for Physical fitness and sound health.
2. demonstrate an understanding of health-related fitness components.
3. compare and contrast various activities that help enhance their health.
4. assess current personal fitness levels.
5. develop Positive Personality

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community

ii) Preparation of health profile

iii) Preparation of chart for balance diet for all age groups

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices - Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis,Cricket etc., Practicing general and specific warm up, aerobics.

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

IT/CD/CM/ CO/CS211	PROBABILITY, STATISTICS & COMPLEX ANALYSIS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester III [Second Year]

COURSE OBJECTIVES:

1. To enlighten the learners in the concepts of probability and sampling distributions.
2. To equip the learners with standard concepts of testing of hypothesis and ANOVA models and complex analysis
   models.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Determine probabilities using discrete and continuous distributions.
2. Interpret data using sampling distribution and hypothesis tests of means.
3. Use ANOVA models to the data
4. Apply the knowledge of complex analysis to engineering problems.

UNIT I [CO:1] **(12)**

Probability distributions: Random Variables, Binomial distribution and Poisson distribution

Probability densities: Continuous random variables, Normal distribution, Normal approximation to the Binomial distribution, Uniform distribution, Gamma distribution, Beta distribution, Weibull distribution.

UNIT II [CO:2] **(12)**

Sampling distribution: Population and samples, the sampling distribution of mean (Ã•Æ' known), the sampling distribution of mean (Ã•Æ' unknown), the sampling distribution of variance.

Testing of Hypotheses :

Point estimation, Interval estimation, tests of hypothesis, null hypothesis and tests of hypothesis, hypothesis concerning one mean, inferences concerning two means (both small and large samples).

UNIT III [CO:3] **(12)**

Curve Fitting: Method of least squares - Straight line, second degree parabola, power curve and exponential curve.

Analysis of Variance (ANOVA): Analysis of Variance (one-way classification), Analysis of Variance (two-way classification).

UNIT IV [CO:4] **(12)**

Complex Analysis: Complex number, nth

root of a complex number, complex function, Cauchy-Reimann equations, Analytic functions, Harmonic functions, Milne Thomson method

Complex Integration: Cauchy`s Theorem, Cauchy Integral formula.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Miller & Freund`s Probability and Statistics for Engineers Ã¢â‚¬â€œ Richard A. Johnson
2. Higher Engineering Mathematics - B.S. Grewal

REFERENCE BOOK(s):

1. U. Dinesh Kumar, Business Analytics: The science of data- driven decision making.
2. S.M Ross, Introduction to Probability and Statistics for Engineers and Scientists.
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
4. W. Feller, an Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley.
5. S.C. Gupta and V.K. Kapoor., Fundamentals of Mathematical Statistics, Sultan Chand &Co.

IT/CB/CD/ CM/CO/CS212	**UNIVERSAL HUMAN VALUES-II UNDERSTANDING HARMONY**	**L**	**T**	**P**	**C**	**Int**	**Ext**
		2	**-**	**-**	**2.0**	**30**	**70**

Semester IV [Second Year]

COURSE OBJECTIVES:

1. To create awareness about Value Education, self-exploration as the Process for Value Education, the Basic Human Aspirations and their fulfillment
2. To realize the importance of Harmony of the Self with the Body and also the program to ensure self-regulation and health.
3. To study harmony in family, values in human-to-human relationship, harmony in the Society and vision for the universal human order
4. To know about the harmony in the nature and realizing existence as co-existence at all levels.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Describe Value Education, self-exploration as the Process for Value Education, the Basic Human Aspirations and their Fulfillment
2. Describe harmony of the Self with the Body, and the process to ensure self-regulation and Health.
3. Discuss harmony in family, values in human-to-human Relationship, harmony in the society and vision for the universal human order
4. Justify the need for Harmony in the Nature and also existence as co-existence at all levels.

UNIT I [CO:1] **(8)**

Introduction: Understanding the need, basic guidelines, content and process for Value Education.

Self- Exploration : What is it? its content and process; Natural Acceptance and Experiential Validation as the mechanism for self-exploration.

Continuous Happiness and Prosperity as basic human aspiration: Basic requirement for fulfillment of Human Aspirations, Right understanding, Relationship and Physical Facility, A critical appraisal of the current scenario, Method to fulfill the above human aspirations.

UNIT II [CO:2] **(8)**

Harmony in the Human Being : Understanding human being as a co-existence of the self and the Body, distinguishing between the needs of Self and Body, the self as the consciousness entity and the body as material entity, Understanding the Body as an instrument of the self, Understanding the harmony in self, Understanding the harmony of self with the Body: Program to ensure self- regulation and Health.

UNIT III [CO:3] **(8)**

Harmony in the Family : Family as basic unit of human interaction, Feeling of relationship as the basis for harmony in the family, understanding relationship, meaning of Justice (nine universal values in relationships) Trust - foundation value in relationship, respect- as the right evaluation, feeling of respect, disrespect arising out of differentiation leading to discrimination, other naturally accepted feelings in relationship.

Harmony in the society : The goal of human being living in society, understanding the harmony in the society (society being an extension of family): right understanding and right feeling (happiness) in every individual, prosperity in every family, fearlessness (trust) and co-existence Visualizing a universal harmonious order in society- harmony from family order to world family order, individual participation in the society.

UNIT IV [CO:4] **(8)**

Harmony in the Nature and Existence: Nature as collection of units, classification of units into four orders, harmony among the four orders, Interconnectedness self- regulation and mutual fulfillment among the four orders of nature, individual participation in nature, realizing existence as co-existence at all levels, understanding units and space, existence as co-existence, holistic perception of harmony in existence.

LEARNING RESOURCES:

TEXT BOOK(s):

1. R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 3rd Revised Edition, UHV Publications, Delhi, 2023, ISBN: 978-81-957703-7-3.
2. R R Gaur, R Asthana, G P Bagaria, Teachers Manual for A Foundation Course in Human Values and Professional Ethics, 3rd Revised Edition, UHV Publications, Delhi,2023 ISBN 978-81-957703-5-9.

REFERENCE BOOK(s):

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.
3. Mohandas Karamchand Gandhi, The Story of My Experiments with Truth, Rajpal & Sons, 2015
4. E. F Schumacher, Small Is Beautiful: Economics as if People Mattered, Vintage publications, 1993.
5. Cecile Andrews, Slow is Beautiful: New Visions of Community, New Society Publishers, 2006
6. J C Kumarappa, Economy of Permanence, Sarva Seva Sangh Prakashan, 2017.

WEB RESOURCES:

1. https://archive.nptel.ac.in/courses/109/104/109104068
2. https://ebooks.inflibnet.ac.in/hrmp01/chapter/48/
3. https://onlinecourses.nptel.ac.in/noc23_hs89/preview
4. https://fdp-si.aicte-india.org/download/HVBE_for_NEP2020.pdf

IT/CD/CM/ CO/CS213	DISCRETE MATHEMATICAL STRUCTURES	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester III [Second Year]

COURSE OBJECTIVES:

The objectives of the course are:

1. To introduce the concepts of mathematical logic.
2. To demonstrate the combinatorial problems.
3. Create generating functions and solve recurrence relations.
4. To use Directed & Un-Directed Graphs concepts and its applications.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Apply formal methods of proof and propositional & First order logic to validate the propositional statements.
2. Apply techniques for counting the occurrences of discrete events including permutations, combinations with and without repetitions.
3. Solve generating functions and recurrence relations.
4. Solve the real-world problems using directed and undirected graphs.

UNIT I [CO:1] **(13)**

Foundations: Sets, Relations and Functions, Fundamentals of Logic, Logical Inferences, Methods of Proof of an implication, First order Logic & Other methods of proof, Rules of Inference for Quantified propositions, Mathematical Induction.

UNIT II [CO:2] **(10)**

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Combinations and Permutations with Constrained Repetitions.

UNIT III [CO:3] **(13)**

Recurrence Relations: Generating functions of sequences, Calculating Coefficients of Generating Functions, solving recurrence relations by Substitution and generating functions. The methods of characteristic roots, solutions of inhomogeneous recurrence relations.

UNIT IV [CO:4] **(13)**

Relations & Digraphs: Properties & Equivalence relations, Operations on relation, Directed Graphs and Adjacency Matrices, Ordering relations, Lattices and Enumerations.

Graphs: IsomorphismÃ¢â‚¬â„¢s and Sub graphs, Planar Graphs, EulerÃ¢â‚¬â„¢s Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem.

LEARNING RESOURCES:

TEXT BOOK:

Joe L. Mott, Abraham Kandel & Theodore P.Baker, Discrete Mathematics for Computer Scientists & Mathematicians, PHI 2nd edition.

REFERENCE BOOK(s):

1. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw - Hill.
2. Discrete and Combinational Mathematics - An Applied Introduction-5th Edition - Ralph. P. Grimaldi. Pearson Education.
3. Discrete Mathematical Structures with applications to computer science Trembly J.P. & Manohar. P, TMH.
4. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition, TMH.

IT/CD/CM/ CO/CS214	COMPUTER ORGANIZATION	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester III [Second Year]

COURSE OBJECTIVES:

The objectives of the course are:

1. To introduce the functional units of computer system, architecture and its operations.
2. To discuss the basic processing unit and I/O devices.
3. To impart the knowledge on memory system.
4. To demonstrate the arithmetic operations in a computer system.
5. To instruct the instruction level parallelism

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Describe components, architecture of a computer system and its working.
2. Discuss instruction execution and control system.
3. lllustrate a pipeline system for the execution of instruction
4. Explain various I/O handling mechanisms and its interfaces.
5. Analyze computer arithmetic algorithms.
6. Summarize various memory systems.

UNIT I [CO:1] **(13)**

Basic structure of computers: Computer types, Functional Units, Basic Operational Concepts, Number Representation and Arithmetic, Character Representation, Performance.

Instruction Set Architecture: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Stacks, Subroutines, Additional Instructions, CISC Instruction sets, RISC and CISC styles, Encoding of Machine Instructions.

UNIT II [CO:2,3] **(14)**

BasicProcessingUnit: SomeFundamentalConcepts,InstructionExecution, Hardware Components, Instruction Fetch and Execution Steps, Control Signals, Hardwired Control.

Pipelining: Basic Concept -The Ideal Case, Pipeline Organization, Pipelining Issues, Data Dependencies, Memory Delays, Branch Delays, Resource limitations.

UNIT III [CO:4] **(10)**

Basic Input/ Output: Accessing I/O Devices: I/O Device Interface, Program-Controlled I/O; Interrupts - Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling I/O Device Behavior, Processor Control Registers.

Input/output Organization: Bus Structure, Bus Operation: Synchronous Bus, Asynchronous Bus; Arbitration, Interface Circuits Ã¢â‚¬â€œ Parallel interface , Serial interface.

UNIT IV [CO:5,6] **(14)**

The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-only Memories, Direct Memory Access, Cache Memories, Performance Considerations.

Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Unsigned Numbers, Multiplication of Signed Numbers, Fast Multiplication-Bit-Pair recoding of Multipliers, Integer Division, Floating-Point Numbers and Operations.

LEARNING RESOURCES:

TEXT BOOK:

Computer Organization and Embedded Systems, 6th Edition by Carl Hamacher, McGraw Hill Higher Education

REFERENCE BOOK(s):

1. Computer Architecture and Organization, 3rd Edition by John P. Hayes, WCB/McGraw- Hill.
2. Computer Organization and Architecture: Designing for Performance, 10th Edition by William Stallings, Pearson Education.

IT/CB/CM/ CO/CS215	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester III [Second Year]

COURSE OBJECTIVES:

The main objectives of this course are to:

1. Impart knowledge on algorithm design strategies and performance analysis of algorithms.
2. Introduce pattern matching algorithms and NP-Completeness

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Analyze the performance of algorithms based on time and space complexities.
2. Apply algorithm design strategies to solve the real world problems.
3. Use string matching algorithms to solve given problems.
4. Differentiate P and NP class problems.

UNIT I *Text Book - 1* [CO:1,2] **(13)**

Introduction: What is an Algorithm? Algorithm Specification, Performance Analysis.

Divide and Conquer: General Method, Merge Sort, Quick sort, Divide and Conquer Run Time Recurrence Relations.

Greedy Programming: General Method, Knapsack problem, Tree Vertex Splitting, MinimumSpanning Tree - Prim's and Kruskal's algorithms, Single Source Shortest-Paths-Dijkstra's.

UNIT II *Text Book - 1* [CO:1,2] **(13)**

Dynamic Programming: General Method, Multi Stage Graph, All Pairs Shortest Paths, Single SourceShortest Paths-general Weights, Optimal Binary Search Trees, String editing, 0/1 Knapsack, Reliability Design, Traveling Salesman Problem.

UNIT III *Text Book - 1* [CO:1,2] **(12)**

Back tracking: General Method, 8-queen problem, Hamiltonion Cycle, 0/1 Knapsack.

Branch and Bound: The Method: Least Cost Search, The 15-puzzle, Control Abstraction for LC Search, Bounding, FIFO branch and bound, LC branch and bound, 0/1 Knapsack problem, Traveling Salesman Problem.

UNIT IV *Text Book - 2* [CO:1,3,4] **(10)**

String Matching : The Naive String Matching Algorithm, The Rabin-Karp Algorithm, String Matching with Finite Automata, The KMP Algorithm.

NP-Completeness: Polynomial Time, Polynomial Time verification, NP Completeness and reducibility, NP Complete Problems.

LEARNING RESOURCES:

TEXT BOOK(s):

1. E. Horowitz, S. Sahni and S.Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publication.
2. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer Algorithm", PHI.

REFERENCE BOOK(s):

1. Sara Basse, A.V. Gelder, "Computer Algorithms", Addison Wesley.
2. Richard E. Neapolitan, Ã¢â‚¬Å“Foundations of AlgorithmsÃ¢â‚¬Â•, Jones & Bartlett Learning.

IT/CB/CD/ CM/CO/CS216	OBJECT ORIENTED PROGRAMMING	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester III [Second Year]

COURSE OBJECTIVES:

The learning objectives of this course are:

1. To make the students understand Java fundamental concepts
2. To elucidate the fundamentals of object-oriented programming in Java
3. To create awareness on exception handling and multithreading
4. To familiarize students with the concepts of Event Handling, Generics and Collections

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Comprehend the concepts of Object-Oriented Programming (OOP) and fundamental Java constructs.
2. Develop reusable and efficient programs using Inheritance, Interfaces, and Packages.
3. Implement robust Java applications using Exception Handling, Multithreading, Generics and Collections.
4. Design interactive Graphical User Interfaces (GUIs) using AWT and Swing components.

UNIT I [CO:1] **(11)**

Introduction: The history and evolution of Java, Java Buzz words, object-oriented programming, Data Types, Variables and Arrays, Operators, Control Statements.

Classes and Objects: Concepts, methods, constructors, types of constructors, constructor overloading, usage of static, access control, this keyword, garbage collection, finalize() method, overloading, parameter passing mechanisms, final keyword, nested classes and inner classes.

UNIT II [CO:2] **(15)**

Inheritance: Basic concepts, access specifiers, usage of super key word, method overriding, using final with Inheritance, abstract classes, dynamic method dispatch, Object class.

Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.

Packages: Creating a Package, setting CLASSPATH, Access control protection, importing packages.Strings: Exploring the String class, String buffer class, Command-line arguments.

UNIT III [CO:3] **(12)**

Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, multiple catch clauses, nested try, Built-in exceptions, creating own exception sub classes.

Multithreading: The Java Thread model, thread life cycle, Thread class, Runnable interface, creating multiple threads, Synchronization, Inter Thread Communication, Deadlock.

Generics: Basics of Generic Methods, Generic Classes.

Collections: Collection Interfaces, Collection Classes, Accessing a Collection via an Iterator.

UNIT IV [CO:4] **(12)**

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.

GUI with Swing :Ã¢â‚¬Å“ Swings introduction, JApplet, JFrame and JComponent, Icons and Labels, text fields,buttons Ã¢â‚¬Å“ The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes,Trees, and Tables.

LEARNING RESOURCES:

TEXT BOOK:

Java The Complete Reference - Herbert Schildt 11th Edition, Mc Graw Hill Education.

REFERENCE BOOK(s):

1. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
3. Cay.S. Horstmann and Gary Cornell, Core Java 2, Vol 1, Fundamentals 7th Edition, Pearson Education.
4. H.M.Dietel and P.J.Dietel, Java How to Program, Sixth Edition, Pearson Education/PHI.
5. Barbara Liskov, Program Development in Java, Addison-Wesley, 2001.
6. Cay Horstmann, John Wiley and Sons, Big Java 2nd Edition, Pearson Education.

IT251	SKILL ENHANCEMENT COURSE-1	L	T	P	C	Int	Ext
		-	-	4	2.0	30	70

Semester III [Second Year]

Skill Courses

Code No.	Subject Name	Code No.	Subject Name
ITSL1	Employability Skills-I	ITSL2	Employability Skills-II

IT252	DESIGN AND ANALYSIS OF ALGORITHMS LAB	L	T	P	C	Int	Ext
		-	-	3	1.0	30	70

Semester III [Second Year]

COURSE OBJECTIVES:

The main objectives of this course are

1. Illustrate Algorithm Design Strategies
2. Demonstrate complex problems using suitable Design Strategy
3. Demonstrates String matching techniques.

COURSE OUTCOMES:

After the successful completion of the course,students are able to

1. Apply Algorithm Design Strategy to solve problem
2. Implement complex problems using the design strategy
3. Make use of string matching algorithms to solve complex problem

EXPERIMENTS:

1. Problems related to Divide and Conquer strategy
2. Problems related to Greedy Strategy
3. Graph Related Problems using Greedy Strategy
4. Problems related to Dynamic Programming
5. Graph Related Problems using Dynamic Programming
6. Problems related to Backtracking Strategy
7. Problems related to Branch and Bound
8. String Matching Problems

LEARNING RESOURCES:

TEXT BOOK(s):

1. E. Horowitz, S. Sahni and S.Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publication.
2. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer Algorithm", PHI

REFERENCE BOOK(s):

1. Sara Basse, A.V. Gelder, "Computer Algorithms", Addison Wesley.
2. Richard E. Neapolitan, "Foundations of Algorithms", Jones & Bartlett Learning.

IT253	OBJECT ORIENTED PROGRAMMING LAB	L	T	P	C	Int	Ext
		-	-	3	1.0	30	70

Semester III [Second Year]

COURSE OBJECTIVES:

The learning objectives of this course are:

1. To make the students understand Java fundamental concepts
2. To elucidate the fundamentals of object-oriented programming in Java
3. To create awareness on exception handling and multithreading
4. To familiarize students with the concepts of Event Handling, Generics and Collections

COURSE OUTCOMES:

After the successful completion of the course,students are able to

1. Comprehend the concepts of Object-Oriented Programming (OOP) and fundamental Java constructs.
2. Develop reusable and efficient programs using Inheritance, Interfaces, and Packages.
3. Implement robust Java applications using Exception Handling and Multithreading.
4. Design interactive Graphical User Interfaces (GUIs) using AWT and Swing components.
5. Utilize advanced Java features such as Generics and Collections for effective data management

EXPERIMENTS:

1. Write a java program for fundamentals of classes and objects.
2. Write a java program using static keyword, this keyword and for variable length arguments.
3. Write a java program for inner classes and constructor overloading.
4. Write a java program for Single, Multilevel and Hirearchical Inheritance.
5. (a) Write a java program for Method overloading, Method Overriding, and using final and super.
   (b)Write a java program for Abstract class, interface, and Dynamic method dispatch.
6. (a)Write a java program for String class and its methods.
   (b)Write a java program for Packages.
7. Write a java program using Exception Handling Techniques.
8. Write a java program using Multithreading concepts.
9. Write a java program using swings.
10. Write a java program on event handling.
11. Write a java program on Swing Components.
12. Write a java program on Generics and collections.

LEARNING RESOURCES:

TEXT BOOK:

Java The Complete Reference - Herbert Schildt 11th Edition, Mc Graw Hill Education

REFERENCE BOOK(s):

1. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.

MC1	CONSTITUTION OF INDIA	L	T	P	C	Int	Ext
		2	-	-	0.0	100	-

Semester IV [Second Year]

COURSE OBJECTIVES:

To provide basic information about Indian Constitution.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. understand the significance of the Indian Constitution as well as their back ground. They will also understand number of undamental rights, DPSP and Fundamental Duties.
2. study guidelines for the Union Government, Legislative, Executive, Judiciary and also Supreme Court of India.
3. understand administration of a State Government and also the powers and functions of High Court.
4. understand election commission as an independent body with enormous powers and functions to be followed both at the Union and State level. Amendments are necessary, only major few amendments have been included.

UNIT I [CO:1] **(8)**

The Constitution of India - Its historical background, salient features, source of Indian Constitution, Preamble, Fundamental rights under Part Ill, Directive Principles of State Policy under Part-IV, IV-A Fundamental duties.

UNIT II [CO:2] **(8)**

Union Executive - President, Vice-President, Prime Minister, Union Legislature - Lok Sabha, Rajya Sabha and Union Judiciary - Supreme Court of India.

UNIT III [CO:3] **(8)**

State Executive Governor, Chief Minister, State Legislature, Legislative Assembly, Legislative Council and State Judiciary - High Court.

UNIT IV [CO:4] **(8)**

Election Commission: Electoral process, Centre State Relations (Amendment Procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments).

LEARNING RESOURCES:

TEXT BOOK:

Durga Das Basu: "Introduction to the Constitution of India" (student edition) Prentice - Hall EEE, 19th/20th Edition, 2001.

REFERENCE BOOK(s):

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
2. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI, Learning Pvt.Ltd., New Delhi, 2011.

IT/CM/CO/ CS221	COMPUTATIONAL STATISTICS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester IV [Second Year]

COURSE OBJECTIVES:

Course Objectives:

1. To enlighten the learners in the concepts of correlation, regression and time series.
2. To equip the learners with standard concepts of Multivariate normal distribution, Discriminant Analysis, principal component analysis and factor analysis.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Analyse the given data using linear statistical models and time series analysis.
2. Interpret the results of Multivariate Normal distribution and Regression.
3. Classify data using Discriminant Analysis.
4. Apply Principal Component Analysis and Factor Analysis techniques to the given data.

UNIT I [CO:1] **(12)**

Linear Statistical Models: Scatter diagram, linear regression and correlation, rank correlation,multiple correlation.

Basics of Time Series Analysis & Forecasting: Stationary, ARIMA Models: Identification,Estimation and Forecasting.

UNIT II [CO:2] **(12)**

Multivariate Normal Distribution: Multivariate Normal Distribution Functions, ConditionalDistribution and its relation to regression model, Estimation of parameters.

Multiple Linear Regression Model: Standard multiple regression models with emphasis oncollinearity, outliers, non-normality and auto correlation, validation of model assumptions.

UNIT III [CO:3] **(12)**

Multivariate Regression: Assumptions of multivariate regression models, Parameter estimation,multivariate analysis of variance and co-variance.

Discriminant Analysis: Statistical background, linear discriminant function analysis, Estimatinglinear discriminant functions and their properties.

UNIT IV [CO:4] **(12)**

Principal Component Analysis: Principal components, Algorithm for conducting principalcomponent analysis, deciding on how many principal components to retain, H-plot.

Factor Analysis: Factor analysis model, Extracting common factors, determining number offactors, Transformation of factor analysis solutions, Factor scores.

LEARNING RESOURCES:

TEXT BOOK:

Richard.A.Johnson and Dean.W. Wichern "Applied Multivariate Statistical Analysis"
Pearson Prentice Hall, 6th Edition, 2007.

REFERENCE BOOK(s):

1. ALVIN C. RENCHER, "Methods of Multivariate Analysis", John Wiley & Sons Publication, 3rd Edition
2. T.W. Anderson, "An Introduction to Multivariate Statistical Analysis", Wiley, 3rd Edition, 2003.

IT/CB/CD/ CM/CS222	ARTIFICIAL INTELLIGENCE	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester IV [Second Year]

COURSE OBJECTIVES:

The main objectives of this course are to:

1. Introduce fundamental concepts of artificial intelligence.
2. Impart knowledge on problem solving using uninformed, informed, local and adversarial search strategies.
3. Create awareness on formalization of knowledge and reasoning.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Explain the fundamental concepts of artificial intelligence
2. Apply search strategies for solving real world problems
3. Solve Constraint Satisfaction Problems
4. Utilize game playing strategies for solving problems
5. Infer knowledge using propositional and predicate logic
6. Summarize the algorithms for classical planning

UNIT I [CO:1,2] **(12)**

Introduction: What Is AI? The Foundations of AI, the History of AI, the State of the Art.

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Solving Problems by Searching: Problem-Solving Agents, Example Problems, Search Algorithms, Uninformed Search Strategies.

UNIT II [CO:2,3] **(12)**

Solving Problems by Searching: Informed (Heuristic) Search Strategies, Heuristic Functions.**Search in Complex Environments:** Local Search and Optimization Problems, Search with Non-Deterministic Actions, Searching with Partial Observations., Online Search Agents and Unknown Environments.

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

UNIT III [CO:4,5] **(12)**

Adversarial Search and Games: Game Theory, Optimal Decisions in Games, Heuristic Alpha-Beta Tree Search.

Logical Agents: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT IV [CO:5,6] **(12)**

First-Order Logic: Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and First-Order Inference, Forward Chaining, Backward Chaining, Resolution.

Automated Planning: Definition of Classical Planning, Algorithms for Classical Planning, Heuristics for

Planning, Hierarchical Planning.

LEARNING RESOURCES:

TEXT BOOK:

Artificial Intelligence-A Modern Approach, Stuart Russell and Peter Norvig, Fourth Edition, Pearson Education

REFERENCE BOOK(s):

1. Artificial Intelligence, E. Richand K.Knight,3rdEdn.,(TMH)
2. Artificial Intelligence, 3rdEdn.,Patrick Henny Winston,3rdEdn.,Pearson Education.
3. A First Course in Artificial Intelligence, Deepak Khemani, Tata Mc-Grah Hill.
4. Artificial Intelligence and Expert systems-Patterson, Pearson Education.
5. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning

IT/CB/CD/ CM/CO/CS223	DATABASE MANAGEMENT SYSTEMS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester IV [Second Year]

COURSE OBJECTIVES:

The main objectives of this course are to:

1. Provide fundamental concepts and architectures of database systems.
2. Enable to use formal relational languages and SQL to query, update, and manage databases
3. Explain the concepts and protocols related to transaction processing, concurrency control, and recovery

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Explain the fundamental concepts and architecture of database systems.
2. Query the database using relational algebra, Calculus and SQL
3. Develop conceptual database schema for a given specification
4. Design databases using normalization process
5. Discuss the role of transaction processing, concurrency control and recovery in a multiuser database system

UNIT I [CO:1] **(10)**

Introduction: Database system Applications, Purpose of Database Systems, View of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators

Introduction to the Relational Model: Structure of Relational Databases, Database Schema, Keys.

UNIT II [CO:2] **(14)**

Relational Query Languages: The Relational Algebra, Relational Calculus.**SQL:** Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database, Join Expressions, Transactions, Integrity Constraints, SQL Data Types and Schemas, Views.

UNIT III [CO:3,4] **(12)**

Database Design and the E-R Model - Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas**Relational Database Design -** Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms, Database-Design Process

UNIT IV [CO:5] **(12)**

Transactions: Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels

Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes, Snapshot Isolation

Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management

LEARNING RESOURCES:

REFERENCE BOOK:

Database System Concepts by Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Seventh Edition, Mc Graw Hill Publishers

IT/CB/CD/ CM/CO/CS224	OPERATING SYSTEMS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester IV [Second Year]

COURSE OBJECTIVES:

The objectives of the course are:

1. To introduce the structure and functions of the operating system.
2. To provide the knowledge of how the operating system manages the resources
3. To expose the students to the issues related to executing multiple processes in the system

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Describe the structure, operations and services provided by the Operating System.
2. Comprehend the concepts of process & threads, inter-process communication and multi-threading issues.
3. Analyze the performance of CPU scheduling algorithms.
4. Illustrate the problem of synchronization and deadlocks.
5. Differentiate the effectiveness and the hardware support required for contiguous, non-contiguous, and virtual memory management.
6. Explain the function, implementation of file systems and performance characteristics of mass storage devices

UNIT I [CO:1,2] **(12)**

Introduction: What Operating System Do, Operating-System Operations, Resource Management, Security and protection, Virtualization, Types of Operating Systems, Kernel Data Structures.

Operating System Structures: Operating System Services, User and Operating System Interface, System Calls, Operating Systems Structure.

Processes: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication, IPC in shared-memory Systems, and IPC in Message-passing Systems.

UNIT II [CO:3,4] **(13)**

Threads and Concurrency: Overview, Multicore Programming, Multithreading Models, Implicit Threading, Threading Issues.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, ThreadScheduling, Multi-Processor Scheduling, Real-Time CPU Scheduling.

Process Synchronization: Background, The Critical-Section Problem, Peterson solution, Hardware support for Synchronization, Mutex Locks, Semaphores, Classic Problems of Synchronization.

UNIT III [CO:4,5] **(13)**

Dead Locks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, DeadlockPrevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

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

Virtual-Memory: Background, Demand Paging, Page Replacement Algorithms, Thrashing.

UNIT IV [CO:6] **(10)**

Mass-Storage Structure: Overview of Mass-Storage Structure, HDD Scheduling.

Files System Interface: File Concept, Access Methods, Directory Structure, Protection.

File-Systems Implementation: File-System Structure, File-System operations, Directory Implementation, Allocation Methods, and Free-Space Management.

LEARNING RESOURCES:

TEXT BOOK:

Operating System Concepts-Abraham Silberchatz, Peter B Galvin, Greg Gange Tenth Edition, WILEY.

REFERENCE BOOK(s):

1. Operating Systems, Internal and Design Principles, Stallings, 8th Edition-2015, Pearson education/PHI.
2. Operating system, A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tenenbaum 4th Edition Pearson/PHI.
4. An Introduction to Operating Systems, Concepts and Practice, 4th Edition, PHI, 2013- Pramod Chandra P. Bhatt.
5. Operating Systems- A concept based approach -DM Dhamdhere -3rd Edition TMH

IT/CB/CD/ CS225	SOFTWARE ENGINEERING	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester IV [Second Year]

COURSE OBJECTIVES:

The main objectives of this course are:

1. impart knowledge on Principles and practices of process models for software development in software industry.
2. introduce software design concepts
3. Provide awareness on Architectural, Component and User experience design models.
4. Introduce testing techniques and metrics that are applicable to a Software Project.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Classify the Process models, processes and life cycle activities used in all the phases of Software development
2. Apply the software engineering requirements and modeling techniques to solve real- world problems
3. Choose appropriate engineering design model to develop Software components in a software system
4. Specify the software architectural, component level concepts and quality assurance to Software Application
5. Explain the software testing principles, techniques and metrics in the development of a software product

UNIT I [CO:1] **(12)**

Software and Software engineering: The Nature of Software- Defining Software, Software Application Domains, Legacy Software, The software Process-The Process frame work, Umbrella activities, Process adaptation.**The Software Process:** Process Models: A Generic Process Model, defining a Framework Activity, identifying a task set, Process Assessment and Improvement, Prescriptive Process Models: The waterfall model, Prototyping Process model, Evolutionary process model, The Unified Process Model. **Agile Development:** What Is Agility? Agility and the cost of change, What Is an Agile Process? Scrum, Other Agile Frameworks- The XP Framework, Kanban, DevOps.

UNIT II [CO:2,3] **(12)**

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Requirements gathering, developing use cases, Building the Analysis Model, Negotiating Requirements, Requirements monitoring, Validating Requirements.**Requirements Modelling:** Requirements Analysis, Scenario-Based Modeling, Class-Based Modeling, Functional Modeling, Behavioural Modeling.**Design Concepts:** Design within the Context of Software Engineering, the Design Process, Design Concepts, the Design Model.

UNIT III [CO:3,4] **(12)**

Architectural Design: Software Architecture, Agility and Architecture, Architectural Styles, Architectural Design, Assessing Alternative Architectural Designs, Architectural Reviews.**Modeling Component-Level Design:** What Is a Component? Designing Class-Based Components, Conducting Component Level Design.**Software Quality Assurance** - Elements of Software Quality Assurance, SQA Processes and Product Characteristics, SQA Tasks, Goals, and Metrics, Formal Approaches to SQA, Statistical Software Quality, Assurance, The ISO 9000 Quality Standards, The SQA Plan.

UNIT IV [CO:5] **(12)**

Software Testing â€“Component Level: A Strategic Approach to Software Testing, Planning and Record keeping, Test case design, White box testing, Black-Box-Testing.**Software-Testing Integration**

level: Software Testing Fundamentals, Integration testing, Validation Testing, Testing Patterns.**oftware Metrics and Analytics:** Software Measurement, Software Analytics, Product Metrics, Metrics for Testing, Metrics for maintenance, Process and Project Metrics, Metrics for Quality.

LEARNING RESOURCES:

TEXT BOOK:

Roger Pressman and Bruce Maxim â€œSoftware Engineering - A Practitioner's Approachâ€•, 9th edition, Tata McGraw-Hill International

REFERENCE BOOK(s):

1. Ian Somerville, Software Engineering. 6 ed, Pearson Education.
2. CarloGhezzi,Mehdi Jazayeri and Dino Mandrioli, Fundamentals of Software Engineering.2 ed, PHI.
3. Rajib Mall, Fundamentals of Software Engineering. 2nd ed, PHI.

IT261 **SKILL ENHANCEMENT COURSE-2**

L	T	P	C	Int	Ext
-	-	4	2.0	30	70

Semester IV [Second Year]

Skill Courses

Code No.	Subject Name	Code No.	Subject Name
ITSL1	Employability Skills-I	ITSL2	Employability Skills-II

IT/CB/CD/ CM/CO/CS262	DESIGN THINKING AND INNOVATION	L	T	P	C	Int	Ext
		1	-	2	2.0	30	70

Semester IV [Second Year]

COURSE OBJECTIVES:

1. Identify the design thinking processes and methods.
2. Plan research activities to gather and empathize from a users viewpoint.
3. Ideate techniques to help arrive at the best solution and evaluation.
4. Identify design thinking approaches for business challenges.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. outline the problem statement; apply the methods of Empathy on user groups
2. describe and define the problem specific to the user group.
3. apply ideation tools to generate ideas to solve the problem.
4. develop prototype and test the ideas and demonstrate storytelling ability to present the ideas.

UNIT I [CO:1] **(12)**

Introduction to Design Thinking: Definition, Need for Design Thinking, ten tools of Design Thinking, Five stages of Design Thinking process, Benefits of Design Thinking, how design Thinking differs from traditional problem solving approaches, Sustainable business model examples using Design Thinking.

Innovation: Study of Innovation, Individuals in the innovation process, Invention and innovation, Types of innovations.

Case Studies: General, Engineering and service applications.

Activities: Identify an opportunity and scope of the Project, Explore the possibilities and prepare design brief.

UNIT II [CO:2] **(12)**

Methods and tools for Empathize and Define Phases:

Empathize Phase: Methods of Empathize phase: Importance of Empathy, Techniques for conducting user Research and gathering Insights: Ask 5 Why/ 5 W+H Questions, stakeholder map, Empathy Map, Peer observation, Trend Analysis.

Define Phase: Transition from empathize phase to define phase: Analyze and synthesize the data (Step 1), Define the core problem (step 2), Identify User needs and opportunities (step 3), develop point of View (POV) (step 4).

Activities: Apply the methods of empathize and define phases, Finalize the problem statement.

UNIT III [CO:3] **(12)**

Methods and Tools for Ideate Phase and Prototype Phase:

Ideate Phase: Clear articulation of the problem statement with focus on latent needs, Techniques for Ideation: Warm up games, Brain Stroming, Six hats thinking, Mind mapping, Role playing, Storytelling, Sketching, SCAMPER, Creative matrix technique, Divergence and Convergence and Evaluation of Ideas.

Activities: Apply the methods of Ideate Phase: Generate lots of Ideas.

Prototype Phase: How prototype enhances the design thinking process, developing mockups, models and prototypes, Types of prototypes, proof of concept and prototyping, Minimum Viable Product,

developing skills for making and presenting prototypes.

Activities: Apply the methods of Prototype Phase: Create prototypes for selected Ideas.

UNIT IV [CO:4] **(12)**

Methods and Tools for Test Phase:

Test Phase: Defining testing and implementation goals, Identifying the key stakeholders of the testing stage, Key challenges in testing and implementation, Overview of piloting and launching in design thinking, Analyzing the test results, Tracking results and measuring success, leveraging Feedback and data , Avoiding the common pitfalls in testing stage.

Activities: Collect feedback; iterate and improve the Ideas.

Solution Overview: Create a Pitch-Plan for scaling up -Road map for implementation.

Activities: Present your solution using Story telling Method.

Project Submission: Fine tuning and submission of the Project.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

REFERENCE BOOK(s):

1. C. Subramanian, T. Paramasivan, S. Venkataramani, Design Thinking: A hands -on Approach, Universities Press, 2025.
2. David Lee, Design Thinking in the Classroom, Ulysses press, 2018
3. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
4. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010. 4. Chesbrough.H, The era of open innovation, 2003.

IT263	ARTIFICIAL INTELLIGENCE LAB	L	T	P	C	Int	Ext
		-	-	3	1.0	30	70

Semester IV [Second Year]

COURSE OBJECTIVES:

The objectives of this course are to:

1. Understand fundamental AI problem-solving techniques such as search, planning, and reasoning
2. Implement uninformed and informed search algorithms using Python
3. Design and develop game-playing agents and adversarial search strategies.
4. Develop knowledge-based agents using propositional and predicate logic.
5. Understand the behaviour of intelligent agents in different environments.
6. Gain hands-on experience in modelling real-world problems as state-space representations.

COURSE OUTCOMES:

After the successful completion of the course,students are able to

1. Apply uninformed search techniques such as Breadth First Search and Depth First Search to solve AI problems.
2. Implement game-playing algorithms including Tic-Tac-Toe and Alpha-Beta Pruning using adversarial search concepts.
3. Solve classical AI problems using state-space search , Design and implement intelligent agents, optimization and combinatorial problems
4. Apply constraint satisfaction techniques and Develop knowledge-based systems using propositional and predicate logic for reasoning and inference
5. Analyze and compare various AI approaches based on time complexity, space complexity, and optimality.

EXPERIMENTS:

1. Write a Program to Implement Breadth First Search using Python.
2. Write a Program to Implement Depth First Search using Python
3. Write a Program to Implement Vacuum Cleaner (Simple Reflex Agent).
4. Write a Program to Implement Tic-Tac-Toe game using Python
5. Write a Program to implement 8-Puzzle problem using Python
6. Write a Program to Implement Water-Jug problem using Python
7. Write a Program to Implement Travelling Salesman Problem using Python
8. Write a Program to Implement Tower of Hanoi using Python
9. Write a Program to Implement Monkey Banana Problem using Python.
10. Write a Program to implement 8-Queens Problem using Python. Constraint Satisfaction Search (Map Coloring).
11. Write a Program to Implement Logical Agent (Wumpus World).
12. Write a Program to Implement Predicate Logic (Knowledge based).

LEARNING RESOURCES:

TEXT BOOK:

Artificial Intelligence-A Modern Approach, Stuart Russell and Peter Norvig, Fourth Edition, Pearson Education

REFERENCE BOOK(s):

1. Artificial Intelligence, E. Richand K.Knight,3rdEdn.,(TMH)

2. Artificial Intelligence, 3rdEdn.,Patrick Henny Winston,3rdEdn.,Pearson Education.

IT264	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C	Int	Ext
		-	-	3	1.0	30	70

Semester IV [Second Year]

COURSE OBJECTIVES:

The main objectives of this course are to:

1. Syntax and usage of DDL, DML, DCL, and TCL statements, asserting database integrity constraints during database creation
2. Semantics of SQL for implementing the user queries on a relational database.
3. Block structured PL / SQL programming concepts

COURSE OUTCOMES:

After the successful completion of the course,students are able to

1. Define, manipulate and control data using Structured Query Language (SQL).
2. Identify various database integrity constraints during database creation.
3. Construct SQL statements for satisfying end user queries by utilizing functions, setoperations, joins, and subqueries.
4. Develop various applications using various PL/SQL data object like Database cursors,Functions, Stored Procedures, Packages, and Triggers.

EXPERIMENTS:

1. Query the sample database using simple select statements retrieving:
   1. Small-large number of attributes
   2. Distinct output values
   3. By Renaming attributes
   4. Computed attributes
   5. By using Simple-complex conditions (AND, OR, NOT)
   6. By using Partial Matching operators (LIKE, %, _, *,?)
   7. Sorted records
   8. By checking for Nulls
2. Query the sample database using joins, nested queries, aggregate functions and setoriented operations
3. Query the sample database using built-in single row functions
4. Implement PL/SQL named and unnamed blocks
5. Implement PL/SQL Implicit and Explicit Cursors
6. Implement PL/SQL pre-defined and user defined exceptions
7. Implement PL/SQL stored procedures, functions and packages
8. Implement PL/SQL database triggers

MC2	ENVIRONMENTAL SCIENCE	L	T	P	C	Int	Ext
		2	-	-	0.0	100	-

Semester IV [Second Year]

COURSE OBJECTIVES:

To understand the management of natural resources, prevent/control pollution and work towards sustainable development for a better world in the light of growing advanced technologies.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. understand various factors that cause natural resource degradation.
2. conserve ecosystems and biodiversity.
3. realize and explore the problems related to environmental pollution and its management.
4. apply the information and technology to analyze social issues, use acts associated with environment.

UNIT I [CO:1] **(8)**

Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance. Natural Resources: Renewable and non- renewable resources - Forest resources - Use and over - exploitation, deforestation - Mining, dams and other effects on forest and tribal people - Water resources - Use and over utilization of surface and ground water - Floods, drought, conflicts over water, dams - benefits and problems - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

UNIT II [CO:2] **(8)**

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

Biodiversity and Its Conservation: Introduction Definition: genetic, species and ecosystem diversity - Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III [CO:3] **(8)**

Environmental Pollution: Definition, Cause, effects and control measures of : Air Pollution - Water pollution - soil pollution - Marine pollution - Noise pollution - Thermal pollution.

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution.

Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV [CO:4] **(8)**

Social Issues and the Environment: From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Environment Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and control of Pollution) Act - Wild life Protection Act - Forest Conservation Act.

Field Work: Visit to a local area to document environmental assets-River / forest grassland / hill / mountain - Visit to a local polluted site-Urban/Rural/Industrial, Agricultural Study of common plants, insects, and birds - river, hill slopes, etc.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Anubha Kaushik, C. P. Kaushik, Perspectives In Environmental Studies, 7th Edition, New Age International Private Limited.
2. Erach Bharucha. 2004, Environmental Studies for undergraduate courses, University Grants Commission, New Delhi, Bharati Vidyapeeth Institute of Environment Education and Research.
3. Palaniswamy, Environmental Studies, Pearson education.
4. S.Azeem Unnisa, Ã¢â‚¬Å“Environmental StudiesÃ¢â‚¬Â• Academic Publishing Company.
5. K.Raghavan Nambiar, Ã¢â‚¬Å“Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabusÃ¢â‚¬Â•, Scitech Publications (India), Pvt. Ltd.

REFERENCE BOOK(s):

1. Anjireddy.M Environmental science & Technology, BS Publications PVT Ltd, Hyderabad.
2. Benny Joseph, 2005, Environmental Studies, The Tata McGraw- Hill publishing company limited, New Delhi.
3. Principles of Environmental Science. & Engg. P.Venu Gopala Rao, 2006, Prentice- Hall of India Pvt. Ltd., New Delhi.

WEB RESOURCES:

NPTEL Courses-Environmental Studies by Dr. Tushar Banerjee, Devi Ahilya Viswavidyalaya, Indore.

IT/CS311	AUTOMATA THEORY AND FORMAL LANGUAGES	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester V [Third Year]

COURSE OBJECTIVES:

The main objectives of this course are to:

1. Introduce the types of Finite Automata and properties of Regular Expressions.
2. Explain Context-Free Grammars and Push Down Automata
3. Introduce the Turing Machine and explain undecidability concept.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Explain the fundamental concepts of Automata and Formal languages. L2
2. Apply the knowledge of Automata Theory, Formal languages, Grammars & Regular Expressions for solving various problems. L3
3. Design PDAs for various languages. L4
4. Design Turing machines to solve problems. L4

UNIT I [CO:1] **(12)**

Automata: Introduction to Automata, The central concepts of automata theory - Alphabets, Strings, Languages.Finite Automata: An Informal picture of finite automata, Deterministic finite automata (DFA) -Definition of DFA, DFA processing strings, Notations for DFA, Extended transition function, thelanguage of DFA,Non deterministic finite automata(NFA) â€“Definition of NFA, Extended transition function, the language of NFA, Equivalence of DFA and NFA.Finite Automata with Epsilon transitions: Use of â^ - transition, notation for a â^ - NFA, Epsilon closures, extended transitions and languages, Applications.

UNIT II [CO:2] **(12)**

Regular Expressions and Languages: Regular expressions, finite automata and regular expressions, Algebraic laws of regular expressions.Properties of Regular Languages: Proving languages are not regular â€“ Pumping lemma for regular languages, Applications of the pumping lemma, Closure Properties of Regular Languages, Equivalence and minimization of automataâ€“Minimization of DFA

UNIT III [CO:3] **(12)**

(Construction based treatment & proofs are excluded)Context Free Grammars: Context Free Grammars, Parse Trees, Constructing parse trees, derivations and parse trees, ambiguous grammars.Push down Automata: Definition of the Push down automata, the languages of PDA, Equivalences of PDAâ€™s and CFGâ€™s.Context Free Languages: Normal formâ€™s for context-Free grammars, the pumping lemma for context free languages.

UNIT IV [CO:4] **(12)**

Properties of Context free languages: Closure properties for context free languages, Decision properties for CFLâ€™s.Introduction to Turing Machines: The Turing Machine, programming techniques for Turing machines.Undecidability: A language that is not recursively enumerable, an undecidable problem that is RE, Undecidability problems about TM, Postâ€™s Correspondence problem, Intractable Problems-Classes P and NP

LEARNING RESOURCES:

TEXT BOOK:

John E. Hopcroft, Rajeev Motwani, and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd Edition, Pearson, 2025.

REFERENCE BOOK(s):

1. Daniel I.A.Cohen, Computer Theory, Wiley Publications
2. KLP Mishra & N.Chandrasekharan, Theory of Computation , PHI

IT/CB/CD/ CS312	COMPUTER NETWORKS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester V [Third Year]

COURSE OBJECTIVES:

1. Introduce the fundamental concepts and layered architectures of networks.
2. Impart knowledge on functionalities, design issues, protocols and mechanisms used in different layers of network stack.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Describe the layered architectures of computer networks.
2. Explain the fundamental concepts of data communications.
3. Illustrate the data link layer protocols and the mechanisms used for accessing a channel.
4. Exemplify optimal routing algorithms and QoS mechanisms used for networks.
5. Explain reliable and unreliable protocols used for end to end connectivity.
6. Discuss the application layer protocols.

UNIT I *Text Book - 1* [CO:1,2] **(12)**

Introduction: Network Technology, From Local to Global, Network Protocols, Reference Models.

Physical Layer: Guided media, From Waveform to Bits, Switching.

UNIT II *Text Book - 1* [CO:3] **(12)**

The Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Improving Efficiency.

The Medium Access Control Sub-layer: Multiple Access Protocols- ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Ethernet, Data Link Layer Switching.

UNIT III *Text Book - 1* [CO:4,5] **(13)**

The Network Layer: Network Layer Design Issues, Routing Algorithms In a Single Network-Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast routing, multicast routing, Traffic Management At The Network Layer, Quality Of Service And Application Qoe- Application Qos Requirements, Traffic Shaping, Packet Scheduling, Internetworking.

The Network Layer in the Internet-The IP version 4.0 protocol, IP Addresses, IP Version 6.0, Internet Control Protocols.

UNIT IV *Text Book - 1* [CO:5,6] **(11)**

The Transport Layer: The Transport Service: Services Provided to the Upper Layers, Transport Service Primitives, Elements of Transport Protocols â€" Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Congestion Control-Desirable Bandwidth allocation, Regulating the sending rate.

The Internet Transport Protocols: UDP : Introduction to UDP, Remote procedure call, Real-Time transport protocols, TCP: Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

The Application Layer: The Domain Name System (DNS)- The DNS Lookup Process, The DNS Name Space and Hierarchy, DNS Queries and Response, Name Resolution, DNS Privacy, Contention Over Names, Electronic mail.

LEARNING RESOURCES:

TEXT BOOK:

Andrew S. Tanenbaum, David 1. Wetherall, Computer Networks, Sixth Edition, Pearson Education.

REFERENCE BOOK(s):

1. James F. Kurose, Keith W. Ross, Computer Networking, Third Edition, Pearson Education.
2. Behrouz A Forouzan, Data Communications and Networking, Fourth Edition, TMH (2007).
3. Kurose & Ross, COMPUTER NETWORKS, A Top-down approach featuring the Internet, Pearson Education, Alberto Leon, Garciak.

ITEL01 INTERACTIVE COMPUTER GRAPHICS

Course Objectives: The main objectives of this course are:
1. Introduce computer graphics systems, Algorithm and 2D transformation.
2. Illustrate clipping, 3D transformation and clipping.
3. Discuss the concepts of animation.

Course Outcomes: After successful completion of the course, the students are able to
1. Implement algorithms for output primitives.
2. Implement 2D transformation and clipping.
3. Implement 3D object representation, transformation and clipping.
4. Develop animation sequence.

UNIT-I (CO1) (13 periods)

Introduction: Basic concepts, Application areas of Computer Graphics, overview of graphics systems -video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations, input devices and their logical classifications, Hard copy devices and Graphics software.

Output primitives: Points and lines, line drawing algorithms - DDA, Bresenham's, mid-point circle and ellipse algorithms, Filled area primitives - Scan line polygon fill algorithm, inside-outside tests, boundary - fill and flood-fill algorithms, character generation and antialiasing.

UNIT-II (CO2) (12 periods)

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view - port coordinate transformation, viewing functions, Cohen-Sutherland and Liang-Barsky line clipping algorithms, Sutherland - Hodgeman polygon clipping algorithm.

UNIT-III (CO3) (13 periods)

Three Dimensional Concepts: 3-D Display method, 3-D object representation: Polygon surfaces, Curved lines and surfaces, quadric surfaces, spline representation, Bezier curve and surfaces.

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

UNIT-IV (CO4) (12 periods)

3-D viewing: Viewing pipeline, viewing coordinates, projections, view volume and general projection transforms and clipping.

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

TEXT BOOK:

1. "Computer Graphics C version", Donald Hearn and M.Pauline Baker, Pearson Education 2nd Edition.

ITEL02 AGILE SOFTWARE DEVELOPMENT

Course Objectives

At the end of the course the students will understand

- the fundamental principles and practices associated with each of the agile development methods.
- how agile methods scale to large and distributed projects.
- perform in-depth explorations into aspects of agile development.

Course Outcomes

At the end of the course the students will be able to

- know the design and develop a software using agile and lean development methods..
- distinguish the various phases of agile software development.
- plan the technical strategy and release of a software with agile development.
- apply Scrum and Sprint agile methodologies in system development.

UNIT – I **Text Book 1 – (12 Hours)**

Introduction to Agile and Lean: Toward a Disciplined Agile Manifesto, Disciplined Agile Values, Disciplined Agile Principles, Lean Principles, Reality over Rhetoric.

Foundations of Disciplined Agile Delivery: Scrum, Extreme Programming (XP), Agile Modeling (AM), Agile Data, Lean Software Development, Open Unified Process (OpenUP).

Roles, Rights, and Responsibilities: The Rights of Everyone, The Responsibilities of Everyone, The DAD Roles.

UNIT – II **Text Book 1 – (12 Hours)**

The Inception Phase: How the Inception Phase Works, Aligning with the Rest of the Enterprise, Securing Funding, Other Inception Activities, When Do You Need an Inception Phase?, Inception Phase Patterns, Inception Phase Anti-Patterns.

The Construction Phase: How the Construction Phase Works, The Typical Rhythm of Construction Iterations, The Risk-Value Lifecycle, When Are You Ready to Deploy? , Construction Patterns, Construction Anti-Patterns.

Initiating a Construction Iteration: Why Agile Planning Is Different, Iteration Planning, Visualizing Your Plan, Look-Ahead Planning and Modeling.

The Transition Phase: How the Transition Phase Works, Planning the Transition Phase, Ensuring Your Production Readiness, Preparing Your Stakeholders for the Release, Deploying the Solution, Transition Phase Patterns, Transition Phase Anti-Patterns.

UNIT – III **Text Book 1 – (12 Hours)**

Identifying an Initial Technical Strategy: Choosing the Right Level of Detail, Choosing the Right Types of Models, Choosing a Modeling Strategy, Architecture throughout the Lifecycle.

Initial Release Planning: Who Does the Planning?, Choosing the Right Scope for the Plan, Choosing a General Planning Strategy, Choosing Cadences, Formulating an Initial Schedule, Estimating the Cost and Value, Identifying Risks.

UNIT – IV **Text Book 2 – (12 Hours)**

Scrum Framework: Scrum Roles, Scrum Activities and Artifacts, Sprints, Daily Scrum.

Sprints: Timeboxed, Short Duration, Consistent Duration, No Goal-Altering Changes, Definition of Done.

Text Books :

1. Scott W. Ambler, Mark Lines, Disciplined Agile Delivery: A Practitioner's Guide to Agile Software Delivery in the Enterprise, IBM Press, 2012 .(UNIT – I to UNIT – III)

2. K.S. Rubin, Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison-Wesley, 2012.(UNIT IV)

Reference Books:

1. K. Beck, Test Driven Development: By Example, Addison-Wesley, 2002.
2. K. Beck, C. Andres, Extreme Programming Explained: Embrace Change, 2nd Edition, Addison-Wesley, 2004.
3. M. Cohn, Succeeding with Agile: Software Development Using Scrum, Addison-Wesley, 2010.

ITEL03 INTRODUCTION TO QUANTUM COMPUTING

L	T	P	C
3	0	0	3

Course Objectives:

At the end of the course, the students will understand:

- conceptual foundation of quantum computation and quantum systems
- quantum logic gates and circuits
- various operators in quantum maps
- fundamental quantum algorithms

Course Outcomes:

After successful completion of the course, the students are able to:

- summarize the fundamental concepts for quantum computation models.
- compare classical and quantum bits configuration with quantum logic gates and circuits.
- use mathematical operators to describe the evolution, noise, or measurement of quantum states.
- Use and apply various quantum algorithms for real world problems.

UNIT I **12Periods (CO1)**

Computational models: Deterministic automata, Turing machines and complexity classes, Circuit model, Church–Turing thesis, Non-deterministic machines, Quantum Turing machines ,Quantum algorithms, QMA problems

Quantum mechanics: Postulates of quantum mechanics, Expectation value of an observable, Evolution of quantum systems and projective measurements, The Hamiltonian of a qubit, Quantum harmonic oscillator, Coherent states, The Jaynes–Cummings Hamiltonian

UNIT II **12Periods (CO2)**

Quantum circuits: Qubits, Quantum circuits and Di Vincenzo criteria, Single-qubit rotations and measurements, Two-qubit gates, Universality, State preparation, The Clifford group and the Gottesman–Knill theorem

Density operators: Definition and examples, Unitary evolution of a quantum state, The measurement of a quantum state, The quantum state of a qubit, Thermal states, Composite systems, Quantum state tomography.

UNIT III **12Periods (CO3)**

Quantum maps: Definition of a quantum map, Depolarizing channel, Amplitude damping, Dephasing, Transposition, Kraus representation of a quantum map, The affine map, Quantum maps from unitary evolutions, Choi–Jamiolkowski isomorphism, Quantum process tomography

Entanglement: Definition and examples, The Schmidt decomposition, Quantifying entanglement for pure states, Quantum dense coding, Quantum teleportation of a qubit state, Entanglement swapping, Realism and locality, Entanglement for mixed states, Quantifying entanglement of mixed states

UNIT IV **12Periods (CO4)**

Early quantum algorithms: Function evaluation with a quantum computer, Black-box problems, Deutsch's algorithm, Bernstein–Vazirani algorithm, Grover's algorithm, Simon's algorithm, The discrete Fourier transform, Period finding, Shor's algorithm

Quantum simulation of Hamiltonian dynamics: Trotterization, Trotterization at higher orders, Trotterization of sparse Hamiltonians , LCU: linear combination of unitaries, Taylor series, Qubitization, Hamiltonian simulation is BQP complete

TEXT BOOKS

Quantum Information Science – Manenti R., Motta M., 1st Edition, Oxford University Press (2023)

REFERENCES

1. Quantum computation and quantum information – Nielsen M. A., and ChuangL., 10th Anniversary edition, Cambridge University Press (2010)

2. A Pathak, Elements of Quantum Computation and Quantum Communication, Boca Raton, CRC Press (2015)
3. Quantum error correction and Fault tolerant computing, Frank Gaitan, 1st edition, CRC Press (2008)
4. Quantum computing explained, David McMahon, Wiley (2008)
5. Introduction to Quantum Computing: From a lay person to a programmer in 30 steps, Hui Yung Wong, 1st edition, Springer-Nature Switzerland AG (2022:}

ITEL 04 ADVANCED JAVA PROGRAMMING

Course Objectives:

The main objectives of this course are

1. Introducing database applications.
2. Introducing network applications by using TCP/IP sockets.
3. Introducing distributed applications
4. Introducing Mail and Enterprise beans .

Course Outcomes:

After successful completion of the course, the students will be able to:

CO1. Create Database applications using JDBC.
CO2. Develop socket applications.
CO3. Design and develop distributed applications in java using RMI and CORBA.
CO4. Design and develop javamail applications and enterprise applications.

Course Content:

UNIT – I [CO1] 10 Hours

Java Database Connectivity (JDBC): Introduction, JDBC Drivers, JDBC Architecture, JDBC Classes and Interfaces, Loading a Driver, Making a Connection, Execute SQL Statement, SQL Statements, Retrieving Result, Getting Database Information, Scrollable and Updatable Resultset, Result Set Metadata.

UNIT – II [CO2] 10 Hours

Networking : Networking Basics, Introduction of Socket, Types of Socket, Socket API, TCP-IP Client/Server Sockets, URL, URLConnection,UDP: Datagrams, java.net package classes: Socket, ServerSocket, InetAddress.

UNIT – III [CO3] 10 Hours

Java and XML: Generating an XML document, XML - DOM Parser, and SAX parser Java Interface Definition Language and CORBA

Java Remote Method Invocation

UNIT – IV [CO4] 10 Hours

Enterprise JavaBeans: Session Beans, Message Driven Beans, Entity Beans. Java Mail API

Learning Resources:

Text Book:

1. Herbert Schildt , Java™:The Complete Reference, Seventh Edition(**UNIT – I, UNIT – II)**
2. Jim Keogh "The complete Reference J2EE" Tata McGraw Hill(Unit III , Unit IV)

Reference Books:

1. Black Book "Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008.
2. Professional Java Server Programming by Subrahmanyam Allamaraju, Cedric Buest Apress Publication
3. Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell, Pearson Publication.

ITEL05	GENERATIVE AI	L	P	C	Int	Ext
		3	0	3	30	70

COURSE OBJECTIVES:

At the end of the course the students will understand

- To understand basic concepts of Deep Learning.
- To introduce the fundamental concepts of generative modeling and autoencoders**.**
- To analyze different ANNs in Deep Learning.
- To understand the working principles of diffusion models and make decisions about the application of Generative AI in various domains with prompt.

COURSE OUTCOMES:

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

- Understand the significance of Deep Learning.
- Analze the fundamentals of generative modeling.
- Understand different ANNs in Deep Learning.
- Implement basic diffusion and transformer models and make informed decisions about the application of Generative AI in various domains.

UNIT-I [CO1] 12 Periods

Introduction to Deep Learning: Deep Feed Forward Networks: Learning XOR, Gradient based Learning, Hidden Units, Architecture Design.
Convolutional Networks: Convolution Operation, Pooling, Data types.

UNIT-II [CO2] 12 Periods

Generative Modeling: What is Generative Modeling? Generative versus Discriminative Modeling, Generative Modeling Framework, Core Probability Theory, Generative Model Taxonomy.
Variational Autoencoders: Autoencoders, Variational Autoencoders, exploring the Latent Space - Latent Space Arithmetic, Morphing between faces.

Unit-III [CO3] 13 Periods
Generative Adversarial Networks: Introduction to GANs, Deep Convolutional GAN, The Discriminator, The Generator, Training the DCGAN, Wasserstein GAN and Gradient Policy- Wasserstein Loss, Lipschitz Constraint, Gradient Penalty Loss, Conditional GAN - Architecture.
Autoregressive Models : LSTM Network - Tokenization, Architecture, Recurrent Neural Network Extensions – Stacked RNN, Gated Recurrent Units, Pixel CNN - Masked Convolutional Layers, Residual Blocks.

Unit-IV [CO4] 13 Periods
Diffusion Models: Denoising Diffusion Models - Forward Diffusion Process, Reverse Diffusion Process, U-Net Denoising Model, Transformers - GPT, other Transformers. Advanced GANs : ProGAN, Self- Attention GAN.

Understanding Prompting and Prompt Techniques: Introducing LLM Prompts, Types of LLM Prompts, Components of LLM Prompt, Exploring LLM Parameters, Challenges and Limitations of using LLM prompts.
Generation of Text with AI for Content Creation: Using AI for copy writing, Creating Social Media posts, Writing Twitter Thread, Writing video scripts, Unlocking Insights from

Unstructured Text - AI Techniques for Text Analysis, Sentiment Analysis, Organizing unstructured data, Cleaning up dirty data, Making Sense of Unstructured Data.

Learning Resources:

TEXT BOOKS:

1. "Deep Learning" Good fellow,Yoshua Bengio, Aaron Courville, MIT Press. [**Unit-I]**
2. "Generative Deep Learning", David Foster 2nd edition. [**Unit-II & III]**
3. "Unlocking the Secrets of Prompt Engineering", Gilbert Mizrahi,1st edition.**[Unit-IV]**

Reference Books:

1. "Generative AI on AWS" by Chris Fregly, Antje Barth, Shelbee Eigenbrode.
2. "Artificial Intelligence & Generative AI for Beginners" by David M.Patel.

ITEL06 BIG DATA ANALYTICS L T P C Int Ext
3 - 2 4 30 70

Course Objectives:
At the end of the course, the students will understand:

- overview of Big Data, processing of big data and concepts of big data and analytics.
- explore tools and practices for working with big data
- the research that requires the integration of large amounts of data.

Course outcomes:
After successful completion of the course, the students are able to:

- Recognize Big Data and its analytics in the real world.
- Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics.
- Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm.
- Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics.

UNIT – I (10 Hours)

Overview of Big Data: What is Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics

Exploring the use of Big Data in Business Context : Use of Big Data in social Networking, use of Big Data in preventing Fraudulent Activities, use of Big Data in detecting Fraudulent Activities Insurance sector, use of Big Data in Retail Industry

Understanding Big Data Technology Foundations: Exploring the Big Data Stack, Virtualization and Big Data, Virtualization approaches

UNIT – II (14 Hours)

Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Introducing Hadoop, In-Memory Computing Technology for Big Data

Understanding hadoop Ecosystem: Hadoop Ecosystem, Hadoop Distributed File System, MapReduce, Hadoop YARN, HBase, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie

Understanding MapReduce Fundamentals and HBase: MapReduce Framework, Techniques to Optimize MapReduce Jobs, Uses of MapReduce, Characteristics of HBase.

UNIT – III (14 Hours)

Storing Data in Databases and Data Warehouses: RDMS and Big Data, Nom-Relational Database, Polyglot Persistence, Integrating Big Data with traditional Data Warehouses, Big Data Analysis and Data Warehouses, Changing deployment in Big Data Era

Storing Data in Hadoop: Introducing HDFS, Introducing HBase, Combining HBase and HDFS, Selecting the suitable Hadoop Data organization for Applications

NoSQL Data Management: Introduction to NoSQL, Aggregate Data Models, Key Value Data Models, Document Databases, Relationships, Graph Databases, Schema-Less Databases, Materialized Views, Distribution Models, Sharding, MapReduce Partioning and Combining, Composing MapReduce Calculations

UNIT – IV (12 Hours)

Understanding Analytics and Big Data: Comparing Reporting and Analysis, The Analytic Process, Types of Analytics

Analytical Approaches and Tools to Analyze Data: Analytical Approaches, History of Analytical Tools, Introducing Popular Analytical Tools, Comparing various Analytical Tools

Data Visualization: Introducing Data Visualization, Techniques used for Visual Data Representation, Application of Data Visualization**,** Visualizing Big Data, Tools used in Data Visualization

Social Media Analytics and Text Mining: Introducing Social Media, Introducing Key Elements of Social Media, Introducing Text Mining, Understanding Text Mining Process, Sentiment Analysis

Text Book:

1. BIG DATA Black Book , Dreamtech Press, 2015 EDITION

Reference Books:

1. Bill Franks, Taming The Big Data Tidal Wave, 1st Edition, Wiley, 2012.
2. Frank J. Ohlhorst, Big Data Analytics,1st Edition, Wiley, 2012.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition (2012), O'Reilly(SPD).

ITEL 07 CYBER SECURITY

UNIT I 13 Periods

Information Security Assets & Threats: Introduction, Role of a security analyst, Threats, Virus, Worms, Trojans, Other Threats, types of Network Attacks, types of Phishing Attack, Types of viruses, Types of worms, types of Trojans. DoS (denial-of-service) attack, Common Vulnerabilities and Exposures (CVE), Bluetooth related attacks.

Fundamentals of Information Security: Elements of information security, Principles and concepts - data security, Types of controls, Discretionary Access Control (DAC), Role-Based Access Control (RBAC).

UNIT II 13 Periods

Roles and Responsibilities: Information and Data Security Team, CEO or Executive Management, Security Engineer, Systems Administrator, Security Steering Committee, Security Incident Response Team.

Data Leakage: Introduction – Data Leakage, Organizational Data Classification, Location and Pathways, Content Awareness, Content Analysis Techniques, Data Protection, DLP Limitations, DRM-DLP Conundrum,Case studies: SQL Injection using OWASP tool.

Information Security Policies, Procedures, Standards and Guidelines: Information Security Policies, Key Elements of a Security Policy, Security Policy implementation, Security Standards, COSO, COBIT,ISO27001,SANS.

UNIT III 12 Periods

Information Security Performance Metrics: Introduction –Security Metrics, Types of Security Metrics, Using Security Metrics, Developing the Metrics Process, Metrics and Reporting.

Configuration review: Configuration Management, Organizational SecCM Policy, Identify CM Tools, Implementing Secure Configurations, case studies.

Log Correlation and Management: Event Log Concepts, Log Management Infrastructure and functions, Log Management - Using Log watch.

UNIT IV 13 Periods

Data Backup: Types of Backup, Backup Procedures, Types of Storage, Features of a Good Backup Strategy.

Information Security Audit: Information Systems Audit versus Information Security Audit, What is an Information Security Audit, Scope of the Audit, Types of Security Audits, Phases of Information Security Audit, Information Security Audit Methodology, Role of an Auditor, Penetration testing stages.

Vulnerability Analysis: What Is Vulnerability Assessment, Vulnerability Classification, Types of Vulnerability Assessment, Vulnerability Analysis Tools,Case studies.

Text Book : NASSCOM Handbook Study Material

Reference Books:

1. Nina Godbole, “Information System Security”, Wiley
2. Bothra Harsh, “Hacking”, Khanna Publishing House, Delhi.
3. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
4. MarttiLehto, PekkaNeittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
5. Nelson Phillips and EnfingerSteuart, ―Computer Forensics and Investigations‖, Cengage Learning, New Delhi, 2009.

ITEL08 - PARALLEL ALGORITHM

The main objectives of this course are:

1 Illustrate basic sequential and parallel l algorithms.
2 Demonstrate advance data structures for parallel algorithms.
3 Demonstrate design techniques for parallel algorithms.

Course Outcomes:

After successful completion of the course, the students are able to:

1 Analyze computation complexity of parallel algorithms.
2 Implement searching, and sorting for parallel algorithms.
3 Solve permutations and matrix operations using parallel algorithms.
4 Develop solutions for computational problems using appropriate data structures for parallel algorithms.

CO-PO Mapping:

	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1
CO1	3	3	-	-	-	-	-	-	-	-	-	2
CO2	3	3	2	2	2	-	-	-	-	-	-	2
CO3	3	3	1	2	-	-	-	-	-	-	-	2
CO4	3	3	1	2	-	-	-	-	-	-	-	2

UNIT I 12 Periods

Introduction to Parallel Algorithms: Models of Computation – Analyzing Algorithms, Selection- The Problem and a lower Bound, A Sequential algorithm, Desirable Properties of Parallel algorithm, An algorithm for parallel Selection.
Merging: A Network for Merging, Merging on the CREW and EREW Models – A better Algorithm for the EREW model

UNIT II 12 Periods

Sorting: A network for Sorting, Sorting on a Linear Array, Sorting on CRCW, CREW, EREW Models Searching: Searching a Sorted Sequence – Searching a Random Sequence, Searching on a tree, searching on Mesh.

UNIT III 12 Periods

Generating Permutations and Combinations: Sequential Algorithms, generating permutations in Parallel, generating combinations in Parallel.
Matrix Operations: Transpositions, Matrix by Matrix Multiplications, Matrix by Vector multiplication.

UNIT IV 12 Periods

Graph Theory: Computing the Connectivity Matrix, Finding Connected Components, All Pairs Shortest Paths, Computing Minimum Spanning Trees.
Applications: Job Sequencing with Deadlines, Knapsack Problem.

TEXT BOOKS:

1. Selim G. Akl, The Design and Analysis of Parallel Algorithms, Prentice Hall, New Jersey, 1989

REFERENCE BOOKS:

1. Michael J. Quinn, Parallel Computing: Theory & Practice, Tata McGraw Hill Edition, 2003.

2. Justin R. Smith, the Design and Analysis of Parallel Algorithms, Oxford University Press, USA,
1993.
3. Joseph JaJa, Introduction to Parallel Algorithms, Addison-Wesley, 1992.

IT/CS316	WEB TECHNOLOGIES	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester V [Third Year]

COURSE OBJECTIVES:

At the end of the course the students will understand

1. Basic technologies to develop web documents.
2. Dynamic HTML Pages and Event handling mechanism.
3. XML, WebServers, Servlet technologies
4. Java Server Page Technologies.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Create web pages with HTML, CSS, and JavaScript.
2. Design dynamic web pages using clientside scripting.
3. Create XML documents, work with Web Servers and develop Web applications with Servlets.
4. Design and develop serverside programs with Java Server Pages.

UNIT I [CO:1] **(12)**

Introduction to HTML5 Part - I & II.Cascading StyleSheets (CSS) Part-I & II.JavaScript: Introduction to Scripting, Control Statements Part-I & II.

UNIT II [CO:2] **(12)**

JavaScript: Functions, Arrays, Objects. DOM Objects and Collections.JavaScript Event Handling

UNIT III [CO:3] **(12)**

XML: XML Basics, XML Namespaces, DTD, XML Schema, MathML.**Servlets:** Introduction to Java Servlets, Static and Dynamic contents, Servlet life Cycle and Life cycle methods, Servlet Request and Response Model, Deploying a Servlet, Servlet State Transitions, Servlet Config and ServletContext, Servlet Redirection and Request Dispatch, Maintaining Client State: Cookies, Session Tracking, Connecting to a database using JDBC.

UNIT IV [CO:4] **(12)**

Introduction to JSP:JSP & Servlet as Web Components, Servlets vs. JSP, JSP Lifecycle, JSP Page Lifecycle Phases, General Rules of Syntax, JSP syntactic elements, JSP element syntax, Template content, JSP elements-directives , declarations, expressions, scriptlets, actions.**JSP Standard Actions:** jsp:useBean, jsp:getProperty, jsp:setProperty, jsp:include, jsp:forward, jsp: plugin, jsp: param.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Harvey M. Deitel and Paul J. Deitel, "Internet & World Wide Web How to Program", 5/e, Pearson Education.(UNIT I, UNIT II and UNIT III).
2. Subrahmanyam Allamaraju and Cedric Buest,â€œProfessional Java Server Programming: J2EEâ€• (UNIT III and UNIT IV (Servlets and JSP)

REFERENCE BOOK(s):

1. Jason Cranford Teague, "Visual Quick Start Guide CSS, DHTML & AJAX", 4/e, Pearson Education.

2. Tom Nerino DoliSmith, "JavaScript & AJAX for the Web", Pearson Education,2 007.
3. Bill Dudney, Johathan Lehr, Bill Willies, Lery Mattingly, "Mastering JavaServer Faces", WilleyIndia, 2006.
4. Web Technology â€“ Uttam K. Roy, Oxford University, Press, 2010.

IT353	TINKERING LAB	L	T	P	C	Int	Ext
		-	-	2	1.0	30	70

Semester V [Third Year]

COURSE OBJECTIVES:

1. Develop proficiency in the use of tools, equipment and facilities available in the AICTE IDEA Lab.
2. Understand and apply basic mechanical, electronic and digital fabrication processes for prototyping.
3. Acquire skills to design, build and integrate functional systems/projects, including suitable enclosures using modern fabrication techniques.
4. Foster innovation, creativity and design thinking to solve real-world engineering problems through hands-on learning.

COURSE OUTCOMES:

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

1. explain the working principles of various manufacturing and digital fabrication processes used in the IDEA Lab.
2. design and develop functional prototypes using embedded systems, 3D printing, robotics, IoT and related technologies.
3. operate and utilize IDEA Lab equipment and tools for fabrication, prototyping and testing.
4. apply design thinking and problem-solving skills to convert real-world problems into practical engineering solutions/products.
5. work effectively in teams and demonstrate communication and collaboration skills during project development.

Laboratory Activities:

1. Familiarization with Electronic Circuit Design and PCB Fabrication

- Schematic design and PCB layout of a suitable electronic circuit.
- Fabrication and testing of the designed circuit.

2. Hands-on Demonstration of 3D Machining on Soft Materials

- Machining of simple 3D geometries on soft materials such as soft wood or modelling wax using appropriate machining tools.

3. Hands-on Demonstration of 3D Scanning and 3D Printing

- Surface scanning of a geometrical object using a 3D scanner.
- Printing of the scanned geometry or other object using FDM or SLA 3D printing technology.

4. Hands-on Demonstration of Laser Cutting and Engraving for Press-fit Designs

- 2D profile cutting for press-fit box/casing designs using Acrylic sheets (3 mm / 6 mm), Cardboard, and MDF board (2 mm).
- 2D profile cutting on plywood/MDF boards (6-12 mm) for press-fit structural designs.

5. Familiarization with Welding Equipment and Workshop Tools

- Introduction to welding tools and safety practices.
- Demonstration of basic welding operations.
- Demonstration of various workshop tools and their applications.

6. Familiarization with Lathe Operations

- Familiarization and basic operation of Metal lathe.
- Familiarization and basic operation of Wood lathe.

7. Demonstration and Familiarization of Emerging Technologies

- Embedded programming using Arduino and/or Raspberry Pi and/or Arm processors.
- Demonstration and working principles of Quadcopters (Drones).
- Familiarization with Electric (EV) Bicycles and their components.
- Familiarization of Robo assembly.

8. Design and Implementation of a Capstone Project

- With embedded hardware, software and machined or 3D printing enclosure.
- Documentation and demonstration of the project - submission of a project report and a short video presentation for semester end assessment.

IT354	WEB TECHNOLOGIES LAB	L	T	P	C	Int	Ext
		-	-	2	1.0	30	70

Semester V [Third Year]

COURSE OBJECTIVES:

1. Basic technologies to develop web documents.
2. Dynamic HTML Pages and Event handling mechanism.
3. XML, WebServers, Servlet technologies
4. Java Server Page Technologies.

COURSE OUTCOMES:

After the successful completion of the course,students are able to

1. Create web pages with HTML, CSS, and JavaScript.
2. Design dynamic web pages using clientside scripting.
3. Create XML documents, work with Web Servers and develop Web applications with Servlets.
4. Design and develop serverside programs with Java Server Pages.

EXPERIMENTS:

1. Develop a simple static website using XHTML.
2. Develop a simple static web page using different types of styles in CSS.
3. Java script covering Function, recursive functions, Arrays and Objects.
4. Java script on collection objects.
5. Java script event bubbling and mouse event model.
6. Develop well-formed and valid XML documents.
7. Program on simple servlets.
8. Develop an application for cookie and session. .
9. Develop application to connect JDBC with servlet.
10. Develop program on simple JSP.
11. program on JSP action tags.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Harvey M. Deitel and Paul J. Deitel, "Internet & World Wide Web How to Program", 5/e, Pearson Education.(UNIT I, UNIT II and UNIT III).
2. Subrahmanyam Allamaraju and Cedric Buest, "Professional Java Server Programming: J2EE"â€¢ (UNIT III and UNIT IV (Servlets and JSP)

IT355	DATA ANALYSIS LAB	L	T	P	C	Int	Ext
		-	-	2	1.0	30	70

Semester V [Third Year]

COURSE OBJECTIVES:

The main objectives of this course are

1. Introduce Python NumPy package for storing and manipulating data
2. Introduce Python Pandas package for data analysis.
3. Discuss Time Series data.
4. Impart knowledge of plotting graphs using Matplotlib package.

COURSE OUTCOMES:

After the successful completion of the course,students are able to

1. Use a fast and efficient multidimensional array object ndarray.
2. Apply Pandas package for data analysis operations.
3. Apply Pandas package for data analysis operations to Time Series data.
4. Interpret the statistical data by various functions of graphical representation.

EXPERIMENTS:

1. NumPy ndarray creation and arithmetic operations.
2. Indexing and slicing on NumPy ndarray.
3. Universal Functions on data in ndarrays.
4. Array-Oriented Programming with Arrays.
5. Pandas Datastructures.
6. Mechanics of interacting with the data contained in a Series or DataFrame.
7. Mathematical and statistical methods of pandas objects.
8. Reading and Writing Data in Text Format.
9. Handling Missing Data.
10. Data Transformation operations using Pandas.
11. String Manipulation and Regular Expressions using Pandas.
12. Combining and Merging Datasets using Pandas.
13. Reshaping and Pivoting using Pandas.
14. GroupBy (split - apply - combine) Mechanics using Pandas.
15. Data Aggregation using GroupBy methods with Pandas.
16. Pivot Tables and Cross Tabulations using Pandas.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Wes McKinney, Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition. OReilly/SPD
2. Jake VanderPlas, Python Data Science Handbook Essential Tools for Working with Data. OReilly/SPD

CS/IT/CB/CD/CM 321 CRYPTOGRAPHY AND NETWORK SECURITY

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. Describe the architecture of network security.
2. Explain design principles of symmetric and asymmetric encryption techniques.
3. Discuss various authentication protocols.
4. Describe the web security and network endpoint security applications.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Identify common network security vulnerabilities/attacks, classical and symmetric encryption schemes.
2. Analyze the concepts of public key encryption and key management schemes.
3. Design MAC and Hashing techniques needed for authentication.
4. Discuss the authentication applications, web, E-Mail and Network Endpoint security mechanisms.

UNIT I

Information and Network Security Concepts: The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, Cryptography, Network Security.

Introduction to Number Theory: Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.

UNIT II

Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure, The Data Encryption Standard, The Strength of DES, Block Cipher Design Principles.

Advanced Encryption Standard: AES Structure, AES Transformation Functions, AES Key Expansion.

Block Cipher Operation: Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode.

Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm.

Other Public-Key Cryptosystems: Diffie–Hellman Key Exchange, Elgamal Cryptographic System.

UNIT III

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA), SHA-3.

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs, MACs Based on Hash Functions: HMAC.

Digital Signatures: Digital Signatures, ElGamal Digital Signature Scheme.

Cryptographic Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates.

UNIT IV

User Authentication: Kerberos.

Transport-Level Security: Web Security Considerations, Transport Layer Security.

Electronic Mail Security: S/MIME.

IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload.

Network Endpoint Security: Firewalls, Intrusion Detection Systems, Malicious Software.

TEXT BOOK:

1. Cryptography and Network Security Principles and Practice William Stallings, 8th Edition, Pearson Education.

REFERENCE BOOKS:

1. BehrouzA.Ferouzan,"Cryptography&NetworkSecurity",TataMcGrawHill,2007.
2. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications,2003.
3. CharlesPfleeger,"SecurityinComputing",4thEdition,PrenticeHallofIndia,2006.
4. Ulysess Black, "Internet Security Protocols", Pearson Education Asia,2000.

CS /IT 322 FULL STACK

COURSE OBJECTIVES:
At the end of the course the students will understand the

1. To Explore theNode.js-to-React Stack.
2. To make the students understand the MonoDB and NoSQL databases
3. To Develop Dynamic custom web applications using MERN Full Stack Web Framework

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COURSE OUTCOMES:
After successful completion of the course, the students are able to

1. Discuss MERN Stack Components and React Components.
2. Implement React Applications using React State, Forms and React routers.
3. Design Express Applications with GraphQLand ESLint
4. Create backend programming by using Mongo DB Server and Mongo Shell

UNIT I **(CO – 1) (12 periods)**

Introduction: What is MERN,MERN Components, Why MERN? Tools and Libraries.
Hello World Application: Serverless Hello World, JSX, Project Setup, Express, Separate Script File, JSX TransForm, Older Browsers Support.
React Components: Component Types, Function Component, Class Components, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition

UNIT II **(CO – 2) (12 periods)**

React State: Initial State, Async State Initialization ,Updating State,Lifting State Up ,Event Handling ,Stateless Components, Designing Components :State vs. Props ,Component Hierarchy Communication Stateless Components,React Prop Types
React Forms: Controlled Components ,Controlled Components in Forms ,More Filters ,Typed Input, Edit Form ,**Specialized Input Components**: Number Input ,Date Input ,Text Input ,Update API, Updating an Issue , Updating a Field, Delete API, Delete Issue.
React Router: Simple Routing ,Route Parameters , Query Parameters,Links,Programmatic Navigation ,Nested Routes, Browser History Router.

UNIT III **(CO – 3) (12 periods)**

Express and GraphQL: Routing, Request Matching, Route Parameters, Route Lookup, Handler Function, Request Object Response Object, Middleware, REST API: Resource Based and HTTP methods as action, GraphQL:Field Specification,Graph Based,Single Endpoint ,Strongly Typed ,Introspection,Libraries,The About API.
Architecture and ESLint: UI Server, Multiple Environments, Proxy-Based Architecture, ESLint, ESLint for the Front-End

UNIT IV **(CO – 4) (12 periods)**

MongoDB Basics: MongoDB Server and Mongo Shell Installation, the Mongo Shell Commands, Documents, Collections, and Databases, Query Languages.
MongoDB CURD Operations: Create, Read, Projection, Update, Delete, Aggregate, MongoDB Node.js Driver, MongoDb Connection Establishment steps, Reading from MongoDB, Writing to MongoDB

TEXT BOOK:

1. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node (Second Edition), by Vasan Subramanian ,APRESS

REFERENCE BOOKS:

1. Beginning Node.js, Express & MongoDB Development,by Greg Lim (Author) ,ISBN-10 : 9811480281,
2. Beginning Node.js, Basarat Syed, APress, ISBN-10: 9781484201886

IT 323 MACHINE LEARNING

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. basic concepts and applications of machine learning.
2. supervised learning and its applications
3. unsupervised learning and its applications
4. multilayer perceptrons and kernel tricks

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. apply the machine learning concepts in real life problems
2. design solutions for supervised learning problems
3. use rule sets and reinforcement learning to solve real world problems
4. discuss the issues in feature engineering, regression analysis and unsupervised learning.

UNIT I **12Periods (CO1)**

Introduction: Well posed learning problems, Designing a Learning System, Perspectives and Issues in machine learning.

Concept Learning and general to specific ordering: concept learning Task , Concept learning as a search, Finding a Maximally Specific Hypothesis , Version Spaces and Candidate Elimination Algorithm, Remarks on Version space and candidate elimination. **Bayesian Learning:** Bayes Theorem, Maximum Likelihood and Least Square Error Hypotheses, Bayes Optimal Classifier, Naïve-Bayes Classifier, Bayesian Belief Network.

UNIT II **12 Periods (CO2)**

Decision Tree Learning : Decision Tree Representation, appropriate problems for decision tree, the basic decision tree Algorithm, Issues in decision tree learning.

Artificial Neural Networks: Introduction, Neural Network Representation, appropriate problems for neural network, Perceptrons , Multilayer Networks and the Back Propagation Algorithm.

Instance Based Learning: Introduction, KNN Learning, Locally Weighted Regression , Radial Bias Functions, Case-Based Reasoning.

UNIT III **12 Periods (CO3)**

Learning Sets of Rules: Sequential Covering Algorithm , Learning Rule Sets: summary , Learning First Order Rules, Learning set of first order rules: FOIL.

Reinforcement Learning: Introduction, the Learning Task , Q Learning , Non Deterministic Rewards and Actions , Temporal Difference Learning , Generalizing from Examples , Relationship to Dynamic Programming

UNIT IV **12 Periods (CO4)**

Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset selection.

Regression: Introduction, Example of regression, Common regression algorithms – Simple Linear regression, Multiple Linear regression, assumptions regression analysis, Main problems in regression analysis, improving the accuracy of linear regression model.

Unsupervised Learning : Introduction, Unsupervised Vs Supervised Learning, applications of Unsupervised Learning, Clustering – Clustering as a machine learning task, different types of clustering techniques, Partitioning methods: K-Means, K-Medoids methods, Hierarchical Clustering : AGNES and DIANA, Denisty based methods :DBSCAN, Finding Pattern using Association Rule – Definition of common terms, Association rule, Apriori and FP-Growth method algorithms for association rule learning

TEXT BOOK:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. **(UNIT I , UNIT II, and UNIT III)**
2. Saikat Dutt, Subramanian chandramouli, Amit Kumar Das – Machine Learning, Pearson-2019 **(UNIT IV)**

REFERENCE BOOKS:

1. Ethem Alpaydin, Introduction to Machine Learning , MIT Press, Prentice Hall of India, Third Edition 2014.
2. Stephen Marsland, ―Machine learning: An Algorithmic Perspective‖, CRC Press, 2009
3. Machine Learning: a Probabilistic Perspective, Kevin P. Murphy, MIT Press, 2012
4. Foundations of Machine Learning, Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar, MIT Press, 2012.
5. Machine Learning -The Art and Science of Algorithms that Make Sense of Data, Peter Flach, Cambridge

ITPE09 DIGITAL IMAGE PROCESSING

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. fundamental concepts in digital image processing.
2. approaches used in enhancement in spatial domain and frequency domain
3. image segmentation and image restoration.
4. image compression techniques and morphological transformations.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. **define** image processing systems.
2. **compare** and contrast enhancement techniques in spatial and frequency domains.
3. **develop** image restoration, and image compression standards.
4. **implement** morphological transformation algorithms, and image segmentation techniques.

UNIT I [CO:1] (10)

Introduction: Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

Digital Image Fundamentals: Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels.

UNIT II [CO:2] (14)

Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformation, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing spatial Filters, Sharpening spatial Filters.

Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain, Smoothing frequency domain Filters, Sharpening frequency-domain Filters, Homomorphic Filtering.

UNIT III [CO:3] (12)

Image Restoration: A Model of the Image Degradation/Restoration Process, Linear, Position-Invariant Degradations, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.

Image Compression: Image Compression Models, Error-free Compression: Variable length coding, LZW coding, Bit-Plane coding, Lossless predictive coding; Lossy Compression: Lossy Predictive coding, Transform coding; Image Compression Standards: Binary image compression standards, Continuous Tone still image compression standards.

UNIT IV [CO:4] (12)

Morphological Image Processing: Dilation and Erosion, The Hit-or-Miss Transformation, Some basic Morphological Algorithms, Extension to Gray-Scale Images.

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation.

TEXT BOOK:

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing' Addison Wesley Pubs (Second Edition).

REFERENCE BOOK(s):

1. "Image Processing. Analysis, and Machine Vision", Milan Sonka, Vaclav Hlavac, Roger Boyle (Second Edition).
2. A.K.Jain, "Fundamentals of Digital Image Processing" PHI.B.

ITPE10 MOBILE COMPUTING

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. architecture for mobile computing.
2. wireless communication through telephony and the emerging technologies.
3. various wireless communication architectures used in mobile computing.
4. messaging services and applications.
5. mobile device operating systems.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. **Know** the architecture and design considerations for mobile computing.
2. **identify** the communication architecture for the applications.
3. **familiarize** with different messaging technologies.
4. **identify** the operating system suitable for the device and the services.

UNIT I **[CO: 1][12 Periods]**

Introduction: Mobility of Bits and Bytes, Wireless-The Beginning, Mobile Computing, Dialogue Control– Networks, Middleware and Gateways, Application and Services (Contents), Developing Mobile Computing Applications, Security in Mobile Computing, Standards-Why are they Necessary?, Standard Bodies, Players in the Wireless Space.

Mobile Computing Architecture: Internet-The Ubiquitous Network, Architecture for Mobile Computing, Three-Tier Architecture, Design Considerations for Mobile Computing, Mobile Computing through Internet, Making Existing Applications Mobile-Enabled.

UNIT II **[CO: 2][12 Periods]**

Mobile Computing Through Telephony: Evolution of Telephony, Multiple Access Procedures, Mobile Computing through Telephone, Developing an IVR Application, Voice XML, Telephony Application Programming Interface (TAPI).

Emerging Technologies: Introduction, Bluetooth, Radio Frequency Identification (RFID), WIMAX, Mobile IP-IPv6, Java Card.

UNIT III **[CO: 3][12 Periods]**

Global System for Mobile Communications (GSM): GSM Architecture, Entities, Call Routing in GSM, PLMN Interfaces, GSM Addresses and Identifiers, Network Aspects in GSM, GSM Frequency Allocation, Authentication and Security.

CDMA and 3G: Introduction, Spread-Spectrum Technology-Is-95, CDMA Vs GSM, Wireless Data, 3GNetworks & Applications.

GPRS: Packet Data Network, Network Architecture, Network Operations, Data Services in GPRS, Applications for GPRS, Limitations, Billing and Charging.

UNIT IV **[CO:4][12 Periods]**

Short Message Service (SMS): Mobile Computing over SMS, SMS, Value Added Services through SMS, Accessing the SMS Bearer.

Wireless Application Protocol (WAP): Introduction, WAP, MMS, GPRS Applications.

Programming for the PALM OS: Introduction, History of Palm OS, Palm OS Architecture, Application Development, Communication in Palm OS, Multimedia.
Wireless Devices with Windows CE: Introduction, Different Flavors of Windows CE, Windows CE Architecture, Windows CE Development Environment.

TEXT BOOK:

1. Asoke K Talukder & Roopa R.Yavagal, Mobile Computing: Technology, Applications and Service Creation, Second Edition, TMH 2010.

REFERENCE BOOKS:

1. Uwe Hansmann, Lother Merk, Martin S.Nicklous, Thomas Staber, Principles of Computing, 2/e, Springer International Edition.
2. J.Schiller, Mobile Communications, Addison-Wesley, 2003.

ITPE11 SOFTWARE TESTING

COURSE OBJECTIVES:

At the end of the course the students will understand the:

1. **Understand** the principles of software testing, software quality concepts, software life cycle models, and fundamental testing techniques.
2. **Apply** appropriate testing methods at different levels of software testing, including integration, system, acceptance, performance, and regression testing.
3. **Analyze** advanced testing approaches such as ad hoc, usability, accessibility, agile, and exploratory testing, and evaluate their effectiveness in software quality assurance.
4. **Utilize** test planning, test management, automation techniques, and software testing metrics to improve software quality and testing efficiency.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. **Explain** software testing principles, software quality concepts, SDLC models, and white-box and black-box testing techniques.
2. **Apply** integration, system, acceptance, performance, and regression testing techniques to validate software systems.
3. **Analyze** software quality issues using ad hoc, usability, accessibility, exploratory, and agile testing approaches.
4. **Develop** test plans, manage testing activities, employ automation frameworks, and use testing metrics for effective software testing and quality assurance.

UNIT I **(**12)

Principles of Testing.

Software Development Life Cycle Models – Phases of Software Project – Quality, Quality Assurance and Quality. Control - Testing, Verification and Validation – Process Model to Represent Different Phases.

White Box Testing: Static Testing – Structural Testing – Challenges.

Black Box Testing.

UNIT II **(**12)

Integration Testing: Integration Testing as a Type of Testing – Integration Testing as a Phase of Testing – Scenario Testing – Defect Bash.

System and Acceptance Testing: Overview – Functional Versus NonFunctional – Functional System Testing & Non-Functional – Acceptance Testing.

Performance Testing: Introduction – Factors, Methodology, Tools & Process.

Regression Testing: Introduction –Types – When to do Regression Testing – How to do Regression Testing.

UNIT III **(**12)

Ad hoc Testing: Overview – Buddy Testing – Pair Testing – Exploratory Testing – Iterative – Agile and Extreme Testing – Defect Seeding.

Usability and Accessibility Testing: Approach to Usability – When to do Usability – How to achieve Usability – Quality Factors for Usability – Aesthetics Testing – Accessibility Testing – Tools for Usability – Usability Lab Setup – Test Roles for Usability.
Common People Issues: Perceptions and Misconceptions About Testing – Comparison between Testing and Development Functions – Providing Career Paths for Testing Professionals – Role of the Ecosystem and a Call for Action.

UNIT IV **(**12)
Test Planning, Management, Execution and Reporting: Introduction – Planning – Management – Process – Reporting – Best Practices.
Software Test Automation: Terms used in Automation – Skills needed for Automation – What to Automate, Scope of Automation – Design and Architecture for Automation – Generic Requirements for Test Tools – Process Model for Automation – Selecting a Test Tool – Automation for Extreme Programming Model – Challenges.
Test Metrics and Measurements: Metrics & Measurements – Types – Project – Progress – Productivity – Release.

TEXT BOOK:
1. Srinivasa Desikan & Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2007

ITPE12 DevOps

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. To introduce the fundamental concepts and microservices.
2. To provide the knowledge of working with Docker file.
3. To expose the resources and namespaces of Kubernetes.
4. To create awareness on monitoring in Kubernetes.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. **Understand** the basic concepts of Devops, Kubernetes and trends of microservices.
2. **Apply** Docker file syntax for developing a Docker file.
3. **Analyze** Kubernetes resources, objects, namespaces which is a portable, extensible open-source platform for managing.
4. **Create** kubernetes namespaces for monitoring and logging external resources.

UNIT I (10)

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

Trend of Microservices: Modular programming, package management, MVCdesign pattern, Monolithic application, Remote Procedure call, REST ful design, Microservices.

UNIT II (10)

DevOps with Container: understanding container, Resource isolation, Linux container concept, Containerized delivery, getting started container, Installing Docker for Ubuntu, Installing Docker for CentOS, Installing Docker for macOS.

Container life cycle: Docker basics, Layer, image, container, and volume,distributing images, connect container.

Working with Docker file: writing your first Docker file, Docker file syntax, organizing a Dockerfile.

UNIT III (10)

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

Getting started with Kubernetes: Preparing the environment, kubectl, kubernetes resources, kubernets objects, Namespace, Name, Label and selector, Annotation, Pods, ReplicaSet (RS) and Replication Controller (RC), Deployments, Services,volumes, Secrets, Control Map, Using ConfigMap via volume, Using ConfigMap via environment variables.

UNIT IV (10)

Monitoring and Logging: Inspecting a container, Kubernetes dashboard, Montoring in Kubernetes, Application, Host, External resources, container, Kubernetes, Getting monitoring essentials for Kubernetes.

Cluster Administration: Kubernetes namespaces, Default namespaces, Create a new namespace.

TEXT BOOK:

1. DevOps with Kubernetes: Accelerating software delivery with container by Hideto Saito, Hui-Chuan Chloe Lee, Cheng-Yang Wu, Second Edition, January 2019.

Reference Books:

1. Managing Kubernetes:Operating Kubernetes Clusters in the Real Worls byBrendan Burns, Craig Tracey, O'Reilly publications, 2017.

E-Resources:

1. Introduction to DevOps Tools, Edureka, April, 2018, https://www.youtube.com/watch?v=lpWjKXa_4Hs
2. Hitesh Choudary, What is DevOps? Easy way, Aug 16, 2019 https://www.youtube.com/watch?v=_Gpe1Zn-1fE
3. https://www.threatstack.com/blog/50-best-online-devops-training-resources
4. https://geekflare.com/learn-devops/
5. http://www.scmgalaxy.com/tutorials/top-10-devops-online-resources-to-learn-share-and-practice/

ITPE13 - VIRTUAL AND AUGMENTED REALITY

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. Discuss basic concepts Virtual Reality.
2. Illustrate 2-D to 3-D modeling transformation.
3. Introduce the VR systems for animation of Virtual Environment.
4. Introduce Augmented Reality and its applications

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. **Describe** VR for real time problems.
2. **Apply** Modeling transformation for world objects.
3. **Design** 3-D Virtual Environment.
4. **Use** Augmented Reality to solve practical problems

UNIT I

Introduction to Virtual Reality: Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.

UNIT II

Computer Graphics and Geometric Modeling: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion from 2D to 3D, 3D space curves, 3Dboundary representation, Simple 3D modeling, 3D clipping, Illumination models, Reflection models, Shading algorithms.

Geometrical Transformations: Introduction, Frames of reference, Modeling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

UNIT III

Virtual Environment: Input: Tracker, Sensor, Digital Gloves, Movement Capture, Video-based Input, 3D Menus & 3D Scanner etc. Output: Visual /Auditory / Haptic Devices. **Generic VR system:** Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT IV

Augmented Reality- Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

AR / VR Applications- Introduction, Engineering, Entertainment, Science, Training

TEXT BOOKS:

1. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
2. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

ITPE14 NATURAL LANGUAGE PROCESSING

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. Understand the Representation and Layers of NLP.
2. Represent the sentences as parse trees and describe NER and its challenges.
3. Use and create sentiment lexicons and Q & A.
4. Describe extractive Summarization in three generations and LLMs.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. **Explain** the probabilistic formulation of POS tagging.
2. **Execute** steps in top-down, bottom-up parsing and NER for example sentences.
3. **Analyze** the semantic analysis, Question Answering of natural language sentences.
4. **Distinguish** between extractive and abstractive summarization and LLMs.

UNIT I [CO 1][12 Periods]

Introduction: Language and Linguistics, Ambiguity and Layers of NLP, Grammar, Probability, and Data, Generations of NLP.

Representation and NLP: Ambiguity and Representations, Generation 1: Belongingness via Grammars, Generation 2: Discrete Representational Semantics, Generation 3: Dense Representations.

Shallow Parsing: Part-of-Speech Tagging, Statistical POS Tagging, Neural POS Tagging, Chunking.

UNIT II [CO 2][13 Periods]

Deep Parsing: Linguistics of Parsing, Algorithmics of Parsing, constituency Parsing: Rule Based, Statistical Parsing, dependency Parsing, Neural Parsing.

Named Entity Recognition: Problem Formulation, Ambiguity in Named Entity Recognition, Datasets, first Generation: Rule-Based Approaches, Second Generation: Probabilistic Models, Third Generation: Sentence Representations and Position-Wise Labeling.

Natural Language Inference: Ambiguity in NLI, Problem Formulation, Datasets, First Generation: Logical Reasoning, Second Generation: Alignment, Third Generation: Neural Approaches.

UNIT III [CO 3] [13 Periods]

Machine Translation: Introduction, Rule-Based Machine Translation, Indian Language Statistical Machine Translation, Phrase-Based Statistical Machine Translation, Factor-Based Statistical Machine Translation, Cooperative NLP: Pivot-Based Machine Translation, Neural

Machine Translation.

Sentiment Analysis: Problem Statement, Ambiguity for Sentiment Analysis, Lexicons for Sentiment Analysis, Rule-Based Sentiment Analysis, Statistical Sentiment Analysis, Neural Approaches to Sentiment Analysis, Sentiment Analysis in Different Languages.

Question Answering: Problem Formulation, Ambiguity in Question Answering, Dataset Creation, Rule-based Q&A, Second Generation, third Generation.

UNIT IV **[CO 4][12 Periods]**

Conversational AI: Problem Definition, Ambiguity Resolution in Conversational AI, Rule-Based Approaches to Conversational AI, Statistical Approaches, Neural Approaches.

Summarization: Ambiguity in Text Summarization, Problem Definitions, Early Work, Summarization Using Machine Learning.

Large Language Models: Background, Ambiguity Resolution, Generative LLMs, Usage of LLMs.

TEXT BOOK:

1. Natural Language Processing, Pushpak Bhattacharyya, Aditya Joshi, Wiley, 2023.

REFERENCE BOOKS:

1. Daniel Jurafsky and James H Martin,"Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008.
2. C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA: 1999.

ITPE15 Quantum AI

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. Understand the fundamentals of quantum computing and artificial intelligence.
2. Learn quantum algorithms and their applications in AI.
3. Explore quantum machine learning techniques.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. **distinguish** classical computation and quantum computation with AI.
2. **perform** computation with Qubits and develop search algorithms..
3. **Analyze** Quantum problem solving methods.
4. **Evaluate** related approaches with quantum cognition

UNIT I **CO1:12HOURS**

Introduction: Artificial Intelligence, Motivation and Goals, Guide to the Reader, Classical computation, Quantum computation.

Problem Solving: Knowledge Representation, Production System, Sub-Symbolic Models of Problem

Information: Information and Thermodynamics, Hierarchical Structures, Information and Measurement, Information and Memory, Sparse code for Sub-symbols, Deduction Systems and Associative Memory.

UNIT II **CO2:12HOURS**

Computation with Qubits: Computation with one Qubit, Computation with m Qubit, Matrix Representation of Serial and Parallel Operations, Entanglement, Quantum Boolean Circuits, Deutsch Algorithm, Deutsch Jozsa Algorithm, Amplitude Distribution.

Search: Search and Quantum Oracle, Lower Bound $\Omega(\sqrt{n})$ for U_f -based Search*, Grover's Amplification, Circuit Representation, Speeding up the Traveling Salesman Problem, The Generate-and-Test Method.

UNIT III **CO3:12HOURS**

Quantum Problem-Solving: Symbols and Quantum Reality, Uninformed Tree Search, Heuristic Search- Heuristic functions, Invention of heuristic, Quality of heuristic.

Quantum Tree Search: Principles of quantum tree , Iterative quantum tree, No constant branching factor, Quantum Production System, Tarrataca's Quantum Production System, 3-puzzle , Extending for any n, Pure production system, Unitary control strategy, A General Model of a Quantum, Cognitive architecture, Representation.

UNIT IV **CO4:12HOURS**

Quantum Cognition: Quantum, Decision Making, Interference, Unpacking Effects.

Related Approaches: Quantum Walk -Random walk, Principles of Quantum Artificial Intelligence, Quantum insect, Quantum walk on a graph, Quantum walk on one dimensional lattice, Quantum walk and search, Quantum walk for formula evaluation, Adiabatic Computation - Quantum annealing, Quantum Neural Computation, Epilogue.

TEXT BOOK:

1. PRINCIPLES OF QUANTUM ARTIFICIAL INTELLIGENCE by Andreas Wichert, 2014 by World Scientific Publishing Co. Pte. Ltd., ISBN 978-981-4566-74-2

REFERENCE BOOKS:

1. Michael A. Nielsen and Isaac L. Chuang, "Quantum Computation and Quantum Information", Cambridge University Press, 10th Anniversary Edition.
2. Jack D. Hidary, "Quantum Computing: An Applied Approach", Springer, 2019.
3. Parag K. Lala, "Quantum Computing: A Beginner's Introduction", McGraw-Hill Education.
4. Eleanor Rieffel and Wolfgang Polak, "Quantum Computing: A Gentle Introduction",MIT Press.

ITPE16 SOFT COMPUTING

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. explain the principles and core components of these techniques.
2. equip students with practical skills to apply soft computing techniques to real-world problems.
3. independently analyze, model, and solve complex problems using soft computing methods.
4. assess when and where soft computing approaches are most suitable and articulate their reasoning.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. **Understand** the principles and concepts of soft computing, including fuzzy sets, neural networks, genetic algorithms, and other related techniques.
2. Proficiency in **designing, training, and implementing** neural networks, including feed forward and recurrent architectures.
3. **Apply** fuzzy logic, Sets, relations in decision-making and control systems.
4. **Apply** genetic algorithms to optimization and search problems.

UNIT I **[CO1, CO2] 12 Hours**

Introduction: Neural Networks, Application Scope of Neural Networks, Fuzzy Logic, Genetic Algorithm, Hybrid Systems, Soft Computing.

Artificial Neural Network: An Introduction, Fundamental Concept, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of A.NNs, McCulloch-Pitts Neuron, Linear Separability, Hebb Network.

UNIT II **[CO1, CO3] 12 Hours**

Supervised Learning Network: Introduction, perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neurons, Back propagation Network.

Un-Supervised Learning algorithms: Introduction, Fixed Weight Competitive Nets, Kohonen Self-Organizing Feature Maps, Counter Propagation Networks

UNIT III **[CO1, CO3] 12 Hours**

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets: Introduction to Fuzzy Logic, Classical Sets, Fuzzy Sets.

Classical Relations and Fuzzy Relations: Introduction, Cartesian Product of Relation, Classical Relation, fuzzy Relations, Tolerance and Equivalence Relations, Non interactive Fuzzy Sets.

UNIT IV **[CO1, CO4] 12 Hours**

Genetic Algorithms: Introduction, Biological Background, Traditional Optimization and Search Techniques, Genetic Algorithm and Search Space, Generic Algorithm vs. Traditional Algorithms, Basic Terminologies in Genetic Algorithm, Simple GA, General Genetic Algorithm.
Operators in Generic Algorithm: Encoding, Selection, Crossover, Mutation.

TEXT BOOK:

1. Principles of Soft Computing by S. N. Sivanandan and S. N. Deepa, 2nd edition, Wiley India 2007.

REFERENCE BOOKS:

1. Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and applications by S. Rajasekaran and G. A. Vijayalakshmi Pai, PHI, 2013.
2. Soft computing and Intelligent Systems: Theory and Applications, by Naresh K. Sinha, Madan N. Gupta, Academic Press 2000.

IT361 SKILL ENHANCEMENT COUeRSE4(ISP CODING II)

IT362 FULL STACK LAB

List of Programs:

Lab 01.

Create a Node.JS environment with node and npm utilities commands and to check and test the node environment with Node.js Console module.

- steps for installation of Node.js environment Node
- Test through the node REPL shell commands
- Also install prompt-sync module using npm utility.
- Test and check the prompt-sync with console Module Application

Lab 02.

Create a custom Date module using exports keyword Node module by using npm commands and to determine and display current Node.JS Webserver time and date.

- Create Node Package Module myDate() using node utilities without package.json file
- Also Create the Node Package Modulemy Date() using with package.json file directives like version, name, bin, etc.,
- Also install created packaged module using npm utility

Lab 03.

Create Node JS Application with Folder structure using npm utilities and develop one application to display "welcome Node JS APP" Greet message

- With Visual Studio Code APP Framework(Any other)
- Without Visual Studio Code APP Framework
- Also Access the Custom myDate Module.

Lab 04.

Create React Application by using with the following to display "welcome React APP" Greet message:

- Using npxcreate –react-app and npminit react-app utilities
- Using ViTE Tool create-ract-app

Lab 05.

Create React Applications by using two types of Reac JS Component (Function and Class) and demonstrate each one application.

- Class component Dynamic MyInput react app
- Functional component Increment react app

Lab 06.

Creating a simple counter using React which increments or decrements count dynamically on-screen as the user clicks on the button. Using fundamental React concepts such as State, Component, etc.

the simple counter APP with the following steps:

- Create React state to store the count value.
- Declare JS functions to incement or decrement the value through setState().
- Add HTML buttons with onClick to JSX code.

Lab 07.
Create Simple Registration Form with different form input elements using react Event handling concepts and use effect and state variables.

- Use Effect hook mechanism
- provide single page environment using React DOM

Lab 08.
Building a Simple Calculator with React, React Hooks and Grid single page web application.
Using Lambda React JS Expressions.

- React button event actions.
- Use State hook action
- React Grid Data

Lab 09.
Create React Application by using with the following to display "welcome React APP" Greet message:

- Using npx create –react-app and npminit react-app utilities
- Using ViTE Tool create-ract-app

Lab 10.
Create Simple Arithmetic Operations Form with different form input elements N1 and N2 text components and ADD button component.

- provide Express Server with listen port:3000
- Use Express.use route and URL Pattern '/add'
- provide different routing configurations either POST or GET

Lab 11.
Create Simple Login form Page Application using Express JS Module:

- provide Express Server with listen port:4000 with URL Pattern '/login'
- Display the login form with username, password, and submit button on the screen.
- Users can input the values on the form.
- Validate the username and password entered by the user.
- Display Invalid Login Credentials message when the login fails.
- Show a success message when login is successful.

Lab 12.
Create Simple MongDBServer withmongod configuration data and also manage Mongoshell using mongosh:

- Create simple student document Database
- Insert one student record in mongosh
- Update and delete one document in mongosh
- Also to perform connection from MongoDB to node.js driver connection string
- CURD Operation on MongoDB

IT363 MACHINE LEARNING LAB

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. Introduce basic concepts and applications of machine learning.
2. Demonstrate supervised and unsupervised learning and its applications
3. Discuss Advanced machine learning algorithms.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Apply the machine learning concepts in real life problems.
2. Implement machine learning solutions to classification, regression, and clustering.
3. Use machine algorithms to solve complex problems.

LAB CYCLE:

1) Implementation of Find-S and Candidate Elimination algorithms in concept learning
2) Implementation of Naive Bayes Classification
3) Implementation of Decision Tree Classification
4) Implementation of back propagation algorithm for ANN
5) Implementation of k-Nearest Neighbour Classification
6) Use Scikit-learn Python library for implementing SVM, KNN classifiers.
7) Use Scikit-learn Python library for implementing Decision tree, Naive bayes classifiers.
8) Implement algorithms in Regression.
9) Implementation of apriori algorithm in Association rule mining.
10) Implementation of K-Means Clustering in unsupervised learning
11) Implementation algorithms in Hierarchical clustering.
12) Implementation of FOIL algorithm in inductive learning and Q-Learning in reinforcement learning

IT MC3 TECHNICAL PAPER WRITING & IPR

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. To develop an understanding of the structure, style, and ethics of technical and scientific writing.
2. To train students in effective academic communication, including research paper, thesis, and project report writing.
3. To create awareness about various forms of intellectual property and the process of securing IP rights.
4. To provide foundational knowledge on patents, copyrights, trademarks, and design rights.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Write effective technical papers and reports that conform to academic and professional standards
2. Present technical information clearly and ethically in various formats (papers, posters, presentations).
3. Understand the process of peer review and publishing in journals/conferences.
4. Identify and explain different types of intellectual property and how they are protected.

UNIT I Fundamentals of Technical Writing [8] [CO1]

Basics of Technical Writing: Types of documents- Case studies, research papers, project reports, thesis Structure and components of a technical paper (Abstract, Introduction, Materials & Methods, Results, Discussion, Conclusion, Significance/Novelty etc.), Different Steps in Writing Report-Layout of the Research Report.

Ethics in writing: plagiarism: data falsification, multiple submissions, AI Plagiarism detection.

UNIT II Writing for Publication [8] [CO2]

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature Problems and Framing Research Questions- Synopsis Manuscript preparation, types of journals-indexing, understanding journal impact factor, scope, and formatting guidelines Selection of journal/conference, Submission process and peer review system, Responding to reviewers and revisions.

Tools for formatting and referencing :(MS Word, Mendeley) Best practices for graphical and tabular data representation, citation rules, Collaboration and authorship ethics, Copyright and open-access publishing.

UNIT III Introduction to IPR [8] [CO3]

Introduction to Intellectual property: Introduction, Definition and need for Intellectual Property, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Categories: Patents, Copyrights, Trademarks, Trade Secrets, Industrial Designs, Basic principles of patentability: novelty, utility, National and international IPR organizations (WIPO, IPO,), IPR protection mechanisms in India.

UNIT IV Patent Filing and Innovation Management [8] [CO4]

Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights toperform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Patent filing process in India and abroad, Patent search using free databases (Google Patents, WIPO), Patent drafting basics: claims, specifications, drawings, Technology transfer and commercialization of IP, Role of incubation centers and start-up policy.

TEXT BOOK:

1. M. Ashok Kumar & R. Murugesan, Research Methodology and IPR, CharulathaPublications.
2. TECHNICAL WRITING by BASU, B.N. eBook ISBN : 9789354431661; Print Book ISBN : 9788120333345. Pages : 168
3. Text book on technical writing and thesis writing with practical September 2025 by Sagar Mondal (Author), Devayan Chatterjee (Author), Kankan Kr. Chowdhury (Author), & 1 More
4. Principles of Scientific and Technical Writing. 1st Edition. 935532748X ·9789355327482. By Pratap K. J. Mohapatra, Sanjib Moulick. © 2025

REFERENCE BOOKS:

1. B.L. Wadehra, Law Relating to Intellectual Property, Universal Law Publishing Co.
2. Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patentsand Trade Secrets, Cengage Learning.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc26_hs84/preview
2. https://onlinecourses.nptel.ac.in/noc23_mg68/preview