DEPARTMENT OF INFORMATION TECHNOLOGY

Three weeks orientation programme is mandatory before starting Semester I[First Year]

Semester - I [First Year]

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category Code
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	IT/CS 111	Mathematics – I	3	0	30	70	3	BS
2	IT/CS 112	Engineering Physics	3	0	30	70	3	BS
3	IT/CS 113	Basic Electrical & Electronics Engineering	3	0	30	70	3	ES
4	IT/CS 114	Programming for Problem Solving	3	0	30	70	3	ES
5	IT/CS 151	Engineering Physics Lab	0	3	30	70	1.5	BS
6	IT/CS 152	Basic Electrical & Electronics Engineering Lab	0	3	30	70	1.5	ES
7	IT/CS 153	Engineering Graphics and Design Lab	1	4	30	70	3	ES
8	IT/CS 154	Programming for Problem Solving Lab	0	3	30	70	1.5	ES
9	IT/CS MC1	Constitution of India	2	0	100	-	-	MC
		TOTAL	15	13	340	560	19.5	

Category	CREDITS
Basic Science Courses	7.5
Engineering Science Courses	12
TOTAL CREDITS	19.5

Semester - II [First Year]

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category Code
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	IT/CS 121	Mathematics – II	3	0	30	70	3	BS
2	IT/CS 122	Engineering Chemistry	3	0	30	70	3	BS
3	IT/CS 123	Digital Electronics	3	0	30	70	3	ES
4	IT/CS 124	English for Communication Skills	3	0	30	70	3	HS
5	IT/CS 125	Programming in Python	2	0	30	70	2	ES
6	IT/CS 161	Engineering Chemistry Lab	0	3	30	70	1.5	BS
7	IT/CS 162	Programming in Python Lab	0	2	30	70	1	ES
8	IT/CS 163	Computer Engineering Workshop Lab	0	3	30	70	1.5	ES
9	IT/CS 164	English Language Communication skills Lab	0	3	30	70	1.5	HS
10	IT/CS MC2	Environmental Science	2	0	100	-	-	MC
		TOTAL	16	11	370	630	19.5	

Category	CREDITS
Basic Science Courses	7.5
Engineering Science Courses	7.5
Humanities and Social Science Courses	4.5
TOTAL CREDITS	19.5

Semester - III [Second Year]

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category Code
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	IT/CS 211	Probability and Statistics	3	0	30	70	3	BS
2	IT/CS 212	Discrete Mathematics	3	0	30	70	3	ES
3	IT/CS 213	Computer Organization	3	0	30	70	3	PC
4	IT/CS 214	Data Structures	3	0	30	70	3	PC
5	IT/CS 215	Object Oriented Programming	3	0	30	70	3	PC
6	IT/CS 251	Probability and Statistics Lab	0	3	30	70	1.5	PC
7	IT/CS 252	Data Structures Lab	0	3	30	70	1.5	PC
8	IT/CS 253	Object Oriented Programming Lab	0	3	30	70	1.5	PC
9	IT SL1	Skill Oriented Course - I	1	2	100	-	2	SC
10	IT/CS MC3	Design Thinking & Product Innovation	2	0	100	-	-	MC
		TOTAL	18	11	440	560	21.5	

Category	CREDITS
Basic Science Course	3
Engineering Science Courses	3
Professional Core Courses	13.5
Skill Oriented Course	2
TOTAL CREDITS	21.5

Semester - IV [Second Year]

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	IT/CS 221	Computational Statistics	3	0	30	70	3	BS
2	IT/CS 222	Database Management Systems	3	0	30	70	3	PC
3	IT/CS 223	Operating Systems	3	0	30	70	3	PC
4	IT/CS 224	Software Engineering	3	0	30	70	3	PC
5	IT/CS 225	Web Technologies	3	0	30	70	3	PC
6	IT/CS 261	Computational Statistics Lab	0	3	30	70	1.5	PC
7	IT/CS 262	Database Management Systems Lab	0	3	30	70	1.5	PC
8	IT/CS 263	Web Technologies Lab	0	3	30	70	1.5	PC
9	IT SL2	Skill Oriented Course - II	1	2	100	-	2	SC
10	IT/CS MC4	Ethics & Human Values	2	0	100	-	-	MC
		TOTAL	18	11	440	560	21.5	
Internship 3 to 4 weeks (minimum 3 weeks-Mandatory) during summer vacation (to be evaluated during next semester)								
Honors/Minor course (Maximum Two courses can be registered)			4	-	30	70	4	HR/MR

Category	CREDITS
Professional Core Courses	16.5
Basic Science Course	3
Skill Oriented Course	2
TOTAL CREDITS	21.5

Semester- V [Third Year]

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category
			L	P	Internal Marks	em End Exa n Marks	Credits	
1	IT/CS 311	Automata Theory & Formal Languages	3	0	30	70	3	PC
2	IT/CS 312	Computer Networks	3	0	30	70	3	PC
3	IT/CS 313	Design & Analysis of Algorithms	3	0	30	70	3	PC
4	IT 314	Professional Elective - I	3	0	30	70	3	PE
5	IT 315	Open / Job Oriented Elective - I	3	0	30	70	3	OE
6	IT/CS 351	Design & Analysis of Algorithms Lab	0	3	30	70	1.5	PC
7	IT/CS 352	Data Analysis Lab	0	3	30	70	1.5	PC
8	IT 353	Summer Internship	-	-	100	-	1.5	PR
9	IT SL3	Skill Oriented Course - III	1	2	100	-	2	SC
		TOTAL	16	8	410	490	21.5	
Honors/Minor course (Maximum Two courses can be registered)			4	-	30	70	4	HR/MR

Category	CREDITS
Professional Core Courses	12
Professional Elective Courses	3
Open / Job Oriented Elective Courses	3
Skill Oriented Course	2
Summer Internship	1.5
TOTAL CREDITS	21.5

Semester- VI [Third Year]

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Categor y
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	IT/CS 321	Artificial Intelligence	3	0	30	70	3	PC
2	IT/CS 322	Cryptography & Network Security	3	0	30	70	3	PC
3	IT/CS 323	Machine Learning	3	0	30	70	3	PC
4	IT 324	Professional Elective -II	3	0	30	70	3	PE
5	IT 325	Open / Job Oriented Elective - II	3	0	30	70	3	OE
6	IT/CS 361	Artificial Intelligence lab	0	3	30	70	1.5	PC
7	IT/CS 362	Machine Learning Lab	0	3	30	70	1.5	PC
8	IT/CS 363	Term Paper	0	3	100	-	1.5	PR
9	IT SL4	Skill Oriented Course - IV	1	2	100	-	2	SC
		Total	16	11	410	490	21.5	
Internship 6 to 8 weeks (minimum 6 weeks-Mandatory) during summer vacation (to be evaluated during next semester)								
Honors/Minor course (Maximum Two courses can be registered)			4	-	30	70	4	HR/MR

Category	CREDITS
Professional Core Courses	12
Professional Elective Courses	3
Open / Job Oriented Elective Courses	3
Skill Oriented Course	2
Project/Term Paper	1.5
TOTAL CREDITS	21.5

Semester -VII [Fourth Year]

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category
			L	P	Internal Marks	Sem End Exam Marks	Credits	
1	IT 411	Humanities Elective	3	0	30	70	3	HS
2	IT412	Professional Elective - III	3	0	30	70	3	PE
3	IT413	Professional Elective - IV	3	0	30	70	3	PE
4	IT414	Professional Elective – V(MOOCS)	0	0	-	100	3	PE
5	IT415	Open / Job Oriented Elective - III	3	0	30	70	3	OE
6	IT416	Open / Job Oriented Elective – IV (MOOCS)	0	0	-	100	3	OE
7	IT/CS 451	Internship / Certification	-	-	100	-	3	PR
8	IT452	Skill Oriented Course - V	1	2	100	-	2	SC
		TOTA	13	2	320	480	23	
Honors/Minor course (Maximum Two courses can be registered)			4	-	30	70	4	HR/MR

Category	CREDITS
Professional Elective Courses	9
Open / Job Oriented Elective Courses	6
Humanities Elective	3
Skill Oriented Course	2
Industrial/Research Internship	3
TOTAL CREDITS	23

Semester - VIII [Fourth Year]

S.No	Course Code	Course Title	Hours Per Week		Scheme of Examination			Category Code
			L	P	Internal Marks	em End Exa Marks	Credits	
1	IT 461	Project Work, Seminar and Internship in Industry	0	12	30	70	12	PR
		TOTAL	0	12	30	70	12	

Professional Elective Courses

Professional Elective Courses for III/IV B. Tech.		Professional Elective Courses for IV/IV B. Tech.	
CODE NO.	SUBJECT NAME	CODE NO.	SUBJECT NAME
ITEL01	Embedded Systems	ITEL09	Network Programming
ITEL02	Interactive Computer Graphics	ITEL10	Web Services and Service Oriented Architecture
ITEL03	Software Architecture and Design	ITEL11	Compiler Design
ITEL04	Distributed Systems	ITEL12	Natural Language Processing
ITEL05	Quantum Computing	ITEL13	Parallel Algorithms
ITEL06	Digital Image processing	ITEL14	Deep Learning
ITEL07	Cyber Security	ITEL15	Augmented and Virtual Reality
ITEL08	Industry Recommended Course	ITEL16	Industry Recommended Course

Skill Courses

A. C++ Programming
B. Computer Animation
C. Mobile App Development
D. Unix Shell Programming
E. PHP Programming
F. Soft Skills
G. Internet of Things
H. Google Go
I. DevOps
J. Ethical Hacking

Humanities and Social Sciences Elective

CODE NO.	SUBJECT NAME
HSEL1	Industrial Management and Entrepreneurship
HSEL2	Economics for Engineers
HSEL3	Introduction to Industrial Management
HSEL4	Project Management & Entrepreneurship
HSEL5	Human Resources and Organizational Behavior

Open Elective Courses (Offered by IT Department)

CODE NO.	SUBJECT NAME	CODE NO.	SUBJECT NAME
ITOL1	Data Structures and Algorithms	ITOL2	WEB TECHNOLOGIES
ITOL3	Computer Architecture and Organization		

Job Oriented Elective Courses (Offered by IT Department)

Code No.	Subject Name	Code No.	Subject Name
JOEL025	Java Script Technologies	JOEL04	Cloud Computing using AWS

Open Elective Courses (Offered by Other Departments)

CODE NO.	SUBJECT NAME	CODE NO.	SUBJECT NAME
CBOL1	Operating Systems Concepts	CBOL2	Business Analytics
CDOL1	Python for Data Science	CDOL2	Data Science for Engineers
CEOL1	Basic Surveying	CEOL2	Building materials and construction
CHOL1	Energy Engineering	CHOL2	Solid Waste Management
CMOL1	Fundamentals of Artificial Intelligence	CMOL2	Programming with C++
COOL1	Fundamentals of IoT	COOL2	IoT Architecture and Protocols
CSOL1	Programming with JAVA	CSOL2	Relational DataBase Management System
ECOL01	Applied Electronics	ECOL02	Microprocessors & Interfacing
EEOL1	Renewable energy sources	EEOL2	Utilization of Electrical Energy
MEOL1	Operations Research	MEOL2	Applied Mechanics & Mechanical Engineering

Minor in IT

Eligibility: Students of CE/ChE/ECE/EEE/ME branches				
Subject Code	Subject Name	No of Hours		
		Lecture	Tutorial	Practical
ITMR1	Database Management Systems	3	1	-
ITMR2	Unix and Shell Programming	3	1	-
ITMR3	Computer Networks	3	1	-
ITMR4	Software Engineering	3	1	-
ITMR5	Cryptography and Network Security	3	1	-
ITMR6	Machine Learning	3	1	-

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 16 credits with minimum 1 subject from each pool.
3. Compulsory MOOC / NPTEL Courses for 4 credits (2 courses @ 2 credits each)

Subject Code	Subject Name	No. of Hours		
		Lecture	Tutorial	Practical
Pool 1	ITH11- Information security assessments and audit	4	0	0
	ITH12- Introduction to Data Science	4	0	0
	ITH13- Fundamentals of Blockchain	4	0	0
	ITH14- MEAN Web Development	4	0	0
Pool 2	ITH21-Digital Watermarking and Steganography	4	0	0
	ITH22- Data Warehousing and Mining	4	0	0
	ITH23-Blockchain Platforms and Use cases	4	0	0
	ITH24-Full Stack Web Development with ReactJS	4	0	0
Pool 3	ITH31-Cyber Laws and Security Policies	4	0	0
	ITH32-Big Data Analytics	4	0	0
	ITH33-Blockchain and Distributed Ledger Technology	4	0	0
	ITH34-Python Django Web Development	4	0	0
Pool 4	ITH41-Cyber Forensics	4	0	0
	ITH42-Data Analysis using Tableau	4	0	0
	ITH43-Smart contracts and solidity	4	0	0
	ITH44-Web Services using Spring Boot	4	0	0

I YEAR

IT/CS 111	Mathematics-I	L	P	C
		3	0	3

Course Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more a level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

The students will able to:

1. Evaluate certain improper integrals apart from some other applications they will have a basic understanding of Beta and Gamma functions.
2. Apply Role's theorem which is fundamental application of analysis to Engineering problems.
3. Solve problems related to linear algebra including linear transformations in a Comprehensive manner
4. Find Matrix Eigen values and know diagonalization and orthogonalization.

Course Content:

UNIT I Text Book-1 **CO1** 15 Periods

Evolutes and Involutes, Evaluation of improper integrals: Integrals without infinite limits of integration, Beta function, Gamma function, Relation between beta and gamma functions (without proof) Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT II Text Book-1 **CO2** 15 Periods

Rolle's theorem (without proof), Lagrange's mean value theorem (without proof), Taylor's and Maclaurin series, Sequences, Series, Series of positive terms, Convergence tests: Comparison test (limit form) D'Alembert's ratio test, Raabe's test for convergence.

UNIT III Text Book-2 **CO3** 15 Periods

Vectors: addition and scalar multiplication, linear dependence and independence of vectors.
Vector space, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Matrix associated with a linear map.

UNIT IV Text Book-2 **CO4** 15 Periods

Characteristic equation, Eigen values and eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, Eigen basis, Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Learning Resources:

Text Books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd edition.
2. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson, 2002.
2. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
3. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.

IT/CS 112	Engineering Physics	L	P	C
		3	0	3

Course Objectives:

1. Introducing the concept of electron motion in periodic potentials and classification of solids, band formation by learning the prerequisite quantum physics.
2. Explaining the diode equation and formation of P-N junction from the basics of semiconductors.
3. Understanding the interaction of radiation with bulk semiconductors and the relevant Optoelectronic devices with energy band diagrams.
4. Exploring the applications of devices in low dimensional materials by understanding the density of states and experimental techniques to be used for measurement of transport properties.

Course Outcomes:

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

1. Demonstrate the necessity of periodical potentials and conditions for explaining the properties and band formation with the help of quantum physics.
2. Explain the theory of P-N junction diode from the basics of semiconductor concepts.
3. Explain the theory and application of Optoelectronic devices.
4. Describe measuring techniques employed in transport phenomena and variation of properties in low dimensions.

Course Content:

UNIT I CO1 15 Periods

Principles of Quantum Mechanics: Wave nature of particles, de Broglie's hypothesis, Davisson and Germer's experiment, Time dependent and Time independent Schrodinger wave equations, Physical significance of wave function, Uncertainty principle, single slit experiment. Particle in a box and extension to 3D box (qualitative treatment only).

Electron Theory of Metals: Salient features of free electron theory, Fermi - Dirac distribution function, Fermi level, Density of States, Bloch wave function, Kronig-Penney model, E-k curves, Brillouin zones, Effective mass, Degrees of freedom, Distinction of metals, semiconductors and insulators. Concept of hole, Energy band formation in solids.

UNIT II CO2 15 Periods

Semiconductor Physics: Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, drift and diffusion equations, Einstein's relation, P-N junction formation, diode equation, Hall effect and applications.

UNIT III CO3 15 Periods

Lasers and Optoelectronic Devices: Direct and Indirect band gap semiconductors, Light-semiconductor interaction: Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission, Optical loss and gain; Density of states for photons, Semiconducting laser, Homo and Hetero

structure lasers with band diagrams, characteristics of laser and LED,PIN diode, Solar cell , working principle and characteristics.

UNIT IV CO4 15 Periods

Low Dimensional Structures and Measuring Techniques: Density of states in 2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots. Four-point probe and Van der Pauw measurements for carrier density, resistivity and Hall mobility, Hot-point probe measurement, capacitance-voltage measurements, Parameter extraction from Diode I-V characteristics.

Learning Resources:

Text Book:

1. M.N. Avadhanulu, P.G. Kshirasagar - A Text book of Engineering Physics, S. Chand & Company Ltd., 2018.

Reference Book(s):

1. Donald A.Neeman - Semiconductor Physics and Device : Basic Principle (Fourth edition), TMH, 2012.
2. J.Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
3. B.E.A.Saleh and M.C.Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
4. S.M.Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
5. A.Yariv and P.Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
6. P.Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).

Web Resources:

1. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL.
2. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL.

IT/CS 113	Basic Electrical & Electronics Engineering	L	P	C
		3	0	3

Course Objectives:

The main objectives of this course are
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:

Upon successful completion of the course, the student will be able to:
1. Analyze concepts of basic electrical circuits and batteries.
2. Solve problems on AC circuits.
3. Describe the principle of operation and characteristics of Diode and transistors.
4. Summarize feedback topologies and oscillators.

Course Content:

UNIT – I Text Books – 1&2 CO1 16 Periods

DC Circuits: Batteries: Lead-acid, Nickel-iron, Nickel-Cadmium batteries (Operation only). Elementary calculations for energy consumption. DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

UNIT-II Text Books – 1&2 CO2 16 Periods

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), real power, reactive power, apparent power, power factor. Three phase balanced circuits, voltage and current relations in star and delta connections (balanced loads only).

UNIT - III Text Book - 2 CO3 16 Periods

Semiconductor Diodes: Semiconductor diode, Zener diode, Half-Wave Rectifier, Full-Wave rectifier, Clippers and Clampers.
Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitter configuration, Common collector configuration.

UNIT - IV Text Book – 2, Reference Book-4 CO4 16 Periods

Amplifiers: Need of biasing, Thermal runaway, Types of biasing-fixed bias, collector base bias, self-bias. Feedback and Oscillator Circuits: Feedback concepts, feedback connection types, Barkhausen criteria, Phase-Shift oscillator, Wien bridge oscillator, Hartley oscillator, Colpitts oscillator.

Learning Resources:

Text Books:

1.A. Sudhakar and Shyam Mohan SP, “Circuits and Networks: Analysis and Synthesis”, 5th Edition, TMH, 2017.
2. M.S. Sukhija, T.K. Nagasarkar, “Basic Electrical & Electronics Engineering”, Oxford press, 2012.

Reference Books:

1. V.K. Mehta, “Principles of Electrical Engineering and Electronics”, S. Chand, 2010.
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.

IT/CS 114	Programming for Problem Solving	L	P	C
		3	0	3

Course Objectives:

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

Course Outcomes:

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

1. Develop algorithms and flow charts for simple problems.
2. Use suitable control structures for developing code in C.
3. Design modular programs using the concepts of functions and pointers.
4. Develop code for complex applications using structures and file handling features.

Course Content:

UNIT I CO1 15 Periods

Introductory Concepts: Block Diagram of Computer, Computer Characteristics, Hardware vs Software, how to Develop a Program, Software Development Life Cycle, 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, Input/ Output functions.

UNIT II CO2 15 Periods

Control Statements: Branching, Looping, Nested Control Structures, Switch Statement, Break Statement, continue Statement, and Goto Statement
Arrays: Defining an Array, Processing an Array, Multidimensional Arrays & Strings.

15 Periods

UNIT III CO3

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, Arrays of Pointers.

15 Periods

UNIT IV CO4

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

Learning Resources:

Text Book:

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

Reference Books:

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 References:

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

IT/CS 151	Engineering Physics Lab	L	P	C
		0	3	1.5

Course Objectives:

The aim and objective of the Lab course on Physics is to introduce the students of B.Tech. class to the formal structure of Physics so that they can use these in Engineering as per their requirement.

1. To familiarize the students with electronic measuring instruments.
2. To measure various parameters of the optical components.
3. Design/problem solving skills, practical experience are developed through laboratory assignments which provide opportunities for developing team in multidisciplinary environments.
4. To understand the general, scientific concepts and a wide idea on various components &instruments required for technology.

Course Outcomes:

At the end of the course, the student will be to draw:

1. Use CRO, Function generator, Spectrometer for making measurements.
2. Test the optical instruments using principles of interference and diffraction.
3. Carrying out precise measurements and handling sensitive equipment.
4. Draw conclusions from data and develop skills in experimental design.

List of Experiments:

1. Measurements using Vernier Calipers, Screw Gauge and Spherometer.
2. Newton's rings - Measurement of radius of curvature of plano-convex lens.
3. Determination of Energy band gap of a Semiconductor.
4. Optical fibers – Determination of Numerical Aperture.
5. Diffraction grating - Measurement of wavelengths using Spectrometer.
6. Magnetic field in Helmholtz coil.
7. PhotoVoltaic Cell – Determination of fill factor.
8. Series LCR resonance circuit –Determination of Q – factor.
9. Four probe method apparatus for measurements of resistivity and conductivity
10. Determination of wavelengths using diffraction grating
11. Variation of magnetic field along the axis of a circular current carrying coil
12. Carey Foster's bridge – Determination of Specific Resistance

Reference Book:

Physics Lab Manual: RVR & JCCE, Guntur

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/CS 152	Basic Electrical & Electronics Engineering Lab	L	P	C
		0	3	1.5

Course Objectives:

The main objectives of this lab course are
1. To conduct experiments on electrical circuits.
2. To design experimental setups for theorems.
3. To learn Diode characteristics, and basic diode applications as rectifiers and regulators.
4. To learn BJT characteristics and Oscillators.

Course Outcomes:

Upon completion of this laboratory, the student will be able to:
1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Use common electrical measuring instruments.
4. Verify the network theorems.
5. Design Zener voltage regulator to meet the specifications.
6. Verify popular BJT applications experimentally.

List of experiments/demonstrations:

1. Familiarization of Electrical Installations and Electrical Testing Equipment: Miniature circuit breakers (MCBs), Moulded Case Circuit Breakers (MCCBs), Earth-leakage circuit breakers (ELCBs), Fuses, Types of Wires, Wire Gauges, continuity test, megger, Cables and Earthing.
2. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, wattmeter, multi-meter, oscilloscope, measurement of basic parameters.
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. Wein Bridge 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.

IT/CS 153	Engineering Graphics & Design Lab	L	P	C
		1	4	3

Course Objectives:

1. Expose the students to standards and conventions followed in preparation of engineering drawings.
2. Make them understand the concepts of orthographic and isometric projections
3. Develop the ability of conveying the engineering information through drawings.
4. Make them understand the relevance of engineering drawing to different engineering domains.
5. Develop the ability of producing engineering drawings using drawing instruments.
6. Enable them to use computer aided drafting packages for the generation of drawings.

Course Outcomes:

Upon completion of this course, students will be able to

1. Prepare engineering drawings as per BIS conventions mentioned in the relevant codes.
2. Produce computer generated drawings using CAD software.
3. Use the knowledge of orthographic projections to represent engineering information / concepts and present the same in the form of drawings.
4. Develop isometric drawings of simple objects reading the orthographic projections of those objects.
5. Convert pictorial and isometric views of simple objects to orthographic views.

(**UNIT I to IV** shall be taught in conventional drawing method and Unit V shall be taught with the aid of computer)

UNIT I CO1 10 Periods

General: Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering.
Conic sections: Construction of Ellipse, Parabola, Hyperbola and Rectangular Hyperbola. (General method only)
Curves: Cycloid, Epicycloid, Hypocycloid and Involute; and Scales

UNIT II CO2 10 Periods

Method of Projections: Principles of projection - First angle and third angle projection of points, Projection of straight lines inclined to both planes. Traces of lines.
Projections of planes: Projections of planes inclined to both the planes, projections on auxiliary planes.

UNIT III CO3 10 Periods

Projections of Regular Solids: Projections of solids (Prism, Pyramid, Cylinder and Cone) with varying positions.
Sections of Solids: Sections of Prisms, Pyramids, cylinders and Cones. True shapes of sections. (Limited to the cutting plane perpendicular to one of the principal plane).

Development of surfaces: Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT IV CO4 10 Periods

Isometric Projections: Principles of Isometric Projection-Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids.
Orthographic Projections: Conversion of pictorial views into Orthographic views and Vice-versa. (Treatment is limited to simple castings).
Perspective Projections: Introduction to Perspective Projection.

UNIT V CO5 10 Periods

Over view of Computer Aided drafting (AutoCAD): Introduction, starting and customizing AutoCAD screen, usage of different menus, toolbars (drawing, editing, dimension, text, object properties.etc), tabs (Object, snap, grid, polar, ortho, otrack.etc.) and command prompt. Setting units, limits, layers and viewports (Isometric, Top, Front, back, etc.). 2D drawings of various mechanical and structural components, electrical and electronic circuits. Orthographic and Isometric views of mechanical castings and simple structures.

Learning Resources:

Text Book:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.

Reference Books:

1. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
3. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
4. (Corresponding set of) CAD Software Theory and User Manuals

IT/CS 154	Programming for Problem Solving Lab	L	P	C
		0	3	1.5

Course Objectives:

1. Introduce Basic problem solving process using Flow Charts and algorithms.
2. Narrate the Basic concepts of control structures in C.
3. Describe the concepts of arrays, functions, pointers and Dynamic memory allocation in C.
4. Illustrate the 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. Develop algorithms and flow charts for simple problems.
2. Use suitable control structures for developing code in C.
3. Design modular programs using the concepts of functions and recursion.
4. Develop code for complex applications using structures, pointers and file handling features.

List of Exercises / Activities:

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

Lab1 Simple computational problems using arithmetic expressions.
Lab2 Problems involving if-then-else & switch.
Lab3 Iterative problems.
Lab4 1D Array manipulation.
Lab5 Problems on 2D arrays and Strings.
Lab6 Function calling mechanisms (Call by value).
Lab7 Function calling mechanisms (Call by reference).
Lab8 Recursive functions.
Lab9 Dynamic memory allocation.
Lab10 Structures and unions.
Lab11 File operations.
Lab12 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/CS MC1	Constitution of India	L	P	C
		2	0	0

Course Objective:

To provide basic information about Indian Constitution.

Course Outcomes:

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

1. Understand the significance of many provisions of the Constitution as well as to gain insight into their back ground. They will also understand number of fundamental rights subject to limitations in the light of leading cases.
2. Study guidelines for the State as well as for the Citizens to be followed by the State in the matter of administration as well as in making the laws. It also includes fundamental duties of the Indian Citizens in Part IV A (Article 51A).
3. Understand administration of a State, the doctrine of Separation of Powers.
4. Know how the State is administered at the State level and also the powers and functions of High Court.
5. Understand special provisions relating to Women empowerment and also children. For the stability and security of the Nation, Emergency Provision are Justified.
6. 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.

Course Content:

UNIT I CO1 10 Periods

Preamble to the Constitution of India Domicile and Citizenship. Fundamental rights under Part III, Leading Cases. Relevance of Directive Principles of State Policy under Part-IV, IV-A Fundamental duties.

UNIT II CO2,3,4 10 Periods

Union Executive - President, Vice-President, Prime Minister, Union Legislature - Parliament and Union Judiciary - Supreme Court of India. State Executive - Governors, Chief Minister, State Legislature and High Court.

UNIT III CO5 10 Periods

Special Constitutional Provisions for Scheduled Casters and Tribes, Women and Children and Backward Classes, Emergency Provisions.

UNIT IV CO6 10 Periods

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

Learning Resources:

Text Book:

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

Reference Books:

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/CS 121	Mathematics-II	L	P	C
		3	0	3

Course Objectives:

The objective of this course is to extend concepts developed in Calculus to functions of several variables of multivariable calculus and ordinary differential equations and to develop student understanding and skills in the topic necessary for its applications to science and engineering.

Course Outcomes:

The students will be able to:
1. Optimize functions of several variables essential in many engineering problems'.
2. Evaluate double and triple integrals and find areas and volumes.
3. Concepts like divergence, curl in integration of vector functions.
4. Solve differential equations which model physical processes.

Course Content:

UNIT I CO1 15 Periods

Multivariable Calculus: Limit, continuity and partial derivatives, total derivative
Maxima, minima and saddle points of two variables, Method of Lagrange multipliers

UNIT II CO2 15 Periods

Multiple Integrals: Double integrals (Cartesian and polar), change of order of integration, change of variables (Cartesian to polar), area by double integration, triple integrals, volume by triple integrals.

UNIT III CO3 15 Periods

Scalar and vector point functions, Gradient, directional derivative, divergence and curl, del applied twice to point and product of point functions (without proofs) Vector integration: line integral, surface and volume integrals, Green's theorem (without proof), Stoke's theorem (without proof), Gauss divergence theorem (without proof)

UNIT IV CO4 15 Periods

First order ordinary differential equations: Linear, Bernoulli and exact equations Second order ordinary linear equations: Solution by method of variation of parameters,Cauchy's equation, Power series solutions; Legendre polynomials, Besselfunctions of the first kind and their properties

Learning Resources:

Text Book:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd edition.

Reference Books:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2010.
2. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.

IT/CS 122	Engineering Chemistry	L	P	C
		3	0	3

Course Objectives:

1. To develop concepts involved in molecular structure, intermolecular forces and make them understand the chemistry behind electrochemical energy systems.
2. To acquire knowledge on the chemical concepts involved in Water treatment and Corrosion.
3. Student shall know about the major organic reactions and end products like conducting polymers.
4. Learn analytical methods useful in characterization of compounds.

Course outcomes:

After successful completion of the course student shall be able to:

1. Identify stable complexes and suitable electrochemical energy systems for end usage.
2. Apply his knowledge for effective water treatment and corrosion prevention.
3. Identify chemical reactions that are used in the synthesis of molecules and polymers
4. Distinguish the ranges of the electromagnetic spectrum and characterize a given compound using analytical techniques.

Course Content:

UNIT I **CO1** 15 Periods

Molecular structure, Intermolecular forces and Energy systems:
Crystal field theory-salient features, energy level diagrams-tetrahedral and octahedral complexes, crystal field stabilization energies and magnetic properties.

Ionic, dipolar, Vander Waal's interaction and Hydrogen bonding, critical Phenomena-Andrew's isotherms of CO_2, derivation of critical constants from Vander Waal's equation.

Electrode potential, electrochemical series, Nernst equation and its applications. Batteries-Primary (Dry cell) and secondary (Lead acid), Lithium battery (Li-MnO_2)- advantages, Fuel cell (H_2-O_2 cell).

UNIT II **CO2** 15 Periods

Water Chemistry and Corrosion:
Water Chemistry-WHO standards, Municipal water Treatment-Removal of suspended Impurities-Sedimentation, Co-agulation and Filtration-Disinfection of water by chlorine, Break point chlorination, DE chlorination, Purification by ion-exchange method and reverse osmosis.

Corrosion-Introduction, Electrochemical theory of corrosion, galvanic corrosion, differential aeration corrosion, Factors-temperature, pH, overvoltage. Cathodicprotection by sacrificial anodic method and impressed current method. Electroplating (Cu), Electrolessplating (Ni).

UNIT III **CO3** 15 Periods

Organic Reactions and Polymers:
Types of organic Reactions-Substitution (SN_1 and SN_2), Elimination (E_1 and E_2), Addition-Markownikoff's rule and anti-Markownikoff's rule, Cyclisation (Diel's Alder reaction), Synthesis of aspirin.

Polymers-Functionality, Degree of Polymerization, Tacticity-Addition and condensation polymerization, Relationship between Structure and Properties of polymers (Strength, Crystallinity, Elasticity, Plastic Deformation, Glass transition temperature (T_o)), Factors affecting T_o.

Conducting polymers: Introduction, Examples, General applications, Mechanism of conduction in polyacetylene.

UNIT IV **CO4** 15 Periods

Spectroscopic techniques and its applications:
Beer-Lambert's law, limitations, colorimetric determination of Fe(III)
UV-VIS spectroscopy – electronic transitions, shifts-blue and red, Block diagram - brief introduction of components, Applications – purity and differentiation of conjugated and non-conjugated dienes.

IR Spectroscopy–condition to be IR active, vibrational modes of–AB_2, Block diagram-brief introduction of components, IR spectrum of CO_2 and H_2O molecules, General applications. Fluorescence and its applications in medicine.

Learning Resources:

Text Books:

1. Engineering chemistry, P.C. Jain and Monica Jain, 16th edition, Dhanpat Rai Publishing Company.
2. Wiley Engineering chemistry, 2nd edition, Wiley India Private Limited.

Reference Books:

1. University Chemistry, Bruce H. Mahan, 3rd edition, Narosa Publishing House.
2. A text book of Engineering chemistry, Shashi Chawla, 3rd edition, Dhanpat Rai Publishing Company.

Web References:
1. Engineering Chemistry (NPTEL Web Book by B.L. Tembe, Kamaluddin &M.S. Krishnan).
2. http://www.powerstream.com/BatteryFAQ.html#lec.
3. http://freevideolectures.com/Course/3029/Modern-Instrumental-Methods-ofAnalysis.

IT/CS 123	Digital Electronics	L	P	C
		3	0	3

Course Objectives:

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

Course Outcomes:

On successful completion of the course, students will be 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.

Course Content:

UNIT I CO1, CO2, CO3, CO4 12 Periods

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 CO1, CO2, CO3 12 Periods

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 IIICO1, CO2, CO312 Periods

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

UNIT IV CO1, CO4 12 Periods

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:

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

Reference Books:

1. Z. Kohavi - Switching and Finite Automata Theory,2nd Edition Tata McGraw Hill.
2. R.P. Jain - Modern digital electronics, 4thEdition, McGraw Hill.

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/CS 124	English for Communication Skills	L	P	C
		3	0	3

Course Objectives:

The objectives of the course are:

1. To enable students, improve their lexical and communicative competence and to equip Students with oral and written communication skills.
2. To help students understand and learn the correct usage and application of Grammar Principles.
3. To get them acquainted with the features of successful professional communication.
4. To enable students, acquire various specific features of effective written communication.

Course Outcomes:

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

1. Use vocabulary contextually.
2. Compose effectively the various forms of professional communication.
3. Apply grammar rules efficiently in spoken and written forms.
4. Improve clarity to locate and learn the required information.

No. of Units		Name of the Topic	COs
UNIT I		**Vocabulary Building:**	
	1.1	Root words from foreign languages and their use in English	CO 1
	1.2	Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives	CO 1
	1.3	Synonyms, Antonyms, and Standard abbreviations.	CO 1
	1.4	One word substitutes	CO 1
UNIT II		**Writing Skills**	
	2.1	Proposal writing	CO 1,CO 2,CO 3
	2.2	Letter-writing	CO 1,CO 2,CO 3
	2.3	Techniques for writing precisely (Précis writing)	CO 1,CO 2,CO 3
	2.4	E-mail writing	CO1,CO 2,CO 3
UNIT III		**Identifying Common Errors in Writing**	
	3.1	Subject-verb agreement	CO 3
	3.2	Noun-pronoun agreement	CO 3
	3.3	Articles	CO 3
	3.4	Prepositions	CO 3
	3.5	Tenses	CO 3
	3.6	Redundancies	CO 3
UNIT IV		**Nature and Style of sensible writing**	
	4.1	Description & Narration. (Paragraph writing)	CO 1,CO2,CO 3
	4.2	Essay Writing. (Expository Essay)	CO1,CO 2,CO 3
	4.3	Note-Making and Note-Taking	CO1,CO 2, CO 4
	4.4	Methods of preparing notes.	CO1,CO 2, CO 4

Learning Resources:

Text Book:

1.Communication Skills, Sanjay Kumar and PushpaLata, Oxford University Press.

Reference Book(S):

1. Remedial English Grammar. F.T. Wood, macmillan,2007
2. On WritingWell, William Zinsser, Harper Resource Book, 2001
3. Study Writing, Liz Hamp-Lyons and Ben Heasly, Cambridge University Press, 2006
4. Practical English Usage, Michael Swan, OUP, 1995 Press.

IT/CS 125	Programming in Python	L	P	C
		2	0	2

Course Objectives:

The objectives of the course are to:

1. Introduce the fundamentals of Python Programming language.
2. Teach students processing of files, mutable and immutable data types.
3. Impart knowledge of Object – Oriented Programming using Python

Course Outcomes:

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

1. Explain the fundamentals of Python programming language.
2. Create user defined functions to solve problems
3. Manipulate the data structures lists, tuples, sets and dictionaries
4. Use Exception handling and Object – Oriented programming features of Python in solving real world problems

Course Content:

UNIT I CO1 10 Periods

The way of the program: What is a program? Running Python, The first program, Arithmetic operators, Values and types

Variables, expressions and statements: Assignment statements, Variable names, Expressions and statements, Script mode, Order of operations, String operations.

Functions: Function calls, Math functions, Composition, Adding new functions, Definitions and uses, Flow of execution, Parameters and arguments, Variables and parameters are local, Stack diagrams, Fruitful functions and void functions, Why functions.

Conditionals and recursion: Floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Stack diagrams for recursive functions, Infinite recursion, Keyboard input.

UNIT II CO2 10 Periods

Fruitful functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Checking types.

Iteration: Reassignment, Updating variables, The while statement, break, Square roots.

Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and counting, String methods, The in operator, String comparison.

Files: Persistence, Reading and writing, Format operator, Filenames and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules,.

UNIT III CO3 10 Periods

Lists: A list is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map, filter and reduce, Deleting elements, Lists and strings, Objects and values, Aliasing, List arguments.

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters. Looping and dictionaries, Reverse lookup, Dictionaries and lists, Memos, Global variables.

Tuples: Tuples are immutable, Tuple assignment, Tuples as return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples.

UNIT IV CO4 10 Periods

Classes and objects: Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying.

Classes and methods: Object-Oriented features, Printing objects, The init method, The __str__ method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation.
Inheritance: Card objects, Class attributes, Comparing cards, Decks, Printing the deck, Add, remove, shuffle and sort, Inheritance, Data encapsulation.

Learning Resources:

Text Book:

1. Think Python: How to Think Like a Computer Scientist, Allen Downey, Green Tea Press, Version 2.0.17

Reference Books:

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/CS 161	Engineering Chemistry Lab	L	P	C
		0	3	1.5

Course Objectives:

1. To know the methods of determining hardness and chloride ion content of water sample.
2. To learn the redox methods to determine Fe2+ ions present in solution.
3. To know principles and methods involved in using instruments like conductivity bridge and potentiometer.
4. To know the molecular properties like surface tension, viscosity.
5. To know synthetic methods for preparation of drugs and polymer.

Course outcomes:

After successful completion of the course student shall be able to:

1. Estimate the Fe(II) content of a given solution and chloride/hardness content of water.
2. Measure conductance of solutions, redox potentials of a cell.
3. Synthesize a small drug molecule and polymer.
4. Measure molecular properties such as surface tension, viscosity and determine physical parameters like saponification value, partition co-efficient and Rf value.

List of Experiments:

1.	Estimation of Mohr's salt using KMnO4.	CO1
2.	Estimation of Mohr's salt using K2Cr2O7.	CO1
3.	Determination of chloride ion content of water.	CO1
4.	Determination of Hardness of water using EDTA method.	CO1
5.	Determination of Fe(II) strength using K2Cr2O7 potentiometrically.	CO1& CO2
6.	Determination on strength of NaOH using HCI conduct metrically.	CO2
7.	Preparation of p-bromo acetanilide.	CO3
8.	Preparation of Phenol Formaldehyde resin.	CO3
9.	Determination of surface tension.	CO4
10.	Determination of Viscosity.	CO4
11.	Determination of Saponification / acid value of oil.	CO4
12.	Determination of partition co-efficient of I2 in water.	CO4
13.	Determination of Rf value using TLC.	CO4
14.	Verification of Freundlich isotherm using adsorption of acetic acid on activated charcoal.	CO4

IT/CS 162	Programming in Python Lab	L	P	C
		0	2	1

Course Objectives:

The objectives of the course are:

1. To introduce the fundamentals of Python Programming language.
2. To make the students process files, mutable and immutable data.
3. To impart knowledge of Object – Oriented Programming using Python

Course Outcomes:

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

1. Illustrate the fundamentals of Python programming language.
2. Create user defined functions to solve problems
3. Write programs to manipulate the data structures lists, tuples, sets and dictionaries
4. Use Exception handling and Object – Oriented programming features of Python in solving real-world problems.

List of Exercises / Activities:

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

Lab1	Simple Programs to demonstrate Input - Output operations.
Lab2	Programs to demonstrate the behavior and use of various operators.
Lab3	Programs to emphasize the usage of Conditional Control Statements.
Lab4	Programs to emphasize the usage of Iterative control statements.
Lab5	Programs on the usage of Built-in functions.
Lab6	Programs to demonstrate the creation and usage of User Defined Functions.
Lab7	Programs to demonstrate Recursion.
Lab8	Programs on creation and importing of modules.
Lab9	Programs on Lists and its operations
Lab10	Programs on List Processing. (Sortings, Searchings, Permutations...)
Lab11	Programs to demonstrate Exception Handling.
Lab12	Programs to demonstrate OOP concepts.

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/CS 163	Computer Engineering Workshop	L	P	C
		0	3	1.5

Course Objectives:

The objectives of the course are:

1. To make the students aware of the basic hardware components of a computer and installation of operating system.
2. To introduce Raptor Tool for flowchart creation.
3. To get awareness of cyber hygiene to protect the personal computer from getting infected with the viruses, worms and other cyber-attacks.
4. To introduce the usage of Productivity tools in crafting professional word documents, excel spreadsheets and power point presentations using open office tools.

Course Outcomes:

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

1. Apply knowledge for computer assembling and software installation.
2. Draw flowcharts for the given problems
3. Troubleshoot hardware and software level problems.
4. Prepare professional word documents using the Microsoft office.

Apply the tools for preparation of PPT, and budget sheet etc.

TASK 1: PC Hardware: PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition, hardware and software level troubleshooting process, tips and tricks would be covered.

Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

TASK 2: Software Installation: Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

TASK 3: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

TASK 4: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate how to access the websites and email.

TASK 5: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured. Search Engines & Netiquette: Students should know what search engines

are and how to use the search engines. Usage of search engines like Google, Yahoo, ask.com and others should be demonstrated by student.

TASK 6: Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

TASK 7: Drawing flowcharts (Raptor Tool): Students should draw flowcharts for the problems validating an email id entered by user, printing first fifty numbers and preparing electricity bill.

TASK 8: Productivity tool: Microsoft (MS) office: Importance of MS office, Details of the three tasks and features that should be covered in each, MS word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter. Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Using MS Word to create project certificate: Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colours, Inserting Header and Footer, Using Date and Time option in Word.

TASK 9: Spread sheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler: - Gridlines, Format Cells, Summation, auto fill, Formatting Text

TASK 10: Creating Power Point: Student should work on basic power point utilities and tools in Ms Office which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and Charts.

** Minimum 8 tasks should be done by the student to get eligibility to appear for the exam
** Tasks 1 to 7 are mandatory

Text Books:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.
3. Computer Fundamentals, l e, Anita Goel, Person Education.

Reference Books:

1. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.

IT/CS 164	Communication Skills Lab	L	P	C
		0	3	1.5

Course Objectives:
The objectives of the course are:

1. To identify speaker's purpose and tone; make inferences and predictions about spoken discourse, discuss and respond to content of a lecture or listening passage orally and/or in writing.
2. To acquaint the students with the Standard English pronunciation, i.e., Receive Pronunciation (RP), with the knowledge of stress and intonation.
3. To develop production and process of language useful for social and professional life.
4. To develop in them communication and social graces necessary for functioning. Improve the dynamics of professional presentations.
5. To develop critical reading and comprehension skills at different levels.

Course Outcomes:

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

1. Comprehend relationships between ideas and make inferences and predictions about spoken discourse.
2. Speak English with a reasonable degree of accuracy in pronunciation.
3. Develop appropriate speech dynamics in professional situations.
4. Use effective strategies and social graces to enhance the value of communication.
5. Develop effective communication and presentation skills and using language effectively to face interviews with success.

List of Exercises / Activities:

1. Listening Comprehension.
2. Pronunciation, Intonation, Stress and Rhythm.
3. Common Everyday Situations: Conversations and Dialogues.
4. Interviews.
5. Formal Presentations.
6. Reading Comprehension.

Reference Book(S):

1. Communication Skills. Sanjay Kumar and Pushpa Lata. Oxford University Press.
2. Practical English Usage. Michael Swan. OUP. 1995 Press.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University.
4. Technical English M. Sambaiah, Wiley Publications, New Delhi.

IT/CS MC2	Environmental Science	L	P	C
		2	0	-

Course Objectives:

To enable the students to

1. Understand that humans are an integral part of environment and hence their activities reflect on theenvironment.
2. realize and appreciate the importance of ancient practices and their importance in the present times
3. appreciate the contribution of individuals for the upkeep of environmental standards, in turn help the humans live better.

Course Outcomes:

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

1. Evaluate the implications of human activities and thereby promote ecofriendly technologies.
2. Promote awareness among the members of the society for a sustainable environment.
3. Include and give priority to environmental protection in all developmental projects.

Course Content:

A. AWARENESS ACTIVITIES - SMALL GROUP MEETINGS

I. Source of water for human consumption/activities:

a. collection of information pertaining to water resources and consumption in Andhra Pradesh

b. Water resource on campus: General / Laboratory use and

c. Drinking water - understand the background and adopt judicious management.

d. Recycled water for Gardening - Particularly Lawns.

e. Cut down wastage of electricity in class rooms / labs / hostels etc. by avoiding misuse.

II. After the group meetings and exposure to the local issues and healthy practices, students motivated to make:

a. Posters

b. Slogans/One liners for promoting awareness

III. Lectures from Experts (at least 2 in the course duration)

IV. A walk in the neighborhood to promote a chosen theme on environmental consciousness.

B. ACTUAL ACTIVITIES

1. Plantation on Campus and on the sides of approach road.
2. Distribution of saplings to the local colony dwellers and encourage plantation.
3. Development of Kitchen garden on campus - Cultivation of at least leafy vegetables
4. and creepers like cucumber etc. for use in college canteen/hostels etc.
5. Adoption of "NO PLASTICS" on campus.
6. Field trip to gain knowledge of biodiversity, water shed, mining, pollution and other
7. local issues.
8. Preparation of working models for energy generation/transformation etc.

C. THEORY SYLLABUS FOR ASSESSMENT

Part-I

1. Introduction to Environmental Studies, Scope and Importance.

2. Natural resources Renewable and Non-Renewable; Definition and importance of the following resources in detail: a. Forest b. Water c. Land d. Energy

3. Sustainable development - Concept and Measures.

4. Biodiversity - Definition, Types of Biodiversity, Values and threats to Biodiversity, Conservation of biodiversity, IUCN classification: Endangered, Threatened, Vulnerable, Rare species; Endemic and Exotic species.
5. Climate change - Global warming, Ozone depletion and Acid rain.

Part-II

6. Water shed, water shed management in detail.
7. Solid wastes and Solid waste management.
8. Environmental Legislation, Environmental acts - Wild life protection act, Water act, Forest conservation act, Air act and Environmental protection act.
9. Case studies: Chernobyl nuclear disaster, Bhopal gas tragedy, Narmada bachaoandolan, Silent valley, Story of Tuvalu, Story of Ganga.
10.Earth summit and Kyoto protocol; Measures at individual level for conservation of natural resources and sustainable development.

Learning Resources:

Text Books:

1. Anubha Kaushik and C.P. Kaushik - Environmental Studies, 3rd Edition, New Age International Publishers, New Delhi., 2012.
2. R. Rajagopalan - Environmental studies from crisis to cure, 3rd Edition, Oxford University press, 2012.

Assessment

1. Two assessments each of 40 marks will be done in the semester. The split up of each assessment is as follows:
a. Two internal theory examinations will be conducted for 18 marks each.
b. Evaluation of the prepared activity sheets and working models will be done for 12M (continual evaluation) twice in the semester in line with the theory examination.
c. 5 Marks for attendance and 5 marks for oral test.

II
YEAR

IT/CS 211	Probability and Statistics	L	P	C
		3	0	3

Course Objectives:

The student who successfully completes this course will have:

1. The ability to understand the basic principles of various probability distributions.
2. The ability to know the sample distributions of the data
3. The basic concepts of testing of hypothesis and their applications for the data.
4. The skill to predict the future behaviour based on time series data.

Course Outcomes:

On completion of this course, students will be able to:

1. Apply various formulae to analyze and interpret the data.
2. Apply the knowledge of distribution theory to both software and hardware design problems.
3. Apply the basic concepts of testing of hypothesis and derive the conclusions for the data.
4. Analyze the behavior of the data by various models in time series

Course Content:

UNIT I CO1 **14 periods**

Probability distributions: Random Variables, Binomial distribution, Poisson distribution, and Geometric distribution.

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

UNIT II CO2 **14 periods**

Sampling distribution: Population and samples, the sampling distribution of mean (σ known), the sampling distribution of mean (σ unknown), the sampling distribution of variance.

Testing of Hypotheses (Parametric Tests):
Inferences Concerning Means: Point estimation, Interval estimation, tests of hypothesis, null hypothesis and tests of hypothesis, hypothesis concerning one mean, inferences concerning two means

UNIT III CO3 **14 periods**

Testing of Hypotheses (Parametric Tests) (Contd…):
Inferences Concerning Variances*:* The estimation of variances, hypothesis concerning one variance, hypothesis concerning two variances.

Inferences Concerning Proportions: The estimation of proportions, hypothesis concerning one proportion, hypothesis concerning several proportions, The analysis of r×c tables, Goodness of fit.

UNIT IV CO4 **14 periods**

Testing of Hypotheses (Non-Parametric Tests): Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman's and Kendall's test. Tolerance region.

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

Learning Resources:

Text Book:

1. Miller &Freund's Probability and Statistics for Engineers – Richard A. Johnson

Reference Books:

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.

Discrete Mathematics

IT/CS 212

L	P	C
3	0	3

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:

At the end of the course, the student will be 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.

Course Content:

UNIT I CO1 **13 periods**

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 CO2 **10 periods**

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 CO3 **13 periods**

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 CO4 **14 periods**

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

Graphs: Isomorphism's and Sub graphs, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem.

Learning Resources:

Text Book:

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

Reference Books:

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, FifthEdition.TMH.

IT/CS 213	Computer Organization	L	P	C
		3	0	3

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:

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

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

Course Content:

UNIT I CO1 **12 Periods**

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, Encoding of Machine Instructions.

UNIT II CO2,3 **12 Periods**

Basic Processing Unit: Some Fundamental Concepts, Instruction Execution, 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.

10 Periods

UNIT III CO4

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; PCI Bus, SCSI Bus.

UNIT IV CO 5,6 **14 Periods**

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(s):

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

Reference Books:

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/CS 214	Data Structures	L	P	C
		3	0	3

Course Objectives:

The objectives of this course are:

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

1. Analyze computation complexity of algorithms
2. Implement searching, sorting and hashing techniques
3. Apply operations on linear and non-linear data structures
4. Develop solutions for computational problems using appropriate data structures

Course Content:

UNIT I CO1 **10 Periods**

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.

UNIT II CO2 **14 Periods**

Lists: Pointers, Singly Linked Lists, Polynomials, Circular Linked Lists: Operations & their algorithms, Polynomials: Addition, Multiplication

Hashing: Static Hashing - Hash Tables, Hashing Functions, Overflow Handling

UNIT III CO3 **12 Periods**

Stacks and Queues: Stack ADT, Queue ADT, Evaluation of Expressions, Multiple Stacks and Queues, Dynamically Linked Stacks and Queues

UNIT IV CO4 **14 Periods**

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 - Depth First Search, Breadth First Search, Connected Components

Learning Resources:

Text Book:

1. 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", 2nd Edition, 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", Pearson Education, 1983.
4. Jean Paul Trembly and P.G.Sorenson, An Introduction of Data Structures with Applications

IT/CS 215	Object Oriented Programming	L	P	C
		3	0	3

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:

By the end of the course, the students will be able to

1. Use an integrated development environment to write, compile Run and test simple Object oriented Java Programs.
2. Develop reusable and efficient programs using Inheritance & Polymorphism.
3. Demonstrate the importance of packages and interfaces.
4. Use the concept of exception handling to create error free codes and avoid abnormal program terminations.
5. Design multi-tasking applications using Multithreading.
6. Develop Event Driven applications and generic programs

Course Content:

UNIT I CO1 **12 Periods**

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.

Utility Classes: Date, Calendar, Scanner, Random

UNIT II CO2 **12 Periods**

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 CO3 **12 Periods**

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.
Applets: Concepts of Applets, life cycle of an applet, creating applets
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.

UNIT IV CO4 **12 Periods**

AWT: AWT Components, , File Dialog boxes, Layout Managers, Event handling model of AWT, Adapter classes, Menu, Menu bar.

GUI with Swing– Swings introduction, JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons. Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables

Generics: Basics of Generic Methods, Generic Classes

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

Learning Resources:

Text Book:

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

Reference Books:

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.

IT/CS 251	Probability & Statistics with R Lab	L	P	C
		0	3	1.5

Course Objectives:

The student who successfully completes this course will have:

1. The knowledge to use R for statistical programming, computation, modelling and graphics.
2. The skill to write functions and use R in an efficient way.
3. The ability to fit some basic types of statistical models using R.
4. The idea to expand the knowledge of R on their own.

Course Outcomes:

On completion of this course, students will be able to:

1. Write the programs in R to solve the statistical problems.
2. Apply various built in functions in R to solve the computational and modelling problems.
3. Interpret the statistical data by various functions of graphical representation.
4. Understand- reading, writing, working and manipulating the data in various data frames.

List of Experiments

Cycle I:

Introduction to R

Functions

Control flow and Loops

Working with Vectors and Matrices

Reading in Data

Writing Data

Working with Data

Manipulating Data

Simulation

Linear model

Data Frame

Graphics in R

Cycle II:

1. Graphical representation of data
   a) Bar plot b)Frequency polygon
2. Graphical representation of data
   a) Histogram b)Pie chart c) Scatter plot
3. Measures of central tendency
   a) Mean b)Median c)Mode
4. Measures of central tendency
   a)Geometric Mean e)Harmonic Mean
5. Measures of dispersion
   a)Range b)Quartile deviation

6. Measures of dispersion
   a)Mean deviation b)Standard deviation
7. Goodness of fit
   a) Binomial b)Poisson
8. Goodness of fit
   a)Normal b)Contingency table
9. Parametric tests
   a) t-test for one-mean b) t-test for two means
10. Parametric tests
   a) paired t-test b) F-test
11. Non-parametric tests
   a) Sign test b) Wilcoxon-Signed rank test
12. Non-parametric tests
   a) Mann-Whitney test b)Kolmogorov-Smirnov test
13. Time series
   a) Trend line b)Non-linear trend line
14. Time series
   a)Moving averages b)ARIMA

Learning Resources:

Text Books:

1.Hands-on Programming with R, Garrett Grolemund, O′Reilly.

2.R for Everyone: Advanced Analytics and Graphics, Jared P. Lander, Addison-Wesley

IT/CS **252**	**Data Structures Lab**	**L**	**P**	**C**
		0	**3**	**1.5**

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 completion of course, the student will be able to

1. Implement linear and non-linear ADTs.
2. Develop solutions for the given problems using appropriate data structures.
3. Solve real world problems using searching, sorting and hashing algorithms.

List of Experiments to implement

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

IT/CS 253	Object Oriented Programming Lab	L	P	C
		0	3	1.5

Course Objectives:

1. To introduce java compiler, interpreter
2. To make the students learn an object oriented way of solving problems using java
3. To make the students write programs using multithreading concepts and exception handling
4. To make the students understand the usage of Event handling, generics, collections

Course Outcomes:

By the end of this course the students will be able to

1. Write simple java programs using java fundamentals and basic OOP concepts.
2. Design programs using inheritance and polymorphism.
3. Demonstrate inter process communication using multithreading.
4. Demonstrate the creation of user defined exceptions and usage of exception handling keywords (try, catch, throw, throws and finally).
5. Develop Event driven applications and Generic programs.

List of Experiments:

The programming concepts to be implemented in the Lab are

Week 1: Fundamentals of classes and objects

Week 2: static keyword, this keyword, variable length arguments

Week 3: inner classes, constructor overloading

Week 4: Types of inheritances

Week 5: Method overloading, Method Overriding, usage of final and super

Week 6: Abstract classes, interfaces, Dynamic method dispatch.

Week 7: String class and its methods

Week 8: Packages

Week 9: Exception Handling Techniques

Week 10: Multithreading concepts

Week 11: Applets and event handling

Week 12: AWT components and delegation event model

Week 13: MVC architecture in Swing

Week 14: Generics and collections

ITSL1	PHP Programming	L	P	C
		1	2	2

Course Objectives:

At the end of the course, the students will understand

1. usage of PHP for developing web applications.
2. PHP Browser Handling Power.
3. accessing web form data at the server
4. creation of database driven web applications.
5. usage of Ajax for partial rendering.
6. XML and RSS with PHP.

Course Outcomes:

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

1. Apply basic concepts of PHP programming.
2. Design and Develop server side programs using PHP Technologies.
3. Assess the principles of object oriented development using PHP.
4. Develop Database Connectivity using MYSQL.
5. Design powerful web applications using Ajax.
6. Develop XML, RSS applications using PHP.

Course Content

UNIT I CO1 **10 periods**

Essential PHP, Operators and Flow Control, String Arrays, Creating Functions

UNIT II CO2,3 **10 periods**

Reading Data in Web Pages, PHP Browser- HANDLING Power, Object Oriented Programming, Advanced Object Oriented Programming

UNIT III CO4,5 **10 periods**

File Handling, Working with Databases, Sessions, Cookies, and FTP, Ajax

UNIT IV CO6 **10 periods**

Advanced Ajax, Drawing Images on the Server, XML and RSS

Learning Resources:

Text Book:

1. PHP: The Complete Reference By Steven Holzner, TATA McGraw Hill.

Reference Books:

1. Beginning PHP and MySQL: From Novice to Professional, By by W. Jason Gilmore, Apress.
2. PHP 6 and MySQL 6 Bible, By Steve Suehring, Tim Converse, Joyce Park, Wiley Publishing, Inc.

IT/CS MC3	Design Thinking & Product Innovation	L	P	C
		2	0	-

Course Objectives:

1. Identify the design thinking principles and practices in today's industry.
2. Learn the Planning of research activities to gather and empathize from a user's viewpoint.
3. Study the Ideate techniques to help arrive at the best solution and evaluation.
4. Knowledge to Identify design thinking approaches for business challenges.

Course Outcomes:

1. Interpret the concepts of Design thinking to real-world activities.
2. Investigate a problem to determine its root cause in terms of Design Thinking perspective.
3. Apply group thinking methods and experiment with different solutions to a given problem.
4. Develop innovative thinking and creative problem solving abilities.

Course Content:

UNIT I [T1,T2] CO1 **12 Periods**

Introduction to Design Thinking – Origin of Design Thinking, Features & Principles of Design Thinking, Applications of Design Thinking, Role of Research in Design Thinking.

UNIT II[T3] CO2 **12 Periods**

Modules of Design Thinking – Inspiration – methods & tools used in Explore and Empathize phases of Design Thinking, Case study-activity.

UNIT III [T3] CO3 **12 Periods**

Modules of Design Thinking – Ideation & Implementation – methods & tools used in Experiment, Engage and Evolve phases of Design Thinking, Case study-activity.

UNIT IV [T4] CO4 **12 Periods**

Design Thinking applied in Business & Strategic Innovation – Ten Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization, Creative Culture, Strategy & Organization – Design Thinking approaches.

Learning Resources:

Text Book(S):

1. "Design Thinking for Entrepreneurs and Small Businesses" by Beverly Rudkin Ingle, Apress. [UNIT -1]
2. "Change by design", Tim Brown, Harper Collins, 2009 [UNIT -1]
3. "Design Thinking- The Guide Book" – Facilitated by the Royal Civil Service Commission, Bhutan. [UNIT –II & III]
4. Idris Mootee, "Design Thinking for Strategic Innovation", John Wiley & Sons (2013). [UNIT -IV]

Reference Book(S):

1. "Design Thinking Business Innovation", Rio de Janeiro – 2012 1st edition, MJV press.
2. "Design Thinking- Understanding How Designers Think and Work" by Nigel Cross, Berg publishers.

Web Reference:

1. IDEO: Design Thinking for Educators toolkit https://designthinkingforeducators.com/.
2. https://dschool.stanford.edu/resources/a-virtual-crash-course-in-design-thinking
3. https://dschool-old.stanford.edu/groups/designresources/wiki/4dbb2/ (wallet Project)

Semester - IV (Second Year)

IT/CS 221	Computational Statistics	L	P	C
		3	0	3

Course Objectives:

The objectives of the course are:

1. To introduce the concepts of linear statistical and ANOVA models and draw the conclusions.
2. To impart modern computational statistical approaches and their application to a variety of datasets.
3. To reveal the key technologies in data science and business analytics.
4. To demonstrate principles of data science to analyze and visualize the data.

Course Outcomes:

On completion of this course, students will be able to:

1. Remember the basic concepts of linear statistical models.
2. Interpret the results of Multivariate Regression models.
3. Estimate the discriminate function to segregate and allot the item to the subgroup.
4. Implement data reduction and visualization.

Course Content:

UNIT I CO1 **14 periods**

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

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

UNIT II CO2 **14 periods**

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

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

UNIT III CO3 **14 periods**

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

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

UNIT IV CO4 **14 periods**

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

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

Learning Resources:

Text Book:

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

Reference Books:

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/CS 222	Database Management Systems	L	P	C
		3	0	3

Course Objectives

The objectives of the course are:

1. To introduce fundamental concepts and architectures of database system
2. To impart Features and design of conceptual and relational data models
3. To demonstrate various operations on relational data model.
4. To discuss the protocols related to transaction processing, concurrency control and recovery.

Course Outcomes

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

1. Discuss the fundamental concepts and architecture of database systems and data models.
2. Use relational query languages and SQL for querying the database.
3. Develop conceptual database schema for a given specification.
4. Construct the database using normalization process.
5. Describe the role of transaction processing, concurrency control and recovery in a multi user database system.

Course Content:

UNIT I **(CO1)** **11 Periods**

Introduction: Database system Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators

Introduction to the Relational Model: Structure of RDBMS, Database Schema, Keys, Relational Query Languages, Relational Operations

UNIT II **(CO2)** **15 Periods**

Formal Relational Query Languages - The Relational Algebra and 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, Views, Transaction, Integrity Constraints, SQL Data Types and Schemas, Authorization

UNIT III **(CO3 and CO4)** **12 Periods**

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 **(CO5)** **12 Periods**

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:

Text Book:

1. Database System Concepts by Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Sixth Edition, McGraw Hill Publishers.

REFERENCES:

2. Introduction to Database Systems, C.J.Date Pearson Education.
3. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATAMcGrawHill 3rd Edition.
4. Database Systems, Ramez Elmasri and Shamkant B.Navathe, Pearson Education, 6th edition.

IT/CS 223	Operating Systems	L	P	C
		3	0	3

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, students will be able to:

1. Describe the fundamental concepts of operating systems.
2. Apply the concepts of multithreading and IPC mechanisms.
3. Analyze the performance of CPU scheduling algorithms, page replacement algorithms, and disk scheduling algorithms.
4. Solve critical section problems and deadlocks.
5. Differentiate virtual memory management schemes.
6. Implement file systems.

Course Content:

UNIT I CO1 12 Periods

Introduction: What Operating Systems Do, Operating-System Operations, Resource Management, Security and Protection, Virtualization, Distributed Systems, Kernel Data Structures.

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

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

UNIT II CO2,3 14 Periods

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

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

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

UNIT III CO4,5 14 Periods

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

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

Virtual-Memory: Background, Demand Paging, Page Replacement, allocation of frames, Thrashing - Memory Compression, Other considerations.

UNIT IV CO6 10 Periods

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

Files System Interface: File Concept, Access Methods, Directory Structure, Protection, Memory –mapped files.

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

Learning Resources:

Text Book(s):

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

Reference Books:

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/CS 224	Software Engineering	L	P	C
		3	0	3

Course Objectives:

The objectives of the 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. Expose knowledge on testing techniques and metrics that are applicable to a Software Project

Course Outcomes:

After successful completion of the course, students will be 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 modelling techniques to solve real world problems.
3. Choose appropriate engineering design model to develop Software components in a software system.
4. Develop the architectural model and user interface to the Software Application.
5. Evaluate various software testing techniques and metrics.

Course Content:

UNIT I CO1 **12 Periods**

Software and Software engineering: The Nature of Software, Defining Software, Software Application Domains, Legacy Software, The software Process.

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.

Agile Development: What Is Agility? What Is an Agile Process? Scrum Other Agile Process Models, Scrum, Other Agile Frameworks- The XP Framework.

UNIT II CO2 **13 Periods**

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 Modelling, Behavioural Modelling.

Design Concepts: Design within the Context of Software Engineering, the Design Process, Design Concepts, the Design Model.

UNIT III CO3 **13 Periods**

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.

User Experience Design: User Experience Design Elements, The Golden Rules, User Interface Analysis and Design, Interface Analysis and Design Models, The process.

UNIT IV CO4,5 **12 Periods**

Software Testing –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.

Software Metrics and Analytics: Software Measurement, Software Analytics, Product Metrics, Metrics for Testing, Metrics for maintenance, Process and Project Metrics, Metrics for Quality.

Learning Resources:

Textbook(s):

1. Roger Pressman and Bruce Maxim "Software Engineering- A Practitioner's Approach", 9th edition, Tata McGraw-Hill International.

Reference Books:

1. Ian Somerville, Software Engineering. 6 ed, Pearson Education.
2. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, Fundamentals of Software Engineering.2 ed, PHI.
3. RajibMall, Fundamentals of Software Engineering. 2 ed, PHI.

Web Resources:

1. http://nptel.ac.in/courses/106101061/2
2. http://nptel.ac.in/courses/106101061/5

IT/CS 225	Web Technologies	L	P	C
		3	0	3

Course Objectives:

At the end of the course the students will understand

- Basic technologies to develop web documents.
- Dynamic HTML Pages and Event handling mechanism.
- XML, Web Servers, Servlet technologies.
- Java Server Page Technologies.

Course Outcomes:

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

1. Create web pages with HTML, CSS, and JavaScript.
2. Develop dynamic webpages using client side scripting.
3. Create XML documents, work with Web Servers and develop Web applications with Servlets.
4. Develop server side programs with Java Server Pages.

Course Content

UNIT I **(CO1)** 12 Periods

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

UNIT II **(CO2)** 12 Periods

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

UNIT III **(CO3)** 12 Periods

XML: XML Basics, XML Namespaces, DTD, XML Schema, MathML, XSL & XSLT.
Web Servers (IIS and Apache).
Introduction to Servlets: Common Gateway Interface (CGI), Lifecycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, using Cookies and Sessions, connecting to a database using JDBC.

UNIT IV **(CO4)** 12 Periods

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.

Text Book:

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” (UNIT III and UNIT IV (Servlets and JSP)

Reference Books:

1. Jason Cranford Teague "Visual Quick Start Guide CSS, DHTML & AJAX", 4/ e, "Pearson Education".
2. Tom Nerino Doli Smith "JavaScript & AJAX for the Web" Pearson Education, 2007.
3. Bill Dudney, Johathan Lehr, Bill Willies, Lery Mattingly "Mastering Java Server Faces" Willey India, 2006.
4. Web Technology - Uttam K.Roy, Oxford University Press, 2010.

Web References:

1. www.deitel.com
2. www.w3schools.com
3. www.tutorialspot.com

IT/CS 261	Computational Statistics Lab	L	P	C
		0	3	1.5

Course Objectives:

The objectives of the course are:

1. Introduce the concepts of linear statistical and ANOVA models and draw the conclusions.
2. Demonstrate modern computational statistical approaches and their application to a variety of datasets.
3. Introduce key technologies in data science and business analytics.
4. Expose principles of data science to analyse and visualize the data.

Course Outcomes:

On completion of this course, students will be able to:

1. Explain the basic concepts of linear statistical models
2. Interpret the results of Multivariate Regression models
3. Estimate the discriminate function to segregate and allot the item to the subgroup.
4. Implement Multi-Variate Statistical Analysis techniques using Python.
5. Apply data reduction and visualization techniques.

Lab Programs to implement

WEEK 1	Simple Linear Regression
WEEK 2	Correlation methods
WEEK 3	Multiple Regression
WEEK 4	Multivariate Regression
WEEK 5	Multivariate analysis of variance and co-variance
WEEK 6	Analysis of Variance (one-way classification),
WEEK 7	Analysis of Variance (two-way classification)
WEEK 8	Multivariate Normal Distribution
WEEK 9	Linear discriminant analysis for multivariate data
WEEK 10	Principle component analysis for multivariate data
WEEK 11	Factor Analysis for multivariate data
WEEK 12	Cluster analysis for multivariate data

Learning Resources:

Text Books:

1. Richard. A. Johnson and Dean. Wichern "Applied Multivariate Statistical Analysis" Pearson/Prentice Hall, 6th Edition, 2007
2. Daniel J. Denis "Applied Univariate, Bivariate, and Multivariate Statistics Using Python: A Beginner's Guide to Advanced Data Analysis", Daniel J. Wiley.
3. Alejandro Garcia, "Applied Multivariate Analysis with Python"

Reference Books:

1. Regression Diagnostics , Identifying Influential Data and Sources of Collinearity, D.A. Belsey, E. Kuh and R.E. Welsch
2. Applied Linear Regression Models, J. Neter, W. Wasserman and M.H. Kutner.
3. The Foundations of Factor Analysis, A.S. Mulaik.
4. Introduction to Linear Regression Analysis, D.C. Montgomery and E.A. Peck.
5. Cluster Analysis for Applications, M.R. Anderberg.
6. Multivariate Statistical Analysis, D.F. Morrison.

IT/CS 262	Database Management Systems Lab	L	P	C
		0	3	1.5

Course Objectives:

The objectives of the course are:

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

Course Outcomes:

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

1. Define, manipulate and control data using Structured Query Language (SQL).
2. Identify database integrity constraints during database creation.
3. Use SQL functions, set operations, joins, and sub queries for satisfying end user queries.
4. Develop applications using PL/SQL constructs like Database cursors, Functions, Stored Procedures, Packages, and Triggers.

Week 1

Practice DDL and DML statements for creating a sample database without integrity constraints.

Week 2

Practice DDL and DML statements for refining a sample database including integrity constraints.

Week 3

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

Week 4-6

Query the sample database using joins, nested queries, aggregate functions and set oriented operations

Week 7 Query the sample database using built-in single row functions

Week 8 Implement PL/SQL named and unnamed blocks

Week 9 Implement PL/SQL Implicit and Explicit Cursors

Week 10 Implement PL/SQL pre-defined and user defined exceptions

Week 11 Implement PL/SQL stored procedures, functions and packages

Week 12 Implement PL/SQL database triggers

IT/CS 263	Web Technologies Lab	L	P	C
		0	3	1.5

Course Objectives:

1. Explain the basic properties of web documents.
2. Demonstrate HTML Pages and Event handling mechanism.
3. Discuss XML documents and Web Servers.
4. Demonstrate Server side Technologies.

Course Outcomes:

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

1. Create static web pages with HTML and CSS.
2. Design dynamic webpages using client side scripting.
3. Create XML documents
4. Develop Server side web applications.

List of Experiments

Week 1: Develop a simple static website using XHTML.

Week 2: Develop a simple static web page using different types of styles in CSS.

Week 3: Java script covering Function, recursive functions

Week 4: Java script with Arrays and Objects.

Week 5: Java script on collection objects.

Week 6: Develop event bubbling and mouse event applications.

Week 7: Program on well-formed and valid XML documents.

Week 8: Program for displaying XML data using XSLT.

Week 9: Develop an application using JDBC .

Week 10: Develop server side application with JSP.

Week 11: Server program on JSP with action tags.

Reference Books:

1. Harvey M. Deitel and Paul J.Deitel, "Internet & World Wide Web How to Program", 4/3, Pearson Education.
2. Subrahmanyam Allamaraju and Cedric Buest, “Professional Java Server Programming: J2EE” (UNIT III and UNIT IV (Servlets and JSP)).
3. Jason Cranford Teague "Visual Quick Start Guide CSS, DHTML & AJAX", 4/ e, "Perason Education".
4. Tom Nerino Doli Smith "JavaScript & AJAX for the Web" Pearson Education, 2007.
5. Bill Dudney, Johathan Lehr, Bill Willies, Lery Mattingly "Mastering Java Server Faces" Wiely India, 2006.
6. Web Technology - Uttam K.Roy, Oxford University Press, 2010.

Web reference:

1. www.deitel.com
2. www.w3schools.com
3. www.tutorialspot.com

ITSL	**Skill Oriented Course**	**L**	**P**	**C**
	C++ Programming	**1**	**2**	**2**

Course Objectives:

The objectives of the course are:

1. Introduce to the student the fundamentals of C++ language.
2. Make the students understand the principles of data abstraction, inheritance and polymorphism
3. Create awareness about generic programming and exception handling
4. Make the students familiar with IO streams, STL.

Course Outcomes:

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

1. Differentiate POP and OOP and then use C++ fundamentals and various function modifiers to create and manipulate classes and objects.
2. Make use of the advantages of Compile time polymorphism and also develop reusable programs by applying inheritance.
3. Use runtime polymorphism, generic programming and exception handling techniques for developing efficient programs.
4. Demonstrate C++ streams, Name Spaces and STL.

Course Content:

UNIT I CO1 **10 periods**

An Overview of C++: The Origins of C++, What is Object Oriented Programming, some C++ fundamentals, Old-Style Vs Modern C++, Introducing C++ Classes, Function Overloading, Operator Overloading, Inheritance, Constructors and Destructors, The C++ Keywords, The General Form of a C++ Program

Classes and Objects: Classes, Structures and Classes, Unions and Classes are Related, Friend Functions, Friend Classes, Inline Functions, Parameterized Constructors, Static Class Members, When Constructors and Destructors are Executed, Scope Resolution Operator, Nested Classes, Local Classes, Passing and Returning Objects, Object Assignment, arrays of objects.

UNIT II CO2 **10 periods**

Function Overloading, Copy Constructors and Default Arguments: Function Overloading, Overloading Constructor Functions, Copy Constructors, Finding the Address of an Overloaded Function, Overload Anachronism, Default Arguments, Function Overloading and Ambiguity.

Operator Overloading: Creating Member Operator Function, Overloading Using a Friend Function, overloading new delete, Overloading Special Operators & Comma Operator

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

UNIT III CO3 **10 periods**

Virtual Functions & Polymorphism: Virtual Functions, The Virtual Attribute is inherited, Virtual Functions are Hierarchical, Pure Virtual Functions, Using Virtual Functions, Early Vs Late Binding.

Templates: Generic Functions, Applying Generic Functions, Generic Classes, Typename and export Keywords, Power of Templates.

Exception Handling: Fundamentals, Derived-Class Exceptions, Options, Terminate() and unexpected(), uncaught_exception(), exception and bad_exception Classes, Applying Exception Handling.

UNIT IV CO4 **10 periods**

The C++ I/O System Basics: Old Vs. Modern C++ I/O, Streams, Stream Classes, Formatted I/O, Overloading << and >>, Creating Manipulators.
C++ File I/O: File Classes, Opening and Closing a File, Text Files, Unformatted Binary I/O, get(), Getline() functions, Detecting EOF ,Random Access

Namespaces, Conversion Functions and other Advanced Topics: Namespaces, The std Namespace, Creating Conversion Functions, const Member Functions and mutable, Volatile Member Functions, Explicit Constructors, Differences between C and C++.

Introducing Standard Template Library: An Overview of STL

Learning Resources:

Text Book:

1. The Complete Reference - C++ - Herbert Schieldt, 4/e, Tata McGraw Hill.

Reference Books:

1. Bjarne Stroustrup, "The C++ Programming Language", Special Edition, Pearson Education.
2. C++ - How to Program – Dietel & Dietel
3. Programming in C++ - Barkakati
4. Mastering C++ by Venugopal

ITSL	Skill Oriented Course	L	P	C
	Computer Animation	**1**	**2**	**2**

Course objectives:

The objectives of the course are:

1. Familiarize the students with various approaches, methods and techniques of Animation Technology.
2. Explain conceptualization, creativity, and visual aesthetics
3. Introduce traditional & digital tools to produce stills and moving images.
4. Demonstrate different approaches in computer animation.

Course Outcomes:

The student will be able to

1. Use software to develop storyboards and 3-dimensional animation.
2. Apply conceptualization, creativity, and visual aesthetics.
3. Organize various aspects of animation using a variety of 3 dimensional software.
4. Develop concepts, storyboarding and production of several 3 dimensional animations.

UNIT I CO1 **10 periods**

Understanding the Interface, Editors and Workspaces, Navigate and Save, Objects in Editor, Editing Objects, Editing Tools

UNIT II CO2 **10 periods**

Modifiers, Editing with Generate Modifiers, Editing with Deform Modifiers, Editing Using Curves, Editing Techniques and Examples

UNIT III CO3 **10 periods**

The Outliner and Collections, Text, Viewport Shading, Scene Lighting and Cameras

UNIT IV CO4 **10 periods**

Nodes – Materials and Textures, Rendering, Animation

Learning Resources:

Text Book:

1. The Complete Guide to Blender Graphics Computer Modeling & Animation By John M. Blain 6th Edition

Reference Books:

1. pdfcoffee.com_perspective-drawing-eguide-3-pdf
2. Adobe Photoshop CC Classroom in a Book
3. Adobe Animate CC Classroom in a Book

ITSL	Skill Oriented Course	L	P	C
	Mobile App Development	**1**	**2**	**2**

Course Objectives:

The objectives of the course are:

1. Provide knowledge on tools required for Mobile Application Development using Android.
2. Discuss android User Interface using Views.
3. Impart Android User Interface for pictures and menus.
4. Introduce knowledge on android databases.

Course Outcomes:

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

1. Install the required tools for android application development.
2. Design user interfaces for android applications.
3. Design user interfaces for menus using Views.
4. Develop android applications using android database.

Course Content

UNIT I CO1

Text Book - 1 **10 periods**

Android Programming: What Is Android? Obtaining the Required Tools, Creating Your First Android Application. Android studio for Application development: Exploring IDE, using code completion, debugging your Application, Generating a signed APK.

UNIT II CO2

Text Book - 1 **10 periods**

Activities, Fragments, and Intents: Understanding Activities, Linking Activities Using Intents, Fragments, Displaying Notifications.

Android User Interface: Components of a Screen, Adapting To Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface Programmatically.

UNIT III CO3

Text Book - 1 **10 periods**

User Interface with Views: Using Basic Views, Using Picker Views, Using List Views To Display Long Lists, Understanding Specialized Fragments.

Pictures and Menus with Views: Using Image Views to Display Pictures, Using Menus with Views.

UNIT IV CO4

Text Book - 1 **10 periods**

Using Web View. Notifications - Creating and Displaying notifications, Displaying Toasts.

Data Persistence: Saving and Loading User Preferences, Persisting Data to Files, Creating and Using Databases.

Learning Resources:

Text Books:

1. Beginning Android Programming with Android Studio, J.F. DiMarzio, Wiley India (Wrox), 2017.

Reference Books:

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India (Wrox), 2012.
2. Reto Meier, Professional Android 4 Application Development, Wiley India, (Wrox), 2012.
3. James C Sheusi, Android Application Development for Java Programmers, Cengage Learning, 2013.

		L	P	C
ITSL	**Skill Oriented Course**			
	Unix Programming	**1**	**2**	**2**

Course Objectives:
The objectives of the course are:

1. Introduce UNIX Architecture and its key features.
2. Impart UNIX commands and AWK programming
3. Discuss functions of UNIX shells and the concepts of Bourn shell programming.
4. Demonstrate file and process management system calls signal handling mechanism in UNIX.
5. Demonstrate signal handling mechanism and IPC mechanisms like pipes, shared memory, and semaphores in UNIX

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

1. apply UNIX commands for solving problems and work with AWK programming.
2. develop shell scripts for solving problems that can't be solved by simple commands.
3. apply system calls for system programming.
4. create applications using basic IPC mechanisms like pipes, shared memory, and semaphores.

Course Content:

UNIT I CO1 **10 Periods**

Introduction: UNIX architecture, Features of UNIX.

UNIX Utilities: pwd, mkdir, ls, cd, rmdir, cat, more, page, head, tail, editing a file: vi, cp, mv, rm, wc, ln, unlink, chmod, chown, chgrp, who, sort, nl, grep, egrep, fgrep, find, cmp, diff, uniq, tr, sed, cut, paste, join, tee, tty.

Programmable text processing: AWK - awk programs, accessing individual fields, Begin and end, operators, variables, control structures, extended regular expressions, condition ranges, field separators, Built - in functions.

UNIT I I CO2 **10 Periods**

UNIX Shells: Introduction, shell functionality, Built - in commands, meta characters, input/output redirection, filename substitution, pipes, command substitution, sequences, grouping commands, background processing, scripts, subshells, shell variables, Quoting

Bourne Shell: Working with variables, Arithmetic, conditional expressions, control structures, positional parameters, passing command line arguments, shell programs, functions, and arrays.

UNIT I III CO3 **10 Periods**

File Management: Introduction to system calls and file management, Regular file management system calls - open (), read (), write (), lseek (), Close (), unlink (), stat (), getdents (). Miscellaneous file management system calls – chown () and fchown (), chmod () and fchmod (), dup () and dup2(), fcntl (), ioctl (), link (), mknod (), sync (), truncate () and ftruncate ().

Process Management: Creating a new process – fork (), orphan processes, terminating a process – exit (), zombie processes, waiting for a child – wait (), Differentiating a process – exec (), changing directories – chdir (), changing priorities- nice (), Accessing user and Group ID's.

UNIT I V CO4 **10 Periods**

Signals: Introduction, A list of signals, terminal signals, Requesting an Alarm signal - alarm (), handling signals - signal (), protecting critical code and chaining interrupt handlers, sending signals - kill (), Death of children, suspending and Resuming processes, process Group's and control terminals.

Inter process communication: Pipes, shared memory and semaphores.

Learning Resources:

Text Book:

1. "Unix for programmers and users" 3rd edition by Graham Glass, King Ables, Pearson education

Reference Book(S):

1. Behrouz A. Forouzan, Richard F. Gilberg: UNIX and Shell Programming- Cengage Learning – India Edition. 2009.
2. W. Richard Stevens, Advanced programming in the Unix environment, 3rd Edition Pearson education.
3. Kernighan W. Brian and Pike Rob, Unix programming environment, Pearson education.
4. Sumitabha Das, Your Unix the ultimate guide, TMH 2rd edition.
5. Marc J. Rochkind, Advanced UNIX programming, 2nd edition Pearson Education.
6. Meeta Gandhi, Rajiv Shah, TilakShetty, The "C" Odyssey UNIX - The Open, Boundless C, BPB Publications.

Web Resources:

1. www.webreference.com > Programming
2. www.iu.hio.no/~mark/unix/unix.html

Web References:

1. Unix Basics (http://www.tutorialspoint.com/unix/)
2. Bourn Shell(http://www.shellscript.sh/)
3. System calls (http://www.tutorialspoint.com/unix_system_calls/)

ITSL	Skill Oriented Course	L	P	C
	PHP Programming	**1**	**2**	**2**

Course Objectives:
The objectives of the course are:

1. Discuss usage of PHP for developing web applications.
2. Introduce PHP Browser Handling Power.
3. Demonstrate accessing web form data from the server
4. Demonstrate creation of database driven web applications.
5. Impart usage of Ajax for partial rendering.
6. Introduce XML and RSS with PHP.

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

1. Apply basic concepts of PHP programming.
2. Design and Develop server side programs using PHP Technologies.
3. Assess the principles of object oriented development using PHP.
4. Develop Database Connectivity using MYSQL.
5. Design powerful web applications using Ajax.
6. Develop XML, RSS applications using PHP.

Course Content

UNIT I CO1 **10 periods**

Essential PHP, Operators and Flow Control, String Arrays, CreatingFunctions

UNIT II CO2,3 **10 periods**

Reading Data in Web Pages, PHP Browser- HANDLING Power, ObjectOriented Programming, Advanced Object Oriented Programming

UNIT III CO4 **10 periods**

File Handling, Working with Databases, Sessions, Cookies, and FTP,Ajax

UNIT IV CO5,6 **10 periods**

Advanced Ajax, Drawing Images on the Server, XML and RSS

Learning Resources:

Text Book:

1. PHP: The Complete Reference By Steven Holzner, TATA McGraw Hill.

Reference Books:

1. Beginning PHP and MySQL: From Novice to Professional, By by W. Jason Gilmore, Apress.
2. PHP 6 and MySQL 6 Bible, By Steve Suehring, Tim Converse, Joyce Park, Wiley Publishing, Inc.

IT MC4	Ethics & Human Values	L	P	C
		2	0	-

Course Objectives:

The objectives of the course are:

1. Create awareness to specific set of morals, values and ethics.
2. Introduce the importance of moral autonomy, professional ideals and Ethical theories.
3. Provide the safety/risk aspects, welfare of the public and about employee rights
4. Impart the global issues and code of ethics of professional bodies

Course Outcomes

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

1. Have basic understanding of how a prospective engineer should behave in his chosen field and society.
2. Realize the importance of moral autonomy, professional ideals and Ethical theories.
3. Identify the safety/ risk, welfare of the public and employee rights
4. Expose to global issues and codes of some professional bodies

Course Content:

UNIT I CO1 **15 Periods**

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

UNIT II CO2 **15 Periods**

Engineering Ethics: Senses of Engineering Ethics- Variety of Moral Issues - Types of Inquiry - Moral Dilemmas - Moral Autonomy - Kohlberg's Theory - Gillian-s Theory - Consensus and Controversy.

Professions and Professionalism: The nature and characteristics of Professions, Professionalism, the foundation and norms of Professional ethics, the need for separate code of conduct for Professionals, Professional Rights, Theories about Right Action, Uses of Ethical Theories. Case studies like The Space Shuttle Challenger, Bhopal gas tragedy, Chernobyl disaster etc.

UNIT III CO3 **15 Periods**

Engineering as Social Experimentation: Engineering as Experimentation - Engineers as Responsible Experimenters Safety.

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

UNIT IV CO4 **15 Periods**

Multinational Corporations - Environmental Ethics - Computer Ethics - Business ethics - Engineers As Managers - Consulting Engineers - Engineers As Expert Witnesses and Advisors - Codes Of Ethics -Sample Code Of Ethics Like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management Etc.,

Learning Resources:

Text Books:

1. Mike martin and Ronald Schinzinger, "Ethics in Engineering" McGraw-Hill, New York 1996
2. Govindarajan M, Natarajan S, Senthil Kumar V.S., "Engineering Ethics", PHI, New Delhi
3. Bayles.M. D, Professional ethics, California, Wards worth publishing company,1981
4. Koehn.D, The ground of Professional Ethics, Routledges, 1995

Reference Books:

1. Charles D,Fleddermann, "Engineering Ethics", Pearson / PHI, New Jersey 2004 (Indian Reprint)
2. Charles E Harris, Michael S.Protchard and Michael J Rabins, "Engineering Ethics - Concepts and Cases" Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "Ethics and the conduct of business" Pearson, New Delhi, 2003.
4. Edmund G.Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers" Oxford University Press, Oxford, 2001.

III
YEAR

IT/CS 311	AUTOMATA THEORY & FORMAL LANGUAGES	L	P	C
		3	0	3

Course Objectives:

The main objectives of this course are:

1. Introduce basics of Finite Automata.
2. Describe the concepts of regular expressions and their properties.
3. Impart context Free Languages and their properties.
4. Explain context Sensitive languages, design the Turing Machines and classify the decidable and un-decidable problems**.**

Course Outcomes:

After completion of course, the student will be able to

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

Course Content

UNIT – I CO 1 (13 periods)

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, the language of DFA, Non deterministic finite automata (NFA) – Definition of NFA, Extended transition function, the language of NFA, Equivalence of DFA and NFA Finite.

Automata with ∈ transitions: Use of ∈ - transition, notation for an ∈ - NFA, Epsilon closures, extended transitions and languages, Applications.

UNIT – II CO 2 (12 periods)

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 – Pumping lemma for regular languages, Applications of the pumping lemma, Closure Properties of Regular Languages, Equivalence and minimization of automata – Minimization of DFA

UNIT – III CO 3 (13 periods)

(Construction based treatment & proofs are excluded)

Context Free Grammars: Context Free Grammars, Parse Trees, Constructing parse trees, derivations and parse trees, ambiguous grammars.

Pushdown Automata: Definition of the Pushdown automata, the languages of PDA, Equivalences of PDA's and CFG's.

Context free languages: Normal form's for context- Free grammars, the pumping lemma for context free languages.

UNIT – IV CO 4 (12 periods)

Properties of Context free languages: closure properties for context free languages, Decision properties for CFL'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, Post's Correspondence problem.

TEXTBOOK:

1. John.E.Hopcroft, R.Motwani, &Jeffery.D Ullman, "Introduction to Automata Theory,Languages and Computations", Second Edition, Pearson Education, 2003

REFERENCE BOOKS:

1. Daniel I.A.Cohen, 'Computer Theory',
2. KLP Mishra &N.Chandrasekharan, 'Theory of Computation', PHI.
3. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.
4. R.K.Ragade, "Automata and Theoretical Computer Science", First Edition, Pearson Education, 2004.

IT/CS 312	COMPUTER NETWORKS	L	P	C
		3	0	3

Course Objectives:

The main objectives of this course are

1. Introduce the fundamental concepts of networks.
2. Discuss OSI and TCP/IP architectures.
3. Impart routing, congestion control algorithms and QoS techniques.
4. Provide awareness on application layer protocols.

Course Outcomes:

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

1. Describe the layered architectures of a network.
2. Explain the general principles of data communication.
3. Illustrate the data link layer protocols and the mechanisms used for accessing a channel.
4. Apply the optimal routing algorithm and QoS mechanisms for a network.
5. Compare reliable and unreliable protocols used for end to end connectivity.
6. Discuss the communications protocols and interface methods used in process-to-process communications.

Course Content:

UNIT I **CO 1 12 Periods**

Introduction: Network Hardware, Network Software, Reference Models.

Physical Layer: The theoretical basis for data communication, Guided media, digital modulation and multiplexing, switching.

UNIT II **CO 2,3 13 Periods**

The Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols.

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 **CO 4 14 Periods**

The Network Layer: Network Layer Design Issues, Routing Algorithms-Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast routing, multicast routing, Congestion control algorithms, Quality of Service-Application Requirements, Traffic Shaping, Packet Scheduling, Admission Control, Internetworking, The Network Layer in the Internet-The IP version 4.0 protocol, IP Addresses, IP Version 6.0, Internet Control Protocols.

UNIT IV **CO 5,6 11 Periods**

The Transport Layer: The Transport Service: Services Provided to the Upper Layers, Transport Service Primitives, Elements of Transport Protocols – addressing: Connection Establishment, Connection Release, Error Control and Flow Control, Congestion control-Desirable Bandwidth allocation, Regulating the sending rate, The Internet Transport Protocols: Introduction to UDP, Remote procedure call, Real-Time transport protocols, Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

The Application Layer: DNS- The Domain Name System, Electronic mail.

TEXT BOOKS:

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

REFERENCES:

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.

IT/CS 313	DESIGN & ANALYSIS OF ALGORITHMS	L	P	C
		3	0	3

Course Objectives:

The main objectives of this course are

1. Instruct performance analysis of an algorithm.
2. Illustrate algorithm design Strategies.
3. Demonstrate pattern matching algorithms
4. Impart knowledge on P, NP and NP-complete and NP-hard class of problems.

Course Outcomes

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

1. Analyze the performance of algorithms
2. Apply algorithm design techniques to solve real world problem
3. Make use of string matching algorithms to solve complex problems
4. Solve P class and NP class problems

Course Content:

UNIT I **CO 1, 2 10 Periods**

Introduction- What is an Algorithm? Algorithm Specification, Performance Analysis, Randomized Algorithms – Identifying the repeated element, primality testing, advantages and disadvantages.

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

UNIT II **CO 2 15 Periods**

Greedy Programming: General Method, Knapsack problem, Job Sequencing with Dead Lines, Minimum Spanning Tree - Prim's and Kruskal's algorithms, Single Source Shortest-Paths-Dijkstra's.

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

UNIT III **CO 2 13 Periods**

Back tracking: General Method, 8-queen problem, Hamiltonian Cycles, 0/1 Knapsack.

Branch and Bound: Control Abstraction for LC Search, Bounding, FIFO branch and bound, LC branch and bound, 0/1 Knapsack problem, Travelling Salesman Problem.

UNIT IV **CO 3,4 12 Periods**

String Matching – The Naïve 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. Approximation Algorithms - The Travelling Sales Persons Problem. (Excluding Theorem Proofs)

TEXT BOOK:

1. E. Horowitz, S. Sahni and S.Rajsekaran, "Fundamentals of Computer Algorithms", Galgotia Publication. (Unit I, II, III).
2. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer Algorithm", PHI. (Unit IV).

REFERENCE BOOK(S):

1. Sara Basse, A.V. Gelder, "Computer Algorithms", Addison Wesley.

IT/CS 314	**PROFESSIONAL ELECTIVE - I**	**L**	**P**	**C**
		3	**0**	**3**

IT/CS 315	**OPEN ELECTIVE / JOB ORIENTED COURSE – I**	**L**	**P**	**C**
		3	**0**	**3**

IT/CS 351	DESIGN & ANALYSIS OF ALGORITHMS LAB	L	P	C
		0	3	1.5

Course Objectives:

The main objectives of this course are

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

Course Outcomes:

After completion of course, the student will be 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 problems

List of Experiments to implement

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

IT/CS 352	DATA ANALYSIS LAB	L	P	C
		0	3	1.5

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:

On completion of this course, students will be 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.

List of 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 Data structures
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.
17. Indexing, Selection, Subsetting of Time Series using Pandas.
18. Visualization using matplot lib
    i. Bar graph
    ii. Pie chart
    iii. Box plot
    iv. Histogram
    v. Line chart and subplots
    vi. Scatter plot
19. Controlling colours and styles of various graph elements in matplot lib
20. Adding text at any location using text boxes
21. Composing multiple figures
22. Working with 2D figures

LEARNING RESOURCES:

1. Wes McKinney, Python for Data Analysis - Data Wrangling with Pandas, NumPy, and IPython 2nd Edition. O'Reilly/SPD

2. Jake VanderPlas, Python Data Science Handbook Essential Tools for Working with Data. O'Reilly/SPD

IT/CS353 - SUMMER INTERNSHIP / MINI PROJECT

Practical	:	-	Internal Marks	:	100
Tutorial:	:	-	Semester End Examination Marks	:	-
Sem End Exam Duration		-	Credits	:	1.5

ITSL3 - SOFT SKILLS (SKILL ORIENTED COURSE 3)

Lectures	:	1 period/week	Internal Marks	:	100
Practical	:	2 periods/week	Semester End Examination Marks	:	-
Sem End Exam Duration	:	-	Credits	:	2

IT/CS321 - ARTIFICIAL INTELLIGENCE

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration		3 Hours	Credits	:	3

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, students will be able to:

1. Use the fundamental concepts of artificial intelligence in problem solving
2. Apply search, game playing strategies for solving AI problems
3. Construct the given natural language sentences into appropriate predicate/proposition logic
4. Choose knowledge representation strategy for the real world problems
5. Summarize the algorithms for classical planning.

Course Content:

UNIT I CO 1 **10 Periods**

Introduction to AI: 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.
Problem Solving by Search: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

UNIT II CO 2 **14 Periods**

Beyond Classical Search: Local Search Algorithms and Optimization Problems, Searching with Non-Deterministic Actions.
Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning.
Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

UNIT III CO 3,4 **12 Periods**

Logical Agents: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Effective Propositional Model Checking, Agents Based on Propositional Logic.
First-Order Logic: Representation Revisited, 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 Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT IV CO 5 **14 Periods**

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.
Automated Planning: Definition of Classical Planning, Algorithms for Classical Planning.
Planning and Acting in the Real World: Time, Schedules and Resources, Hierarchical Planning.

TEXT BOOKS:

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

REFERENCES:

1. Artificial Intelligence, E. Rich and K. Knight,3rd Edn.,(TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, 3rd Edn., 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/CS 322 - CRYPTOGRAPHY & NETWORK SECURITY

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

Course Objectives

The main objectives of this course are

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 security applications.

Course Outcomes

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

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

Course Content:

UNIT I CO 1 **13 Periods**

Introduction- Computer Security Concepts, The OSI security architecture, Security Attacks, Security Services, Security Mechanisms, A model for Network Security.

Number Theory- Prime Numbers, Fermat's and Euler's theorem, testing for primality, The Chinese remainder theorem, Discrete logarithms.

Classical Encryption techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Steganography.

UNIT II CO 2 **13 Periods**

Block Ciphers & Data Encryption Standard- Traditional Block Cipher Structure, Data Encryption Standard, Strength of DES, Block Cipher Design Principles.

Advanced Encryption Standard(AES): AES structure, AES Transformation functions, AES key expansion.

Block Cipher operations- Public key cryptography and RSA: Principles of public key crypto systems, The RSA Algorithm.

Other Public Key Crypto Systems- Diffie Hellman Key exchange, Elgamal Cryptographic System.

UNIT IIICO 3 ` **12 Periods**

Cryptographic Hah Functions- Applications of cryptographic hash functions, Hash function based on cipher block chaining, SHA 512, SHA-3.

Message Authentication codes- Message Authentication requirements, Message Authentication functions, MAC Based on Hash functions: HMAC

Digital signatures- Digital Signatures, ELGamal Digital Signature Scheme.

Key management and Distribution- Symmetric key distribution using Symmetric and asymmetric encryption, Distribution of public keys, X.509 Certificates.

UNIT IV CO 4 **12 Periods**

User authentication- Kerberos.

Transport Level Security- Web security Considerations, Transport Layer Security(TLS), Secure Shell(SSH)

E-Mail Security- S/MIME, Pretty Good Privacy (PGP)

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

TEXT BOOK:

1. Cryptography and Network Security Principles and Practice William Stallings, 7th 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.

IT/CS 323 - MACHINE LEARNING

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

Course Objectives:

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

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 concept learning and Bayesian learning methods for real life problems
2. Develop solutions for classification problems using Decision tree, ANN, and instance based methods.
3. Construct rule based classifiers using Inductive learning methods ,
4. Construct reinforcement learning methods for generating optimal solutions.
5. Apply various dimensionality reduction methods.
6. Implement clustering algorithms.

UNIT I CO 1 (12 periods)

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 CO 2 (12 periods)

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 CO 3, 4 (12 periods)

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 CO 5,6 (12 periods)

Dimensionality Reduction : Introduction, subset selection, Principal component analysis, Feature Embedding, Factor analysis, Singular Value Decomposition and Matrix factorization, Multidimensional Scaling, Linear Discriminant analysis, Canonical correlation analysis.

Clustering: Introduction, Mixture Densities, *K*-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Spectral Clustering, Hierarchical Clustering, Choosing the Number of Clusters.

TEXT BOOK:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. (UNIT I , UNIT II, and UNIT III)
2. Ethem Alpaydin, Introduction to Machine Learning , MIT Press, Prentice Hall of India, Third Edition 2014. (UNIT IV)

REFERENCE BOOKS:

1. Stephen Marsland, ―Machine learning: An Algorithmic Perspective‖, CRC Press, 2009
2. Machine Learning: a Probabilistic Perspective, Kevin P. Murphy, MIT Press, 2012
3. Foundations of Machine Learning, Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar, MIT Press, 2012.
4. Machine Learning -The Art and Science of Algorithms that Make Sense of Data, Peter Flach, Cambridge

IT/CS 324 - PROFESSIONAL ELECTIVE -II

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

IT/CS 325 - OPEN ELECTIVE / JOB IRIENTED COURSE - II

Lectures	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

IT/CS 361 - ARTIFICIAL INTELLIGENCE LAB

Practical	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration		3 Hours	Credits	:	1.5

Course Objectives:

The main objectives of this course are:

1. Demonstrate various Python packages that are used for solving AI problems
2. Illustrate AI problems using informed and uninformed search techniques.
3. Discuss computational problems using AI techniques

Course Outcomes:

After the successful completion of the course students are able to

1. Solve the given problems using Python.
2. Apply heuristic search techniques for solving simple AI problems.
3. Implement solutions to problems using uninformed search techniques.
4. Develop solutions for the given real world problems.

List of Experiments to implement

1. Informed Search Strategies
2. Uninformed Search Strategies
3. Game Playing Strategies
4. Constraint Satisfaction Problems
5. First-Order Logic-propositional and predicate logic
6. Classical Planning

IT/CS 362 - MACHINE LEARNING LAB

Practical	:	3 periods/week	Internal Marks	:	30
Tutorial:	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	1.5

Course Objectives

The main objectives of this course are:

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 Naive Bayes Classification
2 Implement Logistic Regression.
3 Implementation of Decision Tree Classification
4 Implementation of Random Forests Classification
5 Implementation of k-Nearest Neighbour Classification
6 Implementation of Support Vector Machines Classification
7 Implement classification using Multilayer Perceptron.
8 Implementation of Ensembles of Classifiers
9 Implementation of K-Means Clustering
10 Implement Hierarchical clustering.
11 Implementation of Kernel Trick
12 Implementation of EM algorithm for some specific problem

IT/CS 363 - TERM PAPER

Practical	:	3 periods/week	Internal Marks	:	100
Tutorial:	:	0 period/week	Semester End Examination Marks	:	-
Sem End Exam Duration	:	-	Credits	:	1.5

Course Objectives

The main objectives of this course are:

1. To understand the issues and concepts salient to the research process.
2. To understand the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.
3. To understand the concepts and procedures of sampling, data collection, analysis and reporting.

Course Outcomes

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

1. To analyze theoretical literature.
2. To define the research problem and goals.
3. To select and use research methods.
4. To analyze empirical data and interpret research results.
5. To draw conclusions

It is aimed as a precursor to the project work done in the second semester of the Third year B.Tech., It should help the students to identify their research area / topic and should form the groundwork and preliminary research required for the project work. The batch must gain an understanding of the research tools used and the related material, available both in printed and digital formats. Each individual of the project batch must make the presentation for two rounds on the same research paper about their Problem, Analysis, Design, Results and Discussions, and Conclusion. At the end of the Semester, the batch must submit a detailed report. Evaluation is to be done for the two presentations made and the report submitted. Method of Evaluation:

1. Day to day work - 20 marks
2. Seminar – I - 30 marks
3. Seminar – II - 30 marks
4. Term Paper Report - 20 marks

TOTAL - 100 marks

ITSL4 - SKILL ORIENTED COURSE 4

Lectures	:	1 period/week	Internal Marks	:	100
Practical	:	2 period/week	Semester End Examination Marks	:	-
Sem End Exam Duration	:	-	Credits	:	2

ITEL01 - EMBEDDED SYSTEMS

Course Objectives:

The main objectives of this course are:

1. Introduce the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
2. Introduce key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices
3. Discuss programming environment to develop embedded solutions.

Course Outcomes:

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

1. Identify suitable hardware components for design of embedded systems in satisfying real world design challenges.
2. Outline various issues in CPU environment.
3. Explain the hardware and software tools used for building and debugging embedded systems.
4. Analyze the architecture of the processor and its programming aspects.

Course Content

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

Introduction to Embedded Computing - Complex Systems and Microprocessors, The Embedded System Design Process, Formalisms for System Design, Model Train Controller.

Instruction Sets - Preliminaries, ARM Processor, TI C55x DSP

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

CPUs - Programming Input and Output, Supervisor Mode, Exceptions and Traps, Co-Processors, Memory System Mechanisms, CPU Performance, CPU Power Consumption, Design Example: Data Compressor .

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

Bus-Based Computer Systems- The CPU Bus, Memory Devices, I/O Devices, Component Interfacing, Designing with Microprocessors, Development and Debugging, System-Level Performance Analysis, Design Example: Alarm Clock.

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

Program Design and Analysis- Components for Embedded Programs, Models of Programs, Assembly, Linking, and Loading, Basic Compilation Techniques, Program Optimization,

Processes and Operating Systems- Multiple Tasks and Multiple Processes, Preemptive Real-Time Operating Systems, Priority-Based Scheduling, Interprocess Communication Mechanisms, Design Example: Telephone Answering Machine.

TEXT BOOK:

1. Wayne Wolf - Computers as Components - Principles of Embedded Computing System Design Second Edition, Morgan Kaufmann Publishers - 2008

REFERENCE BOOK(s):

1. David E.Simon, An Embedded Software Primer, Pearson Education Asia., 2000.
2. Sriram V.Iyer, Pankaj Gupta, Embedded Real-time Systems Programming, Tata McGraw Hill publishers, 2004.
3. D.Gajski, F.Vahid, S.Narayan, J.Gong, Specification and Design of Embedded Systems, Prentice Hall of India Pvt. Ltd.
4. Raj Kamal, Embedded Systems Architecture & Programming, Tata McGraw-Hill.

ITEL02 - 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. Develop algorithms for output primitives
2. Develop 2D transformation and clipping algorithms.
3. Explain 3D object representation
4. Develop 3D transformation and clipping.
5. Apply animation sequence for real world applications.

Course Content

UNIT I CO 1 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 CO 2 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 CO 3,4 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 CO 4,5 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.

REFERENCE BOOKS:

1. "Computer Graphics Principles & Practice", Second Edition in C, James.D.Foley, Andries VanDam, Steven K.Feiner and Hughes, Pearson Education.
2. "Computer Graphics", Steven Harrington, TMH.
3. "Computer Graphics Second edition", Zhigand Xiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw Hill edition.
4. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw Hill, 2nd edition.
5. "Principles of Interactive Computer Graphics", Willam.M.Neuman and Robert.F.Sproul, TMH.
6. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.

WEB REFERENCES:

1. http://kat.ph/hearn-baker-computer-graphics-c-version-2nd 5edt3295235.html
2. http://users.abo.fi/jawester/compgraph/
3. http://research.cs.wisc.edu/graphics/Courses/559-s2002/cs559.html
4. http://www.cs.umd.edu/~mount/427/Lects/427lects.pdf

ITEL03 - SOFTWARE ARCHITECTURE AND DESIGN

Course Objectives

The main objectives of this course are:

1. Introduce concepts for software architecture design and development.
2. Discuss architectural models for a problem along with quality guidelines.
3. Illustrate principles in construction of software system.
4. Demonstrate advanced software architectures and their properties.

Course Outcomes

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

1. Define core design principles in envisioning architecture.
2. List the capabilities in creating software architecture and the importance to assess the quality of a design.
3. Analyze the architectures.
4. Recall the suitable, select and apply architectures in specific contexts.

Course Content

UNIT - I CO 1 **(10 Periods)**

Envisioning Architecture - The Architecture Business Cycle - Where Do Architectures Come From? , Software Processes and the Architecture Business Cycle, What Makes a "Good" Architecture?

What Is Software Architecture? -What Software Architecture Is and What It Isn't, Architectural Patterns, Reference Models, and Reference Architectures, Why Is Software Architecture Important? Architectural Structures and Views

UNIT - II CO 2 **(12 Periods)**

Creating an Architecture- Understanding Quality Attributes - Functionality and Architecture, Architecture and Quality Attributes, System Quality Attributes, Quality Attribute Scenarios in Practice, Other System Quality Attributes, Business Qualities, Architecture Qualities

Achieving Qualities - Introducing Tactics, Availability Tactics, Modifiability Tactics, Performance Tactics, Security Tactic, Testability Tactics, Usability Tactics, Relationship of Tactics to Architectural Patterns, Architectural Patterns and Styles

Designing the Architecture – Architecture in the Life Cycle, Designing the Architecture, . Forming the Team Structure, Creating a Skeletal System

UNIT - III CO 3 **(14 Periods)**

Documenting Software Architectures - Uses of Architectural Documentation, . Views, Choosing the Relevant Views, Documenting a View, Documentation across Views, Unified Modeling Language.

Reconstructing Software Architectures- Introduction, Information Extraction, Database Construction, View Fusion, Reconstruction

Analyzing Architectures - The ATAM: A Comprehensive Method for Architecture Evaluation - Participants in the ATAM, Outputs of the ATAM, Phases of the ATAM, The Nightingale System: A Case Study in Applying the ATAM

The CBAM: A Quantitative Approach to Architecture Design Decision Making - Decision-Making Context, The Basis for the CBAM, Implementing the CBAM, Case Study: The NASA ECS Project, Results of the CBAM Exercise

UNIT - IV CO 4 **(12 Periods)**

Moving From One System to Many- Software Product Lines: Re-using Architectural Assets - Overview, What Makes Software Product Lines Work?, Scoping, Architectures for Product Lines, What Makes Software Product Lines Difficult?

CelsiusTech: A Case Study in Product Line Development - Relationship to the Architecture Business Cycle, Requirements and Qualities, Architectural Solution

Building Systems from Off-the-Shelf Components - Impact of Components on Architecture, Architectural Mismatch, Component-Based Design as Search, ASEILM Example

Software Architecture in the Future - The Architecture Business Cycle Revisited, Creating an Architecture, Architecture within the Life Cycle, The Impact of Commercial Components

TEXT BOOK:

1. Len Bass, Paul Clements, Rick Kazman " Software Architecture in Practice" Second Edition, Publisher: Addison Wesley, 2003 , ISBN: 0-321-15495-9

REFERENCE BOOKS:

1. Boehm, B. *Software Engineering Economics*. Prentice Hall, 1981.
2. Bosch, J. *Design and Use of Software Architectures: Adopting and Evolving a Product Line Approach*. Addison-Wesley,2000.
3. Clements, P., Bachmann, F., Bass, L., Garlan, D., Ivers, J., Little, R., Nord, R., Stafford, J*D. documenting Software Architectures: Views and Beyond*. Addison-Wesley, 2003.

ITEL04 - DISTRIBUTED SYSTEMS

Course Objectives

The main objectives of this course are:

1. Introduce basics in distributed systems and their architectures.
2. Discuss multi-threading concepts and naming in distributed systems.
3. Illustrate synchronization among distributed applications, consistency protocols and Replica management in distributed file systems.
4. Discuss paradigms used to organize distributed systems.

Course Outcomes

After completion of this course, Students will able to

1. Describe the basic issues, architectures and communication mechanisms in distributed systems.
2. Define processes and naming concepts in distributed systems.
3. Describe synchronization, consistency and replication of distributed applications.
4. Define Fault Tolerance and distributed file systems concepts.

Course Content

UNIT-1 CO 1 (12 Periods)

Introduction: Definition of a Distributed System, Goals, types of distributed systems.
Architectures: Architectural Styles, System Architectures, Architectures Versus Middleware.
Communication: Fundamentals, Remote Procedure Call, Message-Oriented Communication, Stream-Oriented Communication, Multicast Communication.

UNIT - II CO 2 (12 Periods)

Processes: Threads, Virtualization, Clients, Servers, Code Migration.
Naming: Names, Identifiers, and Addresses; Flat Naming, Structured Naming, Attribute-Based Naming.

UNIT – III CO 3 (12 Periods)

Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Election Algorithms.
Consistency and Replication: Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, Consistency Protocols.

UNIT -IV CO 4 (12 Periods)

Fault Tolerance: Introduction To Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery.
Distributed File Systems: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance.

TEXT BOOK:

1. Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems: Principles and Paradigms, 2nd Edition, Pearson Education/PHI.

REFERENCE BOOKS:

1. GeorgeCoulouris, Jean Dollimore, Tim Kindberg, Distributed Systems Concepts and Design 3rd edition, Pearson Education.
2. MukeshSinghal & NiranjanG.Shivaratri, Advanced Concepts in Operating Systems, Tata Mc. Graw Hill edition 2001.
3. Pradeep Kumar Sinha, Distributed Operating System - Concepts and Design, PHI.

WEB REFERENCES:

1. www.cis.upenn.edu/~lee/00cse380/lectures/
2. www.cs.uah.edu/~weisskop/Notes690/

ITEL05 - QUANTUM COMPUTING

Course Objectives:

The main objectives of this course are:

1. Introduce basics of Quantum Computing.
2. Discuss the concepts of Quantum gates.
3. Illustrate the importance of Shor's algorithm & Grover's algorithm.
4. Explore the applications of Quantum Computing.

Course Outcomes:

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

1. Describe vital applications using Quantum computing principles and Practices.
2. Explain simple circuits using Quantum gates.
3. Apply Shor's and Grover's algorithm in Quantum computing.
4. Make use of the Quantum computing for applications.

Course Content

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

Introduction to Quantum computing: Introduction to Quantum computing, From Bits to Qubits, Power of Quantum computing, How quantum physics differs from classical physics.

Qubits, Quantum Mechanics and Computer Science Perspectives: Quantum mechanics, Quantum bits (Qubits), Multiple Qubits, Computer science perspectives.

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

Quantum gates: Single qubits gates, Multiple qubit gates, Matrix representation of quantum gates & circuits, Bell states.

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

Shor's Algorithm and Quantum Fourier Transform: Shor's Algorithm simplified through examples, Quantum fourier transform, Implementation Quantum fourier transform using Quantum gates, Phase estimation, Shor's Algorithm Using Phase estimation, Order finding and factoring explained further.

Grover's Algorithm (Quantum search Algorithm): what is in an ORACLE?, Steps in Grover's Algorithm, Geometrics visualization of Grover's Algorithm, order of Grover's Algorithm.

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

Physical Realization of Quantum Computers: Basic representation for quantum computation, harmonic oscillator quantum computer, quantum computer, optical photon quantum computer, optical cavity quantum electrodynamics, Ion Taps, Nuclear magnetic resonance, Silicon quantum computers,

Quantum Computing Software: Quantum Qudit Simulator, Quack (Quantum Computer Simulator for MATLAB).

TEXT BOOK:

1. Vishal sahni."Quantum Computing",TMH,2007.

REFERENCE BOOK(s):

1. Dan C.Marinescu, Gabriela M.Marinescu "Approaching Quantum Computing "Prentice HALL,2004.
2. MIKA Hirnensalo "Quantum Computin", 2nd Edition, Springer,2004
3. Giuliano Beneti, Giulio Casati, Guilianotrini "Principles of Quantum Computation and Information" Vol.1 Basic Concepts, World Scientific Publishing Company; New Ed edition (October 2004)

ITEL06 - DIGITAL IMAGE PROCESSING

Course Objectives:

The main objectives of this course are:

1. Introduce fundamental concepts in digital image processing.
2. Illustrate approaches used in enhancement in spatial domain and frequency domain
3. Demonstrate image segmentation and image restoration.
4. Demonstrate compression techniques and morphological transformations.

Course Outcomes:

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

1. Explain the fundamental concepts of digital image processing.
2. Compare the enhancement techniques in spatial and frequency domain.
3. Develop image restoration, and image segmentation algorithms.
4. Develop morphological transformation algorithms, and image compression standards.

Course Content

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] (14)**

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation.

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.

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 Compression: Image Compression Models, Error-free Compression, Lossy Compression, Image Compression Standards.

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.

ITEL07 - CYBER SECURITY

Course Objectives:

The main objectives of this course are:

1. Introduce the fundamental Information security concepts & Threats.
2. Illustrate the security standards and policies to be maintained by the organizations.
3. Describe various Security Performance Metrics & Configuration reviews.
4. Discuss the different log management and backup procedures.

Course Outcomes:

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

1. Analyze the Information Security Assets and Threats.
2. Identify the various security standards and policies to be maintained by the organizations.
3. Explain Security Performance Metrics, Configuration reviews, and log management.
4. Apply the backup procedures, and Security Audit process using Vulnerability analysis tools.

Course Content

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

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 **[CO:2] (13)**

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

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

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.

TEST BOOK:

1. NASSCOM Handbook Study Material

REFERENCE BOOK(s):

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 - INDUSTRY RECOMMENDED COURSE

ITSL	Skill Oriented Course	L	P	C
	Internet of Things	**1**	**2**	**2**

Course Objectives:
The objectives of the course are:

1. Elaborate the interconnection and integration of the physical world and IOT.
2. Relate the virus IOT applications and its infrastructures.
3. Categorize the concept of setting up IOT devices with python.
4. Explain the concepts of interfacing sensors with raspberry pi.

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

1. Explain the physical and logical design of IoT.
2. Discuss the application areas of IoT.
3. Explain the network management protocols and M2M system management.
4. Design IoT applications using Raspberry Pi.

Course Content

UNIT I [CO1] 12 periods
Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT.
Design of IOT: Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

UNIT II [CO2] 12periods
Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail.
Applications: Logistics, Agriculture, Industry, Health & Life Style.

UNIT III [CO3] 12 periods
M2M & System Management: M2M, Difference between IOT & M2M, SDN & NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management.
NETCONF-YANG: Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems, management with NETCONF-YANG

UNIT IV [CO4] ` 12 periods
Logical Design using Python:
Control Flow, Functions, Modules, Packages, File Handling, Date/Time Operations, Classes, PythonPackages
IOT Physical Devices: What is IOT Device, Exemplary Device, Board, Linux on Raspberry Pi
Endpoints: Interfaces, and Programming & IOT Devices.

Learning Resources:
Text Book:

1. Vijay Madisetti, Arshdeep Bahga, Internet of Things A Hands-On-Approach, 2014, ISBN:9780996025515

Reference Books:

1. Adrian McEwen, Designing the Internet of Things, Wiley Publishers, 2013, ISBN: 978-1-118-43062-0
2. Daniel Kellmereit, The Silent Intelligence: The Internet of Things, 2013, ISBN:0989973700
3. Internet of Things: Design Principles and Applications

Web References:

1. https://en.wikipedia.org/wiki/Internet_of Things
2. www.iot-a.eu/

ITSL	Skill Oriented Course	L	P	C
	Google Go	**1**	**2**	**2**

Course Objectives:
The objectives of the course are:

1. Understanding of the fundamental concepts that form the basis of the Go programming language.
2. Develop the ability to understand and utilize functions, methods, and packages effectively in Go.
3. Understanding of error handling and exception handling mechanisms in Go, ensuring the implementation of robust error management strategies in software applications.
4. Acquire the knowledge and skills necessary to write, execute, and interpret tests in Go, enabling the creation of thoroughly tested and dependable Go applications.

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

1. Explain the basic concepts and syntax of the Go programming language.
2. Ability to understand the concepts of functions, methods, and packages in Go.
3. Develop an understanding of error handling and exception handling in Go.
4. Write and execute tests in Go.
5. Develop problem-solving skills using Go programming language.

UNIT I CO1 10 periods
Program Structure: Names, Declarations, Variables, Assignments, Type Declarations, Packages and Files, Scope

Basic Data Types: Integers, Floating-Point Numbers, Complex Numbers, Booleans, Strings, Constants
Composite Types: Arrays, Slices, Maps, Structure, JSON, Text and HTML Templates

UNIT II CO2 10 periods
Functions: Function Declarations, Recursion, Multiple Return Values, Errors, Function Values, Anonymous Functions, Variadic Functions, Deferred Function Calls, Panic, Recover.

Methods: Method Declarations, Methods with a Pointer Receiver, Composing Types by Struct Embedding, Method Values and Expressions, Example: Bit Vector Type, Encapsulation.

UNIT III CO3,CO4 10 periods
Interfaces: Interfaces as Contracts, Interface Types, Interface Satisfaction, Parsing Flags with flag. Value, Interface Values, Sorting with sort. Interface, The http. Handler Interface, The error Interface Example: Expression Evaluator, Type Assertions, Discriminating Errors with Type Assertions, Querying Behaviors with Interface Type Assertions, Type Switches, Example: Token-Based XML Decoding, A Few Words of Advice.

Go routines and Channels: Go routines, Example: Concurrent Clock Server, Example :Concurrent Echo Server, Channels, Looping in Parallel, Example: Concurrent Web Crawler, Multiplexing with select, Example: Concurrent Directory Traversal, Cancellation, Example: Chat Server

UNIT IV CO5 10 periods

Concurrency with Shared Variables: Race Conditions, Mutual Exclusion: sync.Mutex, Read/Write Mutexes: sync.RWMutex, Memory Synchronization, Lazy Initialization: sync.Once, The Race Detector, Example: Concurrent Non-Blocking Cache, Go routines and Threads

Packages and the Go Tool: Introduction, Import Paths, The Package Declaration, Import Declarations, Blank Imports, Packages and Naming, The Go Tool

Text Book(s):

[1]. The Go Programming Language by Alan A. A. Donovan, Brian W. Kernighan, Addison-Wesley, October 2015.

ITSL	Skill Oriented Course	L	P	C
	DevOps	**1**	**2**	**2**

Course Objectives:

The objectives of the course are:

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.

Course Content

UNIT I **10 periods**

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

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

UNIT II **10 periods**

DevOps with Container: understanding container, Resource isolation, Linuxcontainer concept, Containerized delivery, getting started container, InstallingDocker for Ubuntu, Installing Docker for CentOS, Installing Docker for macOS.

Container life cycle: Docker basics, Layer, image, container, and volume,distributing images, connect container.

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

UNIT III **10 periods**

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, kubernetesresources, 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 viaenvironment variables.

UNIT IV **10 periods**

Monitoring and Logging: Inspecting a container, Kubernetes dashboard, Montoringin Kubernetes, Application, Host, External resources, container, Kubernetes, Gettingmonitoring essentials for Kubernetes.

Cluster Administration: Kubernetes namespaces, Default namespaces, Create a new namespace.

Text Book(s):

[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.

ITSL	Skill Oriented Course	L	P	C
	Ethical Hacking	**1**	**2**	**2**

Course Objectives:

The main objectives of this course are:

1. To discuss different computer and network attacks.
2. To demonstrate various ethical hacking technique.
3. To expose the students to the issues related to hacking on printing, scanning and social engineering.
4. To demonstrate Hacking Web Servers and Wireless Network.

Course Outcomes:

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

1. Demonstrate Knowledge on Network and Computer attacks, OS Vulnerabilities, Hacking web servers, hacking wireless network
2. Analyze system and network vulnerabilities.
3. Design security solutions for risks that arise from hacking.
4. Use appropriate ethical hacking technique to solve Security problems.
5. Apply contextual knowledge to assess safety and legal issues in applications like cybercrime, social engineering.
6. Inculcate use of ethical hacking practices while maintaining professional ethics.

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

Ethical Hacking Overview: Ethical hacking, Certification programs for network security personnel.

Network and Computer Attacks: Malicious software, Protection against malware, Intruder attacks on networks and computers, Addressing physical security.

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

Foot printing and Social Engineering: Using web tools for foot printing, Conducting competitive intelligence, Using domain name system zone transfers, Introduction to social engineering.

Port Scanning: Port scanning, Using port scanning tools, Conducting ping sweeps, Understanding scripting.

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

Enumeration: Enumeration, Enumerating windows operating systems, Netware operating system and Unix operating system.

Desktop and Server OS Vulnerabilities: Windows OS vulnerabilities, Tools for identifying vulnerabilities in windows, Best practices for hardening windows systems, Linux OS vulnerabilities.

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

Hacking Web Servers: Understanding web applications, Web application vulnerabilities, Tools for web attackers and Security testers.

Hacking Wireless Network: Understanding wireless technology, Wireless network standards, Authentication, Wardriving, Wireless hacking.

TEST BOOK:

1. Michael T. Simpson, Kent Backman and James E. Corley, Hands-On Ethical Hacking and Network Defense, Cengage Learning, First edition, 2013.

REFERENCE BOOK(s):

1. Kimberly graves, CEH Official Certified Ethical Hacker Review Guide, Wiley Publications, 2007.
2. Michael Gregg, Certified ethical hacker (CEH) Cert guide, Pearson Education, 2014.
3. Ec-Council, "Ethical Hacking and Countermeasures: Attack Phases", Delmar Cengage Learning,2009.
4. Patrick Engebretson, "The Basics of Hacking and Penetration Testing – Ethical Hacking and Penetration Testing Made Easy", Syngress Media, Second Revised Edition, 2013.
5. Jon Erickson, "Hacking: The Art of Exploitation", No Starch Press, Second Edition, 2008.

IV
YEAR

Management Elective Courses

CODE NO.	SUBJECT NAME
HSEL01	Industrial Management and Entrepreneurship
HSEL02	Economics For Engineers
HSEL03	Introduction to Industrial Management
HSEL04	Project Management & Entrepreneurship
HSEL05	Human Resources and Organizational Behavior

HSEL01- INDUSTRIAL MANAGEMENT & ENTREPRENEURSHIP

Course Objectives:

1. To enable the student to demonstrate a thorough working knowledge of Management and Organisations.
2. To alert the students in regular business activity on Time values of money and depreciation.
3. To motivate the students on Entrepreneurial Perspectives at present business.
4. To enable the student on the MSME sector and motivate the startup of MSME and support agencies.

Course Outcomes:

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

1. To gain insight into contemporary issues in Management and Business Organisation
2. Ability to identify, analyze and interpret various concepts of time values of money and depreciation.
3. An understanding of the impact of knowledge on Entrepreneurship to enable the student to meet the needs of Industry
4. Recognition of the needs and ability to MEME and Support Agencies

UNIT I **[CO1] (15)**:

Management and Business Organization: Management concept-Managerial and operational functions of management-Scientific management-Job Design-Job description and job specification. Sole Proprietorship, Partnership Firm, Limited Liability Partnership (LLP), Joint Stock Company, One Person Company (OPC), Private Company; Public Limited Company, Forms of Organization, Co-Operatives.

UNIT II **[CO2] (15)**:

Time values of money and depreciation: Simple interest -Compound interest-Present worth factors Future worth factors-Depreciation Concept-Straight-line method of depreciation-Diminishing method of depreciation-Sum of the year digits method of depreciation etc along with problems

UNIT III **[CO3] (15)**:

Entrepreneur and Entrepreneurship: Concept of Entrepreneur-Characteristics of an Entrepreneur Distinction between an Entrepreneur and Intrapreneur and a Manager – Functions of an Entrepreneur-– Types of entrepreneurs- Recent Trends of Women Entrepreneurship – Rural Entrepreneurship Entrepreneurial process – Growth of Entrepreneurship in India

UNIT IV **[CO4] (15)**:

MSME and Support Agencies: Meaning of MSME-Definitions of MSME, Characteristics of MSME- – Relationships of MSME- Certificate of MSME –Make in India concept of MSME-Commercial Banks financial institutions – (KVIC) Khadi and Village Industries Commission- (SIDO) Small Industries Development Corporation –(NSIC) National Small Industries Corporation-(NPC) National productivity council- (DIC) District Industries Centre- (SFC) State Financial corporation.

TEXT BOOK(s):

1. KK Ahuja, Industrial Management, Vol. I & II, Dhanpat Rai, 1978.
2. E.PaulDegarmo, John R Chanda, William G Sullivan, Engineering Economy, Mac Millan Publishing Co, 1979. B.Tech.(HS)/R-18/2018-2019 Page 1/ 2
3. Poornima M Charantimath, Entrepreneurship Development Small business environment, Pearson Education
4. ShivganeshBhargav, Entrepreneurial Management, Sage Publications, 2008.
5. Prasanna Chandra, Project Management, Tata McGraw-Hill Education, 2013 Edition,

REFERENCE BOOK(s):

1. Philip Kotler, Marketing Management, 11th Edition, Pearson Education, 2004.
2. P. Gopalakrishnan, Hand Book of Materials Management, PHI, 1999.
3. Gary Dessler, Human Resource Management, 11th Edition, 2008.
4. Heinz Weirich and Harold Koontz, Management, 10th Edition, TMH, 2004.

HSEL02- ECONOMICS FOR ENGINEERS

Course Objectives:

1. To provide the students with knowledge of basic economic problems and the relationship between engineering technology and economics.
2. To make the students understand the demand determinants and the methods of demand forecasting of a product.
3. The students gain the knowledge about various cost concepts for determining the manufacturing of a product.
4. To sensitize the students about the changing environment of banking scenario and to understand the functions of RBI.

Course Outcomes:

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

1. Understand the basic economic problems and objectives of a firm.
2. Get knowledge about overall functions and concepts of Demand elasticity of the firm and forecasting.
3. Linkage of various cost concepts and to understand how to sustain break even for a business.
4. Know the overview of Liberalization, Privatization and Globalization and their impact on Indianeconomy.

UNIT I **Text Book - 1, 2 [CO1] (15)**

ENGINEERING ECONOMICS: Economics definition - Functions & Scope of Engineering economics - Basic economic problem - Relationship between Science - Engineering - Technology - Economics. FIRMS OBJECTIVE: Theories of Maximization - Profit Maximization - Wealth Maximization - Growth Maximization - Sales Revenue Maximization - Utility Maximization.

UNIT II **Text Book - 2, 3 [CO2] (15)**

THEORY OF DEMAND: Demand Definition - Nature and Characteristics of Demand - Demand schedule Law of demand - Limitations to the law of demand - Various concepts of Demand Elasticity – Price Elasticity - Income Elasticity - Cross elasticity - Demand Forecasting definition - Factors determining Demand Forecasting - Methods of Demand forecasting.

UNIT III **Text Book - 4 [CO3] (15)**

COST CONCEPTS: Introduction - Types of costs - Fixed cost - Variable cost - Average cost – Marginal cost - Real cost - Opportunity cost - Accounting cost - Economic cost - Break - Even analysis.

UNIT IV **Text Book - 4 [CO4] (15)**

INDIAN ECONOMY - AN OVERVIEW: Nature and characteristics of Indian economy – Banking -Structure of Indian Banking- RBI functions - Functions of Commercial banks - Merits and Demerits of Liberalization - Privatization – Globalization (LPG) - Elementary concepts of WTO - GATT- GATS - TRIPs - TRIMs - Monetary Policy - Fiscal Policy.

TEXT BOOK(s):

1. Riggs, Bedworth and Randhwa, Engineering Economics, McGraw-Hill Education India.
2. S.C.Sharma and T.R.Banga, Industrial Organisation and Engineering Economics, Khanna Publishers.
3. S.K.Misra and V.K.Puri, Economic Environment of Business, Himalaya Publishing House.
   H.L.Ahuja, Managerial Economics, S.Chand Publishing.

REFERENCE BOOK(s):

1. Singh A and Sadh A.N., Industrial Economics , Himalaya Publishing House , Bombay
2. R.L.Varshney&K.L.Maheswari, Managerial Economics,S.Chand Publishing ,2003 Edition
3. Datt&Sundharam, Indian Economy ,S.Chand Publishing, 2014 Edition

WEB RESOURCES:

1. www.managementstudyguide.com: Describes about the amalgamation of economic theory with business practices.
2. www.tutorialspoint.com: Provides a platform to learn various courses discussed in the syllabus.

HSEL03-INTRODUCTION TO INDUSTRIAL MANAGEMENT

Course Objectives:

1. To provide the students a foundation in concepts and skills in management.
2. To make the students understand the concept of interest and evaluation of project alternatives.
3. Prepare the students for facing the changing environment, its implication on human resources and to achieve the corporate excellence.
4. Provide awareness about the materials requirement and procurement, in order to produce good quality products and maintain quality as desired by the consumer.

Course Outcomes:

1. The course helps the students to become aware of the inference of organization structure and performance of people working in organizations.
2. The course helps students to get knowledge about time value of money, evaluation of alternatives in the changing economic environment.
3. The course helps the students to understand the elements of human resource management to acquire competitive advantage.
4. The course helps the students to use right sort of material for delivering the right products and services to the market.

UNIT I CO1 [Text Book-1] 15 Periods

GENERAL MANAGEMENT: Management Concept, Managerial levels, Managerial Skills, Managerial levels v/s skills, Brief treatment of managerial functions, Scientific Management Principles, Administrative Principles of Management.

FORMS OF BUSINESS ORGANISATION: Salient features of sole proprietorship. Partnership, Joint Stock Company, Private limited and Public limited companies.

UNIT II CO2 [Text Book-1] 15 Periods

FINANCIAL MANAGEMENT: Objectives of Financial Management – Concept of money - Simple interest – Compound interest Equivalent cash flow diagram.

ECONOMIC EVALUATION OF ALTERNATIVES: Basic methods – the annual equivalent method – Present worth method – future worth method.

DEPRECIATION: Purpose – Definition – types of depreciation – common methods of depreciation – The Straight Line Method – Diminishing Balance Method - the sum of the Years Digits Method.

UNIT III CO3 [Text Book-1] 15 Periods

HUMAN RESOURCE MANAGEMENT: Functions of Human Resource Management – Job Analysis – Human Resources Planning – Brief treatment of Recruitment - Selection – Placement - induction & Orientation – Training and Development - Performance Appraisal.

UNIT IV CO4 [Text Book-1] 15 Periods

MATERIAL MANAGEMENT: Functions of Materials Management - Material Requirement Planning – Purchasing – Objectives of Purchasing – Sources of Selection – Procurement Methods – Vendor Rating – Inventory Management – EOQ – EPG – ABC Analysis.

MARKETING MANAGEMENT: Functions of Marketing – Marketing Mix – Product life cycle – channels of distribution – Marketing Segmentation – Advertising & Sales promotion – Market Research.

TEXT BOOKS:

1. KK Ahuja, Industrial Management and Organizational Behaviour, Khanna Publishers.
2. Pravin Kumar, Industrial Engineering and Management , Person Publications.
3. N.V.S.Raju, Industrial Engineering and Management, Cengage Learning.

REFERENCE BOOKS:

1. Philip Kotler, Marketing Management, 11th Edition, Pearson Education.
2. Gary Dessler, Human Resource Management, Pearson Education 11th Edition.
3. Heinz Weirich and Harold Koontz, Management, 10th Edition, TMH.

WEB REFERENCES:

1. www.managementstudyguide.com:Describes the Concepts of Management & Its Operational Functions.
2. www.1000 ventures.com: Describes about Management Gurus, Business Gurus.
3. www.citehr.com: Describes the Human Resource Management Topics.

HSEL04 - PROJECT MANAGEMENT & ENTREPRENEURSHIP

Course Objectives:

1. To grasp the project identification, Planning and execution of the projects.
2. To understand the project analysis, apply appropriate project tools and techniques.
3. To develop Entrepreneurial creativity and Entrepreneurial initiative, adopting the key steps in the elaboration of business idea.
4. To be aware the growth and development of Entrepreneurial process and the resources needed for the successful development of Entrepreneurial ventures.

Course Outcomes:

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

1. Understand the conceptual clarity about project identification, formulation and feasibility analysis.
2. Analyse the learning and implementation of the project techniques for project planning, scheduling and execution.
3. Utilize the ideas to create value.
4. Self-advocacy and problem solving skills and manage strong identity purpose.

UNIT I **[CO1] (15)**:

Project **Identification and Formulation:** Meaning and definition of Project - concepts - Project Life cycle - Project Identification - Project Selection - Source of Finance for a Project - Project appraisal (Theory) - Technical, Financial, Market appraisal - preparation of detailed project report.

UNIT II **[CO2] (15)**:

Implementation of project: An overview of Project Planning and Scheduling - Management and Control of Projects - Network Analysis - PERT and CPM (Problems).

UNIT III **[CO3] (15)**:

Entrepreneurship: An overview of Entrepreneurship - Characteristics and competencies of Entrepreneur - Entrepreneurial traits - Classification of Entrepreneurs - functions of Entrepreneur - Distinction between Entrepreneur, Intrapreneur and Manager - Entrepreneurial decision process

UNIT IV **[CO4] (15)**:

Entrepreneurship growth and Development: Factors affecting Entrepreneurial Development – Economic and Non-Economic factors - Entrepreneurial Development Programs - Need and objectives of EDP – EDP programs in India - Entrepreneurial Motivation - theories of Maslow's and Mc Clelland's - MSME an introductory framework.

TEXT BOOK(s):

1. Prasanna Chandra, Project Planning, Analysis, Selection, Implementation and Review, Tata McGraw Hill.
2. Rao. P.C.K., Project Management & Control, S. Chand, New Delhi.
3. Dr. S.S Khanka, Entrepreneurial Development, S. Chand and Company limited, New Delhi.
4. H. Nandan, Fundamentals of Entrepreneurship, PHI, New Delhi.

HSEL05 - HUMAN RESOURCES & ORGANISATIONAL BEHAVIOUR

Course Objectives:

1. To familiarize the student with the fundamental aspects of various issues associated with Human Resource Management and Organizational behaviour.
2. This course aims to give a comprehensive overview about Career Planning, theories of Motivation and styles of Leadership.
3. To introduce the basic concept of Individual behaviour.
4. To enhance the awareness of Group behaviour.

Course Outcomes:

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

1. Know the Functions of Human Resource Management, Job Description and Job Specification
2. Familiarize with the concepts in Compensation, Motivation and styles of Leadership
3. Understand the behaviour of people at individual level through the concepts of Perception, Learning and Personality
4. Comprehend the Group and Team Dynamics in an Organization.

UNIT I **[CO1] (15)**:

Human Resource Management: Nature - significance - functions of HRM - .Job Analysis – Objectives and methods of Job Analysis - Job Description - Job Specification - Job Rotation - Job Enlargement - Job Enrichment - Job Evaluation & its Methods.

UNIT II **[CO2] (15)**:

Career Planning & Motivation: Career Planning and Development - Career Stages - Compensation - Components of Pay Structure - Wage and Salary administration - Incentives and Employee Benefits - Motivation: Maslow's Theory - Herzberg's Two Factors Theory of Motivation - McGregor's Theory X and Y - Vroom's Expectancy Theory - Leadership: Theories of Leadership and its Styles.

UNIT III **[CO3] (15)**:

Introduction to Organizational Behaviour: Meaning- Importance - Nature & Scope of OB – Contribution of other Disciplines to OB - Need for Development of individual Skills; Perception - Process of Perception - Enhancing Perceptual Skills - Learning - Theories of learning - Personality - Stages of personality Development - Determinants of personality.

UNIT IV **[CO4] (15)**:

Groups and Teams: Meaning & Definition of Group and Group Dynamics - Dynamics of Group Formation - Reasons for Group Formation - Types of Groups - Concept and Definition of Team - Types of Teams - Work Teams - Cross-functional Teams - Virtual Teams - Group/Team Effectiveness - How to make Teams more Effective - Team Building - Collaboration - Group Leadership.

TEXT BOOK(s):

1. Aswathappa.K., Human Resource Management, Text and Cases 8th Edition, McGraw Hill, New Delhi.
2. De Cenzo. & Stephen P. Robbins, Personnel/ Human Resource Management, Pearson Publications.
3. Stephen P. Robbins, Organisational Behavior, PHI, 9th edition
4. Fred Luthans, OrganisationalBehaviour, Tata McGraw Hill.-12th Edition.

REFERENCE BOOK(s):

1. VSP Rao, Human Resource and Personnel Management, PHI
2. Edwin B. Flippo, Personnel Management, McGraw-Hill.
3. Aswathappa.K., OrganisationalBehaviour , Himalaya Publishing House, New Delhi
4. Jai, B.P.Sinha, "Culture and OrganisationalBehaviour", Sage Publications

IT 412 - PROFESSIONAL ELECTIVE -III

Lectures	:	2 periods/week	Internal Marks	:	30
Practical	:	2 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

IT 413 - PROFESSIONAL ELECTIVE -IV

Lectures	:	2 periods/week	Internal Marks	:	30
Practical	:	2 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

IT 414 - PROFESSIONAL ELECTIVE - V (MOOCs)

Lectures	:	0 periods/week	Internal Marks	:	--
Practical	:	0 period/week	Semester End Examination Marks	:	100
Sem End Exam Duration	:	0 Hours	Credits	:	3

IT 415 - OPEN ELECTIVE / JOB ORIENTED COURSE -III

Lectures	:	3 periods/week	Internal Marks	:	30
Practical	:	0 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	3

IT 416 - OPEN ELECTIVE / JOB ORIENTED COURSE -IV (MOOCs)

Lectures	:	0 periods/week	Internal Marks	:	--
Practical	:	0 period/week	Semester End Examination Marks	:	100
Sem End Exam Duration	:	0 Hours	Credits	:	3

IT/CS 451 - INDUSTRIAL / RESEARCH INTERNSHIP

Lectures	:	- periods/week	Internal Marks	:	100
Practical	:	- period/week	Semester End Examination Marks	:	--
Sem End Exam Duration	:	- Hours	Credits	:	3

ITSL5 - SKILL ORIENTED COURSE V

Lectures	:	1 periods/week	Internal Marks	:	100
Practical	:	2 period/week	Semester End Examination Marks	:	--
Sem End Exam Duration	:	3 Hours	Credits	:	2

IT 461 - PROJECT (PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY)

Lectures	:	0 periods/week	Internal Marks	:	30
Practical	:	12 period/week	Semester End Examination Marks	:	70
Sem End Exam Duration	:	3 Hours	Credits	:	12

Course Objectives

At the end of the course the students will

1. Groom up their Personality towards the Industrial Standards.
2. Understand theoretical and practical skills on subjects by working on real-time projects.
3. Understand the application of software Engineering concepts in completing their project.

Course Outcomes

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

1. Demonstrate team work in selecting a problem for project work.
2. Implement available literature for the chosen problem.
3. Formulate the methodology to solve the identified problem.
4. Apply the principles, tools and techniques to solve the problem.
5. Prepare and present project report.

The Project work will be carried out by a batch consisting not more than four students. It will help the students to comprehend and apply different theories and technologies that they have learnt. It will lead to a substantial result as a comparative study, a new application of the technologies available or some extension to the works carried out by some researcher and published in conference/ journal. Each batch must carry out the analysis, design, implementation and testing of the entire project basing on the Software Engineering principles. There will be a total of four reviews for each batch.

0th review : The idea/concept for their project shall be presented tothe panel and get the approval.

1st review : The analysis and design carried out.

2nd review : The implementation and the testing done.

3rd review : Over all presentation of the work.

A comprehensive report is to be submitted at the end of the semester, which is certified by the concerned guide and the HOD. There will be an external examiner to make an assessment and to carry out the Viva-Voce examination.

Professional Elective Courses for IV/IV B. Tech.	
CODE NO.	**SUBJECT NAME**
ITEL09	Network Programming
ITEL10	Web Services and Service Oriented Architecture
ITEL11	Compiler Design
ITEL12	Natural Language Processing
ITEL13	Parallel Algorithms
ITEL14	Deep Learning
ITEL15	Virtual and Augmented Reality
ITEL16	Industry Recommended Course

ITEL09 - NETWORK PROGRAMMING

Course Objectives

The main objectives of this course are:

1. Introduce client/server programming design issues and protocols.
2. Discuss elementary TCP/UDP system calls.
3. Describe performance of server process using threads
4. Illustrate TCP client/server design alternatives.

Course Outcomes

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

1. Describe the basics of network programming.
2. Develop client/server applications using elementary socket functions.
3. Develop concurrent client/server programs using multiplexing system calls.
4. Write client/Server program using threads and compare different TCP client/server design alternatives.

Course Content

UNIT-I CO 1,2 (12 periods)

Introduction: A Simple Daytime Client , Protocol independence, Error Handling, A Simple Daytime Server, OSI model, Unix Standards, 64 bit architectures.

The Transport Layer: Introduction, User datagram Protocol (UDP), Transmission Control Protocol (TCP), Stream Control Transmission Protocol (SCTP), TCP Connection Establishment and Termination, TIME_WAIT State, SCTP association Establishment and Termination, Port Numbers, TCP Port Numbers and Concurrent Servers, Buffer Sizes and Limitations, Standard Internet Services, Protocol Usage

Sockets Introduction: Introduction, Socket Address structures, Value-Result Arguments, Byte Ordering Functions, inet_aton, inet_addr,and inet_ntoa Functions, inet_pton and inet_ntop Functions,sock_ntop and Related Functions, readn, written and readline Functions

UNIT-II CO 1,2 ,3 (12 periods)

Elementary TCP Sockets: Introduction, socket Function, connect Function, bind function, listen function, accept Function, fork and exec Functions, Concurrent Servers, close Function, getsockname and getpeername Functions

TCP Client-Server Example: Introduction, TCP Echo Server: main Function, TCP Echo Server: str_echo Function, TCP Echo Client: main Function, TCP Echo Client: str_cli Function, Normal Startup, Normal Termination, POSIX Signal Handling, Handling SIGCHLD Signals, wait and waitpid Functions, Connection

Abort before accept Returns, Termination of Server Process, SIGPIPE Signal, Crashing of Server Host, Crashing and rebooting of Server Host

I/O Multiplexing: The select and poll Functions: Introduction, I/O Models, select Function, str_cli Function, Batch Input and Buffering, shutdown Function, str_cli Function,TCP Echo Server,pselect Function,poll Function,TCP Echo Server

UNIT-III CO 4 (12 periods)

Elementary UDP Sockets: Introduction, recvfrom and sendto Functions, UDP Echo Server: main Function, UDP Echo Server:dg_echo Function, UDP Echo Client: main Function, UDP Echo Client:dg_cli Function, Lost Datagrams, Verifying Received Response, Server Not Running, Summary of UDP Example, connect Function with UDP, dg_cli Function (Revisited), Lack of Flow Control with UDP, Determining Outgoing Interface with UDP,TCP and UDP echo Server Using select

Daemon Processes and the inetd Superserver: Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd Function

UNIT-IV CO 4 (12 periods)

Threads: Introduction, Basic Thread Functions: Creation and Termination, str_cli Function Using Threads, TCP Echo Server Using Threads, Thread-Specific Data, Web Client and Simultaneous Connections, Multexes:Mutual Exclusion, Condition Variables, Web Client and Simultaneous Connections .

Client/Server Design Alternatives: Introduction, TCP Client Alternatives, TCP Test Client, TCP Iterative Server, TCP Concurrent Server, One Child per Client, TCP Preforked Server, No Locking Around accept, TCP Preforked Server, File Locking Around accept, TCP Preforked Server, Thread Locking Around accept, TCP Preforked Server, Descriptor Passing, TCP Concurrent Server, One Thread per Client, TCP Prethreaded Server, per-Thread accept, TCP Prethreaded Server, Main Thread accept.

TEXT BOOK:

1. W.Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming. The Sockets Networking API, Volume 1 , 3rd edition – 2004, Pearson/ Prentice Hall .

REFERENCE BOOKS:

1. Douglas E.Comer, David L.Stevens, Internetworking With TCP/IP: Design, Implementation and Internals, Prentice Hall
2. Rochkind, Advanced Unix Programming, 2nd edition,

WEB REFERENCES:

1. http://www.pearsoned.co.in/wrichardstevens
2. http://www.iana.org

ITEL10 - WEB SERVICES AND SERVICE ORIENTED ARCHITECTURE

Course Objectives:

The main objectives of this course are:

1. Introduce distributed technologies and Web service oriented architecture
2. Discuss SOAP fundamentals and Message passing systems
3. Demonstrate WSDL and UDDI registries
4. Explain Web Services Interoperability and Web Services security

Course Outcomes:

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

1. Create Web Services using distributed technologies
2. Design Web service oriented applications with SOAP
3. Describe and publish web services
4. Develop Secure Web Service applications.

Course Content

UNIT - I **CO1 (14 Periods)**

Evolution and Emergence of Web Services - Evolution of distributed computing, Core distributed computing technologies – client/server, CORBA, JAVA RMI, Microsoft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA).

Introduction to Web Services – The definition of web services, basic operational model of web services, Core web services standards, Industry standards supporting web services , tools and technologies enabling web services, benefits and challenges of using web services.

Web Services Architecture – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication models, basic steps of implementing web services.

UNIT - II **CO2 (11 Periods)**

Developing Web services Using SOAP-Fundamentals of SOAP – SOAP Message Structure, SOAP encoding, Encoding of different data types, SOAP message exchange models, SOAP communication and messaging, Java and Axis, limitations of SOAP.

UNIT – III **CO3 (13 Periods)**

Describing Web Services – WSDL – WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL Tools, limitations of WSDL.

Discovering Web Services –UDDI – UDDI registries, uses of UDDI Registry, Programming with UDDI, Inquiry API, Publishing API, Publishing, searching and deleting information in a UDDI Registry, limitations of UDDI.

UNIT - IV **CO4 (12 Periods)**

Web Services Interoperability – Means of ensuring Interoperability, Overview of .NET, Creating a .NET client for an Axis Web Service, creating Java client for a Web service, Challenges in Web Services Interoperability.

Web Services Security – XML security frame work, Goals of Cryptography, Digital signature, Digital Certificate, XML Encryption.

TEXT BOOK: .

1. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India.

REFERENCE BOOKS:

1. Java Web Service Architecture, James McGovern, Sameer Tyagi et al., Elsevier
2. Eric Newcomer, “Understanding Web Services: XML, WSDL, SOAP, and UDDI”, Addison-Wesley Professional publications
3. Building Web Services with Java, 2nd Edition, S. Graham and others, Pearson Edn.
4. Java Web Services, D.A. Chappell & T. Jewell, O’Reilly,SPD. 4. Web Services, G. Alonso, F. Casati and others, Springer

WEB REFERENCES :

1. https://www.roseindia.net/ejb/introduction/j2eeintroduction.shtml
2. https://en.wikipedia.org/wiki/Web_service
3. https://docs.oracle.com/javaee/6/tutorial/doc/gijti.html

ITEL11 - COMPILER DESIGN

Course Objectives

The main objectives of this course are:

1. Introduce the phases of compiler and lexical analyzer.
2. Discuss the parsing techniques and syntax direct translation schemes.
3. Illustrate run-Time storage allocations strategies and Symbol Table implementation.
4. Illustrate intermediate code forms and code generation.

Course Outcomes

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

1. Explain the phases of compiler and Lexical analysis.
2. Construct Parsers and symbol table look-up schemes.
3. Develop various intermediate code forms for compiler construction.
4. Construct code generator through optimized intermediate code forms.
5. Compare various code optimization methods, and runtime allocation strategies.

Course Content

UNIT – I CO 1 (12 Periods)

Introduction to Compiling: Compilers - Analysis of the source program - Phases of a compiler - Cousins of the Compiler - Grouping of Phases - Compiler construction tools.

Lexical Analysis: Role of Lexical Analyzer - Input Buffering - Specification of Tokens-Recognition of tokens- a language for specifying lexical analyzers- Finite Automata-From Regular expressions to NFA-Design of a lexical analyzer generator.

Syntax Analysis: Role of the parser - Top Down parsing - Recursive Descent Parsing, Predictive Parsing, LL(1) Parser.

UNIT - II CO 2 (16 Periods)

Syntax Analysis - Bottom-up parsing - Shift Reduce Parsing , Operator Precedent Parser – Operator precedence parsing, Operator Precedence functions, Error recovery in operator precedence parsing, LR Parsers - SLR Parser, Canonical LR Parser, and LALR Parser- Parser Generators.

Symbol Tables: Symbol table entries, Data structures for symbol table implementation, representing scope information.

UNIT – III CO 2,3 (12 Periods)

Syntax Directed Translation: Syntax Directed definition- construction of syntax trees, Bottom-up evaluation of S-attribute Definitions-L-attribute Definitions.

Intermediate Code Generation: Intermediate languages – SDT scheme for Assignment Statements - SDT scheme for Case Statements-SDT scheme for Boolean Expressions, SDT scheme for Flow of control constructs - SDT scheme for Procedure calls.

UNIT - IV CO 4,5 (12 Periods)

Code Generation: Issues in the design of code generator - The target machine - Runtime Storage management - Basic Blocks and Flow Graphs - Next-use Information - A simple Code generator - DAG representation of Basic Blocks.

Code Optimization: Introduction- Principal Sources of Optimization - Optimization of basic Blocks - Introduction to Global Data Flow Analysis- Peephole Optimization.

Run Time Environments: Source Language issues - Storage Organization - Storage Allocation strategies – Static allocation scheme, Stack allocation scheme, Heap allocation scheme- Access to non-local names - Parameter Passing methods- Call-by-Value, Call-by-Reference, Call-by-Name methods.

TEXT BOOK:

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", Pearson Education Asia, 2007.

REFERENCE BOOKS:

1. Alfred V.Aho, Jeffrey D. Ullman, Principles of Compiler Design, Narosa publishing, 2002.
2. Lex & Yacc - John R. Levine, Tony Mason, Doug Brown, 2nd Edition, O'reilly
3. Engineering a Compiler - Keith Cooper & Linda Torezon, 2nd Edition Elsevier.

ITEL12 - NATURAL LANGUAGE PROCESSING

Course Objectives:

The main objectives of this course are:

1 Introduce the underlying concepts and techniques required for natural language processing.

2 Illustrate computational models for natural language processing.

Course Outcomes:

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

1. Define the structural components of sentences for a given Grammar.
2. Construct the logical form that represents context-independent meaning of a sentence.
3. Construct the link logical forms with syntactic structures for semantic interpretation of the sentence.
4. Relate ambiguity in natural language constructs for possible interpretations of a sentence.
5. Develop the logical form for the Knowledge representation.

Course Content

UNIT I CO1 **9 Periods**

Introduction to Natural Language Understanding: Linguistic Background-An Outline of English Syntax-Grammars and Parsing-Features and Augmented Grammars.

UNIT II CO2 **14 Periods**

Grammars for Natural Language: Toward Efficient Parsing, Ambiguity Resolution: Statistical Methods.

UNIT III CO3,4 **14 Periods**

Semantics and Logical Form: Linking Syntax and Semantics-Ambiguity Resolution-other Strategies for Semantic Interpretation-Scoping and the Interpretation of Noun Phrases.

UNIT IV CO5 **12 Periods**

Knowledge Representation and Reasoning-Local Discourse Context and Reference-Using World Knowledge-Discourse Structure-Defining a Conversational Agent.

TEXT BOOKS:

1 Allen, James. Natural Language Understanding. The Benjamin/Cummings Publishing Company, Inc., Redwood City, CA. 1995.

REFERENCE BOOKS:

1 Charniak, Eugene: Introduction to Artificial intelligence, Addison-Wesley, 1984.

2 Bates, M. (1995). Models of Natural language understanding. Proceedings of the National Academy of Sciences of the United States of America, Vol. 92, No. 22 (Oct. 24, 1995), pp. 9977-9982.

ITEL13 - PARALLEL ALGORITHMS

Course Objectives:

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.

Course Content

UNIT I CO1 **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 CO2 **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 CO3 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 CO4 **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.

ITEL14 - DEEP LEARNING

Course Objectives:

The main objectives of this course are:

1 Introduce basic concepts and applications of neural networks and deep neural networks.
2 Discuss regularization and optimization techniques in neural networks.
3 Illustrate tools in convolutional neural networks.
4 Describe computational graphs to define recurrent neural networks
5 Demonstrate practical methodologies deep learning.

Course Outcomes:

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

1 apply the regularization for deep learning
2 implement optimization techniques for neural network training
3 construct, train, and use recurrent neural networks.
4 use deep learning to solve practical problems

Course Content

UNIT I CO1 **12 Periods**

Deep Feedforward Networks: Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture, Back-Propagation and Other Differentiation Algorithms.

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier.

UNIT II CO2 **12Periods**

Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning.

UNIT III CO3 **12 Periods**

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory

UNIT IV CO4 **12 Periods**

Practical Methodology: Performance, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition.

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications

TEXT BOOK:

Ian Goodfellow, Yoshua Bengio, Aaron Courville , Deep Learning, MIT Press, 2016.

REFERENCE BOOKS:

Charu C. Aggarwal, Neural Networks and Deep Learning A Textbook, Springer, 2018

ITEL15 - VIRTUAL AND AUGMENTED REALITY

Course Objectives:

The main objectives of this course are:

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

Course Content

Unit-I CO1 **12 Periods**

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 CO2 **12 Periods**

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 CO3 **12 Periods**

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 CO4 **12 Periods**

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.