JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech. in COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)
COURSE STRUCTURE & SYLLABUS (R22 Regulations)
Applicable from AY 2022-23 Batch

I Year I Semester

S. No.	Course Code	Course	L	T	P	Credits
1.	MA101BS	Matrices and Calculus	3	1	0	4
2.	CH102BS	Engineering Chemistry	3	1	0	4
3.	CS103ES	Programming for Problem Solving	3	0	0	3
4.	EE104ES	Basic Electrical Engineering	2	0	0	2
5.	ME105ES	Computer Aided Engineering Graphics	1	0	4	3
6.	CS106ES	Elements of Computer Science & Engineering	0	0	2	1
7.	CH107BS	Engineering Chemistry Laboratory	0	0	2	1
8.	CS108ES	Programming for Problem Solving Laboratory	0	0	2	1
9.	EE109ES	Basic Electrical Engineering Laboratory	0	0	2	1
		Induction Program				
		Total	**12**	**2**	**12**	**20**

I Year II Semester

S. No.	Course Code	Course	L	T	P	Credits
1.	MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2.	PH202BS	Applied Physics	3	1	0	4
3.	ME203ES	Engineering Workshop	0	1	3	2.5
4.	EN204HS	English for Skill Enhancement	2	0	0	2
5.	EC205ES	Electronic Devices and Circuits	2	0	0	2
6.	CS206ES	Python Programming Laboratory	0	1	2	2
7.	PH207BS	Applied Physics Laboratory	0	0	3	1.5
8.	EN208HS	English Language and Communication Skills Laboratory	0	0	2	1
9.	CS209ES	IT Workshop	0	0	2	1
10.	*MC210	Environmental Science	3	0	0	0
		Total	**13**	**4**	**12**	**20**

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CY301PC	Digital Electronics	3	0	0	3
2	CY302PC	Data Structures	3	0	0	3
3	CY303PC	Computer Oriented Statistical Methods	3	1	0	4
4	CY304PC	Computer Organization and Architecture	3	0	0	3
5	CY305PC	Object Oriented Programming through Java	3	0	0	3
6	CY306PC	Data Structures Lab	0	0	3	1.5
7	CY307PC	Object Oriented Programming through Java Lab	0	0	3	1.5
8	CY308PC	Data visualization- R Programming/ Power BI	0	0	2	1
9	*MC309	Gender Sensitization Lab	0	0	2	0
		Total	**15**	**1**	**10**	**20**

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CY401PC	Discrete Mathematics	3	0	0	3
2	SM402MS	Business Economics & Financial Analysis	3	0	0	3
3	CY403PC	Operating Systems	3	0	0	3
4	CY404PC	Computer Networks	3	0	0	3
5	CY405PC	Software Engineering	3	0	0	3
6	CY406PC	Operating Systems Lab	0	0	2	1
7	CY407PC	Computer Networks Lab	0	0	2	1
8	CY408PC	Real-time Research Project/ Field Based Project	0	0	4	2
9	CY409PC	Node JS/ React JS/ Django	0	0	2	1
10	*MC410	Constitution of India	3	0	0	0
		Total	**18**	**0**	**10**	**20**

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CY501PC	Network Security and Cryptography	3	1	0	4
2	CY502PC	Database Management Systems	3	0	0	3
3	CY503PC	Formal Languages and Automata Theory	3	0	0	3
4		Professional Elective - I	3	0	0	3
5		Professional Elective - II	3	0	0	3
6	CY504PC	Network Security and Cryptography Lab	0	0	2	1
7	CY505PC	Database Management Systems Lab	0	0	2	1
8	EN508HS	Advanced English Communication Skills Lab	0	0	2	1
9	CY506PC	UI design-Flutter	0	0	2	1
10	*MC510	Intellectual Property Rights	3	0	0	0
		Total	**18**	**1**	**8**	**20**

III YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CY601PC	Cyber Security Essentials	3	0	0	3
2	CY602PC	Cyber Crime Investigation & Digital Forensics	3	0	0	3
3	CY603PC	Algorithms Design and Analysis	3	0	0	3
4		Professional Elective – III	3	0	0	3
5		Open Elective - I	3	0	0	3
6	CY604PC	Cyber Security Essentials Lab	0	0	2	1
7	CY605PC	Cyber Crime Investigation & Digital Forensics Lab	0	0	2	1
8		Professional Elective – III Lab	0	0	2	1
9	CY606PC	Industrial Oriented Mini Project / Summer Internship/ Skill Development Course (Big data-Spark)	0	0	4	2
10	*MC609	Environmental Science	3	0	0	0
		Total	**18**	**0**	**10**	**20**

Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CY701PC	Vulnerability Assessment & Penetration Testing	3	0	0	3
2	CY702PC	Network Management Systems and Operations	3	0	0	3
3		Professional Elective - IV	3	0	0	3
4		Professional Elective - V	3	0	0	3
5		Open Elective - II	3	0	0	3
6	CY703PC	Vulnerability Assessment & Penetration Testing Lab	0	0	2	1
7	CY704PC	Network Management Systems and Operations Lab	0	0	2	1
8	CY705PC	Project Stage - I	0	0	6	3
		Total	**15**	**0**	**14**	**20**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CY801PC	Organizational Behavior	3	0	0	3
2		Professional Elective – VI	3	0	0	3
3		Open Elective – III	3	0	0	3
4	CY802PC	Project Stage – II including Seminar	0	0	22	11
		Total	**9**	**0**	**22**	**20**

*MC – Satisfactory/Unsatisfactory

Professional Elective - I

CY511PE	Compiler Design
CY512PE	Artificial Intelligence
CY513PE	Data warehousing and Data Mining
CY514PE	Ad-hoc & Sensor Networks
CY515PE	Cloud Computing

Professional Elective - II

CY521PE	Ethical Hacking
CY522PE	Data Science
CY523PE	Distributed Systems
CY524PE	Cyber Laws
CY525PE	IoT Security

Professional Elective - III

CY631PE	Mobile Application Security
CY632PE	Machine Learning
CY633PE	DevOps
CY634PE	Blockchain Technology
CY635PE	Mobile Application Development

 # Courses in PE - III and PE - III Lab must be in 1-1 correspondence.

Professional Elective -IV

CY741PE	Edge Analytics
CY742PE	Web & Database Security
CY743PE	Information System Audit & Assurance
CY744PE	Social Media Security
CY745PE	Deep Learning

Professional Elective -V

CY751PE	Quantum Computing
CY752PE	Data Analytics for Fraud Detection
CY753PE	5G Technologies
CY754PE	Security Incident & Response Management (SOC)
CY755PE	Authentication Techniques

Professional Elective – VI

CY861PE	Quantum Cryptography
CY862PE	IoT Cloud Processing and Analytics
CY863PE	Cloud Security
CY864PE	Digital Watermarking and Steganography
CY865PE	Data Privacy

Open Elective I:
1. CY611OE: Cyber Laws
2. CY612OE: Ethical Hacking

Open Elective II:
1. CY721OE: Information System Audit & Assurance
2. CY722OE: Social Media Security

Open Elective III:
1. CY861OE: Data Privacy
2. CY862OE: 5G Technologies

MA101BS: MATRICES AND CALCULUS

B.Tech. I Year I Sem.   **L T P C**
                                                                                             3 1 0 4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn
- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

Course outcomes: After learning the contents of this paper the student must be able to
- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigenvalues and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes

UNIT - I: Matrices   **10 L**
Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT - II: Eigen values and Eigen vectors   **10 L**
Linear Transformation and Orthogonal Transformation: Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT - III: Calculus   **10 L**
Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series.
Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT - IV: Multivariable Calculus (Partial Differentiation and applications)   **10 L**
Definitions of Limit and continuity.
Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration)   **8 L**
Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.
Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

REFERENCE BOOKS:
1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

CH102BS: ENGINEERING CHEMISTRY

B.Tech. I Year I Sem.   L   T   P   C
                                                                           3   1   0   4

Course Objectives:
1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

Course Outcomes:
1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT - I: Water and its treatment: [8]
Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation - Determination of F^- ion by ion- selective electrode method.
Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion [8]
Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.
Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

UNIT - III: Polymeric materials: [8]
Definition – Classification of polymers with examples – Types of polymerization –
addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene
Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).
Rubbers: Natural rubber and its vulcanization.
Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.
Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources: [8]
Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

UNIT - V: **Engineering Materials: [8]**
Cement: Portland cement, its composition, setting and hardening.
Smart materials and their engineering applications
Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinyl amides
Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:
1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS:
1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

CS103ES: PROGRAMMING FOR PROBLEM SOLVING

B.Tech. I Year I Sem.	L	T	P	C
	3	0	0	3

Course Objectives:
- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

Course Outcomes: The student will learn
- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in the C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- Searching and sorting problems.

UNIT - I: Introduction to Programming
Compilers, compiling and executing a program.
Representation of Algorithm - Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudocode with examples, Program design and structured programming
Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators
Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops
I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

UNIT - II: Arrays, Strings, Structures and Pointers:
Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays
Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings
Structures: Defining structures, initializing structures, unions, Array of structures
Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type

UNIT - III: Preprocessor and File handling in C:
Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef
Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT - IV: Function and Dynamic Memory Allocation:
Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

UNIT - V: Searching and Sorting:
Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

TEXT BOOKS:
1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

EE104ES: BASIC ELECTRICAL ENGINEERING

B.Tech. I Year I Sem.	**L**	**T**	**P**	**C**
	2	**0**	**0**	**2**

Prerequisites: Mathematics

Course Objectives:
- To understand DC and Single & Three phase AC circuits
- To study and understand the different types of DC, AC machines and Transformers.
- To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.

Course Outcomes: After learning the contents of this paper the student must be able to
- Understand and analyze basic Electrical circuits
- Study the working principles of Electrical Machines and Transformers
- Introduce components of Low Voltage Electrical Installations.

Course Objectives	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To understand DC and Single & Three phase AC circuits.	3	2	1		2	0	0	1	2	0	1	2
To study and understand the different types of DC, AC machines and Transformers.	3	2	1	1	3	0	0	0	2	0	1	1
To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.	3	2	0		3	0	0	0	1	2	1	1

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Understand and analyse basic Electrical circuits	3	2	1	0	1	0	0	0	2	0	2	2
Study the working principles of Electrical Machines and Transformers	3	2	1	0	3	1	0	1	1	2	1	2
Introduce components of Low Voltage Electrical Installations.	3	2	1	1	3	2	0	0	1	0	2	2

UNIT-I:
D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

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

UNIT-III:
Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV:
Electrical Machines: Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Construction and working. Construction and working of synchronous generator.

UNIT-V:
Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:
1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:
1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, "Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

ME105ES: COMPUTER AIDED ENGINEERING GRAPHICS

B.Tech. I Year I Sem.   **L T P C**
                                                                          1 0 4 3

Course Objectives:
- To develop the ability of visualization of different objects through technical drawings
- To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products

Course Outcomes: At the end of the course, the student will be able to:
- Apply computer aided drafting tools to create 2D and 3D objects
- sketch conics and different types of solids
- Appreciate the need of Sectional views of solids and Development of surfaces of solids
- Read and interpret engineering drawings
- Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

UNIT – I:
Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

UNIT- II:
Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes

UNIT – III:
Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views

UNIT – IV:
Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

UNIT – V:
Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

TEXT BOOKS:
1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.

REFERENCE BOOKS:
1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers
Note: - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

CS106ES: ELEMENTS OF COMPUTER SCIENCE AND ENGINEERING

B.Tech. I Year I Sem.   **L T P C**
                           0 0 2 1

Course Objective: To provide an overview of the subjects of computer science and engineering.

Course Outcomes:
1. Know the working principles of functional units of a basic Computer
2. Understand program development, the use of data structures and algorithms in problem solving.
3. Know the need and types of operating system, database systems.
4. Understand the significance of networks, internet, WWW and cyber security.
5. Understand Autonomous systems, the application of artificial intelligence.

UNIT – I
Basics of a Computer – Hardware, Software, Generations of computers. Hardware - functional units, Components of CPU, Memory – hierarchy, types of memory, Input and output devices. Software – systems software, application software, packages, frameworks, IDEs.

UNIT – II
Software development – waterfall model, Agile, Types of computer languages – Programming, markup, scripting Program Development – steps in program development, flowcharts, algorithms, data structures – definition, types of data structures

UNIT – III
Operating systems: Functions of operating systems, types of operating systems, Device & Resource management
Database Management Systems: Data models, RDBMS, SQL, Database Transactions, data centers, cloud services

UNIT – IV
Computer Networks: Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensor networks, vehicular networks, 5G communication.
World Wide Web – Basics, role of HTML, CSS, XML, Tools for web designing, Social media, Online social networks.
Security – information security, cyber security, cyber laws

UNIT – V
Autonomous Systems: IoT, Robotics, Drones, Artificial Intelligence – Learning, Game Development, natural language processing, image and video processing.
Cloud Basics

TEXT BOOK:
1. Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.

REFERENCE BOOKS:
1. Fundamentals of Computers, Reema Thareja, Oxford Higher Education, Oxford University Press.
2. Introduction to computers, Peter Norton, 8th Edition, Tata McGraw Hill.
3. Computer Fundamentals, Anita Goel, Pearson Education India, 2010.
4. Elements of computer science, Cengage.

CH107BS: ENGINEERING CHEMISTRY LABORATORY

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:
- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course Outcomes: The experiments will make the student gain skills on:
- Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and nylon-6.
- Estimations saponification value, surface tension and viscosity of lubricant oils.

List of Experiments:
I. Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometry method.
II. Conductometry: Estimation of the concentration of an acid by Conductometry.
III. Potentiometry: Estimation of the amount of Fe^{+2} by Potentiomentry.
IV. pH Metry: Determination of an acid concentration using pH meter.
V. Preparations:
    1. Preparation of Bakelite.
    2. Preparation Nylon – 6.
VI. Lubricants:
    1. Estimation of acid value of given lubricant oil.
    2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.
VII. Corrosion: Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
VIII. Virtual lab experiments
    1. Construction of Fuel cell and its working.
    2. Smart materials for Biomedical applications
    3. Batteries for electrical vehicles.
    4. Functioning of solar cell and its applications.

REFERENCE BOOKS:
1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

CS108ES: PROGRAMMING FOR PROBLEM SOLVING LABORATORY

B.Tech. I Year I Sem.	L	T	P	C
	0	0	2	1

[Note:The programs may be executed using any available Open Source/ Freely available IDE
Some of the Tools available are:
CodeLite: https://codelite.org/
Code:Blocks: http://www.codeblocks.org/
DevCpp : http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:
- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:
- formulate the algorithms for simple problems
- translate given algorithms to a working and correct program
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures
- use pointers of different types
- create, read and write to and from simple text and binary files
- modularize the code with functions so that they can be reused

Practice sessions:
a. Write a simple program that prints the results of all the operators available in C (including pre/ post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.

Simple numeric problems:
a. Write a program for finding the max and min from the three numbers.
b. Write the program for the simple, compound interest.
c. Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
e. 5 x 1 = 5
f. 5 x 2 = 10
g. 5 x 3 = 15
h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:
   a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
   b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
   c. Write a program that finds if a given number is a prime number
   d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
   e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
   f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
   g. Write a C program to find the roots of a Quadratic equation.
   h. Write a C program to calculate the following, where x is a fractional value.
   i. 1-x/2 +x^2/4-x^3/6
   j. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+…………+x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Arrays, Pointers and Functions:
   a. Write a C program to find the minimum, maximum and average in an array of integers.
   b. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single dimension array.
   c. Write a C program that uses functions to perform the following:
   d. Addition of Two Matrices
   e. Multiplication of Two Matrices
   f. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be the same.
   g. Write C programs that use both recursive and non-recursive functions
   h. To find the factorial of a given integer.
   i. To find the GCD (greatest common divisor) of two given integers.
   j. To find x^n
   k. Write a program for reading elements using a pointer into an array and display the values using the array.
   l. Write a program for display values reverse order from an array using a pointer.
   m. Write a program through a pointer variable to sum of n elements from an array.

Files:
   a. Write a C program to display the contents of a file to standard output device.
   b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
   c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.
   d. Write a C program that does the following:
      It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function)
      Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)
      The program should then read all 10 values and print them back.

e. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Strings:
  a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
  b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
  c. Write a C program that uses functions to perform the following operations:
  d. To insert a sub-string into a given main string from a given position.
  e. To delete n Characters from a given position in a given string.
  f. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
  g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
  h. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:
  a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

  b. Write a C program to construct a pyramid of numbers as follows:

```
1              *            1          1          *
1 2            * *          2 3        2 2        * *
1 2 3          * * *        4 5 6      3 3 3      * * *
                                      4 4 4 4    * *
                                                 *
```

Sorting and Searching:
  a. Write a C program that uses non recursive function to search for a Key value in a given
  b. list of integers using linear search method.
  c. Write a C program that uses non recursive function to search for a Key value in a given
  d. sorted list of integers using binary search method.
  e. Write a C program that implements the Bubble sort method to sort a given list of
  f. integers in ascending order.
  g. Write a C program that sorts the given array of integers using selection sort in descending order
  h. Write a C program that sorts the given array of integers using insertion sort in ascending order
  i. Write a C program that sorts a given array of names

TEXT BOOKS:
  1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
  2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:
  1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
  2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
  3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
  4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
  5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
  6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
  7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

EE109ES: BASIC ELECTRICAL ENGINEERING LABORATORY

B.Tech. I Year I Sem.   **L T P C**
                                                                       0 0 2 1

Prerequisites: Basic Electrical Engineering

Course Objectives:
- To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
- To study the transient response of various R, L and C circuits using different excitations.
- To determine the performance of different types of DC, AC machines and Transformers.

Course Outcomes: After learning the contents of this paper the student must be able to
- Verify the basic Electrical circuits through different experiments.
- Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
- Analyze the transient responses of R, L and C circuits for different input conditions.

Course Objectives	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach	3	2	1		2	0	0	1	2	0	1	2
To study the transient response of various R, L and C circuits using different excitations	3	2	1	1	3	0	0	0	2	0	1	1
To determine the performance of different types of DC, AC machines and Transformers	3	2	0		3	0	0	0	1	2	1	1

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Verify the basic Electrical circuits through different experiments	3	2	1	0	1	0	0	0	2	0	2	2
Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods	3	2	1	0	3	1	0	1	1	2	1	2

Analyse the transient responses of R, L and C circuits for different input conditions	3	2	1	1	3	2	0	0	1	0	2	2

List of experiments/demonstrations:
PART- A (compulsory)
1. Verification of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series RL and RC circuits for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque-Speed Characteristics of a Three-phase Induction Motor.

PART-B (any two experiments from the given list)
1. Verification of Superposition theorem.
2. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
5. No-Load Characteristics of a Three-phase Alternator

TEXT BOOKS:
1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:
1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

MA201BS: ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

B.Tech. I Year II Sem.   **L T P C**
                                                                               3 1 0 4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn
- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course outcomes: After learning the contents of this paper the student must be able to
- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems.
- Use the Laplace transforms techniques for solving ODE's.
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I: First Order ODE   **8 L**
Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order   **10 L**
Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type $e^{ax}, \sin ax, \cos ax,$ polynomials in x, $e^{ax}V(x)$ and $x\,V(x)$, method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits

UNIT-III: Laplace transforms   **10 L**
Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation   **10 L**
Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration   **10 L**
Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCE BOOKS:
   1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
   2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
   3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
   4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

PH202BS: APPLIED PHYSICS

B.Tech. I Year II Sem.   **L   T   P   C**
                                                                                       3   1   0   4

Pre-requisites: 10 + 2 Physics

Course Objectives: The objectives of this course for the student are to:
1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibres.

Course Outcomes: At the end of the course the student will be able to:
1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT - I: QUANTUM PHYSICS AND SOLIDS
Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.
Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

UNIT - II: SEMICONDUCTORS AND DEVICES
Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS
Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.
Magnetic Materials: Hysteresis - soft and hard magnetic materials - magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics.
Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors -   materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

UNIT - IV: NANOTECHNOLOGY
Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials.

UNIT - V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations-lasing action - pumping methods- ruby laser, He-Ne laser , CO_2 laser, Argon ion Laser, Nd:YAG laser-semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection-construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers-losses in optical fiber - optical fiber for communication system - applications.

TEXT BOOKS:
1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4thEdition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:
1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

ME203ES: ENGINEERING WORKSHOP

B.Tech. I Year II Sem.			**L**	**T P C**	

B.Tech. I Year II Sem.   **L T P C**
                                                                          0 1 3 2.5

Pre-requisites: Practical skill

Course Objectives:
- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

Course Outcomes: At the end of the course, the student will be able to:
- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

1. TRADES FOR EXERCISES:
At least two exercises from each trade:
  I.   Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
  II.   Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
  III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
  IV.   Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
  V.   Welding Practice – (Arc Welding & Gas Welding)
  VI.   House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
  VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:
Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXT BOOKS:
  1. Workshop Practice /B. L. Juneja / Cengage
  2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:
  1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
  2. Workshop Manual / Venkat Reddy/ BSP

EN204HS: ENGLISH FOR SKILL ENHANCEMENT

B.Tech. I Year II Sem.   **L T P C**
                                                                                        2 0 0 2

Course Objectives: This course will enable the students to:
1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

Course Outcomes: Students will be able to:
1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

UNIT - I
Chapter entitled '**Toasted English**' by R.K.Narayan from **"English: Language, Context and Culture"** published by Orient BlackSwan, Hyderabad.
Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.
Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT - II
Chapter entitled '**Appro JRD' by Sudha Murthy** from **"English: Language, Context and Culture"** **published** by Orient BlackSwan, Hyderabad.
Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT - III
Chapter entitled '**Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from **"English: Language, Context and Culture"** published by Orient BlackSwan, Hyderabad.
Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV
Chapter entitled **'Art and Literature' by Abdul Kalam** from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.
Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice
Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

UNIT - V
Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.
Vocabulary: Technical Vocabulary and their Usage
Grammar: Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)
Reading: Reading Comprehension-Exercises for Practice
Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Note: *Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.*

➢ **Note**: **1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is Open-ended*, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

➢ **Note**: **2**.Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXT BOOK:
1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:
1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

EC205ES: ELECTRONIC DEVICES AND CIRCUITS

B.Tech. I Year II Sem.

L	**T**	**P**	**C**
2	**0**	**0**	**2**

Course Objectives:
1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of devices.
3. To know the switching characteristics of devices.

Course Outcomes: Upon completion of the Course, the students will be able to:
1. Acquire the knowledge of various electronic devices and their use on real life.
2. Know the applications of various devices.
3. Acquire the knowledge about the role of special purpose devices and their applications.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	-	-	1	1	-	-	-	-	1
CO2	3	2	3	-	-	2	1	-	-	-	-	1
CO3	3	3	3	-	-	2	1	-	-	-	-	1

UNIT - I
Diodes: Diode - Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch- switching times.

UNIT - II
Diode Applications: Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

UNIT - III
Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times,

UNIT - IV
Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

UNIT – V
Special Purpose Devices: Zener Diode **-** Characteristics, Zener diode as Voltage Regulator, Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode, Photo diode, Solar cell, LED, Schottky diode.

TEXT BOOKS:
1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky- Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson**.**

REFERENCE BOOKS:
1. Horowitz -Electronic Devices and Circuits, David A. Bell – 5thEdition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly - Basic Electronics-Principles and Applications, Cambridge, 2018.

CS206ES: PYTHON PROGRAMMING LABORATORY

B.Tech. I Year II Sem.   **L T P C**
                                                                                                       0 1 2 2

Course Objectives:
- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

Course Outcomes: After completion of the course, the student should be able to
- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples

Week -1:
1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3.
   i) Write a program to calculate compound interest when principal, rate and number of periods are given.
   ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points
4. Read name, address, email and phone number of a person through keyboard and print the details.

Week - 2:
1. Print the below triangle using for loop.
   5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1
2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval (use break)

Week - 3:
1. i) Write a program to convert a list and tuple into arrays.
   ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
3. Write a function called palindrome that takes a string argument and returnsTrue if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week - 4:
1. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
2. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

i).   Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.

ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.

iii).   Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

3.   i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'

ii) Remove the given word in all the places in a string?

iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

4.   Writes a recursive function that generates all binary strings of n-bit length

Week - 5:

1. i) Write a python program that defines a matrix and prints

ii) Write a python program to perform addition of two square matrices

iii) Write a python program to perform multiplication of two square matrices

2. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.

3. Use the structure of exception handling all general purpose exceptions.

Week-6:

1.   a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.

c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

d. Define a new class called Circle with appropriate attributes and instantiate a few   Circle objects. Write a function called draw_circle that draws circles on the canvas.

2.   Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.

3.   Write a python code to read a phone number and email-id from the user and validate it for correctness.

Week- 7

1. Write a Python code to merge two given file contents into a third file.

2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

3. Write a Python code to Read text from a text file, find the word with most number of occurrences

4. Write a function that reads a file *file1* and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

Week - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.

2. a) Install NumPy package with pip and explore it.

3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR

4. Write a program to implement Half Adder, Full Adder, and Parallel Adder

5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

TEXT BOOKS:
1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:
1. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications - 1st Ed. 2021.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Think Python, Allen Downey, Green Tea Press
6. Core Python Programming, W. Chun, Pearson
7. Introduction to Python, Kenneth A. Lambert, Cengage

PH207BS: APPLIED PHYSICS LABORATORY

B.Tech. I Year II Sem.   **L   T   P   C**
                                                                   0   0   3   1.5

Course Objectives: The objectives of this course for the student to
1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

Course Outcomes: The students will be able to:
1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carried out data analysis.

LIST OF EXPERIMENTS:
1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)
   b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a) Determination of the beam divergence of the given LASER beam
    b) Determination of Acceptance Angle and Numerical Apertureof an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

Note: Any 8 experiments are to be performed.

REFERENCE BOOK:
1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

EN208HS: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

	L	**T**	**P**	**C**

B.Tech. I Year II Sem.   **L   T   P   C**
                                                                0   0   2   1

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:
- ✓ To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- ✓ To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- ✓ To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- ✓ To improve the fluency of students in spoken English and neutralize the impact of dialects.
- ✓ To train students to use language appropriately for public speaking, group discussions and interviews

Course Outcomes: Students will be able to:
- ✓ Understand the nuances of English language through audio- visual experience and group activities
- ✓ Neutralise their accent for intelligibility
- ✓ Speak with clarity and confidence which in turn enhances their employability skills

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:
a. **Computer Assisted Language Learning (CALL) Lab**
b. **Interactive Communication Skills (ICS) Lab**

Listening Skills:
Objectives
1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.
- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:
Objectives
1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise – I
CALL Lab:
Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.
Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs-Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*
ICS Lab:
Understand: Spoken vs. Written language- Formal and Informal English.
Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II
CALL Lab:
Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*
ICS Lab:
Understand: Features of Good Conversation – Strategies for Effective Communication.
Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - III
CALL Lab:
Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).
Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*
ICS Lab:
Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing
Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IV
CALL Lab:
Understand: Listening for General Details.
Practice: Listening Comprehension Tests - *Testing Exercises*
ICS Lab:
Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication-Presentation Skills.
Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V
CALL Lab:
Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests -*Testing Exercises*
ICS Lab:
Understand: Group Discussion
Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**
The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.
System Requirement (Hardware component):
Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:
  i)   Computers with Suitable Configuration
  ii)   High Fidelity Headphones

2. **Interactive Communication Skills (ICS) Lab :**
    The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.
 Source of Material (Master Copy):
  * *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

Suggested Software:
  * Cambridge Advanced Learners' English Dictionary with CD.
  * Grammar Made Easy by Darling Kindersley.
  * Punctuation Made Easy by Darling Kindersley.
  * Oxford Advanced Learner's Compass, 10th Edition.
  * English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
  * English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
  * English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
  * TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
  * Digital All
  * Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS:
  1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
  2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
  3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford University Press
  4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
  5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press.

CS209ES: IT WORKSHOP

B.Tech. I Year II Sem.   **L T P C**
                                                                     0 0 2 1

Course Objectives: The IT Workshop for engineers is a training lab course spread over 60 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, PowerPoint and Publisher.

Course Outcomes:
- Perform Hardware troubleshooting
- Understand Hardware components and inter dependencies
- Safeguard computer systems from viruses/worms
- Document/ Presentation preparation
- Perform calculations using spreadsheets

PC Hardware

Task 1: 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.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: **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, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: 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.

Task 3: **Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX

and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel
Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Powerpoint
Task 1: Students will be working on basic power point utilities and tools which help them create basic powerpoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

REFERENCE BOOKS:
1. Comdex Information Technology course tool kit Vikas Gupta, *WILEY Dreamtech*
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, *WILEY Dreamtech*
3. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education.*
4. PC Hardware - A Handbook – Kate J. Chase *PHI* (Microsoft)
5. LaTeX Companion – Leslie Lamport, *PHI/Pearson.*
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – *CISCO Press, Pearson Education*.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, *Pearson Education.*

*MC210: ENVIRONMENTAL SCIENCE

B.Tech. I Year II Sem.   **L T P C**
                                                                              3 0 0 0

Course Objectives:
- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:
- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT - I
Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II
Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III
Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV
Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V
Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:
1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:
1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

CY301PC: DIGITAL ELECTRONICS

B.Tech. II Year I Sem.   **L   T   P   C**
                                                                                             3   0   0   3

Course Objectives: This course aims at through understanding of binary number system, logic gates, combination logic and synchronous and asynchronous logic.

UNIT - I:
BOOLEAN ALGEBRA AND LOGIC GATES: Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary logic.
Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic gates.

UNIT - II:
GATE – LEVEL MINIMIZATION: The map method, Four-variable map, Five-Variable map, product of sums simplification Don't-care conditions, NAND and NOR implementation other Two-level implementations, Exclusive – Or function.

UNIT - III:
COMBINATIONAL LOGIC: Combinational Circuits, Analysis procedure Design procedure, Binary Adder-Subtractor Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits.

UNIT - IV:
SEQUENTIAL LOGIC: Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure**.** Registers, shift Registers, Ripple counters, synchronous counters, other counters.

UNIT - V
MEMORIES AND ASYNCHRONOUS SEQUENTIAL LOGIC: Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction Read-only memory, Programmable logic Array programmable Array logic, Sequential Programmable Devices.
Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Reduction of state and Flow Tables, Race-Free state Assignment Hazards, Design Example.

TEXT BOOKS:
1. Digital Design – Third Edition, M. Morris Mano, Pearson Education/PHI.
2. Digital Principles and Applications Albert Paul Malvino Donald P. Leach TATA McGraw Hill Edition.
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson.

REFERENCE BOOKS:
1. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.
2. Switching and Logic Design, C.V.S. Rao, Pearson Education
3. Digital Principles and Design – Donald D.Givone, Tata McGraw Hill, Edition.
4. Fundamentals of Digital Logic and Microcomputer Design, 5TH Edition, M. Rafiquzzaman John Wiley.

CY302PC: DATA STRUCTURES

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites: Programming for Problem Solving

Course Objectives
● Exploring basic data structures such as stacks and queues.
● Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
● Introduces sorting and pattern matching algorithms

Course Outcomes
● Ability to select the data structures that efficiently model the information in a problem.
● Ability to assess efficiency trade-offs among different data structure implementations or combinations.
● Implement and know the application of algorithms for sorting and pattern matching.
● Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

UNIT - I
Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks- Operations, array and linked representations of stacks, stack applications, Queues- operations, array and linked representations.

UNIT - II
Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching.
Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT - III
Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, B- Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

UNIT - IV
Graphs: Graph Implementation Methods. Graph Traversal Methods.
Sorting: Quick Sort, Heap Sort, External Sorting- Model for external sorting, Merge Sort.

UNIT - V
Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXT BOOKS:
1. Fundamentals of Data Structures in C, 2 nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

REFERENCE BOOK:
1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning.

CY303PC: COMPUTER ORIENTED STATISTICAL METHODS

B.Tech. II Year I Sem.   L T P C
                                                                             3 1 0 4

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn
- The theory of Probability, Probability distributions of single and multiple random variables
- The sampling theory, testing of hypothesis and making statistical inferences
- Stochastic process and Markov chains.

Course outcomes: After learning the contents of this paper the student must be able to
- Apply the concepts of probability and distributions to case studies.
- Formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.
- Apply concept of estimation and testing of hypothesis to case studies.
- Correlate the concepts of one unit to the concepts in other units.

UNIT - I: Probability   10 L
Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Baye's Rule,
Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions.

UNIT - II: Expectation and discrete distributions   10 L
Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.
Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

UNIT - III: Continuous and Sampling Distributions   10 L
Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions.
Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t - Distribution, F-Distribution.

UNIT - IV: Sample Estimation & Tests of Hypotheses   10 L
Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimating the mean, standard error of a point estimate, prediction interval. Two sample: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions, Two samples: Estimating the ratio of two variances.
Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion. Two samples: tests on two proportions, Two- sample tests concerning variances.

UNIT-V: Stochastic Processes and Markov Chains   8L
Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXT BOOKS:
1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics For Engineers & Scientists, 9th Ed. Pearson Publishers.

2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.
3. S.D.Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi.

REFERENCE BOOKS:
1. T.T. Soong, Fundamentals of Probability and Statistics For Engineers, John Wiley & Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.
3. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations.

CY304PC: COMPUTER ORGANIZATION AND ARCHITECTURE

B.Tech. II Year I Sem.   L   T   P   C
                                                                            3   0   0   3

Co-requisite: A Course on "Digital Electronics".

Course Objectives
- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

Course Outcomes
- Understand the basics of instruction sets and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- Design a pipeline for consistent execution of instructions with minimum hazards.
- Recognize and manipulate representations of numbers stored in digital computers

UNIT - I
Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.
Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.
Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT - II
Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.
Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT - III
Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.
Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT - IV
Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

UNIT - V
Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

TEXT BOOK:
1. Computer System Architecture – M. Morris Mano, Third Edition, Pearson/PHI.

REFERENCE BOOKS:
1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, V th Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4 th Edition, PHI/Pearson.

CY305PC: OBJECT ORIENTED PROGRAMMING THROUGH JAVA

B.Tech. II Year I Sem.	L	T	P	C
	3	0	0	3

Course Objectives
- To Understand the basic object-oriented programming concepts and apply them in problem solving.
- To Illustrate inheritance concepts for reusing the program.
- To Demonstrate multitasking by using multiple threads and event handling
- To Develop data-centric applications using JDBC.
- To Understand the basics of java console and GUI based programming

Course Outcomes
- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
- Use multithreading concepts to develop inter process communication.
- Understand the process of graphical user interface design and implementation using AWT or swings.
- Develop applets that interact abundantly with the client environment and deploy on the server.

UNIT - I
Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT - II
Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

UNIT - III
Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, Exploring java.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

UNIT - IV
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices,

lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT - V
Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- 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.

TEXT BOOKS:
1. Java the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

REFERENCE BOOKS:
1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer. 9. Maurach's Beginning Java2 JDK 5, SPD.

CY306PC: DATA STRUCTURES LAB

B.Tech. II Year I Sem.   **L T P C**
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Prerequisites: A Course on "Programming for problem solving".

Course Objectives:
- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

Course Outcomes:
- Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
- Ability to Implement searching and sorting algorithms

List of Experiments:
1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation   ii) Insertion   iii) Deletion   iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation   ii) Insertion   iii) Deletion   iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i) Creation   ii) Insertion   iii) Deletion   iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays   ii) Pointers
5. Write a program that implement Queue (its operations) using
   i) Arrays   ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Quick sort   ii) Heap sort   iii) Merge sort
7. Write a program to implement the tree traversal methods(Recursive and Non Recursive).
8. Write a program to implement
   i) Binary Search tree   ii) B Trees   iii) B+ Trees   iv)   AVL trees   v) Red - Black trees
9. Write a program to implement the graph traversal methods.
10. Implement a Pattern matching algorithms using Boyer- Moore, Knuth-Morris-Pratt

TEXT BOOKS:
1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

REFERENCE BOOK:
1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

CY307PC: OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

B.Tech. II Year I Sem.   **L T P C**
                                                                             0 0 3 1.5

Course Objectives:
- To write programs using abstract classes.
- To write programs for solving real world problems using the java collection framework.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands-on experience with java programming.

Course Outcomes:
- Able to write programs for solving real world problems using the java collection framework.
- Able to write programs using abstract classes.
- Able to write multithreaded programs.
- Able to write GUI programs using swing controls in Java.

Note:
1. Use LINUX and MySQL for the Lab Experiments. Though not mandatory, encourage the use of the Eclipse platform.

2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

List of Experiments:
1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

3. A) Develop an applet in Java that displays a simple message.
B) Develop an applet in Java that receives an integer in one text field, and computes its factorial
Value and returns it in another text field, when the button named "Compute" is clicked.

4. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

5. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

6. Write a Java program for the following:
Create a doubly linked list of elements.

Delete a given element from the above list.
Display the contents of the list after deletion.

7. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in the selected color. Initially, there is no message shown.

8. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas.
Write a java program to display the table using Labels in Grid Layout.

10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

11. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).

12. Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.

13. Write a Java program to list all the files in a directory including the files present in all its subdirectories.

REFERENCE BOOKS:
1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

CY308PC: DATA VISUALIZATION - R PROGRAMMING/ POWER BI

B.Tech. II Year I Sem.	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Objectives:
- Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
- To discern patterns and relationships in the data.
- To build Dashboard applications.
- To communicate the results clearly and concisely.
- To be able to work with different formats of data sets.

Course Outcomes: At the end of the course a student should be able to
- Understand How to import data into Tableau.
- Understand Tableau concepts of Dimensions and Measures.
- Develop Programs and understand how to map Visual Layouts and Graphical Properties.
- Create a Dashboard that links multiple visualizations.
- Use graphical user interfaces to create Frames for providing solutions to real world
- problems.

Lab Problems:

1. Understanding Data, What is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?

2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, creating basic charts(line, bar charts, Tree maps),Using the Show me panel.

3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.

4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.

5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.

6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.

7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.

8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.

9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.

10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCE BOOKS:
1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning India.

*MC309: GENDER SENSITIZATION LAB

B.Tech. II Year I Sem.   **L T P C**
                                                             0 0 2 0

COURSE DESCRIPTION
This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course
- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes
➢ Students will have developed a better understanding of important issues related to gender in contemporary India.
➢ Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
➢ Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
➢ Students will acquire insight into the gendered division of labor and its relation to politics and economics.
➢ Men and women students and professionals will be better equipped to work and live together as equals.
➢ Students will develop a sense of appreciation of women in all walks of life.
➢ Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

Unit-I: UNDERSTANDING GENDER
Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men
- Preparing for Womanhood. Growing up   Male. First lessons in Caste.

Unit – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

Unit – III: GENDER AND LABOUR
Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit – IV: GENDER - BASED VIOLENCE
The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

Unit – V: GENDER AND CULTURE
Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

> *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".*

☞ **ESSENTIAL READING**: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender"* written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:
- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

CY401PC: DISCRETE MATHEMATICS

B.Tech. II Year II Sem.   L T P C
                                                                                3 0 0 3

Course Objectives:
- Introduces elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

Course Outcomes:
- Understand and construct precise mathematical proofs
- Apply logic and set theory to formulate precise statements
- Analyze and solve counting problems on finite and discrete structures
- Describe and manipulate sequences
- Apply graph theory in solving computing problems

UNIT - I
Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT - II
Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

UNIT - III
Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

UNIT - IV
Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

UNIT - V
Graph Theory: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOKS:
1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS:
1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

SM402MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B.Tech. II Year II Sem.   **L T P C**
                                                                                 3 0 0 3

Course Objective: To learn the basic business types, impact of the economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course Outcome: The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

Unit – I: Introduction to Business and Economics
Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.
Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II: Demand and Supply Analysis
Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.
Supply Analysis: Determinants of Supply, Supply Function and Law of Supply.

UNIT - III: Production, Cost, Market Structures & Pricing
Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.
Cost analysis: Types of Costs, Short run and Long run Cost Functions.
Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. **Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV: Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts (Simple Problems).

UNIT - V: Financial Ratios Analysis: Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXT BOOKS:
1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:
1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

CY403PC: OPERATING SYSTEMS

B.Tech. II Year II Sem.   **L   T   P   C**
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Prerequisites:
1.   A course on "Computer Programming and Data Structures".
2.   A course on "Computer Organization and Architecture".

Course Objectives:
- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

Course Outcomes:
- Will be able to control access to a computer and the files that may be shared
- Demonstrate the knowledge of the components of computers and their respective roles in computing.
- Ability to recognize and resolve user problems with standard operating environments.
- Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

UNIT - I
Operating System - Introduction, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls
Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT - II
CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec
Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

UNIT - III
Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors
Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT - IV
Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT - V
File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

TEXT BOOKS:
1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCE BOOKS:
1. Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

CY404PC: COMPUTER NETWORKS

B.Tech. II Year II Sem.

L	T	P	C
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Pre-requisites:
1. A course on "Programming for problem solving".
2. A course on "Data Structures".

Course Objectives
- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes
- Gain the knowledge of the basic computer network technology.
- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Obtain the skills of subnetting and routing mechanisms.
- Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

UNIT - I
Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.
Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless Transmission.
Data link layer: Design issues, framing, Error detection and correction.

UNIT - II
Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channels.
Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols.
Medium Access sublayer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT - III
Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT - IV
Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

UNIT - V
Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

TEXT BOOK:
1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

REFERENCE BOOKS:
1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

CY405PC: SOFTWARE ENGINEERING

B.Tech. II Year II Sem.
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Course Objectives
- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes
- Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

UNIT - I
Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths. **A Generic view of process**: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). **Process models**: The waterfall model, Spiral model and Agile methodology

UNIT - II
Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.
Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT - III
Design Engineering: Design process and design quality, design concepts, the design model.
Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT - IV
Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.
Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT - V
Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. **Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS:
1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

REFERENCE BOOKS:

1. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

CY406PC: OPERATING SYSTEMS LAB

B.Tech. II Year II Sem.   **L   T   P   C**
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Prerequisites: A course on "Programming for Problem Solving", A course on "Computer Organization and Architecture".

Co-requisite: A course on "Operating Systems".

Course Objectives:
- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

Course Outcomes:
- Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
- Able to implement C programs using Unix system calls

List of Experiments:
1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) Round Robin d) priority

2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)

3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.

4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.

5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs c) Message Queues d) Shared Memory

6. Write C programs to simulate the following memory management techniques a) Paging b) Segmentation

7. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

TEXT BOOKS:
1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

REFERENCE BOOKS:
1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

CY407PC: COMPUTER NETWORKS LAB

B.Tech. II Year II Sem.   **L T P C**
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Course Objectives:
1. To understand the working principle of various communication protocols.
2. To understand the network simulator environment and visualize a network topology and observe its performance
3. To analyze the traffic flow and the contents of protocol frames

Course Outcomes:
1. Implement data link layer farming methods
2. Analyze error detection and error correction codes.
3. Implement and analyze routing and congestion issues in network design.
4. Implement Encoding and Decoding techniques used in presentation layer
5. To be able to work with different network tools

List of Experiments:
1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. **Wireshark**
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
11. How to run Nmap scan
12. Operating System Detection using Nmap
13. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate & Throughput.
    vi. Simulate to Plot Congestion for Different Source/Destination
    vii. Simulate to Determine the Performance with respect to Transmission of Packets

TEXT BOOKS:
1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

REFERENCE BOOKS:
1. An Engineering Approach to Computer Networks, S.Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH.

CY409PC: NODE JS/ REACT JS/ DJANGO

B.Tech. II Year II Sem.	L	T	P	C
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Prerequisites: Object Oriented Programming through Java, HTML Basics
Course Objectives:
- To implement the static web pages using HTML and do client side validation using JavaScript.
- To design and work with databases using Java
- To develop an end to end application using java full stack.
- To introduce Node JS implementation for server side programming.
- To experiment with single page application development using React.

Course Outcomes: At the end of the course, the student will be able to,
- Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
- Demonstrate Advanced features of JavaScript and learn about JDBC
- Develop Server – side implementation using Java technologies like
- Develop the server – side implementation using Node JS.
- Design a Single Page Application using React.

Exercises:
1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)
11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
14. Create a TODO application in react with necessary components and deploy it into github.

REFERENCE BOOKS:
1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, A Press.

*MC410: CONSTITUTION OF INDIA

B.Tech. II Year II Sem.	L	T	P	C
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Course Objectives: Students will be able to:
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:
- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

Unit - 1 History of Making of the Indian Constitution- History of Drafting Committee.
Unit - 2 Philosophy of the Indian Constitution- Preamble Salient Features
Unit - 3 Contours of Constitutional Rights & Duties - Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

Unit - 4 Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit - 5 Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO ZilaPanchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit - 6 Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Reading:
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

CY501PC: NETWORK SECURITY AND CRYPTOGRAPHY

B.Tech. III Year I Sem.   **L T P C**
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Course Objectives:
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection

Course Outcomes:
- Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security.

UNIT - I
Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security
Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT - II
Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT - III
Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512),
Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.
Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT - IV
Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)
Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

UNIT - V
E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange
Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

CY502PC: DATABASE MANAGEMENT SYSTEMS

B.Tech. III Year I Sem.   **L   T   P   C**
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Prerequisites: A course on "Data Structures".
Course Objectives:
- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Course Outcomes:
- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

UNIT - I
Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS
Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT - II
Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views.
Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III
SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.
Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

UNIT - IV
Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT - V
Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM),
B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:
1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition

2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

REFERENCE BOOKS:
1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

CY503PC: FORMAL LANGUAGES AND AUTOMATA THEORY

B.Tech. III Year I Sem.   L T   P C
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Course Objectives
- To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.
- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- Classify machines by their power to recognize languages.
- Employ finite state machines to solve problems in computing.
- To understand deterministic and non-deterministic machines.
- To understand the differences between decidability and undecidability.

Course Outcomes
- Understand the concept of abstract machines and their power to recognize the languages.
- Employ finite state machines for modeling and solving computing problems.
- Design context free grammars for formal languages.
- Distinguish between decidability and undecidability.

UNIT - I
Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.
Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.
Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA, Moore and Melay machines

UNIT - II
Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.
Pumping Lemma for Regular Languages, Statement of the pumping lemma, Applications of the Pumping Lemma.
Closure Properties of Regular Languages: Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

UNIT - III
Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.
Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

UNIT - IV
Normal Forms for Context- Free Grammars: Eliminating useless symbols, Eliminating €-Productions. Chomsky Normal form Greibach Normal form.
Pumping Lemma for Context-Free Languages: Statement of pumping lemma, Applications
Closure Properties of Context-Free Languages: Closure properties of CFL's, Decision Properties of CFL's Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

UNIT - V
Types of Turing machine: Turing machines and halting
Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

TEXT BOOKS:
1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd edition, PHI.

REFERENCE BOOKS:
1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Textbook on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.

CY511PE: COMPILER DESIGN (Professional Elective –I)

B.Tech. III Year I Sem.   L   T   P   C
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Prerequisites
1. A course on "Formal Languages and Automata Theory".
2. A course on "Computer Organization and architecture".
3. A course on "Data Structures".

Course Objectives:
- Introduce the major concepts of language translation and compiler design and impart the
- knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, code optimization techniques, intermediate code generation, code generation and data flow analysis.

Course Outcomes:
- Demonstrate the ability to design a compiler given a set of language features.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool & yacc tool for developing a scanner and parser.
- Design and implement LL and LR parsers
- Design algorithms to do code optimization in order to improve the performance of a program in terms of space and time complexity.
- Design algorithms to generate machine code.

UNIT - I
Introduction: The structure of a compiler, the science of building a compiler, programming language basics
Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

UNIT - II
Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators.

UNIT - III
Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.
Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.

UNIT - IV
Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.
Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation

UNIT - V
Machine-Independent Optimization: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

TEXT BOOK:
1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman.

REFERENCE BOOKS:
1. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Compiler Construction, Louden, Thomson.

CY512PE: ARTIFICIAL INTELLIGENCE (Professional Elective –I)

B.Tech. III Year I Sem.   L T P C
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Prerequisites:
  1. Programming for problem solving, Data Structures.

Course Objectives:
  • To learn the distinction between optimal reasoning Vs. human like reasoning
  • To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
  • To learn different knowledge representation techniques.
  • To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:
  • Understand search strategies and intelligent agents
  • Understand different adversarial search techniques
  • Apply propositional logic, predicate logic for knowledge representation
  • Apply AI techniques to solve problems of game playing, and machine learning.

UNIT - I
Introduction to AI, Intelligent Agents, problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

UNIT - II
Problem Solving by Search-II and Propositional Logic
Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT - III
Logic and Knowledge Representation
First-Order Logic: Representation, 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
Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.
Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

UNIT - V
Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use
Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

TEXT BOOK:
1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:
1. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

CY513PE: DATA WAREHOUSING AND DATA MINING (Professional Elective – I)

B.Tech. III Year I Sem.　　　　　　　　　　　　　　　　　　　　　**L　T　P　C**
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Pre-Requisites:
1. Database Management System
2. Probability and Statistics

Course Objectives:
- Students will become acquainted with both the strengths and limitations of various data mining techniques like Association, Classification, Cluster and Outlier analysis. Understand Data warehouse and OLAP tools and architectures.

Course Outcomes:
- Understand the need of data mining and pre-processing techniques.
- Identify data warehouse models, architectures and schemas for enterprise applications.
- Perform market basket analysis using association rule mining.
- Understanding various classification models.
- Identify appropriate clustering and outlier detection techniques to handle complex data.

UNIT - I
Introduction to Data Mining:
Data mining, Kinds of Data, Knowledge Discovery process, Data Mining Functionalities-Kinds of Patterns mined, Major Issues in Data Mining. Data Pre-processing**:** Descriptive Data summarization, Data Cleaning, Data Integration & Transformation, Data Reduction, Data Discretization.

UNIT- II
Data Warehouse and OLAP:
Data Warehouse basic concepts, Differences between Operational Database Systems and Data Warehouses, multidimensional Data model, data warehouse architecture.

UNIT- III
Mining frequent patterns, associations and correlations: Basic Concepts, Market Basket Analysis, Apriori Algorithm, FP-growth, mining various kinds of association rules, From Association Analysis to Correlation Analysis.

UNIT- IV
Classification and prediction: Basic Concepts, issues regarding classification and prediction, Decision Tree Induction, Bayesian Classification, Rule-Based Classification, classification by backpropagation, lazy learners, prediction: linear regression, nonlinear regression, evaluating accuracy of a classifier or predictor

UNIT- V
Cluster Analysis: Requirements for Cluster Analysis, Overview of Basic Clustering Methods, Partitioning Methods-k-Means, k-Medoids, Hierarchical Methods-AGENES, DIANA, BIRCH, Density-Based Method-DBSCAN, Outlier Analysis.

TEXT BOOKS:
1. Jiawei Han, Micheline Kamber, Jian Pei., Data Mining: Concepts and Techniques, 2nd/3rd Edition, Morgan Kaufmann/Elsevier, 2012.
2. Margaret H Dunham., Data Mining Introductory and Advanced Topics, 2nd Edition, Pearson Education India, 2006.

REFERENCE BOOKS:
1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne and Vipin Kumar., Introduction to Data Mining, 2nd Edition, Pearson Education India, 2021.
3. Amitesh Sinha., Data Warehousing, Thomson Learning, India, 2007.

CY514PE: AD HOC & SENSOR NETWORKS (Professional Elective – I)

B.Tech. III Year I Sem.   **L   T   P   C**
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Prerequisites
- Computer Networks
- Distributed Systems
- Mobile Computing

Course Objectives
- To understand the challenges of routing in ad-hoc and sensor networks
- To understand various broadcast, mutlicast and geocasting protocols in ad hoc and sensor networks
- To understand basics of Wireless sensors, and Lower Layer Issues and Upper Layer Issues of WSN

Course Outcomes
- Understand the concepts of sensor networks and applications
- Understand and compare the MAC and routing protocols for adhoc networks
- Understand the transport protocols of sensor networks

UNIT - I
Introduction to Ad Hoc Networks
Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.
Routing in MANETs
Criteria for classification, Taxonomy of MANET routing algorithms, *Topology-based* routing algorithms-Proactive: DSDV, WRP; Reactive: DSR, AODV, TORA; Hybrid: ZRP; *Position- based* routing algorithms-Location Services-DREAM, Quorum-based, GLS; Forwarding Strategies, Greedy Packet, Restricted Directional Flooding-DREAM, LAR; Other routing algorithms-QoS Routing, CEDAR.

UNIT - II
Data Transmission
Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbour Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT - III
Geocasting
Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR**.**
TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT - IV
Basics of Wireless Sensors and Lower Layer Issues-Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V
Upper Layer Issues of WSN
Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

TEXT BOOKS
1. Ad Hoc and Sensor Networks – Theory and Applications, *Carlos Corderio Dharma P.Aggarwal,* World Scientific Publications, March 2006, ISBN – 981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman)

REFERENCE BOOKS:
1. C. Siva Ram Murthy, B.S. Manoj Ad Hoc Wireless Networks: Architectures and Protocols.
2. Taieb Znati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley.

CY515PE: CLOUD COMPUTING (Professional Elective – I)

B.Tech. III Year I Sem.   **L T P C**
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Pre-requisites:
1. A course on "Computer Networks".
2. A course on "Operating System".

Course Objectives:
- This course provides an insight into cloud computing
- Topics covered include- Cloud Computing Architecture, Deployment Models, Service Models, Technological Drivers for Cloud Computing, Networking for Cloud Computing and Security in Cloud Computing

Course Outcomes:
- Understand different computing paradigms and potential of the paradigms and specifically cloud computing
- Understand cloud service types, cloud deployment models and technologies supporting and driving the cloud
- Acquire the knowledge of programming models for cloud and development of software application that runs the cloud and various services available from major cloud providers
- Understand the security concerns and issues in cloud computing
- Acquire the knowledge of advances in cloud computing.

UNIT - I
Computing Paradigms, Cloud Computing Fundamentals, Cloud Computing Architecture and Management

UNIT - II
Cloud Deployment Models, Cloud Service Models, Technological Drivers for Cloud Computing: SOA and Cloud, Multicore Technology, Web 2.0 and Web 3.0, Pervasive Computing, Operating System, Application Environment

UNIT - III
Virtualization, Programming Models for Cloud Computing: MapReduce, Cloud Haskell, Software Development in Cloud

UNIT - IV
Networking for Cloud Computing: Introduction, Overview of Data Center Environment, Networking Issues in Data Centers, Transport Layer Issues in DCNs, Cloud Service Providers

UNIT - V
Security in Cloud Computing, and Advanced Concepts in Cloud Computing

TEXT BOOK:
1. Chandrasekaran, K. *Essentials of cloud computing*. CRC Press, 2014

REFERENCE BOOKS:
1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

CY521PE: ETHICAL HACKING (Professional Elective – II)

B.Tech. III Year I Sem.　　　　　　　　　　　　　　　　　　　　**L　T　P　C**
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Prerequisites:
　　1. A course on "Operating Systems"
　　2. A course on "Computer Networks"
　　3. A course on "Network Security and Cryptography"

Course Objectives:
- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing security.
- The course includes-Impacts of Hacking; Types of Hackers; Information Security Models;
- Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

Course Outcomes:
- Gain the knowledge of the use and availability of tools to support an ethical hack
- Gain the knowledge of interpreting the results of a controlled attack
- Understand the role of politics, inherent and imposed limitations and metrics for planning of a test
- Comprehend the dangers associated with penetration testing

UNIT- I
Introduction: Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration
Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture
Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

UNIT - II
The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

UNIT - III
Preparing for a Hack: Technical Preparation, Managing the Engagement Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance

UNIT - IV
Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase
Exploitation: Intuitive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

UNIT - V
Deliverable: The Deliverable, The Document, Overall Structure, Aligning Findings, Presentation

Integration: Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion

TEXT BOOK:
1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press.

REFERENCE BOOKS:
1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning.
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning.

CY522PE: DATA SCIENCE (Professional Elective – II)

B.Tech. III Year I Sem.   L   T   P   C
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Course Objectives:
- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

Course Outcomes:
- Understand basic terms of statistical modeling and data science
- Implementation of R programming concepts
- utilize R elements for data visualization and prediction

UNIT- I
Introduction
Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting.
Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT- II
Data Types & Statistical Description
Types of Data: Attributes and Measurement, Attribute, The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes.
Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT- III
Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting,
Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.
Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.
Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

UNIT- IV
Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.
Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.
Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT- V
Charts and Graphs: Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.
Regression: Linear Regression Analysis, Multiple Linear regression

TEXT BOOKS:
1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:
1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

CY523PE: DISTRIBUTED SYSTEMS (Professional Elective – II)

B.Tech. III Year I Sem.   **L T P C**
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Prerequisites:
1. A course on "Operating Systems"
2. A course on "Computer Organization & Architecture"

Course Objectives:
- To provide an insight into Distributed systems.
- To introduce concepts related to Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory

Course Outcomes:
- Understand Transactions and Concurrency control.
- Understand distributed shared memory.
- Design a protocol for a given distributed application.

UNIT - I
Characterization of Distributed Systems: Examples of Distributed systems, Resource sharing and web, challenges
System models: Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication
Distributed objects and Remote Invocation: Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT - II
Operating System Support- OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture.
Distributed File Systems-Introduction, File Service architecture.

UNIT - III
Peer to Peer Systems– Napster and its legacy, Peer to Peer middleware
Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.
Coordination and Agreement- Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT - IV
Transactions and Concurrency Control- Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering.
Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions
Distributed deadlocks: Transaction recovery.

UNIT - V
Replication: Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.
Distributed shared memory: Design and Implementation issues, Consistency models.

TEXT BOOKS:
1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S. Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:
1. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

CY524PE: CYBER LAWS (Professional Elective – II)

B.Tech. III Year I Sem.   **L   T P C**
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Course Objectives:
- Gain an understanding of the evolution and jurisprudence of cyber law in India, including the IT Act 2000.
- Learn about digital signatures, e-governance, and their legal implications under the IT Act.
- Understand the legal framework for electronic contracts, their formation, and international perspectives.
- Explore taxation issues in cyberspace, cybercrimes, electronic evidence, and their adjudication under the IT Act.

Course Outcomes
- Learn evolution and key aspects of Indian cyber law, including recent amendments.
- Gain knowledge about the legalities of digital signatures and the role of e-governance in the IT Act.
- Develop an understanding of the legalities involved in electronic contracts and international conventions.
- Adapt in understanding and analyzing cybercrime, electronic evidence, and intellectual property rights in the context of IT.

UNIT - I
Introduction: History of Internet and World Wide Web, Need for cyber law, Cybercrime on the rise, Important terms related to cyber law.
Cyber law in India: Need for cyber law in India, History of cyber law in India.
Information Technology Act, 2000: Overview of other laws amended by the IT Act, 2000, National Policy on Information Technology 2012.

UNIT - II
Overview of the Information Technology Act, 2000: Applicability of the Act, Important provisions of the Act: Digital signature and Electronic signature, Digital Signature under the IT Act, 2000, E-Governance Attribution, Acknowledgement and Dispatch of Electronic Records, Certifying Authorities, Electronic Signature Certificates, Duties of Subscribers, Penalties and Offences, Intermediaries.

UNIT - III
Overview of rules issued under The IT Act, 2000, Electronic Commerce, Electronic Contracts, Cyber Crimes, Cyber Frauds.

UNIT - IV
Regulatory Authorities: Department of Electronics and Information Technology, Controller of Certifying Authorities (CCA), Cyber Appellate Tribunal, Indian Computer Emergency Response Team (ICERT), Cloud Computing, Case Laws.

UNIT - V
Introduction to Cybercrime and procedure to report Cybercrime: procedure to report cybercrime, some basic rules for safe operations of the computer and internet, the criminal law (amendment) act, 2013: legislative remedies for online harassment and cyberstalking in India.

TEXT BOOKS:
1. Textbook on "Cyber Law", second edition, Pavan Duggal, Universal Law Publishing.
2. Textbook on "Indian Cyber law on Cybercrimes", Pavan Duggal,

REFERENCE BOOKS:

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media, 2006.
2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
4. Thomas R Peltier, Justin Peltier and John Blackley," Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996.

CY525PE: IOT SECURITY (Professional Elective – II)

B.Tech. III Year I Sem.   **L T P C**
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Course Objectives:
- Understand the various attacks and importance of Security aspects in IoT
- Understand the techniques, protocols and security towards Gaming models
- Understand security and privacy challenges of IoT
- Understand the application of block chain technology for IoT Security

Course Outcomes:
- Incorporate the best practices learnt to identify the attacks and mitigate the same
- Adopt the right security techniques and protocols during the design of IoT products
- Assimilate and apply the skills learnt on ciphers and block chains when appropriate
- Describe the essential components of IoT
- Find appropriate security/privacy solutions for IoT

UNIT- I
Fundamentals of IoT and Security and its need, Prevent Unauthorized Access to Sensor Data, Block ciphers, Introduction to Blockchain, Introduction of IoT devices, IoT Security Requirements, M2M Security, Message integrity Modeling faults and adversaries Difference among IoT devices, computers, and embedded devices.

UNIT- II
IoT and cyber-physical systems RFID Security, Authenticated encryption Byzantine Generals problem sensors and actuators in IoT, IoT security (vulnerabilities, attacks, and countermeasures), Cyber Physical Object Security, Hash functions Consensus algorithms and their scalability problems Accelerometer, photoresistor, buttons

UNIT- III
Security engineering for IoT development Hardware Security, Merkle trees and Elliptic curves digital signatures, verifiable random functions, Zero-knowledge systems motor, LED, vibrator, IoT security lifecycle, Front-end System Privacy Protection, Management, Secure IoT Databases, Public-key crypto (PKI), blockchain, the challenges, and solutions, analog signal vs. digital signal

UNIT- IV
Data Privacy Networking Function Security Trees signature algorithms proof of work, Proof of stake, Networking in IoT Device/User Authentication in IoT IoT Networking Protocols, Crypto-currencies, alternatives to Bitcoin consensus, Bitcoin scripting language and their use Real-time communication

UNIT- V
Introduction to Authentication Techniques, Secure IoT Lower Layers, Bitcoin P2P network, Ethereum and Smart Contracts, Bandwidth efficiency, Data Trustworthiness in IoT, Secure IoT Higher Layers, Distributed consensus, Smart Contract Languages and verification challenges, Data analytics in IoT - simple data analyzing methods

TEXT BOOKS:
1. B. Russell and D. Van Duren, "Practical Internet of Things Security," Packt Publishing, 2016.
2. FeiHU,"Security and Privacy Internet of Things (IoTs):Models, Algorithms and Implementations", CRC Press, 2016
3. Narayanan et al., "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction," Princeton University Press, 2016.

REFERENCE BOOKS:

1. A. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Crypto currencies," O'Reilly, 2014.
2. T. Alpcan and T. Basar, "Network Security: A Decision and Game-theoretic Approach," Cambridge University Press, 2011.
3. Security and the IoT ecosystem, KPMG International, 2015.
4. Internet of Things: IoT Governance, Privacy and Security Issues" European Research Cluster.
5. Ollie Whitehouse, "Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond", NCC Group, 2014.
6. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

CY504PC: NETWORK SECURITY AND CRYPTOGRAPHY LAB

B.Tech. III Year I Sem.   **L T P C**
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Course Objectives:
- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.

Course Outcomes:
- Understand basic cryptographic algorithms, message and web authentication and security issues.
- Identify information system requirements for both of them such as client and server.
- Understand the current legal issues towards information security.

List of Experiments:
1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and display the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
       a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement the RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA

TEXT BOOKS:
1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, McGraw Hill, 3rd Edition

REFERENCE BOOKS:
1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, McGraw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

CY5058PC: DATABASE MANAGEMENT SYSTEMS LAB

B.Tech. III Year I Sem.   **L T P C**
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Co-requisites:
- Co-requisite of course "Database Management Systems"

Course Objectives:
- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

Course Outcomes:
- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

List of Experiments:
1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)
    B. Nested, Correlated subqueries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

TEXT BOOKS:
1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

REFERENCES BOOKS:
1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

EN508HS: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B.Tech. III Year I Sem.   **L   T   P   C**
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1. Introduction

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organise ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements.

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub-skills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading –– Reading Comprehension – Exercises for Practice.

2. **Activities on Writing Skills**: Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing –Writing a Letter of Application –Resume vs. Curriculum Vitae – Writing a Résumé **–** Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.

3. **Activities on Presentation Skills -** Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation

4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas **–** Do's and Don'ts - GD Strategies – Exercises for Practice.

5. **Interview Skills**: Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

4. Minimum Requirement:
The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:
- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- One PC with latest configuration for the teacher
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.
- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **Oxford Advanced Learner's Dictionary**, 10th Edition
- **Cambridge Advanced Learner's Dictionary**
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech

6. Books Recommended:
1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). *Engineering English.* Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). Academic *Writing: A Handbook for International Students.* (5th Edition). Routledge.
4. Koneru, Aruna. (2016). *Professional Communication*.   McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). *Technical Communication, Principles and Practice.* (4TH Edition) Oxford University Press.
6. Anderson, Paul V. (2007). *Technical Communication*. Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). *English Vocabulary in Use* Series. Cambridge University Press
8. Sen, Leela. (2009). *Communication Skills.* PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998   ). *Writing with Power.* Oxford University Press.
10. Goleman, Daniel. (2013). *Emotional Intelligence*: *Why it can matter more than IQ.* Bloomsbury Publishing.

CY506PC: UI DESIGN-FLUTTER

B.Tech. III Year I Sem.   **L   T   P   C**
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Course Objectives:
- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widges and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

Course Outcomes:
- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also Apply styling using themes and custom styles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

List of Experiments: Students need to implement the following experiments
1. a) Install Flutter and Dart SDK.
   b) Write a simple Dart program to understand the language basics.

2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
   b) Implement different layout structures using Row, Column, and Stack widgets.

3. a) Design a responsive UI that adapts to different screen sizes.
   b) Implement media queries and breakpoints for responsiveness.

4. a) Set up navigation between different screens using Navigator.
   b) Implement navigation with named routes.

5. a) Learn about stateful and stateless widgets.
   b) Implement state management using set State and Provider.

6. a) Create custom widgets for specific UI elements.
   b) Apply styling using themes and custom styles.

7. a) Design a form with various input fields.
   b) Implement form validation and error handling.

8. a) Add animations to UI elements using Flutter's animation framework.
   b) Experiment with different types of animations (fade, slide, etc.).

9. a) Fetch data from a REST API.
   b) Display the fetched data in a meaningful way in the UI.

10. a) Write unit tests for UI components.
    b) Use Flutter's debugging tools to identify and fix issues.

TEXT BOOK:
1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

*MC510: INTELLECTUAL PROPERTY RIGHTS

B.Tech. III Year I Sem.   **L T P C**
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Course Objectives:
- Significance of intellectual property and its protection
- Introduce various forms of intellectual property

Course Outcomes:
- Distinguish and Explain various forms of IPRs.
- Identify criteria to fit one's own intellectual work in particular form of IPRs.
- Apply statutory provisions to protect particular form of IPRs.
- Appraise new developments in IPR laws at national and international level

UNIT – I
Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III
Law of copyrights: Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV
Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.
Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V
New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits.
International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

TEXT BOOK:
1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

REFERENCE BOOK:
1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

CY601PC: CYBER SECURITY ESSENTIALS

B.Tech. III Year II Sem.   **L T P C**
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Course Objectives:
- Understand fundamental concepts of cyber security, including information assurance, cryptography, network security, and Windows security principles.
- Explore attacker techniques, motivations, and exploitation methods, gaining insights into cyber threats and vulnerabilities.

Course Outcomes:
- Understand basic cryptographic techniques for securing information and analyze cyber threats using concepts such as proxies, tunneling, and fraud techniques.
- Develop skills in identifying and exploiting vulnerabilities, including shellcode, buffer overflows, SQL injection, and web exploit tools.
- Demonstrate knowledge of malicious code, its types (worms, viruses), and countermeasures against evasion, privilege escalation, and information theft.
- Analyze defense and analysis techniques, including memory forensics, honeypots, and intrusion detection systems, for proactive cybersecurity measures.

UNIT- I
Cyber Security Fundamentals: Network and Security Concepts- Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS), Firewalls, Virtualization, Radio-Frequency Identification
Microsoft Windows Security Principles: Windows Tokens, Window Messaging, Windows Program, The Windows firewalls

UNIT- II
Attacker Techniques and Motivations: How Hackers Cover Their Tracks (Antiforensics) How and Why Attackers Use Proxies, Tunneling Techniques, Fraud Techniques, Threat Infrastructure

UNIT- III
Exploitation: Techniques to Gain a Foothold, Misdirection- Shellcode, Integer Overflow Vulnerabilities, Stack-Based Buffer Overflows, Format String Vulnerabilities, SQL Injection, Malicious PDF Files, Race Conditions, Web Exploit Tools, DoS Conditions, Brute Force and Dictionary Attacks, Reconnaissance, and Disruption Methods- Cross-Site Scripting (XSS), Social Engineering, WarXing, DNS Amplification Attacks

UNIT- IV
Malicious Code: Self-Replicating Malicious Code- Worms, Viruses. Evading Detection and Elevating Privileges- Obfuscation, Virtual Machine Obfuscation, Persistent Software Techniques, Rootkits, Spyware, Attacks against Privileged User Accounts and Escalation of Privileges, Token Kidnapping, Virtual Machine Detection. Stealing Information and Exploitation- Form Grabbing, Man-in-the-Middle Attacks, DLL Injection, Browser Helper Objects

UNIT- V
Defense and Analysis Techniques: Memory Forensics, Honeypots, Malicious Code Naming, Automated Malicious Code Analysis Systems, Intrusion Detection Systems.

TEXT BOOK:
1. James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials", CRC Press, Taylor & Francis Group, 2011.

REFERENCE BOOK:
1. Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security (Principles, Theory and Practices) BPB Publications 2018.

CY602PC: CYBER CRIME INVESTIGATION & DIGITAL FORENSICS

B.Tech. III Year II Sem.　　　　　　　　　　　　　　　　　　　　**L　T　P　C**
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Prerequisites
1. Knowledge of computer hardware, operating systems, applications and networking is required.

Course Objectives:
- Know about role of digital devices in cyber crime investigation
- Learn about cyber crime investigation process and methodologies
- An introduction to the methodology and procedures associated with digital forensic analysis in a network environment.

Course Outcomes:
- To obtain and analyze digital information for possible use as evidence in civil, criminal or administrative cases.
- To learn about the importance of digital forensic principles and procedures
- To know legal considerations and digital evidence controls
- To learn about digital forensic tools

UNIT – I
Foundations of Digital Forensics: Digital Evidence, Principles of Digital Forensics, Challenging aspects of Digital Evidence, The Role of computers in crime, Cyber Crime Law.

UNIT – II
Digital Investigations: Digital Investigation process models, Applying Scientific method in Digital Investigations, Handling a digital Crime scene: Fundamental Principles, Surveying and Preserving Digital Investigation.

UNIT - III
Violent Crime and Digital Investigation: The role of Computers in violent crime, Processing Digital crime scene, Investigative Reconstruction, Digital Evidence as Alibi.

UNIT - IV
Cyber stalking, Computer basics for Digital Forensics, Applying Forensics science to computers, Digital Evidence on windows systems, Digital Evidence on Unix systems.

UNIT - V
Network Forensics: Networks basics for Digital Investigators, Applying Forensics science to networks, Digital Evidence on physical and data link layers, Digital Evidence on Network and Transport layers.

TEXT BOOK:
1. Digital Evidence and computer Crime　by Eoghan Casey Academic Press Third Edition.

REFERENCE BOOKS:
1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerback Publications, 2013.
2. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics,
3. J. Sammons, Syngress Publishing, 2012.
4. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010.

CY603PC: ALGORITHMS DESIGN AND ANALYSIS

B.Tech. III Year II Sem.   L   T   P   C
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Prerequisites: Programming for problem solving and Data Structures
Course Objectives:
- Introduces the notations for analysis of the performance of algorithms.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst, average, and best-case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes:
- Analyze the performance of algorithms
- Choose appropriate data structures and algorithm design methods for a specified application
- Understand the choice of data structures and the algorithm design methods

UNIT - I
Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.
Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT - II
Disjoint Sets: Disjoint set operations, union and find algorithms, Priority Queue- Heaps, Heapsort
Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph Coloring, Hamiltonian cycles.

UNIT - III
Dynamic Programming: General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

UNIT - IV
Greedy method: General method, applications- Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.
Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

UNIT - V
Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.
NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

TEXT BOOK:
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.

REFERENCE BOOKS:
1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R.Tamassia, John Wiley and sons.

CY631PE: MOBILE APPLICATION SECURITY (Professional Elective – III)

B.Tech. III Year II Sem.   L   T   P   C
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Course Objectives:
- This course provides a thorough understanding of mobile platforms, including attack surfaces, risk landscape & more.

Course Outcomes:
- Understand common mobile application security vulnerabilities
- Define the security controls of multiple mobile operating systems
- Understand and analyze Bluetooth technology
- understand and analyze overview of SMS security and Enterprise security

UNIT- I
Top Mobile Issues and Development Strategies: Top Issues Facing Mobile Devices, Physical Security, Secure Data Storage (on Disk), Strong Authentication with Poor Keyboards, Multiple-User Support with Security, Safe Browsing Environment, Secure Operating Systems, Application Isolation, Information Disclosure, Virus, Worms, Trojans, Spyware, and Malware, Difficult Patching/Update Process, Strict Use and Enforcement of SSL, Phishing, Cross-Site Request Forgery (CSRF), Location Privacy/Security, Insecure Device Drivers, Multi Factor Authentication, Tips for Secure Mobile Application Development .

UNIT- II
WAP and Mobile HTML Security WAP and Mobile HTML Basics, Authentication on WAP/Mobile HTML Sites, Encryption, Application Attacks on Mobile HTML Sites, Cross-Site Scripting, SQL Injection, Cross-Site Request Forgery, HTTP Redirects, Phishing, Session Fixation, Non-SSL Login, WAP and Mobile Browser Weaknesses, Lack of HTTP Only Flag Support, Lack of SECURE Flag Support, Handling Browser Cache, WAP Limitations.

UNIT- III
Bluetooth Security Overview of the Technology, History and Standards, Common Uses, Alternatives, Future, Bluetooth Technical Architecture, Radio Operation and Frequency, Bluetooth Network Topology, Device Identification, Modes of Operation, Bluetooth Stack, Bluetooth Profiles, Bluetooth Security Features, Pairing, Traditional Security Services in Bluetooth, Security "Non-Features", Threats to Bluetooth Devices and Networks, Bluetooth Vulnerabilities, Bluetooth Versions Prior to v1.2, Bluetooth Versions Prior to v2.1. Security for 1g Wi-Fi Applications, Security for 2g Wi-Fi Applications, Recent Security Schemes for Wi-Fi Applications

UNIT- IV
SMS Security Overview of Short Message Service, Overview of Multimedia Messaging Service, Wireless Application Protocol (WAP), Protocol Attacks, Abusing Legitimate Functionality, Attacking Protocol Implementations, Application Attacks, iPhone Safari, Windows Mobile MMS, Motorola RAZR JPG Overflow, Walkthroughs, Sending PDUs, Converting XML to WBXML.

UNIT- V
Enterprise Security on the Mobile OS Device Security Options, PIN, Remote, Secure Local Storage, Apple iPhone and Keychain, Security Policy Enforcement, Encryption, Full Disk Encryption, E-mail Encryption, File Encryption, Application Sandboxing, Signing, and Permissions, Application Sandboxing, Application Signing, Permissions, Buffer Overflow Protection, Windows Mobile, iPhone, Android, BlackBerry, Security Feature Summary.

TEXT BOOKS:
1. Mobile Application Security, Himanshu Dwivedi, Chris Clark, David Thiel, First edition, Tata McGraw Hill.

REFERENCE BOOKS:
1. Mobile and Wireless Network Security and Privacy, Kami S. Makki, et al, Springer.
2. Android Security Attacks Defenses, Abhishek Dubey, CRC Press.

CY632PE: MACHINE LEARNING (Professional Elective – III)

B.Tech. III Year II Sem.   L T P C
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Course Objectives:
- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

Course Outcomes:
- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensembler to increase the classification accuracy

UNIT - I
Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants: – Perceptron – Linear Separability – Linear Regression.

UNIT - II
Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

UNIT - III
Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

UNIT - IV
Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization
Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms

UNIT - V
Reinforcement Learning – Overview – Getting Lost Example
Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

TEXT BOOKS:
1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

REFERENCE BOOKS:

1. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Datall, First Edition, Cambridge University Press, 2012.
3. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionalsll, First Edition, Wiley, 2014
4. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

CY633PE: DEVOPS (Professional Elective – III)

B.Tech. III Year II Sem.   **L   T   P   C**
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Pre-Requisites:
1. Software Engineering
2. Software Project Management

Course Objectives:
- Understand the skill sets and high-functioning teams involved in Agile , DevOps and related methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle.

Course Outcomes:
- Understand the various components of Devops environment.
- Identify Software development models and architectures of DevOps
- Use different project management and integration tools.
- Select an appropriate testing tool and deployment model for project.

UNIT- I
Introduction to DevOps:
Introduction, Agile development model, DevOps and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, identifying bottlenecks.

UNIT- II
Software development models and DevOps:
DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Micro services and the data tier, DevOps, architecture, and resilience.

UNIT- III
Introduction to project management:
The need for source code control, the history of source code management, Roles and code, source code management system and migrations, shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT- IV
Integrating the system:
Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT- V
Testing Tools and Deployment:
Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development. Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, SaltStack and Docker.

TEXT BOOKS:
1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.
REFERENCE BOOKS:
1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.

CY634PE: MOBILE APPLICATION DEVELOPMENT (Professional Elective – III)

B.Tech. III Year II Sem.   **L   T   P   C**
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Prerequisites
1. Acquaintance with JAVA programming.
2. A Course on DBMS.

Course Objectives
- To demonstrate their understanding of the fundamentals of Android operating systems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

Course Outcomes
- Understand the working of Android OS Practically.
- Develop Android user interfaces
- Develop, deploy and maintain the Android Applications.

UNIT - I
Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes
Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT - II
Android User Interface: Measurements – Device and pixel density independent measuring unit - s Layouts – Linear, Relative, Grid and Table Layouts
User Interface (UI) Components –Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers
Event Handling – Handling clicks or changes of various UI components
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT - III
Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS
Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity
Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT - IV
Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT - V
Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXT BOOK:
1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012

REFERENCE BOOKS:
1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

CY635PE: BLOCKCHAIN TECHNOLOGY (Professional Elective – III)

B.Tech. III Year II Sem.   **L T P C**
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Prerequisites:
1. Knowledge in information security and applied cryptography.
2. Knowledge in Computer Networks

Course Objectives:
- To learn the fundamentals of Blockchain and various types of block chain and consensus mechanisms.
- To understand the public block chain system, Private block chain system and consortium blockchain.
- Able to know the security issues of blockchain technology.

Course Outcomes:
- Understanding concepts behind crypto currency
- Applications of smart contracts in decentralized application development
- Understand frameworks related to public, private and hybrid blockchain
- Create blockchain for different application case studies

UNIT-I
Fundamentals of Blockchain: Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.
Blockchain Types and Consensus Mechanism: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.
Cryptocurrency – Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

UNIT-II
Public Blockchain System: Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.
Smart Contracts: Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

UNIT-III
Private Blockchain System: Introduction, Key Characteristics of Private Blockchain, Need of Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E- commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, ByzantineFault, Multichain.
Consortium Blockchain: Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.
Initial Coin Offering: Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

UNIT-IV
Security in Blockchain: Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

Applications of Blockchain: Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain In Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

UNIT-V
Blockchain Case Studies: Case Study 1 – Retail, Case Study 2 – Banking and Financial Services, Case Study 3 – Healthcare, Case Study 4 – Energy and Utilities.
Blockchain Platform using Python: Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.
Blockchain platform using Hyperledger Fabric: Introduction, Components of Hyper ledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

TEXT BOOK:
1. "Blockchain Technology", Chandramouli Subramanian, Asha A. George, Abhilasj K A and Meena Karthikeyan, Universities Press.

REFERENCE BOOKS:
1. Michael Juntao Yuan, Building Blockchain Apps, Pearson, India.
2. Blockchain Blueprint for Economy, Melanie Swan, SPD O'reilly.
3. Blockchain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gaur, Pearson.

CY611OE: CYBER LAWS (Open Elective – I)

B.Tech. III Year II Sem.   **L T P C**
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Course Objectives:
- Gain an understanding of the evolution and jurisprudence of cyber law in India, including the IT Act 2000.
- Learn about digital signatures, e-governance, and their legal implications under the IT Act.
- Understand the legal framework for electronic contracts, their formation, and international perspectives.
- Explore taxation issues in cyberspace, cybercrimes, electronic evidence, and their adjudication under the IT Act.

Course Outcomes
- Learn evolution and key aspects of Indian cyber law, including recent amendments.
- Gain knowledge about the legalities of digital signatures and the role of e-governance in the IT Act.
- Develop an understanding of the legalities involved in electronic contracts and international conventions.
- Adapt in understanding and analyzing cybercrime, electronic evidence, and intellectual property rights in the context of IT.

UNIT - I
Introduction: History of Internet and World Wide Web, Need for cyber law, Cybercrime on the rise, Important terms related to cyber law.
Cyber law in India: Need for cyber law in India, History of cyber law in India.
Information Technology Act, 2000: Overview of other laws amended by the IT Act, 2000, National Policy on Information Technology 2012.

UNIT - II
Overview of the Information Technology Act, 2000: Applicability of the Act, Important provisions of the Act: Digital signature and electronic signature, Digital Signature under the IT Act, 2000, E-Governance Attribution, Acknowledgement and Dispatch of Electronic Records, Certifying Authorities, Electronic Signature Certificates, Duties of Subscribers, Penalties and Offences, Intermediaries.

UNIT - III
Overview of rules issued under The IT Act, 2000, Electronic Commerce, Electronic Contracts, Cyber Crimes, Cyber Frauds.

UNIT - IV
Regulatory Authorities: Department of Electronics and Information Technology, Controller of Certifying Authorities (CCA), Cyber Appellate Tribunal, Indian Computer Emergency Response Team (ICERT), Cloud Computing, Case Laws.

UNIT - V
Introduction to Cybercrime and procedure to report Cybercrime: procedure to report cybercrime, some basic rules for safe operations of the computer and internet, the criminal law (amendment) act, 2013: legislative remedies for online harassment and cyberstalking in India.

TEXT BOOK:
1. Textbook on "Cyber Law", second edition, Pavan Duggal, Universal Law Publishing.
2. Textbook on "Indian Cyber law on Cybercrimes", Pavan Duggal,

REFERENCE BOOKS:
1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media, 2006.
2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
4. Thomas R Peltier, Justin Peltier and John Blackley," Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996.

CY612OE: ETHICAL HACKING (Open Elective – I)

B.Tech. III Year II Sem.   **L T P C**
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Prerequisites:
1. A course on "Operating Systems".
2. A course on "Computer Networks".
3. A course on "Network Security and Cryptography".

Course Objectives:
- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing security.
- The course includes-Impacts of Hacking; Types of Hackers; Information Security Models;
- Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration).

Course Outcomes:
- Gain the knowledge of the use and availability of tools to support an ethical hack
- Gain the knowledge of interpreting the results of a controlled attack
- Understand the role of politics, inherent and imposed limitations and metrics for planning of a test
- Comprehend the dangers associated with penetration testing

UNIT- I
Introduction: Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration
Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture
Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

UNIT - II
The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

UNIT - III
Preparing for a Hack: Technical Preparation, Managing the Engagement Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance

UNIT - IV
Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase
Exploitation: Intuitive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

UNIT - V
Deliverable: The Deliverable, The Document, Overall Structure, Aligning Findings, Presentation

Integration: Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion.

TEXT BOOK:
1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press.

REFERENCE BOOKS:
1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning.
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning.

CY604PC: CYBER SECURITY ESSENTIALS LAB

B.Tech. III Year II Sem.   **L T P C**
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Prerequisites
- A course on "Network Security and Cryptography"

Course Objectives:
- Understanding Cybersecurity Principles and Techniques
- Application of Security Tools and Methods

Course Outcomes:
1. Practical Skills in Cybersecurity Tools and Techniques
2. Analytical and Problem-Solving Abilities

Lab Experiments
1. Implement and test simple symmetric encryption algorithms like AES and DES.
2. Implement RSA encryption to demonstrate the concept of public and private keys.
3. Set up and configure a basic firewall using tools like iptables on Linux.
4. Demonstrate DNS spoofing and DNS cache poisoning attacks.
5. Set up a proxy server and demonstrate how attackers can use proxies to hide their tracks.
6. Demonstrate basic antiforensics techniques like
      i.   Deleting logs ii. Using steganography tools.
7. Perform SQL injection on a test website and then implement measures to prevent it.
8. Create a simple application vulnerable to buffer overflow and demonstrate how to exploit it.
9. Implement an XSS attack on a test web application and demonstrate ways to mitigate such attacks.
10. Analyze a simple computer virus in a controlled environment and discuss detection and prevention strategies.
11. Investigate the functioning of a rootkit and demonstrate techniques to detect it.
12. Set up a basic IDS like Snort and test its effectiveness in detecting different types of attacks.

TEXT BOOK:
1. James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials", CRC Press, Taylor & Francis Group, 2011.

REFERENCE BOOKS:
1. Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental Of Cyber Security (Principles, Theory and Practices) BPB Publications 2018

CY605PC: CYBER CRIME INVESTIGATION & DIGITAL FORENSICS LAB

B.Tech. III Year II Sem.   **L   T   P   C**
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Course Objectives
- To provide students with a comprehensive overview of collecting, investigating, preserving, and presenting evidence of cybercrime left in digital storage devices, emails, browsers, mobile devices using different Forensics tools
- To Understand file system basics and where hidden files may lie on the disk, as well as how to extract the data and preserve it for analysis.
- Understand some of the tools of e-discovery.
- To understand the network analysis, Registry analysis and analyze attacks using different forensics tools

Course Outcomes
- Learn the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing
- To Learn the file system storage mechanisms and retrieve files in hidden format
- Learn the use of computer forensics tools used in data analysis.
- Learn how to find data that may be clear or hidden on a computer disk, find out the open ports for the attackers through network analysis, Registry analysis.

List of Experiments
1. **Perform email analysis** using the tools like Exchange EDB viewer, MBOX viewer and View user mailboxes and public folders, Filter the mailbox data based on various criteria, Search for particular items in user mailboxes and public folders
2. **Perform Browser history analysis** and get the downloaded content, history, saved logins, searches, websites visited etc using Foxton Forensics tool, Dumpzilla .
3. **Perform mobile analysis** in the form of retrieving call logs, SMS log, all contacts list using the forensics tool like SAFT.
4. **Perform Registry analysis** and get boot time logging using process monitor tool.
5. **Perform Disk imaging and cloning the** using the X-way Forensics tools.
6. **Perform Data Analysis i.e.,** History about open file and folder, and view folder actions using Lastview activity tool.
7. **Perform Network analysis** using the Network Miner tool**.**
8. **Perform information for incident response** using the crowd Response tool
9. **Perform File type detection using** Autopsy tool.
10. **Perform Memory capture and analysis** using the Live RAM capture or any forensic tool.

TEXT BOOKS:
1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerback Publications, 2013.
2. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012.

REFERENCE BOOKS:
1. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010
2. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012
3. Brett shabers, Eric Zimerman, X-ways forensics practitioners guide

CY611PE: MOBILE APPLICATION SECURITY LAB (Professional Elective – III)

B.Tech. III Year II Sem.   **L T P C**
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Course Objectives:
- This course provides a thorough understanding of mobile platforms, including attack surfaces, risk landscape & more.

Course Outcomes:
- Understand common mobile application security vulnerabilities
- Understand and analyze the apks using different tools
- Understand and implement authentication services.

List of Experiments
1. Use the following tools to analyze an apk to detect for any existence of vulnerabilities
    a. QARK
    b. DEVKNOX
    c. OWASP
    d. DROZER
2. Implement Authentication: Single Sign-on
3. Implement Authentication: Two Factor Authentication
4. Demonstrate how to Detect And Remove Malware From Android Phone
5. Demonstrate Remote Lock or Wipe

TEXT BOOK:
1. Mobile Application Security, Himanshu Dwivedi, Chris Clark, David Thiel, First edition, TATA McGraw Hill.

REFERENCE BOOKS:
1. Mobile and Wireless Network Security and Privacy, Kami S.Makki,et al, Springer.
2. Android Security Attacks Defenses, Abhishek Dubey, CRC Press

CY612PE: MACHINE LEARNING LAB (Professional Elective – III)

B.Tech. III Year II Sem.   **L T P C**
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Course Objective:
- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

Course Outcomes:
- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance

List of Experiments
1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

TEXT BOOK:
1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOK:
1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

CY613PE: DEVOPS LAB (Professional Elective – III)

B.Tech. III Year II Sem.   **L T P C**
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Course Objectives:
- Develop a sustainable infrastructure for applications and ensure high scalability. DevOps aims to shorten the software development lifecycle to provide continuous delivery with high-quality.

Course Outcomes:
- Understand the need of DevOps tools.
- Understand the environment for a software application development.
- Apply different project management, integration and development tools.
- Use Selenium tool for automated testing of application.

List of Experiments:
1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application for exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

TEXT BOOK:
1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.

REFERENCE BOOKS:
1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.

CY614PE: BLOCKCHAIN TECHNOLOGY LAB (Professional Elective – III)

B.Tech. III Year II Sem.   **L T P C**
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Prerequisites:
- Knowledge in Basics of JavaScript /Java for Hyperledger Fabric.
- Basics of Solidity for ETH.

Course Objectives:
- To learn the basic blockchain applications.
- To be familiar with the blockchain lab setup.

Course Outcomes:
- Able to work in the field of block chain technologies.

List of Experiments
1. Setup Metamask in the System and Create a wallet in the Metamask with Test Network.
2. Create multiple accounts in Metamask and perform the balance transfer between the accounts and describe the transaction specifications.
3. Setup the Ganache Tool in the system.
4. Create a custom RPC network in Metamask and connect it with Ganache tool and transfer the ether between ganache accounts.
5. Write a smart contract using a solidity program to perform the balance transfer from contract to other accounts.
6. Write a solidity program to perform the exception handling.
7. Setup the Hyperledger Fabric Network with 2 Organizations 1 Peer Each in the system.
8. Create a channel called mychannel, carchannel in the deployed network.
9. Take the existing Fabcar smart contract and add a new function to query the car on the basis of person name and deploy the smart contract on the Hyperledger Fabric Network.
10. Write an SDK program to query the person details from the deployed smart.

TEXT BOOK:
1. Michael Juntao Yuan, Building Blockchain Apps, Pearson.

REFERENCE BOOKS:
1. Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhilasj K A and Meena Karthikeyan, Universities Press.
2. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st ed. Edition, by Daniel Drescher

CY635PE: MOBILE APPLICATION DEVELOPMENT LAB (Professional Elective – III)

B.Tech. III Year II Sem.   **L T P C**
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Course Objectives:
- To learn how to develop Applications in an android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.

Course Outcomes:
- Understand the working of Android OS Practically.
- Develop user interfaces.
- Develop, deploy and maintain the Android Applications.

LIST OF EXPERIMENTS:
1. Create an Android application that shows Hello + name of the user and run it on an emulator.
(b) Create an application that takes the name from a text box and shows hello message along with the name entered in the text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Datepicker), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on the right fragment instead of the second screen with the back button. Use Fragment transactions and Rotation event listeners.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store usernames and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with a Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

TEXT BOOKS:
1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage, 2013.

REFERENCE BOOK:
1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

CY606PC: BIG DATA-SPARK

B.Tech. III Year II Sem.   **L T P C**
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Course Objectives:
- The main objective of the course is to process Big Data with advance architecture like spark and streaming data in Spark

Course Outcomes:
- Develop MapReduce Programs to analyze large dataset Using Hadoop and Spark
- Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components
- Perform the filter, count, distinct, map, flatMap RDD Operations in Spark.
- Build Queries using Spark SQL
- Apply Spark joins on Sample Data Sets
- Make use of sqoop to import and export data from hadoop to database and vice-versa

List of Experiments:
1. To Study of Big Data Analytics and Hadoop Architecture
   (i) know the concept of big data architecture
   (ii) know the concept of Hadoop architecture

2. Loading DataSet in to HDFS for Spark Analysis
   Installation of Hadoop and cluster management
   (i) Installing Hadoop single node cluster in ubuntu environment
   (ii) Knowing the differencing between single node clusters and multi-node clusters
   (iii) Accessing WEB-UI and the port number
   (iv) Installing and accessing the environments such as hive and sqoop

3. File management tasks & Basic linux commands
   (i) Creating a directory in HDFS
   (ii) Moving forth and back to directories
   (iii) Listing directory contents
   (iv) Uploading and downloading a file in HDFS
   (v) Checking the contents of the file
   (vi) Copying and moving files
   (vii) Copying and moving files between local to HDFS environment
   (viii) Removing files and paths
   (ix) Displaying few lines of a file
   (x) Display the aggregate length of a file
   (xi) Checking the permissions of a file
   (xii) Zipping and unzipping the files with & without permission pasting it to a location
   (xiii) Copy, Paste commands

4. Map-reducing
   (i) Definition of Map-reduce
   (ii) Its stages and terminologies
   (iii) Word-count program to understand map-reduce (Mapper phase, Reducer phase, Driver code)
5. Implementing Matrix-Multiplication with Hadoop Map-reduce

6. Compute Average Salary and Total Salary by Gender for an Enterprise.

7. (i) Creating hive tables (External and internal)

(ii) Loading data to external hive tables from sql tables(or)Structured c.s.v using scoop

(iii) Performing operations like filterations and updations

(iv) Performing Join (inner, outer etc)

(v) Writing User defined function on hive tables

8. Create a sql table of employees Employee table with id,designation Salary table (salary ,dept id) Create external table in hive with similar schema of above tables,Move data to hive using scoop and load the contents into tables,filter a new table and write a UDF to encrypt the table with AES-algorithm, Decrypt it with key to show contents

9. (i) Pyspark Definition(Apache Pyspark) and difference between Pyspark, Scala, pandas

   (ii) Pyspark files and class methods

   (iii) get(file name)

   (iv) get root directory()

10. Pyspark -RDD'S

    (i) what is RDD's?

    (ii) ways to Create RDD

    (iii) parallelized collections

    (iv) external dataset

    (v) existing RDD's

    (vi) Spark RDD's operations (Count, foreach(), Collect, join,Cache())

11. Perform pyspark transformations

    (i) map and flatMap

    (ii) to remove the words, which are not necessary to analyze this text.

    (iii) groupBy

    (iv) What if we want to calculate how many times each word is coming in corpus ?

    (v) How do I perform a task (say count the words 'spark' and 'apache' in rdd3) separately on each partition and get the output of the task performed in these partition ?

    (vi) unions of RDD

    (vii) join two pairs of RDD Based upon their key

12. Pyspark sparkconf-Attributes and applications

    (i) What is Pyspark spark conf ()

    (ii) Using spark conf create a spark session to write a dataframe to read details in a c.s.v and later move that c.s.v to another location

TEXT BOOKS:

1. Spark in Action, Marko Bonaci and Petar Zecevic, Manning.
2. PySpark SQL Recipes: With HiveQL, Dataframe and Graphframes, Raju Kumar Mishra and Sundar Rajan Raman, Apress Media.

WEB LINKS:

1. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013301505844518912251 8 2_shared/overview
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01258388119638835242_s hared/overview
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260526842300825616 92 _shared/overview

*MC609: ENVIRONMENTAL SCIENCE

B.Tech. III Year II Sem.	L	T	P	C
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Course Objectives:
* Understanding the importance of ecological balance for sustainable development.
* Understanding the impacts of developmental activities and mitigation measures.
* Understanding the environmental policies and regulations.

Course Outcomes: Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT - I
Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II
Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT - III
Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV
Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT - V
Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:
1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:
1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

CY701PC: VULNERABILITY ASSESSMENT AND PENETRATION TESTING

B.Tech. IV Year I Sem.   **L   T   P   C**
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Prerequisites
1. Knowledge in information security.
2. Knowledge on Web Application.

Course Objectives
- Give an introduction to Vulnerability Assessment and Penetration Testing.
- To be familiar with the Penetration Testing and Tools.
- To get an exposure to Metasploit exploitation tool, Linux exploit and Windows exploit.
- To gain knowledge on Web Application Security Vulnerabilities, Vulnerability analysis and Malware analysis.

Course Outcomes
1. Learn to handle the vulnerabilities of a Web application
2. Able to learn various penetration testing tools.
3. Knowledge on Metasploit, Linux exploit and windows exploit tools
4. Analyze various vulnerabilities

UNIT- I
Introduction
Ethics of Ethical Hacking: Why you need to understand your enemy's tactics, recognizing the gray areas in security, Vulnerability Assessment and Penetration Testing.
Penetration Testing and Tools:
Social Engineering Attacks: How a social engineering attack works, conducting a social engineering attack, common attacks used in penetration testing, preparing yourself for face-to-face attacks, defending against social engineering attacks.

UNIT- II
Physical Penetration Attacks: Why a physical penetration is important? conducting a physical penetration, Common ways into a building, defending against physical penetrations.
Insider Attacks: Conducting an insider attack, defending against insider attacks.
Metasploit: The Big Picture, Getting Metasploit, Using the Metasploit Console to Launch Exploits, Exploiting Client-Side Vulnerabilities with Metasploit, Penetration Testing with Metasploit's Meterpreter, Automating and Scripting Metasploit, Going Further with Metasploit.

UNIT- III
Managing a Penetration Test: planning a penetration test, structuring a penetration test, execution of a penetration test, information sharing during a penetration test, reporting the results of a Penetration Test.
Basic Linux Exploits: Stack Operations, Buffer Overflows, Local Buffer Overflow Exploits, Exploit Development Process.
Windows Exploits: Compiling and Debugging Windows Programs, Writing Windows Exploits, Understanding Structured Exception Handling (SEH), Understanding Windows Memory Protections (XPSP3, Vista, 7 and Server 2008), Bypassing Windows Memory Protections.

UNIT- IV
Web Application Security Vulnerabilities:

Overview of top web application security vulnerabilities, Injection vulnerabilities, cross-Site scripting vulnerabilities, the rest of the OWASP Top Ten SQL Injection vulnerabilities, Cross-site scripting vulnerabilities.

Vulnerability Analysis:
Passive Analysis, Source Code Analysis, Binary Analysis.

UNIT- V
Client-Side Browser Exploits:
Why client-side vulnerabilities are interesting, Internet explorer security concepts, history of client-side exploits and latest trends, finding new browser-based vulnerabilities heap spray to exploit, protecting yourself from client-side exploit.

Malware Analysis: Collecting Malware and Initial Analysis: Malware, Latest Trends in Honeynet Technology, Catching Malware: Setting the Trap, Initial Analysis of Malware.

TEXT BOOKS:
1. Gray Hat Hacking-The Ethical Hackers Handbook", Allen Harper, Stephen Sims, Michael Baucom, 3rd Edition, Tata Mc Graw-Hill.
2. The Web Application Hacker's Handbook-Discovering and Exploiting Security flaws", Dafydd Suttard, Marcus pinto, 1st Edition, Wiley Publishing.

REFERENCE BOOKS:
1. "Penetration Testing: Hands-on Introduction to Hacking", Georgia Weidman, 1st Edition, No Starch Press.
2. The Pen Tester Blueprint-Starting a Career as an Ethical Hacker ", L. Wylie, Kim Crawly, 1st Edition, Wiley Publications.

CY702PC: NETWORK MANAGEMENT SYSTEMS AND OPERATIONS

B.Tech. IV Year I Sem.   **L   T   P   C**
                                                                                    3   0   0   3

Course Objectives:
- Comprehensive understanding of network management.
- Learn about network configurations, security policies, and risk assessments.
- Learn about diagnosing and troubleshooting network faults, performance assessment, and optimization.

Course Outcomes:
- Understanding the challenges and structure of network management in the context of the Internet.
- Defining network management and comprehending its scope, challenges, and variety in multi-vendor environments.
- Identifying and diagnosing network faults, understanding trouble reports, and learning troubleshooting techniques.
- Exploring the various network management tools.

UNIT - I
The Network Management Challenge: Introduction, The Internet and Network Management, Internet Structure, Managing an Entity, Internal and External policies, The state of Network Management, Network Management in the Gartner Model, Benefits of Automation, The Lack of Industry Response, Distributed Systems and new abstractions.
A Review of Network Elements and Services: Introduction, Network Devices and Network Services, Network Elements and Element Management, Effect of physical organization on Management, Examples of Network Elements and Services, Basic Ethernet Switch, VLAN Switch, Access Point for a Wireless LAN,Cable Modem System, DSL Modem System and DSLAM, CSU/DSU used in Wide Area Digital Circuits, Channel Bank, IP Router, Firewall, DNS Server, DHCP Server, Web Server, HTTP Load Balancer.

UNIT - II
The Network Management Problem: Introduction, What is Network Management? The scope of Network Management, variety and multi-vendor environments, element and network management systems, scale and complexity, types of networks, classification of devices.
Configuration and Operation: Introduction, Intuition for configuration, configuration and protocol layering, dependencies among configuration parameters, seeking a more precise definition of configuration, configuration and temporal consequences, configuration and global consistency, global state and practical systems, configuration and default values, partial state, automatic update and recovery, Interface paradigm and incremental configuration, commit and rollback during configuration, automated rollback and timeout, snapshot, configuration, and partial state, separation of setup and activation.

UNIT - III
Fault Detection and Correction: Introduction, Network Faults, Trouble Reports, Symptoms, and causes, Troubleshooting and Diagnostics, Monitoring, Baselines, Items that can be Monitored, Alarms, Logs, and Polling, Identifying the cause of a Fault, Human Failure and Network Faults, Protocol Layering and Faults, Hidden Faults and Automatic Correction, Anomaly Detection and Event Correlation, Fault Prevention.
Performance Assessment and Optimization: Introduction, aspects of performance, Items that can be measured, measures of network performance, application and endpoint sensitivity, degraded service, variance in traffic and congestion, congestion, delay and utilization, local and end-to-end

measurements, passive observation Vs. active probing, bottlenecks and future planning, capacity Planning, planning the capacity of a switch, planning the capacity of a router, planning the capacity of an Internet connection, measuring peak and average traffic on a link, estimated peak utilization and 95th percentile, the relationship between average and peak utilization.

UNIT - IV
Security: Introduction, The illusion of a secure network, security as a process, security terminology and concepts, management goals related to security, Risk Assessment, Security policies, acceptable use policy, basic technologies used for security, management issues and security, Security architecture: Perimeter Vs. Resources, element coordination and firewall unification, resource limits and denial of service, management of authentication, access control and user authentication, management of wireless networks, security of the network, role-based access control, audit trails and security logging, key management.

UNIT - V
Management Tools and Technologies: Introduction, the principle of most recent change, the evolution of Management tools, management tools as applications, using a separate network for management, types of management tools, physical layer testing tools, reachability and connectivity tools (ping), packet analysis tools, discovery tools, device interrogation interfaces and tools, event monitoring tools, triggers, Urgency Levels, and Granularity, events, Urgency Levels and traffic, performance monitoring tools, flow analysis tools, routing and traffic engineering tools, Configuration tools, Security Enforcement tools, Network Planning tools, Integration of Management tools, NOCs and Remote Monitoring, Remote CLI Access, Remote Aggregation Of Management Traffic.

TEXT BOOK:
1. Automated Network Management Systems, D. Comer, Prentice Hall, 2006, ISBN No. 0132393085.

REFERENCE BOOKS:
1. Nagios Core Administration Cookbook - Second Edition, Tom Ryder, 2016, Packt Publishing, ISBN: 781785889332.
2. Terraform: Up and Running, Yevgeniy Brikman, 2017, O'Reilly Media, Inc., ISBN: 9781491977088
3. Applied Network Security Monitoring, Chris Sanders, Jason Smith, Syngress publications.

CY741PE: EDGE ANALYTICS (Professional Elective – IV)

B.Tech. IV Year I Sem.   **L   T   P   C**
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Prerequisites
- A basic knowledge of "Python Programming".

Course Objectives
- The aim of the course is to introduce the fundamentals of Edge Analytics
- The course gives an overview of – Architectures, Components, Communication Protocols and tools used for Edge Analytics

Course Outcomes
- Understand the concepts of Edge Analytics, both in theory and in practical application
- Demonstrate a comprehensive understanding of different tools used at edge analytics
- Formulate, Design and Implement the solutions for real world edge analytics

UNIT- I
Introduction to Edge Analytics
What is edge analytics, Applying and comparing architectures, Key benefits of edge analytics, Edge analytics architectures, Using edge analytics in the real world.

UNIT- II
Basic edge analytics components, Connecting a sensor to the ESP-12F microcontroller, KOM-MICS smart factory platform, Communications protocols used in edge analytics, Wi-Fi communication for edge analytics, Bluetooth for edge analytics communication, Cellular technologies for edge analytics communication, Long-distance communication using LoRa and Signfox for edge analytics.

UNIT- III
Working with Microsoft Azure IoT Hub, Cloud Service providers, Microsoft Azure, Exploring the Azure portal, Azure ioT Hub, Using the Raspberry Pi with Azure IoT edge, Connecting our Raspberry Pi edge device, adding a simulated temperature sensor to our edge device.

UNIT- IV
Using Micropython for Edge Analytics, Understanding Micropython, Exploring the hardware that runs MicroPython, Using MicroPython for an edge analytics application, Using edge intelligence with microcontrollers, Azure Machine Learning designer, Azure IoT edge custom vision.

UNIT- V
Designing a Smart Doorbell with Visual Recognition setting up the environment, Writing the edge code, creating the Node-RED dashboard, Types of attacks against our edge analytics applications, Protecting our edge analytics applications

Text Book:
1. Hands-On Edge Analytics with Azure IoT: Design and develop IoT applications with edge analytical solutions including Azure IoT Edge by Colin Dow

Reference Books:
1. Learn Edge Analytics - Fundamentals of Edge Analytics: Automated analytics at source using Microsoft Azure by Ashish Mahajan

CY742PE: WEB & DATABASE SECURITY (Professional Elective – IV)

B.Tech. IV Year I Sem.   **L T P C**
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Course Objectives
- Give an Overview of information security
- Give an overview of Access control of relational databases

Course Outcomes:
- Understand the Web architecture and applications
- Understand client side and server-side programming
- Understand how common mistakes can be bypassed and exploit the application
- Identify common application vulnerabilities

UNIT - I
The Web Security, The Web Security Problem, Risk Analysis and Best Practices Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification

UNIT - II
The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Anti Theft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications

UNIT - III
Database Security: Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems

UNIT - IV
Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities and

UNIT - V
Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced Location-based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

TEXT BOOKS:
1. Web Security, Privacy and Commerce Simson GArfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends Michael Gertz, Sushil Jajodia

REFERENCE BOOKS:
1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, O'reilly
2. Jonathan LeBlanc Tim Messerschmidt, Identity and Data Security for Web Development - Best Practices, O'reilly
3. McDonald Malcolm, Web Security For Developers, No Starch Press, US

CY743PE: INFORMATION SYSTEM AUDIT AND ASSURANCE (Professional Elective – IV)

B.Tech. IV Year I Sem.   **L T P C**
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Course Objectives:
- Develop Expertise in System Auditing and Control.
- Master Business Continuity and Disaster Recovery Planning.

Course Outcomes:
- Acquire knowledge of the COBIT framework and its application in auditing and assurance services.
- Develop expertise in Internal Control and Information System Audit.
- Learn standard practices, policies, audit planning, and risk assessment to be able to do thorough audits of computer systems.
- Learn to evaluate and manage risks effectively.
- Learn to conduct business impact analyses and develop appropriate disaster recovery strategies.

UNIT - I
System Audit and Assurance: Characteristics of Assurance services, Types of Assurance services, Certified Information system auditor, Benefits of Audits for Organization, COBIT.

UNIT - II
Internal Control and Information System Audit: Internal Control, Detective control, Corrective Control, Computer-Assisted Audit Tools and Techniques.

UNIT - III
Conducting Information System Audit: Standard practices, policies, Audit planning, Risk Assessment, Information gathering techniques, Vulnerabilities, System security testing, Conducting audits for Banks.

UNIT - IV
Audit Control: Network Security and Control, Internet Banking Risks and Control, Operating System Risks and Control, Operational Control Overview

UNIT - V
Business Continuity and Disaster Recovery Planning: Data backup/storage, Developing appropriate Disaster recovery strategy, Business Impact analysis.

TEXT BOOK:
1. Information System Audit and Assurance; D. P. Dube, Ved Prakash Gulati; Tata McGraw- Hill Education, 01-Jan2005

REFERENCE BOOKS:
1. William Stallings and Lawrie Brown, Computer Security: Principles and Practice, Pearson Education.
2. Martin Weiss and Michael G. Solomon, Auditing IT Infrastructures For Compliance (Information Systems Security & Assurance), Jones and Bartlett Publishers, Inc.

CY744PE: SOCIAL MEDIA SECURITY (Professional Elective – IV)

B.Tech. IV Year I Sem.　　　　　　　　　　　　　　　　　　　　**L　T　P　C**
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Course Objectives
- Give introduction about the social networks, its use, the need of security in social data

Course Outcomes
- Learn about browser's risks
- Learn about Social Networking,
- Understand the risks while using social media.
- Understand security of different web browsers.
- Understand threats and safety measures involved using an email communication

UNIT – I
Introduction to Social Media, Understanding Social Media, Different Types and Classifications, The Value of Social Media, Cutting Edge Versus Bleeding Edge, The Problems That Come With Social Media, Is Security Really an Issue? Taking the Good With the Bad

UNIT - II
Dark side Cyber crime, Social Engineering, Hacked accounts, cyber stalking, cyber bullying, predators, phishing, hackers

UNIT – III
Being bold versus being overlooked Good social media campaigns, Bad social media campaigns, sometimes it's better to be overlooked, social media hoaxes, The human factor, Content management, Promotion of social media

UNIT - IV
Risks of Social media Introduction Public embarrassment, Once it's out there, it's out there False information, Information leakage, Retention and archiving, Loss of data and equipment

UNIT – V
Policies and Privacy Blocking users controlling app privacy, Location awareness, Security Fake accounts passwords, privacy and information sharing

TEXT BOOKS:
1. Interdisciplinary Impact Analysis of Privacy in Social Networks,Recognizing Your Digital Friends, Encryption for Peer-to-Peer Social NetworksCrowdsourcing and Ethics, Authors: Altshuler Y, EloviciY, Cremers A.B, Aharony N, Pentland A. (Eds.)
2. Social media security https://www.sciencedirect.com/science/article/pii/B97815974998660000

REFERENCE BOOKS:
1. Michael Cross, Social Media Security Leveraging Social Networking While Mitigating Risk.
2. Online Social Networks Security, Brij B. Gupta, Somya Ranjan Sahoo, Principles, Algorithm, Applications, and Perspectives, CRC press.

CY745PE: DEEP LEARNING (Professional Elective – IV)

B.Tech. IV Year I Sem.   **L T P C**
                                                                                 3 0 0 3

Course Objectives:
- To understand deep Learning algorithms and their applications in real-world data

Course Outcomes:
- Understand machine learning basics and neural networks
- Understand optimal usage of data for training deep models
- Apply CNN and RNN models for real-world data
- Evaluate deep models
- Develop deep models for real-world problems

UNIT - I
Machine Learning Basics
Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning
Deep Feedforward Networks Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT - II
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, Optimization for Training Deep Models, Learning vs Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates

UNIT - III
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

UNIT - IV
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 - V
Practical Methodology: Performance Metrics, 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:
1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.

REFERENCE BOOKS:
1. The Elements of Statistical Learning. Hastie, R. Tibshirani, and J. Friedman, Springer.
2. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.
3. Bishop. C.M., Pattern Recognition and Machine Learning, Springer, 2006.
4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
5. Golub, G.,H., and Van Loan, C.,F., Matrix Computations, JHU Press, 2013.
6. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

CY751PE: QUANTUM COMPUTING (Professional Elective – V)

B.Tech. IV Year I Sem.	**L**	**T**	**P**	**C**
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Course Objectives
- To introduce the fundamentals of quantum computing
- The problem-solving approach using finite dimensional mathematics

Course Outcomes
- Understand basics of quantum computing
- Understand physical implementation of Qubit
- Understand Quantum algorithms and their implementation
- Understand The Impact of Quantum Computing on Cryptography

UNIT - I
History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

UNIT - II
Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

UNIT - III
Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT - IV
Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

UNIT - V
Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

TEXT BOOK:
1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge.

REFERENCE BOOKS:
1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II.
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

CY752PE: DATA ANALYTICS FOR FRAUD DETECTION (Professional Elective – V)

B.Tech. IV Year I Sem.   L T P C
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Course Objectives
- Discuss the overall process of how data analytics is applied
- Discuss how data analytics can be used to better address and identify risks
- Help mitigate risks from fraud and waste for our clients and organizations

Course Outcomes
- Formulate reasons for using data analysis to detect fraud.
- Explain characteristics and components of the data and assess its completeness.
- Identify known fraud symptoms and use digital analysis to identify unknown fraud symptoms.
- Automate the detection process.
- Verify results and understand how to prosecute fraud

UNIT - I
Introduction: Defining Fraud, Anomalies versus Fraud, Types of Fraud, Assess the Risk of Fraud, Fraud Detection, Recognizing Fraud, Data Mining versus Data Analysis and Analytics, Data Analytical Software, Anomalies versus Fraud within Data, Fraudulent Data Inclusions and Deletions

UNIT - II
The Data Analysis Cycle, Evaluation and Analysis, Obtaining Data Files, Performing the Audit, File Format Types, Preparation for Data Analysis, Arranging and Organizing Data Statistics and Sampling, Descriptive Statistics, Inferential Statistics

UNIT - III
Data Analytical Tests: Benford's Law, Number Duplication Test, Z-Score, Relative Size Factor Test, Same-Same-Same Test, Same-Same-Different Test

UNIT - IV
Advanced Data Analytical Tests
Correlation, Trend Analysis, GEL-1 and GEL-2, Skimming and Cash Larceny, Billing schemes: and Data Familiarization, Benford's Law Tests, Relative Size Factor Test, Match Employee Address to Supplier data

UNIT - V
Payroll Fraud, Expense Reimbursement Schemes, Register disbursement schemes

TEXT BOOK:
1. Fraud and Fraud Detection: A Data Analytics Approach by Sunder Gee, Wiley

REFERENCE BOOKS:
1. Blokdyk Gerardus, Data analysis techniques for fraud detection, Create space Independent Publishing Platform
2. Leonard W. Vona, Fraud Data Analytics Methodology: The Fraud Scenario Approach to Uncovering Fraud in Core Business Systems, Wiley

CY753PE: 5G TECHNOLOGIES (Professional Elective – V)

B.Tech. IV Year I Sem.   **L T P C**
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Course Objectives:
- Knowledge on the concepts of 5G and 5G technology and drivers, understand 5G network architecture, components, features and their benefits.

Course Outcomes:
- Understand 5G and 5G Broadband Wireless Communications
- Understand 5G wireless Propagation Channels
- Understand the significance of radio access technologies for 5G
- Analyze Device-to-device (D2D) communications
- Learn Massive MIMO propagation channel models

UNIT - I
Overview of 5G Broadband Wireless Communications: Mobile communications generations: from 1G to 4G, Rationale of 5G - requirements, Standardization activities.

UNIT - II
The 5G wireless Propagation Channels: Channel model requirements, Propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave, MIMO Systems.

UNIT - III
The 5G radio-access technologies: Access design principles for multi-user communications – Orthogonal Frequency Division Multiplexing (OFDM), Filter Bank Multi-Carriers (FBMC) and Universal Filtered Multi-Carrier (UFMC), Multiple Access Techniques – Orthogonal Frequency Division Multiple Accesses (OFDMA), Non-Orthogonal Multiple Accesses (NOMA).

UNIT - IV
Device-to-Device (D2D) Communications– Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

UNIT - V
Millimeter-wave Communications – Spectrum and Regulations, Deployment scenarios, Beam-forming, physical layer techniques.
Massive MIMO propagation channel models, Pilot design for Massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO.

TEXT BOOKS:
1. Afif Osseiran, Jose.F. Monserrat, Patrick Marsch, "Fundamentals of 5G Mobile Networks" , Cambridge University Press.

REFERENCE BOOKS:
1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk "Essentials of LTE and LTE-A", Cambridge University Press
3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, "New Directions in Wireless Communication Systems from Mobile to 5G", CRC Press.
4. Theodore S. Rappaport, Robert W. Heath, Robert C. Danials, James N. Murdock "Millimeter Wave Wireless Communications", Prentice Hall Communications.
5. Martin Sauter "From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband", Wiley-Blackwell.

CY754PE: SECURITY INCIDENT AND RESPONSE MANAGEMENT (Professional Elective – V)

B.Tech. IV Year I Sem.   **L T P C**
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Prerequisites:
- Knowledge of information security and applied cryptography.
- Knowledge of Operating Systems.

Course Objectives:
- Give an introduction to the preparation of inevitable incidents, incident detection and characterization.
- To get exposure to live data collection and forensic duplication.
- To gain knowledge on data collection in Windows, Unix and Mac OS Systems.

Course Outcomes:
- Learn how to handle the incident response management.
- Perform live data collection and forensic duplication.
- Identify network evidence.
- Analyze data to carry out an investigation.
- Knowledge on investigation on Mac and Windows OS systems

UNIT- I
Introduction: Preparing for the inevitable incident: Real-world incident, IR management incident handbook, Pre-incident preparation, preparing the Organization for Incident Response, Preparing the IR team, preparing the Infrastructure for Incident Response.
Incident Detection and Characterization: Getting the investigation started on the right foot, collecting initial facts, Maintenance of Case Notes, Understanding Investigative Priorities.
Discovering the scope of Incident: Examining initial data, Gathering and reviewing preliminary evidence, determining a course of action, Customer data loss scenario, automated clearing fraud scenario.

UNIT- II
Data Collection: Live Data Collection: When to perform live response, Selecting a live response tool, what to collect, collection best practices, Live data collection on Microsoft Windows Systems, Live Data Collection on Unix-based Systems.
Forensic Duplication: Forensic Image Formats, Traditional duplication, live system duplication, Duplication of Enterprise Assets.

UNIT- III
Network Evidence: The case for network monitoring, Types for network monitoring, Setting up a Network Monitoring System, Network Data, Analysis, Collect Logs Generated from Network Events.
Enterprise Services: Network Infrastructure Services, Enterprise Management Applications, Web servers, Database Servers.

UNIT- IV
Data Analysis: Analysis Methodology: Define Objectives Know your data, Access your data, Analyze your data, Evaluate Results.
Investigating Windows Systems: NTFS and File System analysis, prefetch, Event logs, Scheduled Tasks, The Windows Registry, Other Artifacts of Interactive Sessions, Memory Forensics, Alternative Persistence Mechanisms.

UNIT- V
Investigating Mac OS X Systems: HFS and File System Analysis, Core Operating Systems data.
Investigating Applications: What is Application Data? Where is application data stored? General Investigation methods, Web Browser, Email Clients, Instant Message Clients.

TEXT BOOK:
1. "Incident Response and Computer Forensics", Jason T. Luttgens, Mathew Pepe and Kevin Mandia, 3rd Edition, Tata McGraw-Hill Education.

REFERENCE BOOKS:
1. "Cyber Security Incident Response-How to Contain, Eradicate, and Recover from Incidents", Eric. C. Thompson, Apress.
2. "The Computer Incident Response Planning Handbook: Executable Plans for Protecting Information at Risk", N.K. McCarthy, Tata McGraw-Hill.

CS755PE: AUTHENTICATION TECHNIQUES (Professional Elective – V)

B.Tech. IV Year I Sem.   **L   T   P   C**
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Course Objectives:
- Knowledge on concept of authentication types, protocols, physical identification and various authentication algorithms

Course Outcomes:
- Understand different types of authentication techniques
- Understand authentication and Key Transport using Key Cryptography
- Understand different biometric techniques used in authentication.
- Understand the procedure of local authentication and Authentication by Addresses.
- Apply various authentication protocols in different environments and their representation

UNIT - I
Introduction to Authentication: Protocol Architectures, Cryptographic tools, Adversary capabilities, Goals for authentication and key establishment, Tools for verification of Protocols
Authentication Tokens: Tokens, Network Password Sniffing, One-Time Passwords, Man in the middle Attack, IP Hijacking, Incorporating a PIN, Enrolling Users

UNIT- II
Authentication and Key Transport Using Public Key Cryptography: Entity Authentication Protocols: Protocols in ISO/IEC 9798-3, Protocols in ISO/IEC 9798-5, SPLICE/AS, Key Transport Protocols.
Key Agreement Protocols: Introduction, Diffie-Hellman Key Agreement, MTI Protocols, Diffie-Hellman based protocols with Basic Message Format, Diffie-Hellman based protocols with explicit authentication.

UNIT- III
Biometrics: Biometrics, Uses of Biometrics, Biometric Techniques, How Biometrics Work, taking a Biometric Reading, Feedback During Biometric Input, forging a Physical Trait, Building and Matching Patterns, A Trivial Hand Geometry Biometric, Enrolling a User, Biometric Accuracy, Biometric Encryption, Authenticity of Biometric Data, The Problem of Biometric Exploitation

UNIT- IV
Local Authentication: Laptops and Workstations, Workstation Encryption, File Encryption, Volume Encryption, Encryption for Data Protection, Shortcut Attacks on Encryption, Trial-and-Error Attacks on Encryption, Theoretical Guess-Rate Limitations, Key-Handling Issues, Key-Handling Policies, Key Escrow and Crypto Politics
Authentication by Address: Telephone Numbers as Addresses, Identification via Dial-Back, Dial-Up Identification: Caller ID, Network Addresses, Denial of Service Attacks, Effective Source Authentication, Unix Local Network Authentication, Remote Procedure Calls, NFS, and NIS, Authenticating a Geographical Location.

UNIT- V
Indirect Authentication: Indirect Authentication, Network Boundary Control, One-Time Password Products, LAN Resource Control, RADIUS Protocol, Protecting RADIUS Messages, RADIUS Challenge Response, Encrypted Connections and Windows NT, Encrypted Connections, Integrity Protection, Politics, Encryption, and Technical Choices, Windows NT Secure Channels, Secure Channel Keying, Attacks on Secure Channels, Computers' Authentication Secrets

TEXT BOOKS:
1. "Protocols for Authentication and Key Establishment", Colin Boyd and Anish Mathuria, springer, 202.
2. "Authentication: From   Passwords   to   Public   Keys",   Smith, R. E. (2002), United Kingdom: Addison-Wesley.

REFERENCE BOOKS:
1. Biometrics Authentication: A Practical Guide to Fingerprint, Face, Iris, and Speech Recognition by Anil Jain, Arun Ross, and Karthik Nandakumar
2. Kerberos: The Protocol and Its Applications by William Stallings
3. Biometrics Technologies and verification Systems, John Vacca, , Elsevier Inc. , 2007.
4. Pattern Classification, Richard O. Duda, David G.Stork, Peter E. Hart, Wiley 2007.

CY721OE: INFORMATION SYSTEM AUDIT AND ASSURANCE (Open Elective – II)

B.Tech. IV Year I Sem.   **L T P C**
                                                                                                       3 0 0 3

Course Objectives:
- Develop Expertise in System Auditing and Control.
- Master Business Continuity and Disaster Recovery Planning.

Course Outcomes:
- Acquire knowledge of the COBIT framework and its application in auditing and assurance services.
- Develop expertise in Internal Control and Information System Audit.
- Learn standard practices, policies, audit planning, and risk assessment to be able to do thorough audits of computer systems.
- Learn to evaluate and manage risks effectively.
- Learn to conduct business impact analyses and develop appropriate disaster recovery strategies

UNIT - I
System Audit and Assurance: Characteristics of Assurance services, Types of Assurance services, Certified Information system auditor, Benefits of Audits for Organization, COBIT.

UNIT - II
Internal Control and Information System Audit: Internal Control, Detective control, Corrective Control, Computer-Assisted Audit Tools and Techniques.

UNIT - III
Conducting Information System Audit: Standard practices, policies, Audit planning, Risk Assessment, Information gathering techniques, Vulnerabilities, System security testing, Conducting audits for Banks.

UNIT - IV
Audit Control: Network Security and Control, Internet Banking Risks and Control, Operating System Risks and Control, Operational Control Overview

UNIT - V
Business Continuity and Disaster Recovery Planning: Data backup/storage, Developing appropriate Disaster recovery strategy, Business Impact analysis.

TEXT BOOKS:
1. Information System Audit and Assurance; D. P. Dube, Ved Prakash Gulati; Tata McGraw- Hill Education, 01-Jan2005

REFERENCE BOOKS:
1. William Stallings and Lawrie Brown, Computer Security: Principles and Practice, Pearson Education
2. Martin Weiss and Michael G. Solomon, Auditing IT Infrastructures For Compliance (Information Systems Security & Assurance), Jones and Bartlett Publishers, Inc

CY722OE: SOCIAL MEDIA SECURITY (Open Elective – II)

B.Tech. IV Year I Sem.   **L T P C**
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Course Objectives
- Give introduction about the social networks, its use, the need of security in social data

Course Outcomes
- Learn about browser's risks
- Learn about Social Networking,
- Understand the risks while using social media.
- Understand security of different web browsers.
- Understand threats and safety measures involved using an email communication

UNIT - I
Introduction to Social Media, Understanding Social Media, Different Types and Classifications, The Value of Social Media, Cutting Edge Versus Bleeding Edge, The Problems That Come With Social Media, Is Security Really an Issue? Taking the Good With the Bad

UNIT - II
Dark side Cyber crime, Social Engineering, Hacked accounts, cyber stalking, cyber bullying, predators, phishing, hackers

UNIT - III
Being bold versus being overlooked Good social media campaigns, Bad social media campaigns, Sometimes it's better to be overlooked, Social media hoaxes, The human factor, Content management, Promotion of social media

UNIT - IV
Risks of Social media Introduction Public embarrassment, Once it's out there, it's out there False information, Information leakage, Retention and archiving, Loss of data and equipment

UNIT - V
Policies and Privacy Blocking users controlling app privacy, Location awareness, Security Fake accounts passwords, privacy and information sharing

TEXT BOOKS:
1. Interdisciplinary Impact Analysis of Privacy in Social Networks, Recognizing Your Digital Friends, Encryption for Peer-to-Peer Social Networks Crowd sourcing and Ethics, Authors: Altshuler Y, EloviciY, Cremers A.B, Aharony N, Pentland A. (Eds.)
2. Social media security https://www.sciencedirect.com/science/article/pii/B97815974998660000

REFERENCE BOOKS:
1. Michael Cross, Social Media Security Leveraging Social Networking While Mitigating Risk
2. Online Social Networks Security, Brij B. Gupta, Somya Ranjan Sahoo, Principles, Algorithm, Applications, and Perspectives, CRC press

CY703PC: VULNERABILITY ASSESSMENT & PENETRATION TESTING LAB

B.Tech. IV Year I Sem.	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Objectives:
- Learning Penetration Testing methodologies
- Monitoring the network traffic
- To understand the host and services discovery

Course Outcomes:
- Design for monitoring network traffic.
- Perform different penetration testing methods.
- Design different types of vulnerabilities scanning.
- Understand web application assessment.

List of Experiments:
1. Implement Monitoring of Network Traffic using
    a. wireshark
    b. tcpdump
    c. Nagios
    d. solarwinds
2. Implement Host & Services Discovery using Nmap, massscan.
3. Implement Vulnerability Scanning using OpenVAS, Zapproxy, SQLmap.
4. Implement Internal Penetration Testing.
    a. Mapping
    b. Scanning
    c. Gaining access through CVE's
    d. Sniffing POP3/FTP/Telnet Passwords
    e. ARP Poisoning
    f. DNS Poisoning
5. Implement External Penetration Testing.
    a. Evaluating external Infrastructure.
    b. Creating topological map & identifying IP address of target.
    c. Lookup domain registry for IP information.
    d. Examining use of IPV6 at remote location.
6. Implement Vulnerability scanning with Nessus.
7. Implement Vulnerability scanning with openvas.
8. Implement Web application assessment with nikto.
9. Implement Web application assessment with burp suite.
10. Implement Web application assessment with owaspzap,

TEXT BOOKS:
1. " Gray Hat Hacking-The Ethical Hackers Handbook", Allen Harper, Stephen Sims, Michael Baucom, 3rd Edition, Tata Mc Graw-Hill.
2. " The Web Application Hacker's Handbook-Discovering and Exploiting Security flaws", Dafydd Suttard, Marcus pinto, 1st Edition, Wiley Publishing.

REFERENCE BOOKS:
1. "Penetration Testing: Hands-on Introduction to Hacking", Georgia Weidman, 1st Edition, No Starch Press.
2. " The Pen Tester Blueprint-Starting a Career as an Ethical Hacker ", L. Wylie, Kim Crawly, 1st Edition, Wiley Publications.

CY704PC: NETWORK MANAGEMENT SYSTEMS AND OPERATIONS LAB

B.Tech. IV Year I Sem.   **L   T   P   C**
                                                                                             0   0   2   1

Course Objectives:
- Comprehensive understanding of network management.
- Learn about network configurations, security policies, and risk assessments.
- Learn about diagnosing and troubleshooting network faults, performance assessment, and optimization.

Course Outcomes:
- Understanding the challenges and structure of network management in the context of the Internet.
- Defining network management and comprehending its scope, challenges, and variety in multi-vendor environments.
- Identifying and diagnosing network faults, understanding trouble reports, and learning troubleshooting techniques.
- Exploring the various network management tools.

List of Experiments:
1. Network Discovery and Mapping
     A. Utilize tools like Nmap and Wireshark to perform network discovery.
     B. Create a visual map of the network infrastructure.
     C. Analyze the implications of the network structure on management strategies.

2. Policy Implementation and Compliance
     A. Use tools like Snort or Suricata for intrusion detection.
     B. Implement firewall rules with tools such as iptables or pfSense.
     C. Assess compliance with security policies and regulatory requirements.

3. Automation with Ansible
     A. Set up Ansible for network configuration management.
     B. Automate routine tasks such as software updates and configuration changes.
     C. Evaluate the impact of automation on efficiency and responsiveness.
4. Fault Detection with Wireshark and Nagios
5. Protocol Analysis with Tcpdump
6. Traffic Analysis with Wireshark and Bandwidthd
7. Traffic Measurement with Ntopng
8. Threat Modeling with OWASP Cornucopia
9. Risk Assessment with OpenVAS
10. Firewall Configuration with pfSense
11. Network Discovery with Nmap
12. Security Enforcement with Snort

TEXT BOOK:
1. Automated Network Management Systems, D. Comer, Prentice Hall, 2006, ISBN No. 0132393085.

REFERENCE BOOKS:
1. Nagios Core Administration Cookbook - Second Edition, Tom Ryder, 2016, Packt Publishing, ISBN: 781785889332.
2. Terraform: Up and Running, Yevgeniy Brikman, 2017, O'Reilly Media, Inc., ISBN: 9781491977088

CY801PC: ORGANIZATIONAL BEHAVIOUR

B.Tech. IV Year II Sem.   **L T P C**
                                                                      3 0 0 3

Course Objectives:
- This course demonstrates individual, group behavior aspects: The dynamics of organizational climate, structure and its impact on Organizations.

Course Outcomes:
- Students understand their personality, perception and attitudes for overall development and further learn the importance of group behavior in the organizations.

UNIT - I Organizational Behaviour
Definition, need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models.

UNIT - II Individual Behaviour
Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories – Organizational behaviour modification, Misbehaviour – Types – Management Intervention. Emotions - Emotional Labour – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Formation – Measurement- Values. Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management. Motivation – importance – Types – Effects on work behavior.

UNIT - III Group Behaviour
Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Team building - Interpersonal relations – Communication – Control.

UNIT - IV Leadership and Power
Meaning – Importance – Leadership styles – Theories of leadership – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

UNIT - V Dynamics of Organizational Behaviour
Organizational culture and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change – Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life. Organizational development – Characteristics – objectives –. Organizational effectiveness

TEXT BOOKS:
1. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.
2. Fred Luthans, Organisational Behavior, McGraw Hill, 11th Edition, 2001.

REFERENCE BOOKS:
1. Schermerhorn, Hunt and Osborn, Organisational behavior, John Wiley, 9th Edition, 2008.
2. Udai Pareek, Understanding Organisational Behaviour, 2nd Edition, Oxford Higher Education, 2004.

CY861PE: QUANTUM CRYPTOGRAPHY (Professional Elective – VI)

B.Tech. IV Year II Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Prerequisites:
1. Quantum computing

Course Objectives
* Objective of the course is to build quantum-preparedness for the post quantum era.

Course Outcomes
* Basic understanding about quantum information and computation.
* Understand attack Strategies on QKD Protocols
* Analyze and understand statistical analysis of QKD Networks in Real-Life Environment
* Apply Quantum-cryptographic networks

UNIT - I
Quantum Information Theory, Unconditional Secure Authentication, Entropy, Quantum Key Distribution, Quantum Channel, Public Channel, QKD Gain, Finite Resources

UNIT - II
Adaptive Cascade Introduction, Error Correction and the Cascade Protocol, Adaptive Initial Block-Size Selection, Fixed Initial Block-Size, Dynamic Initial Block-Size, Examples

UNIT - III
Attack Strategies on QKD Protocols: Introduction, Attack Strategies in an Ideal Environment, Individual Attacks in an Realistic Environment QKD Systems: Introduction, QKD Systems

UNIT - IV
Statistical Analysis of QKD Networks in Real-Life Environment: Statistical Methods, Statistical Analysis QKD Networks Based on Q3P: QKD Networks, PPP, Q3P, Routing, Transport

UNIT - V
Quantum-Cryptographic Networks from a Prototype to the Citizen: The SECOQC Project, How to Bring QKD into the "Real" Life The Ring of Trust Model: Introduction, Model of the Point of Trust, Communication in the Point of Trust Model, Exemplified Communications, A Medical Information System Based on the Ring of Trust

TEXT BOOK:
1. Kollmitzer C., Pivk M. (Eds.), Applied Quantum Cryptography, Lect. Notes Phys. 797 (Springer, Berlin Heidelberg 2010).

REFERENCE BOOKS:
1. Gerald B. Gilbert, Michael Hamrick, and Yaakov S. Weinstein, Quantum Cryptography, World Scientific Publishing.
2. Gilles Van Assche, Quantum Cryptography and Secret-Key Distillation, Cambridge University Press.

CY862PE: IOT CLOUD PROCESSING AND ANALYTICS (Professional Elective – VI)

B.Tech. IV Year II Sem.   **L T P C**
                                                                               3 0 0 3

Course Objectives
- To analyze the data generated from IoT device, store in cloud, to be able to manage IoT data stored in cloud

Course Outcomes
- Learn IoT Big data challenges
- Integrate Cloud and Big Data for IOT analytics
- Analyze sensor data streams for events
- Know open source framework for IoT analytics
- Review tools for semantic and data stream analytics

UNIT - I
Introducing IoT Analytics
IoT Data and BigData, Challenges of IoT Analytics, Applications, IoT Analytics Lifecycle and Techniques IoT
Cloud and Big Data Integration for IoT Analytics
Introduction, IaaS, PaaS and SaaS Paradigms, Requirements of IoT Big Data Analytics, Platform 3, Functional Architecture, Data Analytics for the IoT, Data Collection Using Low-power, Long-range Radios, WAZIUP Software Platform, iKaaS Software Platform

UNIT - II
Searching the Internet of Things
Introduction, A Search Architecture for Social and Physical Sensors, Local Event Retrieval, Using Sensor Metadata Streams to Identify Topics of Local, Events in the City, Venue Recommendation

UNIT - III
Development Tools for IoT Analytics Applications
Introduction, Related Work, The VITAL Architecture for IoT Analytics Applications, VITAL Development Environment, Development Examples

UNIT - IV
An Open Source Framework for IoT Analytics as a Service
Introduction, Architecture for IoT Analytics-as-a-Service, Sensing-as-a-Service Infrastructure Anatomy, Scheduling, Metering and Service Delivery, Sensing-as-a-Service Example, From Sensing-as-a-Service to IoT-Analytics- as-a-Service

UNIT - V
A Review of Tools for IoT Semantics and Data Streaming Analytics
Introduction, Related Work, Semantic Analysis, Tools and Platforms
Data Analytics for Smart Cities
Introduction, Cloud-based IoT Analytics, Cloud-based City Platform, Solutions, Edge, State of the Art, Edge-based City Platform, Workflow ,Task and Topology, IoT-friendly Interfaces, Use Case of Edge-based Data Analytics

TEXT BOOKS:
1. Building Blocks for IoT Analytics by John Soldatos, River Publisher

REFERENCE BOOKS:
1. Analytics for the Internet of Things (IoT)by Andrew miller, Packt Publishing.
2. Big Data Analytics for Internet of Things by Tausifa Jan Saleem, Mohammad Ahsan Chishti, Wiley Publishing.

CY863PE: CLOUD SECURITY (Professional Elective – VI)

B.Tech. IV Year II Sem.   **L T P C**
                                                                      3 0 0 3

Pre-requisites:
- Computer Networks, Cryptography and Network Security, Cloud Computing.

Course Objectives:
- To understand the fundamentals concepts of cloud computing.
- To understand the cloud security and privacy issues.
- To understand the Threat Model and Cloud Attacks
- To understand the Data Security and Storage

Course Outcomes:
- Acquire the knowledge on fundamentals concepts of cloud computing.
- Distinguish the various cloud security and privacy issues.
- Analyze the various threats and Attack tools
- Understand the Data Security and Storage concepts.

UNIT - I
Overview of Cloud Computing: Introduction, Definitions and Characteristics, Cloud Service Models, Cloud Deployment Models, Cloud Service Platforms, Challenges Ahead.
Introduction to Cloud Security: Introduction, Cloud Security Concepts, CSA Cloud Reference Model, NIST Cloud Reference Model, NIST Cloud Reference Model.

UNIT - II
Cloud Security and Privacy Issues: Introduction, Cloud Security Goals/Concepts, Cloud Security Issues, Security Requirements for Privacy, Privacy Issues in Cloud.
Infrastructure Security: The Network Level, the Host Level, The Application Level, SaaS Application Security, PaaS Application Security, IaaS Application Security.

UNIT – III
Threat Model and Cloud Attacks: Introduction, Threat Model- Type of attack entities, Attack surfaces with attack scenarios, A Taxonomy of Attacks.
Attack Tools: Network-level attack tools, VM-level attack tools, VMM attack tools, Security Tools, VMM security tools.

UNIT - IV
Information Security Basic Concepts: an Example of a Security Attack, Cloud Software Security Requirements, Rising Security Threats.
Data Security and Storage: Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security.

UNIT - V
Evolution of Security Considerations: Security Concerns of Cloud Operating Models, Identity Authentication, Secure Transmissions, Secure Storage and Computation, Security Using Encryption Keys, Challenges of Using Standard Security Algorithms, Variations and Special Cases for Security Issues with Cloud Computing, Side Channel Security Attacks in the Cloud.
Security Management in the Cloud: Security Management Standards, Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management.

TEXT BOOKS:
1. Cloud Security Attacks, Techniques, Tools, and Challenges by Preeti Mishra, Emmanuel S Pilli, Jaipur R C Joshi Graphic Era, 1st Edition published 2022 by CRC press.
2. Cloud Security and Privacy by Tim Mather, Subra Kumaraswamy, and Shahed Lati First Edition, September 2019.
3. Cloud Computing with Security and Scalability, Concepts and Practices by Naresh Kumar Sehgal, Pramod Chandra P. Bhatt, John M. Acken · Springer International Publishing 2022.

REFERENCE BOOKS:
1. Essentials of Cloud Computing by K. Chandrasekaran Special Indian Edition CRC press.
2. Cloud Computing Principles and Paradigms by Rajkumar Buyya, John Wiley.

CY864PE: DIGITAL WATERMARKING AND STEGANOGRAPHY (Professional Elective – VI)

B.Tech. IV Year II Sem.   **L   T   P   C**
                                                                                   3   0   0   3

Course Objectives:
- To learn about the watermarking models and message coding
- To learn about watermark security and authentication.
- To learn about steganography Perceptual models

Course Outcomes:
- Know the History and importance of watermarking and steganography.
- Analyze Applications and properties of watermarking and steganography.
- Demonstrate Models and algorithms of watermarking.
- Possess the passion for acquiring knowledge and skill in preserving authentication of Information.
- Identify the theoretic foundations of steganography and steganalysis.

UNIT - I
Introduction: Information Hiding, Steganography and Watermarking, History of watermarking, Importance of digital watermarking, Applications and Properties, Evaluating watermarking systems. Watermarking models & message coding, Notation, Communications, Communication-based models, Geometric models, Mapping messages into message vectors, Error correction coding, Detecting multi-symbol watermarks.

UNIT - II
Watermarking with side information &analyzing errors: Informed Embedding, Informed Coding – Structured dirty-paper codes, Message errors, False positive errors, False negative errors, ROC curves – Effect of whitening on error rates.

UNIT - III
Perceptual models: Evaluating perceptual impact, General form of a perceptual model, Examples of perceptual models, Robust watermarking approaches, Redundant Embedding, Spread Spectrum Coding, Embedding in Perceptually significant coefficients.

UNIT - IV
Watermark security & authentication: Security requirements, Watermark security and cryptography, Attacks, Exact authentication, Selective authentication, Localization, Restoration.

UNIT - V
Steganography: Steganography communication, Notation and terminology, Information, theoretic foundations of steganography, Practical steganographic methods, Minimizing the embedding impact, Steganalysis.

TEXT BOOKS:
1. Digital Watermarking and Steganography, Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, Morgan Kaufmann Publishers, New York, 2008.

REFERENCE BOOKS:
1. Techniques and Applications of Digital Watermarking and Contest Protection, Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, Artech House, London, 2003.
2. Digital Watermarking for Digital Media, Juergen Seits, IDEA Group Publisher, New York, 2005.
3. Disappearing Cryptography – Information Hiding: Steganography & Watermarking, PeterWayner, Morgan Kaufmann Publishers, New York, 2002.

CY865PE: DATA PRIVACY (Professional Elective – VI)

B.Tech. IV Year II Sem.	L	T	P	C
	3	0	0	3

Course Objectives:
- Instill an understanding of the essential importance of data privacy.
- Classify the necessary statistical and computational techniques essential for data sharing, particularly emphasizing applications in social and health sciences.
- Develop the foundational principles in architecture, algorithms, and technology for the preservation and maintenance of data privacy.

Course Outcomes:
- Outline essential rules and principles for safeguarding privacy and personally identifiable information.
- Develop data that facilitates meaningful statistical inference while minimizing the exposure of sensitive information.
- Identify potential threats related to different types of anonymized data.
- Classify and evaluate methods for generating test data with a focus on both privacy and utility considerations.

UNIT - I
Introduction to Data Privacy: Overview of Data Privacy, Importance of Data Privacy, Protecting Sensitive Data, Use Cases for Data Sharing, Methods of Protecting Data, Balancing Data Privacy and Utility, Introduction to Anonymization Design Principles.
Nature of Data in the Enterprise: Multidimensional Data, Transaction Data, Longitudinal Data, Graph Data, Time Series Data.

UNIT - II
Static Data Anonymization I: Multidimensional Data: -Introduction, Classification of Privacy-Preserving Methods, Classification of Data in a Multidimensional Data: Protecting explicit identifiers protecting Quasi-identifiers, Group Based Anonymization: k-Anonymization, I-Diversity, t-Closeness, Algorithm Comparison.

UNIT - III
Static Data Anonymization II: Complex Data Structures- Introduction, Privacy Preserving Graph Data, Privacy-Preserving Time Series Data, Privacy Preservation of Longitudinal Data, Privacy Preservation of Transaction Data.

UNIT - IV
Threats to Anonymized Data: Threats to Anonymized Data, Threats to Data Structures, Multidimensional Data, Longitudinal Data, Graph Data, Time Series Data, Transaction Data, Threats by Anonymization Techniques: Randomization, k-Anonymization, I-diversity, t-closeness.

UNIT - V
Privacy-Preserving Data Mining: Introduction, Data Mining: Key Functional Areas of Multidimensional Data, Privacy-Preserving Test Data Manufacturing, Test Data Fundamentals, Privacy Preservation of Test Data.
Synthetic Data Generation: Introduction, Synthetic Data and Their Use, Privacy and Utility in Synthetic Data, Dynamic Data Protection: Tokenization Introduction, Understanding Tokenization, Use Cases for Dynamic Data Protection, Benefits of Tokenization Compared to Other Methods, Components for Tokenization.

TEXT BOOKS:

1. Nataraj Venkataramanan, Ashwin Sriram, *Data Privacy: Principles and Practice*, 2016, 1st Edition, Taylor & Francis. (ISBN No.: 978-1-49-872104-2), United Kingdom.

REFERENCE BOOKS:

1. B. Raghunathan, the Complete Book of Data Anonymization: From Planning to Implementation, 1st Edition, CRC press.
2. L. Sweeney, Computational Disclosure Control: A Primer on Data Privacy Protection, MIT Computer Science, 2002.
3. Nishant Bhajaria, Data Privacy: A runbook for engineers, Manning Publications.

CY861OE: 5G TECHNOLOGIES (Open Elective – III)

B.Tech. IV Year II Sem.   **L T P C**
                                                                            3 0 0 3

Course Objectives:
- Knowledge on the concepts of 5G and 5G technology and drivers, understand 5G network architecture, components, features and their benefits.

Course Outcomes:
- Understand 5G and 5G Broadband Wireless Communications
- Understand 5G wireless Propagation Channels
- Understand the significance of radio access technologies for 5G
- Analyze Device-to-device (D2D) communications
- Learn Massive MIMO propagation channel models

UNIT - I
Overview of 5G Broadband Wireless Communications: Mobile communications generations: from 1G to 4G, Rationale of 5G - requirements, Standardization activities.

UNIT - II
The 5G wireless Propagation Channels: Channel model requirements, Propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave, MIMO Systems.

UNIT - III
The 5G radio-access technologies: Access design principles for multi-user communications – Orthogonal Frequency Division Multiplexing (OFDM), Filter Bank Multi-Carriers (FBMC) and Universal Filtered Multi-Carrier (UFMC), Multiple Access Techniques – Orthogonal Frequency Division Multiple Accesses (OFDMA), Non-Orthogonal Multiple Accesses (NOMA).

UNIT - IV
Device-to-Device (D2D) Communications– Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

UNIT - V
Millimeter-wave Communications – Spectrum and Regulations, Deployment scenarios, Beam-forming, physical layer techniques.
Massive MIMO propagation channel models, Pilot design for Massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO.

TEXT BOOK:
1. Afif Osseiran, Jose.F. Monserrat, Patrick Marsch, "Fundamentals of 5G Mobile Networks" , Cambridge University Press.

REFERENCE BOOKS:
1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk "Essentials of LTE and LTE-A", Cambridge University Press
3. Athanasios G. Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, "New Directions in Wireless Communication Systems from Mobile to 5G", CRC Press.
4. Theodore S. Rappaport, Robert W. Heath, Robert C. Danials, James N. Murdock "Millimeter Wave Wireless Communications", Prentice Hall Communications.
5. Martin Sauter "From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband", Wiley-Blackwell.

CY862OE: DATA PRIVACY (Open Elective – III)

B.Tech. IV Year II Sem.   **L T P C**
                                                               3 0 0 3

Course Objectives:
- Instill an understanding of the essential importance of data privacy.
- Classify the necessary statistical and computational techniques essential for data sharing, particularly emphasizing applications in social and health sciences.
- Develop the foundational principles in architecture, algorithms, and technology for the preservation and maintenance of data privacy.

Course Outcomes:
- Outline essential rules and principles for safeguarding privacy and personally identifiable information.
- Develop data that facilitates meaningful statistical inference while minimizing the exposure of sensitive information.
- Identify potential threats related to different types of anonymized data.
- Classify and evaluate methods for generating test data with a focus on both privacy and utility considerations.

UNIT - I
Introduction to Data Privacy: Overview of Data Privacy, Importance of Data Privacy, Protecting Sensitive Data, Use Cases for Data Sharing, Methods of Protecting Data, Balancing Data Privacy and Utility, Introduction to Anonymization Design Principles.
Nature of Data in the Enterprise: Multidimensional Data, Transaction Data, Longitudinal Data, Graph Data, Time Series Data.

UNIT - II
Static Data Anonymization I: Multidimensional Data: Introduction, Classification of Privacy-Preserving Methods, Classification of Data in a Multidimensional Data: Protecting explicit identifiers protecting Quasi-identifiers, Group Based Anonymization: k-Anonymization, I-Diversity, t-Closeness, Algorithm Comparison.

UNIT- III
Static Data Anonymization II: Complex Data Structures- Introduction, Privacy Preserving Graph Data, Privacy-Preserving Time Series Data, Privacy Preservation of Longitudinal Data, Privacy Preservation of Transaction Data.

UNIT- IV
Threats to Anonymized Data: Threats to Anonymized Data, Threats to Data Structures, Multidimensional Data, Longitudinal Data, Graph Data, Time Series Data, Transaction Data, Threats by Anonymization Techniques: Randomization, k-Anonymization, I-diversity,t-closeness.

UNIT-V
Privacy-Preserving Data Mining: Introduction, Data Mining: Key Functional Areas of Multidimensional Data, Privacy-Preserving Test Data Manufacturing, Test Data Fundamentals, Privacy Preservation of Test Data.
Synthetic Data Generation: Introduction, Synthetic Data and Their Use, Privacy and Utility in Synthetic Data, Dynamic Data Protection: Tokenization Introduction, Understanding Tokenization, Use Cases for Dynamic Data Protection, Benefits of Tokenization Compared to Other Methods, Components for Tokenization.

TEXT BOOK:

1. Nataraj Venkataramanan, Ashwin Sriram, *Data Privacy: Principles and Practice*, 2016, 1st Edition, Taylor & Francis. (ISBN No.: 978-1-49-872104-2), United Kingdom.

REFERENCE BOOKS:

1. B. Raghunathan, the Complete Book of Data Anonymization: From Planning to Implementation, 1st Edition, CRC press.
2. L. Sweeney, Computational Disclosure Control: A Primer on Data Privacy Protection, MIT Computer Science, 2002.
3. Nishant Bhajaria, Data Privacy: A runbook for engineers, Manning Publications.