DEPARTMENT OF COMPUTER APPLICATIONS
SMIT, MAJHITAR

Syllabus Schema For

BACHELOR OF COMPUTER APPLICATIONS (BCA)

(COURSE CURRICULUM)

[4 Years Research Degree]

[*with Lateral Entry and Exit Scheme*]

Total Credits:

22+20+20+22+22+24+24+16=170

(2022-2023 BATCH)

Program Educational Objectives for the BCA Course

The BCA curriculum at SMIT/SMU provides the education and training necessary to accommodate students who want professional preparation in computer applications but do not necessarily have a strong interest in computer systems hardware. Within the curriculum, students study subject matter in fundamentals of computer and peripherals, data structures, programming languages, operating systems, software systems, information and data management, software engineering, principles of programming languages, computer architecture, theory of computation and formal languages, data communication, computer networks, artificial intelligence etc. The course is enriched with three specializations such as - Data Science, Cloud Technology and Network Security.

The BCA students are prepared for employment in application oriented IT sectors and business environments and successful professionals in the field to work with peoples from other disciplines. They are sufficiently prepared to be accepted into or complete advanced degree programs such as M.C.A/M.B.A. In addition to this, since the fourth year is primarily focusing on research based subjects and activities, on completion of the same, students can opt for research based career too.

BCA Program Objectives are:

- To apply their knowledge and skills to succeed in their career and/or obtain an advanced degree.
- To function ethically and responsibly, and to remain informed and involved as full participants in the profession and the society.
- To demonstrate strong communication skills and the ability to function effectively in multi-disciplinary teams.

Lateral Entry/Exit Scheme:

- One Year Certificate in Computer Applications – Students can take entry to the course as per the basic eligibility criteria set by SMU. Students can exit the course after successful completion of one year course curriculum with a skill-set of basic and advanced website/web applications development.
- Two Year Diploma in Computer Applications – Students, who have successfully completed one-year certificate in Computer Applications from SMU or any other UGC recognized university having similar course as per NEP guidelines can take entry to the course. Students can exit the course after successful completion of two years course curriculum with a skill-set of basic and advanced website/web applications development, C programming, Machine Learning, Python, Data Structure and C++.
- Three Year Degree in Computer Applications – Students, who have successfully completed two-year diploma in Computer Applications from SMU or any other UGC recognized university having similar course as per NEP guidelines can take entry to the course. Students can exit the course after successful completion of three years course curriculum with a skill-set of basic and advanced website/web applications development, Database Management, C programming, Machine Learning, Python, Data Structure, C++, Advanced Software/Application Development using .NET platform,

Cyber Ethics and Image Processing through MATLAB.

- Four Year Research Degree in Computer Applications - Students, who have successfully completed three-year degree in Computer Applications from SMU or any other UGC recognized university having similar course as per NEP guidelines can take entry to the course. Students can exit the course after successful completion of four years course curriculum with a skill-set of basic and advanced website/web applications development, Artificial Intelligence, Machine Learning, Python, C++, Advanced Software/Application Development using .NET platform, Cyber Ethics, MATLAB etc. They will also acquire research skills along with knowledge of research paper writing. In addition to this, if any student completes the elective subjects defined for specialization with minimum 60% marks; he/she will be eligible to get a specialization on any one of the domains – Data Science, Cloud Technology and Network Security.

I YEAR – I SEMESTER					
Subject Code	**Subject Name**	**Teaching Department**	**Theory Hours**	**Practical/ Tutorial Hours**	**Credit Points**
MA10123A	MATHEMATICS – I	MATHS	3L	1T	4
CA10101A	HTML AND SCRIPTING FOR WEB PAGE DESIGN	CA	3L	1T	4
BA10138A	FUNDAMENTALS OF BUSINESS MANAGEMENT	MGMT	3L	1T	4
CA10102A	C PROGRAMMING - I	CA	3L	1T	4
CA10103A	FUNDAMENTALS OF DIGITAL ELECTRONICS	CA	3L	1T	4
CA10401A	HTML AND SCRIPTING FOR WEB PAGE DESIGN LAB	CA	N/A	2P	1
CA10402A	C PROGRAMMING – I LAB	CA	N/A	2P	1
Total Credits					**22**

I YEAR - II SEMESTER					
Subject Code	**Subject Name**	**Teaching Department**	**Theory Hours**	**Practical/ Tutorial Hours**	**Credit Points**
MA10124A	MATHEMATICS – II	MATHS	3L	1T	4
CA10104A	C PROGRAMMING - II	CA	3L	1T	4
CA10105A	DATABASE MANAGEMENT SYSTEM (DBMS)	CA	3L	1T	4
CA10106A	WEB DEVELOPMENT USING PHP	CA	3L	1T	4
CA10403A	DATABASE MANAGEMENT SYSTEM LAB	CA	N/A	2P	1
CA10404A	C PROGRAMMING - II LAB	CA	N/A	2P	1
CA10405A	PHP LAB	CA	N/A	2P	1
CA10501A	PROJECT BASED LEARNING	CA	N/A	2P	1
Total Credits					**20**

Note: After completion of the First Year and earning of 42 credits student can exit the course with a One Year Certificate in Computer Applications. They will exit with skills such as – Web Page Design (HTML and PHP), Database Management and C programming. The students will also learn dynamic web application development as part of the DBMS lab.

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University Nominee

II YEAR - III SEMESTER					
Subject Code	**Subject Name**	**Teaching Department**	**Theory Hours**	**Practical / Tutorial Hours**	**Credit Points**
MA10125A	MATHEMATICS III	MATHS	3L	1T	4
CA10107A	E – COMMERCE	CA	3L	1T	4
CA10108A	FUNDAMENTALS OF DATA STRUCTURES	CA	3L	1T	4
CA10109A	OBJECT ORIENTED PROGRAMMING USING C++	CA	3L	1T	4
BA10140A	COMMUNICATION SKILL	MGMT	3L	1T	2
CA10406A	DATA STRUCTURES LAB	CA	N/A	2P	1
CA10407A	C++ LAB	CA	N/A	2P	1
Total Credits					**20**

II YEAR - IV SEMESTER					
Subject Code	**Subject Name**	**Teaching Department**	**Theory Hours**	**Practical/ Tutorial Hours**	**Credit Points**
CA10110A	DESIGN & ANALYSIS OF ALGORITHMS (DAA)	CA	3L	1T	4
CA10111A	JAVA PROGRAMMING	CA	3L	1T	4
CA10112A	UNIX AND SHELL PROGRAMMING	CA	3L	1T	4
CA10113A	RECENT TRENDS IN COMPUTER APPLICATIONS	CA	3L	1T	4
CA10114A	DATA COMMUNICATION & NETWORKING	CA	3L	1T	4
CA10408A	DAA LAB	CA	N/A	2P	1
CA10409A	JAVA PROGRAMMING LAB	CA	N/A	2P	1
Total Credits					**22**

Note: After completion of the Second Year and earning of 84 credits student can exit the course with a Two Years Diploma in Computer Applications. They will exit with skills such as – Web Page Design (HTML and PHP), Database Management, C programming, Data Structure and C++, Design and Analysis of Algorithms and Python.

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III YEAR - V SEMESTER					
Subject Code	**Subject Name**	**Teaching Department**	**Theory Hours**	**Practical/ Tutorial Hours**	**Credit Points**
CA10115A	OPERATING SYSTEMS	CA	3L	1T	4
CA10116A	IT LAW AND PRACTICES	CA	3L	1T	4
CA10117A	.NET PROGRAMMING	CA	3L	1T	4
CA103**	ELECTIVE-I	CA	3L	1T	4
CA103**	ELECTIVE-II	CA	3L	1T	4
CA10410A	OPERATING SYSTEMS LAB	CA	N/A	2P	1
CA10411A	. NET LAB	CA	N/A	2P	1
Total Credits					**22**

III YEAR - VI SEMESTER					
Subject Code	**Subject Name**	**Teaching Department**	**Theory Hours**	**Practical/Tutorial Hours**	**Credit Points**
CA10118A	SOFTWARE ENGINEERING	CA	3L	1T	4
CA10119A	PYTHON PROGRAMMING	CA	3L	1T	4
CA103**	ELECTIVE – III	CA	3L	1T	4
CA103**	ELECTIVE – IV	CA	3L	1T	4
CA10412A	SOFTWARE ENGINEERING LAB	CA	N/A	2P	1
CA10413A	PYTHON PROGRAMMING LAB	CA	N/A	2P	1
CA10502A	MINOR PROJECT	CA	N/A	N/A	6
Total Credits					**24**

Note: After completion of the Third Year and earning of 130 credits student can exit the course with a Three Years Degree in Computer Applications. They will exit with skills such as – Web Page Design (HTML and PHP), Database Management, C programming, Python, Data Structure, C++, Application Development using .NET platform, and Cyber Ethics.

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IV YEAR - VII SEMESTER					
Subject Code	**Subject Name**	**Teaching Department**	**Theory Hours**	**Practical/ Tutorial Hours**	**Credit Points**
CA10120A	RESEARCH METHODOLOGY	CA	3L	1T	4
CA103**	ELECTIVE-V	CA	3L	1T	4
CA103**	ELECTIVE-VI	CA	3L	1T	4
GN10101A	UNIVERSAL HUMAN VALUES	CA	2L	0T	2
GN10102A	LEADERSHIP AND BEHAVIOUR MANAGEMENT	CA	2L	0T	2
CA10701A	SEMINAR	CA	N/A	N/A	2
CA10503A	MINOR PROJECT	CA	N/A	N/A	6
Total Credits					**24**

IV YEAR - VIII SEMESTER					
Subject Code	**Subject Name**	**Type**	**Teaching Department**	**Duration**	**Credit Points**
CA10601A	MAJOR PROJECT	Major Project	CA/External Agencies	16 weeks	16
Total Credits					**16**

Note: After completion of the Fourth Year and earning of 170 credits student can exit the course with a Four Years Research Degree in Computer Applications. They will exit with both application development and research skills. The fourth year is basically dedicated to research related subjects and activities. The specializations will be continued with more research insights and a seminar based on the specialization of the student. Faculty mentors will be assigned at the beginning of the semester to each and every student. The minor project in the 7th semester will be based on research works and requires publication of at least one research paper for completion. The 8th semester is fully dedicated to major project which may be carried out in industry or external organization if available. The project may be of application or research. In addition to this, if any student is placed through campus placement drive, there will be provision to carry out/complete the semester/s through MOOC. The department will announce equivalent courses and provisions from time to time.

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LIST OF ELECTIVES – I FOR BCA (V)	
SUB CODE	**SUBJECT**
CA10301A	MOBILE APPLICATION DEVELOPMENT
CA10302A	ARTIFICIAL INTELLIGENCE
CA10303A	WEB TECHNOLOGIES
CA10304A	C# PROGRAMMING

LIST OF ELECTIVES - II FOR BCA (V)		
SPECIALISATION		
V	**DATA SCIENCE**	
	CA10305A	FUNDAMENTALS OF DATA SCIENCE
	CLOUD COMPUTING	
	CA10306A	FUNDAMENTALS OF CLOUD COMPUTING
	NETWORK SECURITY	
	CA10307A	CRYPTOGRAPHY FUNDAMENTALS

LIST OF ELECTIVES – III AND IV FOR BCA (VI)		
SPECIALISATION		
VI	**DATA SCIENCE**	
	CA10308A	DATA ANALYTICS USING PYTHON
	CA10309A	STATISTICAL FOUNDATIONS OF DATA SCIENCE
	CA10310A	MACHINE LEARNING
	CLOUD TECHNOLOGY	
	CA10311A	CLOUD COMPUTING AND SECURITY
	CA10312A	BIG DATA AND ITS APPLICATIONS IN CLOUD
	CA10313A	DISTRIBUTED SYSTEM
	NETWORK SECURITY	
	CA10314A	NETWORK AND INFORMATION SECURITY
	CA10315A	INTERNET SECURITY AND PRIVACY
	CA10316A	SYSTEM AND NETWORK ADMINISTRATION

LIST OF ELECTIVES – V AND VI FOR BCA (VII)		
SPECIALISATION		
VII	**DATA SCIENCE**	
	CA10317A	SECURITY AND PRIVACY FOR DATA SCIENCE
	CA10318A	IMAGE ANALYTICS AND VISUALIZATION
	CA10319A	NATURAL LANGUAGE PROCESSING
	CLOUD TECHNOLOGY	
	CA10320A	EDGE AND FOG COMPUTING
	CA10321A	SCHEDULING IN CLOUD COMPUTING
	CA10322A	CLOUD ARCHITECTURE AND TECHNOLOGY
	NETWORK SECURITY	
	CA10323A	BLOCKCHAIN TECHNOLOGY
	CA10324A	IOT SECURITY AND PRIVACY
	CA10325A	NETWORK SECURITY MANAGEMENT

Minimum No. of Credits to be Earned for Promotion			
Bachelor of Computer Applications			
From	To	Min. Credits to be Earned For Continuation	For Lateral Exit
I Year	II Year	26/42	42
II Year	III Year	56/84	84
III Year	IV Year	86/130	130
Final	Final	170/170	170
Credits:			
Theory paper		4/2 each	
Lab paper		1 each	
Promotion criteria are applicable for year-wise promotion.			

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MA10123A (3L +1T Hrs.)

MATHEMATICS I

Questions to be set: 05 (All Compulsory)

Objectives: Algebra is a consistent computational framework for computer programming. The importance of differentiation as a mathematical tool is obvious in computer application. The use of a symbolic differentiation package such as Maple or Mathematica can solve the problem of obtaining expressions for computer applications.

Pre-requisites: Set theory, permutation and combination, basic concepts of differential calculus and integral calculus, concepts of polynomial

Module	Topics to be covered	Topics	Hrs
Module 1: AP &GP	in class	Laws of indices, Surds, Arithmetic progression: General Term, Arithmetic Mean Summation of A.P. series, Geometric Progression: General term of G.P., Geometric Mean, Summation of G.P.	[8]
	Assignment Topics	AP & GP	
Module 2: Quadratic Equation	in class	Quadratic Equation: Roots of Quadratic Equation Relations between roots and coefficients of quadratic equation. Problems in each case. Basic knowledge in Permutation and Combination, nPr, nCr.	[8]
	Assignment Topics	Quadratic equations	
Module 3: Binomial Theorem & Logarithms	in class	Binomial Theorem; General Term in the Expression : $(x+y)^n, (x-y)^n$ Binomial Coefficients. Logarithms: Definition and Properties of Logarithms, Common Logarithms.	[6]
	Assignment Topics	Binomial expansion and its general terms.	
Module 4: Function of real variable and Differentiation	in class	Function of real variable, different types of functions, examples; limit, continuity, definition with examples. Derivative by First principle for simple functions; simple examples, Geometrical Interpretation. Derivative of sum, product and quotient of two functions, Logarithmic differentiation, simple examples, second order derivative of a simple function. Max. & Min. of a function; simple problems.	[10]

	Assignment Topics	Application of derivatives.	
Module 5: Integration	in class	Integration as inverse of differentiation for different types of functions, method of substitution, integration by parts. Definite Integral, properties of definite integral. Simple problems, geometrical interpretation of definite integral.	[8]
	Assignment Topics	Integration by substitution and definite integrals.	

Text Books:

1. S. N. De: H S Mathematics, U N Dhur Publication.
2. Das and Mukherjee: Differential Calculus, U N Dhur Publication
3. Das and Mukherjee: Integral Calculas, U N Dhur Publication.
4. Hall & Knight: Higher Algebra, Arihant Publications

Reference Books:

1. Shanti Narayan: Differential Calculus , S. Chand and Co.

CA10101A (3L +1T Hrs.)

HTML AND SCRIPTING FOR WEB PAGE DESIGN

Questions to be set: 05 (All Compulsory)

Objectives: In this course, the students will be introduced to the concept of web page designing using HTML, Java scripts. The knowledge of this subject will familiarise the students with web page designing using html and Java scripts.

Pre-requisites: Hands-on with Web pages and basic understanding of programming concepts.

Module	Topics to be covered	Topics	Hrs
Module 1: Introducing Web Pages and understanding HTML documents	in class	An overview of HTML, Adding Some Structure to a Page, Formatting Text and Pages, Linking Pages to the World, Including Pictures in a Page, Creating Lists, Arranging Items within Tables, Getting Feedback with Forms, Splitting a Page into Frames. Understanding the HTML Document Life Cycle: Developing Documents, Planning Document, planning for Maintenance, organizing your Documents, Creating Documents, Testing Documents before Publication.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Formatting the Body Section of your Pages	in class	Using Block-Level Elements to Structure your Documents, Using Text-Level Elements, Using Font-Style Elements, Using Phrase Elements. Understanding the Use of Frames, Creating Frameset Documents, Using Targeted Links, Providing Alternate Content with the No Frames Element, Using INLINE Frame Element to Create Inline Frames.	[11]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Exploring and Navigating Dynamic HTML	in class	Using DHTML in Internet Explorer: Heading and Horizontal Line, Hidden Messages, Messages at the Centre of the Page, Moving boxes, Changeable Box, A Word about Colour, Scripting and Dynamic Effect, The Whole File, Using DHTML in Navigator.	[6]

	Assignment Topics	To be provided by the concern faculty members	
Module 4: Introducing JavaScript [6 Hrs.]	in class	JavaScript and Browsers, JavaScript and Servers, Embedding JavaScript in HTML, JavaScript Comments, Generating HTML, and Variables-Value store houses.	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Creation of Dynamic Web pages using JSP	in class	Dynamic Web Page, Introduction of JSP, Pages Overview, JSP Scripting, Standard Action, Page Directive, Include Directive.	[6]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Sybex, HTML Complete, BPB Publication.
2. Wrox Author Team, Java Server Side Programming -WROX Publication

Reference Books:

1. David Flanagan, Javascript: The Definitive Guide, O'Reily.
2. Jon Duckett, Beginning Web Programming with HTML, XHTML, CSS & JavaScript, Wiley Dreamtech.
3. David R.Brooks, An Introduction to HTML and JavaScript, Springer.
4. Ann Navarro & Todd Stauffer, HTML by Example, PHI.

BA10138A (3L + 1 T Hrs.)

FUNDAMENTALS OF BUSINESS MANAGEMENT

Questions to be set: 05 (All Compulsory)

Objectives: The objective of this course is to enable the students of computer application to understand the basic concepts in book-keeping, accounting and familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights and utilize the same in planning, controlling and decision making process of a business firm.

Pre-requisites: Knowledge in basic concepts of journals, ledger and book-keeping accounting.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction to Book-keeping Accounting.	in class	Introduction to Book-keeping, Objectives and Needs of Book-keeping. Introduction to Accounting, Objectives, Significance, Accounting process, Branches of Accounting, Differences between Book-keeping and Accounting, Users of Financial Statements. Double Entry System and its characteristics, advantages and disadvantages, Single Entry System and its characteristics, advantages and disadvantages, Difference between Double Entry System and Single-Entry System.	[5]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Accounts	in class	Account, Types of Account, Rules of debiting and crediting, Books of Accounts, Journal and its features and advantages, Ledger and its features and advantages.	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Financial Statements	in class	Types of Journals and Ledger, Difference between Journal and Ledger, Preparation of Journal and Ledger. Trial Balance and its characteristics, advantages and disadvantages, Preparation of Trial Balance. Trading and Profit and Loss Account and its significance, Balance Sheet and its significance. Preparation of Trading and Profit and Loss Account and Balance Sheet.	[9]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Consumer and Markets	in class	Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price	[8]

		(MRP), Fair Price, GST, labelling and packaging along with relevant laws, Legal Metrology. Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, and restrictive trade practice.	
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Organizational setup and consumer protection	in class	Advisory Bodies- Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law, who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties, Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.	[12]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Parash Shah, Basis of Financial Accountancy for Management, Oxford Education.
2. A. Mukherjee and M Hanif, Financial Accounting, Mc Grawhill Education.
3. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi

Reference Books:

1. Rober Libby, Patricia Libby and Frank Hodge (2019). Financial Accounting, Mc Grawhill Education.
2. N Ramachandran and Ram Kumar Kakani (20180. Financial Accounting for Management. Mc Grawhill Education.
3. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.
4. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company

CA10102A (3L +1T Hrs.)

C- PROGRAMMING - I

Questions to be set: 05 (All Compulsory)

Objectives: This course covers the fundamentals of computer programming and the basics of the C language. This course covers the fundamental concepts of C such as structure of a C program, variables, constants, data types, storage class, operators, expressions, predefined functions, formatted input/output, logic design and arrays as derived data types. The completion of this course will enable the learners to write programs in C language with basic commands to solve their problems of interest.

Pre-requisites: Knowledge of computers.

Module	Topics to be covered	Topics	Hrs
Method 1: Introduction to Programming Language with C	in class	Levels of Programming Language, Application Programs, System Programs- Operating Systems, Editor, Translator, Linker, Loader. Structured and Object-oriented Programming, Algorithms and Flowcharts. History of C, Importance of C, Basic Structure of a C Program, Sample C Programs, Programming Style, Executing a C Program.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Constants, Variables, Data Types, Operators and Expressions	in class	Introduction, Character Set, Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Declaration of Storage Class, Assigning of Storage Class, Defining Symbolic Constants, declaring a Variable as Constant, Declaring a Variable as Volatile, Overflow and Underflow of Data, Introduction, Different Categories of Operators in C Language, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Type Conversions in Expression, Operator Precedence and Associativity, Mathematical Functions.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Managing Input Output Operations	in class	Introduction, Reading a Character, Writing a Character, Formatted Input, Formatted Output.	[5]
	Assignment Topics	To be provided by the concern faculty members	

Module 4: Decision Making and Branching	in class	Introduction, Decision Making with IF Statement, Simple IF Statement, the IF---ELSE Statement, Nesting of IF---ELSE Statement, the ELSE IF Ladder, the Switch Statement, the?: Operator, the GOTO Statement, Introduction, the WHILE Statement, the DO Statement, the FOR Statement, Jumps in Loops, Concise Test Expressions.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Moule 5: Arrays	in class	Introduction, One-Dimensional Array, Declaration and Initialization of 1-D Array, 2-D Array, Initialization of 2-D Array, Multidimensional Array, Dynamic Arrays.	[5]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. E. Balagurusamy, Programming in ANSI C, Tata McGraw Hill.
2. Kanetkar Y., Let Us C, BPB.

Reference Books:

1. Ashok N. Kamthane, Programming with ANSI and Turbo C, Pearson Education.
2. B.S. Gottfried, Programming with C, Tata McGraw Hill
3. Kernighan and Ritchie, The C Programming, Pearson Education.
4. K. Venugopal, Mastering C, Tata McGraw Hill.

CA10103A (3L +1T Hrs.)

FUNDAMENTALS OF DIGITAL ELECTRONICS

Questions to be set: 05 (All Compulsory)

Objectives: This course covers the topic ranging from understanding of number system, Boolean algebra, logic gates to designing combinational logic circuit, the basic concepts of sequential circuits, flip flops, counters and shift registers. By the end of the course, the learners will acquire knowledge to understand PC hardware and microprocessors at a later stage.

Pre-requisites: No departmental pre-requisite. Knowledge of basic electronics is desirable but not necessary.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction	in class	Number System, Boolean Algebra, De-Morgan's Law, Simplification of Boolean Algebra, Logic Gates, Basic and Universal Gates, K- Map Simplification for 3 Variables and 4 Variables, Tabulation Method.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Combinational Circuit	in class	Introduction to Combinational Circuit, Half Adder Circuit, Full Adder Circuit, Half Subtractor, Full Subtractor, Binary Parallel Adder, Carry Propagation, Magnitude Comparator, Decoder, Encoder, Multiplexer, Demultiplexer Circuit, Design of Code Converter, Parity Bit Generator and Checker.	[12]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Sequential Circuit	in class	Introduction to Flip Flop. Types of Flip Flop: S-R, D, J-K, T, Clocked Flip Flop. S-R Latch, Master-Slave Flip Flop, Realization of One Flip Flop Using Other Flip Flop.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Counter and Shift Registers	in class	Synchronous Counters, Asynchronous Counter, Ring Counter, Serial-In-Parallel Out, Parallel-in-Serial Out, Parallel-in-Parallel Out, Bidirectional Shift Registers.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Memory Organization	in class	Basic cell of static and dynamic RAM, Building large memories using chips, Associative memory, Cache memory organization and Virtual memory organization.	[10]

	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Morris Mano, Digital Logic and Computer Design, PHI .
2. R. P. Jain, Modern Digital Electronics, Tata McGraw Hill.

Reference Books:

1. R.L.Tokheim, Digital Electronics: Principles and Applications, Tata McGraw Hill.
2. W..Gothman, Digital Electronics, PHI.
3. S. Salivahanan & S. Arizavahagan, Digital Circuits and Design, .
4. Malvino Leach, Digital Principles and Application, Tata McGraw Hill.

CA10401A (2Hrs./week)

HTML AND SCRIPTING FOR WEB PAGE DESIGN LAB

Objective: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied /programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10101A – HTML and Scripting for web page design

CA10402A **(2Hrs./week)**

C PROGRAMMING - I LAB

Objective: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied/programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10402A - C Programming – I and associated prerequisites.

MA10124A (3L +1T Hrs.)

MATHEMATICS –II

Questions to be set: 05 (All Compulsory)

Objectives: Linear algebra is used in computer graphics. Basic knowledge of linear algebra such as row-echelon form, LU deposition, linear combination/system, etc. are used in computer programming. Infinite series is used in computer graphics and visual basic. The topics of differential calculus such as, radius of curvature, polar curve, evolute etc are used in artificial intelligence, computer graphics. Differential equations play a prominent role in computer programming such as java, dot net etc.

Pre-requisites: Basic concepts of differential calculus and integral calculus, set theory.

Module	Topics to be covered	Topics	Hrs
Module 1: Differential Calculus	in class	Successive Differentiation, Leibnitz's Theorem, Polar curve, Angle between radius vector and tangent, Angle of intersection between two curves, Derivative of arc (Cartesian and polar), Curvature, Radius of curvature, related problems.	[8]
	Assignment Topics	Evolute.	
Module 2: Theorems		Rolle's Theorem, Mean value theorem (Cauchy's and Lagrange's), Partial derivatives, Euler's theorem, Maxima and Minima of functions of two variables.	[8]
	Assignment Topics	Indeterminant form.	
Module 3: Ordinary Differential Equations I	in class	Definition of order, degree and solutions. Solutions of equation - Homogeneous and non-homogeneous equation, Exact equation, Bernoulli equation.	[8]
	Assignment Topics	Linear equations.	
Module 4: Linear Algebra	in class	Basic Concepts, Matrix Addition, Scalar Multiplication, Matrix Multiplication, Linear System of Equations, Gauss Elimination, Rank of a Matrix, Solution of Linear Systems: Existence, Uniqueness, Determinants, Inverse of a Matrix, Gauss-Jordan Elimination Method.	[8]
	Assignment Topics	Cramer’s Rule.	
Module 5: Infinite Series	in class	Convergence, Divergence, Comparison test, Ratio Test, Cauchy's root test, Cauchy's integral test, Alternating series, Leibnitz's theorem, Expansion of functions into Taylor's and Maclaurin's series.	[8]

	Assignment Topics	Absolute and conditional convergence.	

Textbooks:

1. Shanti Narayan: Differential Calculus, S. Chand & Co.
2. Maity & Ghosh: An introduction to ordinary differential equations; The Central book Agency
3. J. G Chakraborty & P. R. Ghosh: Higher Algebra; U N Dhur Publications.

Reference Books:

1. N. Piskunov: Differential and integral calculus, Vol I & Vol II
2. Hall & Knight: Higher Algebra, Arihant Publications

CA10104A (3L + 1 T Hrs.)

C PROGRAMMING – II

Questions to be set: 05 (All Compulsory)

Objectives: This course covers the concepts of character array and string, the basic operations such as searching and sorting arrays, pointers, structures, unions, dynamic memory allocation in c, and the file management in C. The knowledge of this subject will make the learners skilled programmers in C language.

Pre-requisites: Basic concepts of C programming knowledge

Module	Topics to be covered	Topics	Hrs
Module 1: Character Array and Strings	in class	Introduction. Declaring and Initializing String Variables, Reading Strings from Terminals, Writing Strings to Screen, Arithmetic Operations on Characters, Putting Strings Together, Comparison of Two Strings, String Handling Functions, Table of Strings. Sorting Algorithms- Bubble Sort, Selection Sort, Insertion Sort, Searching Algorithms- Linear Search, Binary Search.	[7]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Pointers	in class	Understanding Pointers, Accessing the Address of a Variable. Declaring and Initializing a Pointer Variable, Accessing a Variable through Pointer, Chain of Pointers and Pointer Expression, Pointer Increment and Scale Factor, Pointers and Arrays, Pointers and Character Strings, Array of Pointers, Pointers as Function Arguments, Function Returning Pointers.	[7]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: User-Defined Data types and functions	in class	Introduction, Function Definition, Need for a User Defined Functions, Elements of a User Defined Function, Return Values and The Return Types, Function Calls, Function Declaration, Category of Functions, Nesting of Functions, Recursion, Passing Arrays to Function, Passing Strings to a Function, Scope, Visibility and Lifetime of a Variable.	[13]

		Defining a Structure, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Copying and Comparing Structure Variables, Operations on Individual Members, Array of Structures, Arrays within Structures, Structures within Structures, Structures and Functions, Unions, Size of Structures.	
	Assignment Topics	To be provided by the concern faculty members	
Module 4: File Management in C	in class	Introduction, Defining and Opening a File, Closing a File, Input/ Output Operations on Files, Error Handling during I/O Operations, Random Access to Files, Command Line Arguments.	[7]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Dynamic Memory Allocation and Linked List	in class	Memory Allocation, Static Memory Allocation, Dynamic Memory Allocation, Static Vs Dynamic Memory Allocation. Definition of malloc, calloc, free and realloc. Basics of Linked List.	[6]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. E. Balagurusamy, Programming in ANSI C, Tata McGraw Hill.
2. Y. Kanetkar, Let Us C, BPB Publication.

Reference Books:

1. Ashok N. Kamthane, Programming with ANSI and Turbo C, Pearson Education.
2. B.S. Gottfried, Programming with C, Tata McGraw Hill
3. Kernighan and Ritchie, The C Programming, Pearson Education.
4. K. Venugopal, Mastering C, Tata McGraw Hill.

CA10105A (3L + 1 T Hrs.)

DATABASE MANAGEMENT SYSTEM

Questions to be set: 05 (All Compulsory)

Objectives: This course provides students with in-depth knowledge of database management systems. It covers the basics of relational database concepts, architecture, models, schemas, database dependencies and normal forms, database design guidelines. It also includes the basics of SQL, transaction processing and concurrency control. Upon successful completion of this course, students will have the skills to analyse business requirements and produce a viable model and implementation of a database to meet such requirements.

Pre-requisites: Programming Concepts.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction	in class	Introduction to Database Management System, Characteristics of the Database Approach, Actors on the Scene, Workers Behind the Scene, Advantages of Using a Database Management System over Traditional File Processing System, Applications of a Database Approach, Database System Concepts and Architecture: Database Models, Schemas and Instances, DBMS Architecture and Data Independence, Database Languages and Interfaces, Classification of Database Management Systems.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: ER Models, Relational Model	in class	Database Modelling using The Entity-Relationship Model, Entity Types, Entity Sets, Attributes and Keys, Relationships, Relationship Types, Roles and Structural Constraints, Weak Entity Types, Naming Conventions and Design Issues, Relational Model Concepts, Relational Model Constraints, Mapping ER diagram to relational schema.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Database Design	in class	Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd	[9]

		Normal Form	
	Assignment Topics	To be provided by the concern faculty members	
Module 4: SQL the Relational Database Standard	in class	Data Definition, Constraints, Basic Queries In SQL, Insert, Update and Delete Statement, Aggregate functions, Join and its types.	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: The relational Algebra and Relational calculus	in class	Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations Examples of Queries in Relational Algebra.	[7]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Elmasri and Navathe, Fundamentals of Database Systems, Addison Wesley.
2. Korth and S.Sudarshan, Database System Concepts, McGraw Hill.

Reference Books:

1. C.J. Date, Introduction to Database Systems, Addison Wesley.
2. Alexis Leon, Mathews Leon, Fundamentals of Database Management Systems, Vijay Nicole Imprints Private Limited.
3. D. J. Ullman, Principles of Database Systems, Computer Science Press.
4. Vij, Fundamentals of Database Management Systems, Excel Books.

CA10106A (3L +1T Hrs.)

WEB DEVELOPMENT USING PHP

Questions to be set: 05 (All Compulsory)

Objectives: This course provides a comprehensive knowledge of web development using PHP. It covers basic programming concepts and logic controls and advanced topics in PHP such as File handling, developing web services and application using PHP. At the end of this course the students are expected to be able to develop PHP based web applications.

Pre-requisites: Knowledge of database management and programming concepts.

Module	Topics to be covered	Topics	Hrs
Module 1: PHP Basics and User defined function	in class	Introduction to PHP, PHP Variable, Static & Global Variable, GET & POST Method, PHP Operator, Conditional Structure & Looping, Structure, Array. Function Argument, Default Argument, Variable Function, Return Function, Variable Length Argument, Function- FUNC_NUM_ARGS, FUNC_GET_ARG, FUNC_GET_ARGS, GETTYPE, SETTYPE, ISSET, UNSET, STRVAL, FLOATVAL, INTVAL, PRINT_R,	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Strings & Math Function	in class	CHR, ORD, STRTOLOWER, STRTOUPPER, STRLEN, LTRIM, RTRIM TRIM, SUBSTR, STRCMP, STRCASECMP, STROPS, STRRPOS, STRSTR, STRISTR, STR_REPLACE, STRREV, ECHO, PRINT, ABS, CEIL, FLOOR, ROUND, FMOD, MIN, MAX, POW, SQRT, RAND), DATE FUNCTION (DATE, GETDATE, SETDATE, CHECKDATE, TIME, MKTIME.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Array Function and File Handling Functions	in class	COUNT, LIST, IN_ARRAY, CURRENT, NEXT, PREVIOUS, END, EACH, SORT, RSORT, ASSORT, ARSORT, ARRAY_MERGE, ARRAY_REVERSE, FOPEN, FREAD, FWRITE, FCLOSE, FILE_EXISTS, IS_READABLE, IS_WRITABLE, FGETS, FGETC, FILE, FILE_GET_CONTENTS, FILE_PUTCONTENTS, FTELL, FSEEK, REWIND, COPY, UNLINK, RENAME,	[8]

		MOVE_UPLOAD_FILE	
	Assignment Topics	To be provided by the concern faculty members	
Module 4: PHP Components	in class	PHP GD Library, PHP Regular Expression, Function, Cookies, Session, Server variable, Database Connectivity with MySQL (Using PhpMyAdmin).	[4]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Advance PHP and Stylesheets	in class	PHP with OOPS, Class, Constructor, Inheritance, Serialize Objects, PHP with XML, XML Overview, Simple XML Functions, PHP with AJAX, AJAX Overview, XMLHttpRreqeust, Introduction of Style Sheet, Types of Style Sheet – Class & ID, CSS Font Property, CSS Text Property, CSS Background Property, CSS Border Property, CSS List Property, CSS Padding Property, CSS Margin Property.	[12]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Steven Holzner, PHP: The Complete Reference, Tata McGraw Hill.
2. Atkinson, Core PHP Programming, Pearson India.

Reference Books:

1. Steve Suehring, PHP6 and MYSQL Bible, Wiley.
2. Ivan Bayross, S. Shah, Applications Development with Oracle & PHP on Linux for Beginners, O'Reilly.
3. N. Elizabeth, J. Gerner, Y. Scouarnec, Beginning PHP5 Apache My SQL Web Development, Wiley.
4. Thomas, Professional PHP, Shroff Publication.

CA10403A (2 Hrs. /week)

DATABASE MANAGEMENT SYSTEM LAB

Objective: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied /programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10105A - Database Management System and associated prerequisites.

The lab will also contain few experiments on NoSQL as per industry demands.

CA10404A (2Hrs./week)

C PROGRAMMING - II LAB

Objective: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied /programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10106A - C Programming – II and associated prerequisites

CA10405A (2Hrs./week)

PHP LAB

Objectives: This course provides a comprehensive knowledge of developing applications in PHP using various concepts like arrays and sessions. To make the students to understand and establish the connectivity between PHP and MySQL. Develop programs to add records, retrieve records and delete records from a table. The outcome of the lab classes must lead to a skilled and self-sustained program and database administrator.

Pre-requisites: Requires knowledge in critical thinking, problem solving and basic concept of project development and management.

CA10501A (2Hrs./week)

PROJECT BASED LEARNING

Objectives: This course provides the integration of knowledge and skills from various areas through more complex investigations and multi-disciplinary projects. Autonomous learning encouraged through independent research of unstructured problems. Teamwork, which helps prepare students for a social environment. The outcome of this learning is to do self-evaluation and self-criticism, which encourages students to see beyond their own ideas and knowledge.

Pre-requisites: Database management systems and programming language knowledge.

MA10125A (3L +1T Hrs.)

MATHEMATICS-III

Questions to be set: 05 (All Compulsory)

Objectives: Numerical analysis is required to create, analyze, and implement algorithms for obtaining numerical solutions to problems involving continuous variables. Descriptive statistics is used in graphical data analysis. Probability is required to construct computer algorithms for generating observations from the various distributions.

Pre-requisite: - MA10123A, MA10124A

Module	Topics to be covered	Topics	Hrs
Module 1: Interpolation	in class	Difference table, Newton's Forward and backward interpolation, Lagange's formula. Numerical Differentiation and integration using Finite differences, trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule.	8
	Assignment Topics	Related Problems	
Module 2: Solutions of algebraic equations	in class	Iterative methods, Bisection method, Newton Raphson method, Regular-Falsi method, Secant method. Solving simultaneous equations using Gauss elimination methods, Gauss Jordan method, gauss - Siedel method, Jacobi Method, Relaxation Method. Power method for finding the largest Eigen Value.	8
	Assignment Topics	Related Problems	
Module 3: Collection of data & Frequency distribution	in class	Need for quantifying data, Quantitative and qualitative data, Frequency distributions - discrete & continuous, Histogram, frequency curve, cumulative frequency curve.	6
	Assignment Topics	Related Problems	
Module 4: Descriptive Statistics	in class	Measures of central tendency: Mean, Median, Mode, Measures of dispersion quartile deviation, standard deviation, coefficient of variation, Skewness, Kurtosis, Correlation and regression.	6
	Assignment Topics	Related problems of Correlation and regression.	
Module 5: Probability Theory	in class	Probability: Basic concepts, Trial, random experiment, sample space, event, equally, likely, mutually exclusive events. Addition and multiplication rules of probability. Independent events, conditional proability, Baye's theorem.	8

	**Assignment Topics	Related problems of compound Probability & Baye's theorem.	

Text Books:

1. S. S. Sastry, An Introductory Methods of Numerical Analysis, PHI
2. N. G. Das: Statistical Methods; McGraw Hill Education.

References:

1. Goon, Gupta and Das Gupta: Fundamental of Statistics (vol I) , The World Press Ltd.
2. N Datta: Computer programming and Numerical Analysis, University Press.

CA10107A (3L +1T Hrs.)

E-COMMERCE

Questions to be set: 05 (All Compulsory)

Objectives: This course provides the basic understanding of Electronic Commerce, Business models, use of electronic media for e-commerce, electronic payment system, understanding of legal issues of e-business, e-commerce infrastructures. At the end of the course, students will be able to explain business technologies, standards and processes involved in implementing e-commerce, learn the usage of information technology in business and to develop simple e-commerce applications.

Pre-requisites: No Departmental pre-requisites. Acquaintance with Internet applications is desirable but not necessary.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction to E-Commerce, Business Strategy in an Electronic Age	in class	Introduction to E-Commerce: Definition of E-commerce, M-Commerce, The Scope of E-Commerce and M-Commerce, E-Commerce trade cycle, Features of E-Commerce, E-Commerce Applications, Benefits and Limitations, Traditional commerce vs. E-Commerce, Electronic Data Interchange (EDI), Types of E-Commerce. Business Strategy in an Electronic Age: Supply Chains, Porter's Value Chain Model, Inter Organizational Value Chains, Competitive Strategy, Porter's Model, Competitive Advantage using E-Commerce.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: E-Commerce Business models, E-Commerce Infrastructure	in class	E-Commerce Business models: Elements of Business models- B2B, B2C, C2C, P2P, M-Commerce business models. E-Commerce Infrastructure- Intranet and Extranet: Categories of network, Internet service provider, virtual private network, Intranet, Extranet, Architecture, Intranet and Extranet Software, Applications of Intranets and Extranets, Web-Based client/ Server system.	[12]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Electronic Payment Systems	in class	Electronic Payment Systems: Introduction, Types of payments, Types of Electronic payment system, Value exchange system, Credit card system, Electronic funds transfer, Electronic cash.	[5]

	Assignment Topics	To be provided by the concern faculty members	
Module 4: E-Commerce Security	in class	E-Commerce Security: Commerce security environment, Type and sources of threats in E-Commerce, Protecting the electronic commerce assets and intellectual property, Firewalls, antivirus, client server protection, Data and message security, digital identification and electronic signature, encryption approach to e commerce security, Security Schemes in Electronic Payment Systems, Secure Electronic Transaction (SET), Secure Socket Layer (SSL).	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Public Policy: From Legal Issues to Privacy	in class	Public Policy: From Legal Issues to Privacy: Understanding ethical, social, and political issues in E-Commerce, Privacy and Information Rights.	[5]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Kenneth C. Laudon, Carol Guercio Traver, E-Commerce-Business, Technology, Society, Pearson Education.
2. David Whitely, E-Commerce, Tata McGraw Hill.
3. E. Turban, J. Lee, D. King, K. Michale Chung, Electronic Commerce, Pearson Education.

Reference Books:

1. Rayport, Introduction to E-Commerce, Tata McGraw Hill.
2. Greenstein, Electronic Commerce, Tata McGraw Hill.
3. Chan Henry, E-commerce Fundamentals and Applications, WILEY.
4. Minoli Daniel, Minoli Emma, Web Commerce Technology Handbook, Tata McGraw Hill.

CA10108A (3L +1T Hrs.)

FUNDAMENTALS OF DATA STRUCTURES

Questions to be set: 05 (All Compulsory)

Objectives: This course covers the organization of information, the implementation of common data structures such as array, lists, stacks, queues, trees, and graphs. It also explores recursion, various searching and sorting algorithms and also the close relationship between data structures and algorithms. By the end of this course, the students will be able to solve problems using appropriate data structures and writing programs for those solutions, assess the impact of choice of a data structure on program's performance and to choose appropriate data structure for a specified problem.

Pre-requisites: CP – I and CP - II.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction and Overview, Arrays	in class	Definitions, Concept of Data Structure, Overview of Data Structure. Arrays: Definitions, Terminologies, 1D Array- Memory Allocation, Representation in Memory, Operations on Array, Application of Arrays, 2D and 3D Array Representation. Various Sorting and Searching Algorithms- Insertion Sort, Selection Sort, Merge Sort, Linear Search, Binary Search.	[12]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Linked Lists,	in class	Linked Lists: Definition, Single Linked List- Representation in Memory, Operations on a Single Linked List, Circular Linked List, Doubly Linked List- Operations on Doubly Linked List.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Stacks, Queues	in class	Stacks: Definition, Array Representation of Stacks, Operations on Stacks- Push, Pop. Queues: Definition, Array Representation of Queue, Operations on Queue: Insertion, Deletion, Various Queue Structure: Circular Queue, Insertion, Deletion Operations on a Circular Queue	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Trees	in class	Trees: Definition, Binary Trees, Representing Binary Trees, Traversing Binary tree, Binary Search Tree, Searching, Inserting and Deleting in a Binary Search tree,	[5]

	Assignment Topics	To be provided by the concern faculty members	
Module 5: Graphs	in class	Graphs: Basic Terminologies, Adjacency Matrix Representation and Adjacency List Representation of Graphs, Graph Traversals: BFS and DFS. Definition of a Spanning Tree.	[5]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. D. Samanta, Classic Data Structures, PHI.
2. Reema Thareja, Data Structures Using C, Oxford University Press.

Reference Books:

1. Horowitz & Sahni, Fundamentals of Data Structures, Galgotia.
2. Tannenbaum, Augustine & Longsu, Data Structures using C and C++, Prentice Hall
3. J.P. Trembly, and P.G Sorenson, An Introduction to Data Structures with Applications, McGraw Hill.
4. S. Lipschutz, Data Structures, Schaum Series.

CA10109A (3L +1T Hrs.)

OBJECT ORIENTED PROGRAMMING USING C++

Questions to be set: 05 (All Compulsory)

Objectives: This course introduces fundamentals and basic principles of object-oriented programming using C++, object-oriented problem solving, program design and development, managing input/output and working with files. By the end of this course, the students will be able to practice the object-oriented programming concepts and techniques, the use of C++ classes and class libraries and to modify existing C++ classes, develop C++ classes for simple applications.

Pre-requisites: Computer Programming concepts.

Module	Topics to be covered	Topics	Hrs
Module 1: Overview of C++, Classes & Objects	in class	Overview of C++: Concept of Object Oriented Programming, Introduction to C++ Classes and Objects, Basic Concepts of OOP. Classes & Objects: Classes, Structure & Classes, Union & Classes, Inline Function, Friend Function, Friend Classes, Scope Resolution Operator, Static Data Member, Static Member Function, Passing Objects to Function, Returning Objects.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Constructor & Destructor, Array, Pointers, Function & Operator Overloading	in class	Constructor & Destructor: Introduction, Constructor, Parameterized Constructor, Multiple Constructors in a Class, Copy Constructor, Destructor. Array, Pointers : Array of Objects, Pointers to Object, Type Checking C++ Pointer, This Pointer, Pointer to Class Members. Function & Operator Overloading: Function Overloading, Overloading Unary and Binary Operators, Overloading << and >>	[11]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Inheritance, Virtual Functions & Polymorphism	in class	Inheritance: Introduction to Inheritance, Types of Inheritance: Single, Multiple, Multilevel, Hierarchical and Hybrid Inheritance, Making Private Member Inheritable, Virtual Base Class, Abstract Class. Virtual Functions & Polymorphism: Virtual Function, Pure Virtual Functions, Early Vs Late Binding.	[9]
	Assignment Topics	To be provided by the concern faculty members	
	in	Templates: Introduction, Class Template and Function	[8]

Module 4: Templates, Managing Console I/O Operations	class	Template. Managing Console I/O Operations: C++ Stream, C++ Stream Classes, Unformatted I/O Operations – Get(), Put(), Getline(), Write(), Formatted Console I/O Operations – Width(), Precision(), Fill(), Setf(), Unsetf()	
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Working With Files	in class	Working With Files: Classes for File Stream Operations, Opening and Closing Files- Using Constructors, Using Function FOpen(), File Modes, Detecting End Of File- EOF()	[4]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Herbert Schildt, The Complete Reference C++, Tata McGraw Hill.
2. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill.

Reference Books:

1. Bjarne Stroustrup, C++ Programming Language, Addison Wesley.
2. Stanley B Lippman and Lajoie, C++ Primer, Addison Wesley.
3. Saurav Sahay, OOP with C++, Oxford Higher Education.
4. B.L. Juneja and Anita Seth, Programming with C++, New Age International Publication.

BA10140A (3L +1T Hrs.)

COMMUNICATION SKILL

Questions to be set: 05 (All Compulsory)

Objectives:

- To sensitize students to their communicative behaviour.
- To enable them to reflect and improve on their communicative behaviour/performance.
- To build capacities for self-criticism and facilitate growth.
- To lead students to effective performances in communication.
- To enable students to use Technology for optimizing their communication.

Pre-requisites: No Departmental Prerequisites required

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction, Business Correspondence	in class	Introduction: Communication Skills - Communication Process, 7 C's of Communication, Barriers to Communication Active Listening- Listening vs Hearing, Types of Listening, Tips for Effective Listening, Verbal and Non-verbal Communication. Business Correspondence: Principles of business writing, Business letters- Business letters, Notices, Memos and Circulars, Preparing Agenda and writing Minutes for meetings, Resume Writing and Cover letters	[14]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Report Writing	in class	Report Writing: Introduction - Types of Reports, Objectives and characteristics of Reports, Structure of Reports, Writing different types of Reports, Graphic Representation of Data.	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Oral Communication	in class	Oral Communication: Public Speaking, Making Effective Presentation - Definition and Purpose, Analysis of audience and locale, Organizing content, Preparing the slides, Delivering the presentation - Visual aids, nuances of delivery, Body language, Handling questions, Class Presentations by students, Group Discussions- Types of GD, Guidelines for GD, Group discussions as a part of the selection process, Role functions in group discussion. GD Practice in class, Facing Interviews.	[13]

	Assignment Topics	To be provided by the concern faculty members	
Module 4: Technology Enabled Communication	in class	Technology Enabled Communication: Email drafting and Etiquettes , Basics of Telephone communication- Telephone etiquettes, How to handle calls, Leaving a message, Making requests, Greeting and Leave Taking over phone(etiquette), Asking for and giving information, Giving Instructions, Listening for Tone/Mood and Attitude at the other end, Handling the situations especially trouble shooting, Effective use of SMS, Managing Teleconferences and Video conferences, Handling Tele interviews , Using Voice Mail, Fax, Internet and Google docs etc.	[7]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Meenakshi Raman & Sangita Sharma, Technical Communication; Principles and Practice, Oxford University Press.
2. M Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hill.
3. Andrea J. Rutherford, Basic Communication Skills for Technology, Person Education Asia

Reference Books:

1. Prashant Sharma, Soft Skills 3rd Edition: Personality Development for Life Success, BPB Publications, 2021, ISBN-13: 978-9391392093
2. Sanjay Kuma, Communication Skills, Oxford University Press, ISBN-13 : 978-0199457069

CA10406A (2Hrs./week)

DATA STRUCTURES LAB

Questions to be set: 05 (All Compulsory)

Objectives: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied /programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10108A - Data Structures and associated prerequisites

CA10407A (2Hrs./week)

C++ LAB

Questions to be set: 05 (All Compulsory)

Objectives: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied /programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10109A - Object Oriented Programming Using C++ and associated prerequisites.

CA10110A (3L +1T Hrs.)

DESIGN & ANALYSIS OF ALGORITHMS

Questions to be set: 05 (All Compulsory)

Objectives: To Introduce various designing techniques and methods for algorithms, performance analysis of Algorithms using asymptotic and empirical approaches, demonstrate a familiarity with major algorithms and data structures, to give clear idea on algorithmic design paradigms like Divide-and-Conquer, Dynamic Programming, Greedy, Branch and Bound etc.

Pre-requisites: Data Structures, Programming Knowledge

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction	in class	What is an Algorithm?, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental Data Structures. Fundamentals of the Analysis of Algorithm: Efficiency Analysis Framework, Asymptotic Notations and Basic Efficiency Classes.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Searching & Sorting	in class	Brute Force and Exhaustive Search: election Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Exhaustive Search, Depth First Search, Breadth First Search.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Divide & Conquer, Decrease & Conquer	in class	Merge sort, Quicksort, Binary Search, Binary tree traversals and related properties. Decrease and Conquer: Insertion Sort, Topological Sorting	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Transform and Conquer	in class	Balanced Search Trees, Heaps and Heapsort.	[6]

	Assignment Topics	To be provided by the concern faculty members	
Module 5: Dynamic Programming	in class	The Knapsack Problem and Memory Functions, Optimal Binary search tree.	[6]
	Assignment Topics	To be provided by the concern faculty members	

Textbooks:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 2ndEdition, PHI, 2006.
2. Introduction to Algorithms. Cormen Thomas H. 3rd Edition, PHI Learning, latest edition.
3. Introduction to The Design & Analysis of Algorithms, Anany Levitin, 2nd Edition, Pearson Education, 2007.

Reference Book:

1. Computer Algorithms by Horowitz E., Sahni S., Rajasekaran S., Galgotia Publications, 2001.
2. Introduction to the Design and Analysis of Algorithms A Strategic Approach, R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T.Tsai, TMH, 2005.

CA10111A (3L +1T Hrs.)

JAVA PROGRAMMING

Questions to be set: 05 (All Compulsory)

Objectives: This course introduces the Java programming language. It covers basic data types, control structures, arrays, classes, objects, methods, techniques of data abstraction, interfaces and packages. It also includes File handling, exception handling, threads and multi-threaded programming. Upon completing this course, the students will be able to create, compile, and run Java programs, write simple programs using primitive data types, create and use methods, apply object oriented programming and establish a firm foundation on Java concepts.

Pre-requisites: Computer programming concepts and Object-Oriented Programming concepts

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction to Java- History and Features, Java Fundamentals	in class	Introduction to Java- History and Features: Overview of Java, Introduction to Object Orientated Programming Language, Features of Java, Comparison of Java with Other Languages- Java Vs C, Java Vs C++, Java Virtual Machine (JVM). Java Fundamentals: Types of Java Program- Standalone Programs, Applets, Servlets, Java Architecture, Steps Involved in Running Java Programs Using JDK (Standalone, Applets, Servlets)	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Java Programming, Classes & Objects	in class	Java Programming: The First Java Program, Compiling and Executing Java Program, Command Line Arguments, Tokens, Identities, Constants, Data Types, Operators, Operator Precedence, Control and Looping Statements - Input / Output, Control Flow, Decision Making- Switch, If-Else, Loop- While, For, Do While, Break, Continue, Return, and Type Casting. Classes & Objects: Defining a Class, Naming Rules, Creating Objects, Declaring Variables, Methods, Constructor, New Operator, and This Operator. Accessing Class Members. Static Members. Methods: Passing Arguments, Call by Value, Call by Reference, Polymorphism, Method Overloading, Final Variables and Methods, Final Classes, Finalizer Methods, Abstract Methods and Classes, Visibility Control.	[8]

	Assignment Topics	To be provided by the concern faculty members	
Module 3: Arrays, Strings and Vectors, Inheritance & Interfaces, Packages	in class	Arrays, Strings and Vectors: Arrays - One Dimensional & Two Dimensional, Strings, Vectors, Wrapper Classes. Inheritance & Interfaces: Introduction, Inheritance in Java, Extending a Class, Methods Overriding, Introduction to Interface, Creating an Interface. Packages: What is a Package, How to Create Package.	[12]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: File Handling, Exception Handling	in class	File Handling: File Class, Byte-Stream Class, Random Access Files. Exception Handling: Exception Handling Fundamentals, Exception Types, Uncaught Exception, Using Try-Catch, Multiple Catch Clauses, Nested Try Statement, Throw, Throws, Finally.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Multithreaded Programming	in class	Multithreaded Programming: What is Thread? Creating Java Threads, Extending the Threads Class, Stopping and Blocking a Thread, Life cycle of a Thread, Using Thread methods, Thread Exceptions, Thread priority, Synchronization, Implementing the 'Runnable' Interface.	[4]
	Assignment Topics	To be provided by the concern faculty members	

Text Book:

1. E. Balagurusamy, Programming with Java, Tata McGraw Hill.
2. Herbert Schildt, Java: The Complete Reference, Tata McGraw Hill.

Reference Books:

1. K. Arnold and J. Gosling, The Java Programming Language, Addison Wesley.
2. Allamaraju, Professional Java Server Programming, Shroff Publication.
3. Patrick Naughton and Herbert Schildt, JAVA2: The Complete Reference, Tata McGraw Hill.
4. R. Krishnamoorthy & S. Prabhu, Internet & Java Program, New Age Internet Publisher.

CA10112A (3L +1T Hrs.)

UNIX AND SHELL PROGRAMMING

Questions to be set: 05 (All Compulsory)

Objectives: This course focuses on the principles and techniques of Unix Operating System, terminologies and tools. It also covers the UNIX file system, shell programming, Unix commands and its utilities. After this course the learners will be able to develop skills in UNIX operating system, shell programming and open source programming.

Pre-requisites: Data Structures and Programming language concepts.

Module	Topics to be covered	Topics	Hrs
Module 1: Getting Started, Commands	in class	Getting Started: The Operating System, the UNIX Operating System, Multi-User, Multitasking, Organized File System, The UNIX Environment- Personal Environment, Time Sharing Environment, Client/Server Environment, The UNIX Structure- The Kernel, the Shell, Utilities Applications, Accessing UNIX- User ID, Passwords, Interactive Session. Commands: Basic Concepts, Common Commands such as Date, Time, Calendar, who, who am I, Change Password, Print Message, Online Documentation, Print, Terminal, Clear Screen, Record Session, System Name and Calculator commands	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Editor Concepts, File System	in class	Editor Concepts: Line Editors, Screen Editors, the *vi* Editor- Command Mode, Text Mode Changing Modes. File System: Filenames, Wildcards, different File Types, Directory Commands, File Commands. File Security and Permissions.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Introduction to Shell, Filters	in class	Introduction to Shell: Shell Session and Shell Verification, Standard Streams, Redirecting Input, Output and Errors, Pipes, Tree Command, Aliases in the C, korn and bash shell, Variables types and operations. Filters: Concatenate Command and options, Head and Tail Command, Cut/Paste Command, Unique Commands, Output format, Compare Command, Difference Command, Common Command. Sorting: Sort by lines, sort by fields, Multiple-Pass Sorting.	[7]
	Assignment Topics	To be provided by the concern faculty members	

Module 4: Working with Characters, Introduction to SED	in class	Working with Characters: Simple Translate, Nonmatching Translate Strings, Delete Characters, Complement, Squeeze Output, Count Characters/words/lines, Commands for the VI Editor Commands and operations. Regular Expressions and Operators. Introduction to SED: Scripts, Operations, Addresses, Commands. Introduction to AWK- Execution, Fields & Records, Scripts, Operation, Patterns, Actions, Associative Arrays, String Functions, Mathematical Functions, Using System Commands, Applications, SED and AWK.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Introduction to korn Shell & Programming	in class	Introduction to korn Shell & Programming: Script Components and their operations, Expressions, Decisions Making, Loop Redirection, Startup Scripts, Command History, Command Execution, Basic Scripts Concepts, Special Parameters and Variables, Changing Positional Parameter, Argument Validation and Debugging Scripts.	[5]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. A. Behrouz, Richard F. Forouzan, Gilberg, UNIX and Shell Programming, Thomson Brokes/Cole.
2. Sumitabha Das, UNIX Concepts and Application, Tata McGraw Hill.

Reference Books:

1. Yashwant Kanetkar, UNIX Shell Programming, BPB Publication.
2. Kochan, UNIX Shell Programming, Pearson Education.
3. M.G. Venkateshmurthy, Introduction to UNIX & Shell Programming, Pearson Education.
4. K.A. Robbins, UNIX Systems Programming, Pearson Education.

CA10113A (3L +1T Hrs.)

RECENT TRENDS IN COMPUTER APPLICATIONS

Questions to be set: 05 (All Compulsory)

Objectives: This course gives an introduction to recent methods and trends in computer applications. The course aim is to introduce the latest concepts of computing applications and their usages in technical areas.

Pre-requisites: There are no prerequisites for this subject.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction to Cloud Technology	in class	Introduction to Cloud Technology: Introduction to Cloud Computing including benefits, challenges, and risks. Cloud Computing Models including Infrastructure/ Platform/Software – as-a-service. Public cloud, private cloud and hybrid clouds, Cloud OS. Data centres for Cloud Computing.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Introduction to Information Security	in class	Introduction to Information Security: The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defence, Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption algorithms, The Data Encryption Standard. Program Security: Secure Programs, Non-malicious Program Errors, viruses and other malicious code. Data base Security: Security requirements, Reliability and integrity, multilevel database, proposals for multilevel security. Security in Network: Threats in Network.	[12]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Introduction to Data Science:	in class	Introduction to Data Science: Describe what Data Science is and the skill sets needed to be a data scientist. Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modelling. Use R to carry out basic statistical modelling and analysis. Explain the significance of	[10]

		exploratory data analysis (EDA) in data science. Apply basic tools (plots, graphs, summary statistics) to carry out EDA	
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Introduction to Machine Learning	in class	Introduction to Machine Learning: Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation. Linear regression, Decision trees, overfitting. Probability and Bayes learning. Support Vector Machine, Kernel function	[8]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley India.
2. Wm. Arthur Conking, Gregory B. White, et al, Principles of Computer Security: Security and Beyond , McGraw Hill, 2010.
3. Shai Shalev-Shwartz, Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press, 2014.

Reference Books:

1. George Reese, "Cloud Application Architectures", O'Reilly.
2. Sandy Ryza, Uri Laserson, Sean Owen & Josh Wills, Advanced Analytics with Spark: Patterns for Learning from Data at Scale, O'Reilly, ISBN-10: 1491912766.
3. Yves Kodratoff, Ryszard S. Michalski, Machine Learning: An Artificial Intelligence Approach, Elsevier, 2014.

CA10114A (3L +1T Hrs.)

DATA COMMUNICATION AND NETWORKING

Questions to be set: 05 (All Compulsory)

Objectives: This course highlights the functional evolution and role of data communications. It emphasizes on basic knowledge of computer network and data communication. It also covers the Physical layer and Data Link layer and MAC sub-layer with their respective protocols of the OSI architecture in details. At the completion of this unit students will be able to explain the basic concepts of data communication, design computer programs that are aware of basic aspects of networking and describe emerging networking technologies.

Pre-requisites: Basic electronics and Fundamentals of Computers

Module	Topics to be covered	Topics	Hrs
Module 1: Overview, Physical Layer	in class	Overview: Introduction to Data Communications, Network types. Data Flow, Concepts of Communication in Computer Networks, Layered Architecture, OSI, TCP/IP, Network Addressing. Physical Layer: Data and Signal Fundamentals, Analog and Digital Signals, Transmission Impairments, Transmission Media- Guided and Unguided Guided Media: Twisted Pair, Coaxial, and Fiber Optics Cables, Radio Waves, Microwaves, and Infra-red.	[13]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Data Link Layer	in class	Data Link Layer: Data link layer design Issue, Roles and Responsibilities of Data Link Layer, Error Detection and correction – Single Parity bit, Cyclic Redundancy Check (CRC), Framing, Elementary Data link Protocol: Stop-and-Wait ARQ, Sliding Window, Go-Back-N, Selective Repeat.	[7]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Switching Techniques, Multiple Access	in class	Switching Techniques: Circuit-Switched, Packet Switched- Datagram, and Virtual Circuit Networks, Message Switching. Multiple Access: Random Access: Aloha (Pure and Slotted), CSMA, CSMA/CD, CSMA/CA.	[9]
	Assignment Topics	To be provided by the concern faculty members	

Module 4: Network layer	in class	Network layer: Network design issue, Routing algorithm- Introduction, Optimality principle, Shortest path, Flooding, Distance vector routing, Link State Routing.	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Transport layer	in class	Transport layer: Transport services, Element of transport protocols, TCP- connection management, transmission policy, congestion control, UDP.	[5]
	Assignment Topics	To be provided by the concern faculty members	

Text Book:

1. Behrouz A. Forouzan, Data Communications and Networking, Tata McGraw Hill.
2. A. S. Tanenbaum, Computer Networks, Pearson Education Asia.

Reference Books:

1. Bharat Bhushan Agarwal, Sumit P. Tayal, Computer Network, University Science Press.
2. William Stallings, Data and Computer Communications, PHI.
3. L. L. Peterson & B.S. Davie, Computer Networks: A System Approach, Elsevier.
4. Alberto Leon-Garcia, Indra Widjaja, Communication Networks, Tata McGraw Hill

CA10408A (2Hrs./week)

DAA LAB

Questions to be set: 05 (All Compulsory)

Objectives: To course highlights the design and implement efficient algorithms for a specified application. At the completion of this lab, the student can strengthen the ability to identify and apply the suitable algorithm for the given real-world problem.

Pre-requisites: Basic knowledge in searching and sorting algorithms.

CA10409A (2Hrs./week)

JAVA PROGRAMMING LAB

Questions to be set: 05 (All Compulsory)

Objectives: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied /programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10111A - Java Programming and associated prerequisites.

CA10115A (3L +1T Hrs.)

OPERATING SYSTEMS

Questions to be set: 05 (All Compulsory)

Objectives: The principles and concepts that govern the design of modern computer operating systems are studied. Managing computing resources such as the memory, the processor and the Input/output devices are covered. Basics of CPU scheduling, process coordination, deadlock and memory management techniques are also discussed. After this course the students will able to understand the interface between the hardware, software and user-machine interface.

Pre-requisites: Programming language concepts

Module	Topics to be covered	Topics	Hrs
Module 1: Basic Concepts in Threading	in class	Basic Concepts, Simple Batch Systems, Multi-programmed Batched Systems, Time-Sharing Systems	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Processes and Threads	in class	Process Concept, Process Scheduling, Operation on Processes, Cooperating Processes, Inter-process Communication.	[7]
	Assignment Topics		
Module 3: CPU Scheduling, Process Synchronization	in class	CPU Scheduling: Scheduling Criteria, Scheduling algorithms, Multiple process scheduling. Process Synchronization: The Critical-Section Problem, Basics of Semaphores.	[12]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Deadlocks	in class	Deadlocks: Deadlock Characterization, Methods of Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection & Recovery from Deadlock.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Memory Management	in class	Memory Management: Logical versus Physical Address Space, Swapping, Paging.	[7]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, John Wiley & Sons. Inc.
2. Andrew S. Tanenbaum, Modern Operating Systems, PHI

Reference Books:

1. H.M.Diatel, An Introduction to Operating System, John Wiley.
2. William Stallings, Operating Systems: Internals and Design Principles, Pearson Publication.
3. D.M. Dhamdhare, Operating System, Tata McGraw Hill.

CA10116A (3L +1T Hrs.)

IT LAWS AND PRACTICES

Questions to be set: 05 (All Compulsory)

Objectives: This course provides the understanding of various ethical and legal issues related to the information technologies and its applications including the electronic commerce. This course also covers various legislative acts and articles related to information technologies and international initiative in the field of IT laws. This course will inculcate the ethics of IT profession to the learners.

Pre-requisites: Basic awareness of computer and its applications.

Module	Topics to be covered	Topics	Hrs
Module 1: The Development of Information Technology, The Indian Penal Code	in class	The Development of Information Technology: Computers and Cyberspace, Legal Implications of Cyberspace, Key Regulatory Issues. Legal Recognition to E-Commerce Practices, Benefits of E-Commerce, Risk of E-Commerce. The Indian Penal Code: The Indian Penal Code – 1860 (Sections 29A, 167, 172, 173, 175, 192, 204, 463, 464, 466, 468, 469, 470,471)	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: The Indian Evidence Act	in class	The Indian Evidence Act: The Indian Evidence Act – 1872 (Sections 3, 17, 22A, 34, 35, 39, 47A, 59, 65A, 65B,67A, 73A, 81A, 85A, 85B)	[4]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: The Reserve Bank of India Act, Cyber Space and Legal Control	in class	The Reserve Bank of India Act: The Reserve Bank of India Act, 1934 (Section 58), The Bankers Book Evidence Act, 1891 (Sections 2, 2A, 3, 4, 5, 6, 7, 8). Cyber Space and Legal Control: Cyber Law – An Introduction, Definition of Cyber Law, Why Cyber Law in India, International Scenario, The Information Technology Act – 2000.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Detecting and Prosecuting Computer Crime,	in class	Detecting and Prosecuting Computer Crime: Definition of Cyber Crime, Categories of Cyber Crime (Against	[9]

Intellectual Property Law		Persons, Against Property, Against Government), Technical Hurdles for Law Enforcement Agencies, Intellectual Property Law: Intellectual Property Law, Applying Copyright Protection to Software, Literal and Non Literal Copying of Computer Programs, Patenting Softwares, Trademark Issues, Effect of Trademarks, Trademarks and Information Technology.	
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Electronic Communication Act 2000, Problems of Jurisdiction:	in class	Electronic Communication Act 2000: Definitions, Electronic Records, Secure Digital Signatures, Security Procedures, Digital Signature Certificates, Duties of Subscribers, Cyber Regulations Appellate Tribunal. Problems of Jurisdiction: Jurisdiction Over Internet, Internet Contracts, Intellectual Property Infringements, Indian Context, Effects of Foreign Judgments.	[11]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Pavan Duggal, Cyber Law: The Indian Perspective, Saukaar Publication.
2. Parag Diwan and Shammi Kapoor, Cyber and E-Commerce Laws, Bharat Publishing House.

Reference Books:

1. Krishna Kumar, Cyber Laws and Intellectual Properties, Dominant Publishers.
3. IT Laws and Practices, Manipal University press.
4. V. Sharma, Handbook of Cyber Laws, McMillan Publication.
5. Universal, Intellectual Property Laws, Universal Law Publication.

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CA10117A (3L +1T Hrs.)

.NET PROGRAMMING

Questions to be set: 05 (All Compulsory)

Objectives: It covers the technique of creating.NET programming that delivers dynamic content to the standalone applications. Students will learn how to

1. Create, compile and run object-oriented C# programs using Visual Studio
2. Write and understand C# language constructs, syntax and semantics
3. Develop reusable .NET components via interface realization and standard design patterns
4. Leverage the major namespaces and classes of the .NET Framework
5. Access databases using Language Integrated Query (LINQ)

Pre-requisites: Object oriented programming knowledge

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction to .NET, Control Structure	in class	Introduction to .NET: Programming language, Application, Library, Framework, The Microsoft .NET framework, Technology, Components within .NET framework, Features of .NET framework, Tokens, Compiler, Environment variable, Rule of c#(C Sharp), C# Program using .NET Framework, Rule of VB, Common Type System, Data type, Type conversion, Managing console I/O operations, Read() and ReadLine(), Write() and WriteLine(), Formatted output, Standard number Format, Format Character. Control Structure: The Decision control structures, The Selection control structures, The Jump control structures, The Repetition control structures	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Object Oriented Approach, Object, String and Collections	in class	Object Oriented Approach: Classes and Objects, Class Members, Properties and Fields, Methods, Constructors, Finalizers, Events, Nested Classes, Access Modifiers and Access Levels, Instantiating Classes, Static Classes and Members, Anonymous Types, Inheritance, preventing inheritance, Virtual Methods, Abstract Class, Interfaces, Overriding Members, Delegates. Object, String and Collections: Object class, Object type, Structure object and class object, String, String method, String builder, Array, Declaration, Memory creation, Single Dimensional Array, Double Dimensional Array, Jagged Array, Collection, Collection Classes	[10]

	Assignment Topics	To be provided by the concern faculty members	
Module 3: Exception Handling, Windows application	in class	Exception Handling: Basic Concept, Type of exception, Exception class, Try, catch, final, throw, Checked and unchecked, Creating user defined exception. Windows application: Windows form, Form class, Properties, Events and Methods of Form, Toolbox, Common controls, Control class.	[9]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Dialog controls, Port Programming	in class	Dialog controls: Colordialog control, FolderBrowserdialog control, FontDialog control, OpenDialog, Savedialog control. Port Programming: Introduction, Serial port, Read, Write, Get ports, Priority, Open, close, Baud rate	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Data Access using ADO.NET, Multithreading	in class	Data Access using ADO.NET: Characteristics of ADO.NET, Comparing ADO and ADO.NET, Creating a connection, Select command, Using a command with a data reader, Updating data, Accessing, modifying, updating disconnected data, Selecting multiple tables. Multithreading: Process, Thread, Multithreading, Thread class mutex class, Creating and starting thread, Scheduling a thread, Synchronizing threads, Thread pooling	[9]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Jesse Liberty, Dan Hurwitz, Programming .NET Windows Applications, O'Reilly.
2. Pradeep Kumar Tapadiya, .NET Programming: A Practical Guide Using C#, Prentice Hall Professional

Reference Books:

1. Paul Vick, The Visual Basic .Net Programming Language, Addison-Wesley
2. Eric Butow, Tommy Ryan, C#: Your Visual Blueprint for Building .NET Applications, Hungry Minds, 2002
3. Michael Stiefel, Robert J. Oberg, Application Development Using C# and .NET, Prentice Hall Professional
4. Xin Chen, Developing Application Frameworks in .NET, Apress

CA103** (3L +1T Hrs.)

ELECTIVE I

[To be chosen from list of electives for fifth semester]

CA103** (3L +1T Hrs.)

ELECTIVE II

[To be chosen from list of electives for fifth semester]

CA10410A (2 Hrs./week)

OPERATING SYSTEMS LAB

Questions to be set: 05 (All Compulsory)

Objectives: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied/programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10115A – Operating Systems and associated prerequisites.

CA10411A (2Hrs./week)

.NET LAB

Questions to be set: 05 (All Compulsory)

Objectives: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied /programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10411A - .NET Programming and associated prerequisites.

CA10118A (2Hrs./week)

SOFTWARE ENGINEERING

Questions to be set: 05 (All Compulsory)

Objectives: This course will offer a wide perspective on software development covering the full life cycle of software development. This would be inclusive of requirements analysis, technical design, estimating, programming style, testing, quality measures, and management issues. At the end of the course, the students will be able to design and develop efficient and reliable software.

Pre-requisites: Data Structures, Database Management System and Programming Concepts.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction to Software Engineering	in class	The software engineering discipline, software development project, emergence of software engineering.	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Software Life Cycle Models & Software Project Management	in class	Discussion on SDLC, Waterfall, Prototype, Evolution and Spiral Models and their Comparison. Size Estimation- LOC and FP Metrics, Cost Estimation- Delphi and Basic COCOMO, Staffing Level Estimation- Putnam's Model.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Software Requirements Specification	in class	Requirement gathering and analysis, SRS Documents, their characteristics and organization. Formal system specification, Axiomatic and Algebraic specification	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Software Design	in class	Classification, Software Design Approaches, Function Oriented Software Design, Structured Analysis-Data flow Diagrams and Structured Design, Introduction to Object Oriented Design.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Coding, Testing and Maintenance of Software	in class	Unit Testing, Block Box Testing, White Box Testing, Debugging, Program Analysis Tools, System Testing. Maintenance Process Models and Reverse Engineering, Estimation of Maintenance Costs.	[8]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Rajib Mall, Fundamentals of Software Engineering, PHI.
2. Richard Fairley, Software Engineering Concepts, Tata McGraw Hill

Reference Books:

1. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House.
2. S.L. Pfleeger, Software Engineering, Pearson.
3. R.S. Pressman, Software Engineering, PHI.
4. Carlo Ghezzi, Mehdi Jazayeri, Fundamentals of Software Engineering, PHI.

CA10119A (2 Hrs./week)

PYTHON PROGRAMMING

Questions to be set: 05 (All Compulsory)

Objectives: This course covers the fundamentals of Python programming. This course covers from the fundamental concepts of Python such as variables, operators, lists, tuples, and objects to topics like files and exception handling. The completion of this course will enable the students to write programs in Python language to solve their problems of interest.

Pre-requisites: Knowledge of basics programming.

Module	Topics to be covered	Topics	Hrs
Module 1: Python Overview	in class	Introduction, Features, Lexical Structure, Data Type, Variables, Numbers, Strings, Expression and Operators, Numeric Operations, Conditional Statements, Looping, Control flow Statements.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: List, Tuple and Dictionary & Functions in Python [7 Hrs.]	in class	Introduction to List and Tuple, Accessing List and Tuple, Operations, working with List and Tuple Build-in Function and Methods, Working with dictionaries, properties and Methods. Functions in Python- Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Python Objects	in class	Defining Class, Creating Object, Built-in class Attributes, Inheritance, Overloading and Overriding, Data Hiding.	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Files	in class	File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules.	[8]

	Assignment Topics	To be provided by the concern faculty members	
Module 5: Error and Exceptions	in class	Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions.	[6]
	Assignment Topics	To be provided by the concern faculty members	

Text books

1. Lutz, Mark, Learning Python, O Rielly.
2. Chun, J Welsey, Core Python Programming, Pearson.

Reference Books:

1. Ljubomir Perkovic, Introduction to Computing Using Python: An Application DevelopmentFocus, John Wiley & Sons.
2. Barry, Paul, Head First Python, O Rielly.
3. Guttag John V, Introduction to Computation and Programmin gUsing Python with Application to Understand Data, PHI.
4. Taneja Sheetal, Python Programming : A modular approach, Pearson.

CA103** (3L +1T Hrs.)

ELECTIVE III

[To be chosen from list of electives under mini specialization for sixth semester]

CA103** (3L +1T Hrs.)

ELECTIVE IV

[To be chosen from list of electives under mini specialization for sixth semester]

CA10412A (2Hrs./week)

SOFTWARE ENGINEERING LAB

Objective: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied /programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10118A – Software Engineering and associated prerequisites.

CA10412A (2Hrs./week)

PYTHON PROGRAMMING LAB

Objective: At least 10 experiments covering the entire syllabus of the corresponding theory paper to be carried out using the theory studied /programming skill of the subject concerned to get insight into the practical applications of the theoretical studies. The outcome of the lab classes must lead to a skilled and self-sustained program developer.

Pre-requisites: Corresponding theory paper CA10119A – Python programming and associated prerequisites

CA10502A

MINOR PROJECT

SL NO	SUBJECT	OBJECTIVES AND GOALS	TOTAL GRADES
1	Project	The students are required to undertake innovative and research oriented project under the direct supervision of a faculty member of the department. The minor project should not only to reflect their knowledge gained in the previous semesters but also to acquire additional knowledge and skill of their own effort.	
2	Project Reviews	The progress of their works is being evaluated in phases through interim seminar/presentation to make the department aware of his/her project.	3
3	Awarded by Project Guide	The faculty-guide assess the work of the group(s) working under his/her guidance on day to day basis and evaluate.	3
		Total Grades	**6**

CA10120A (3L +1T Hrs.)

RESEARCH METHODOLOGY

Questions to be set: 05 (All Compulsory)

Objectives: This course highlights the basics of how research problems are defined, research methods are adopted and/or developed, research is undertaken, and how research results are communicated to the peers. The completion of this course will enable the students comprehend and deal with real world problem in scientific method.

Pre-requisites: Knowledge in statistical methods and basic writing skill required.

Module	Topics to be covered	Topics	Hrs
Module 1: Research and its types	in class	Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Formulation and Design	in class	Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Data Collection and Analysis	in class	Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statically package (Sigma STAT,SPSS for student t-test, ANOVA, etc.), hypothesis testing.	[5]
	Assignment Topics	To be provided by the concern faculty members	

Module 4: Soft Computing	in class	Computer and its role in research, Use of statistical software SPSS, GRETL etcin research. Introduction to evolutionary algorithms - Fundamentals of Genetic algorithms, Simulated Annealing, Neural Network based optimization, Optimization of fuzzy systems.	[5]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Research Ethics, Ipr and Scholary Publishing & Interpretation and Report Writing	in class	Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing-IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability. Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions.	[10]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
2. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.
3. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
4. Wadehra, B.L. 2000. Law relating to patents, trademarks, copyright designs and geographical indications. Universal Law Publishing.

Reference Books

1. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
2. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York.
3. Coley, S.M. and Scheinberg, C. A., 1990, "Proposal Writing", Sage Publications.

CA103* (3L +1T Hrs.)

ELECTIVE -V

[To be chosen from list of electives under mini specialization for sixth semester]

CA103** (3L +1T Hrs.)

ELECTIVE -VI

[To be chosen from list of electives under mini specialization for sixth semester]

GN10101A (2L +0T Hrs.)

UNIVERSAL HUMAN VALUES

Questions to be set: 05 (All Compulsory)

Objectives: The aim of this course is to make students to understand the human values and value-based living. The completion of this course will enable the students to understand the nature and Implications of the holistic understanding on professional ethics.

Pre-requisite: Basic knowledge in human values, relationship, and contribution to society.

Module	Topics to be covered	Topics	Hrs
Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	in class	• Understanding the need, basic guidelines, content and process for Value Education • Self-Exploration–what is it? - its content and process; „Natural Acceptance‟ and Experiential Validation- as the mechanism for self-exploration • Continuous Happiness and Prosperity- A look at basic Human Aspirations • Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority • Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario • Method to fulfill the above human aspirations: understanding and living in harmony at various levels	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Understanding Harmony in the Human Being - Harmony in Myself	in class	• Understanding Harmony in the Human Being - Harmony in Myself • Understanding human being as a co-existence of the sentient „I‟ and the material „Body‟ • Understanding the needs of Self („I‟) and „Body‟ - Sukh and Suvidha. • Understanding the Body as an instrument of	[5]

		„I“ (I being the doer, seer and enjoyer) • Understanding the characteristics and activities of „I“ and harmony in „I“ • Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail • Programs to ensure Sanyam and Swasthya -Practice Exercises and Case Studies will be taken up in Practice Sessions.	
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Understanding Harmony in the Family - Harmony in Human- Human Relationship	in class	• Understanding harmony in the Family-the basic unit of human interaction • Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship • Understanding the meaning of Vishwas; Difference between intention and competence. • Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship.	[4]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Understanding Harmony in the Society - Harmony in Human- Human Relationship and Harmony in the Nature and Existence - Whole existence as Co-existence	in class	• Understanding the harmony in the society (society being an extension of family): • Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals • Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family. - Practice Exercises and Case Studies will be taken up in Practice Sessions.	[9]

		• Understanding the harmony in the Nature • Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature • Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space • Holistic perception of harmony at all levels of existence -Practice Exercises and Case Studies will be taken up in Practice Sessions.	
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics	in class	• Natural acceptance of human values • Definitiveness of Ethical Human Conduct • Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order • Competence in professional ethics: o Ability to utilize the professional competence for augmenting universal human order o Ability to identify the scope and characteristics of people-friendly and eco- friendly production systems, o Ability to identify and develop appropriate technologies and management patterns for above production systems. • Case studies of typical holistic technologies, management models and production systems • Strategy for transition from the present state to Universal Human Order: o At the level of individual: as socially and ecologically responsible engineers, technologists and managers o At the level of society: as mutually enriching institutions and organization	[6]

	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2.
2. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Reference Books:

1. Corliss Lamont, Philosophy of Humanism
2. Gaur. R.R. , Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
3. Gaur. R.R. , Sangal. R , Bagaria. G.P, Teachers Manual Excel Books, 2009.
4. I.C. Sharma . Ethical Philosophy of India Nagin & co Julundhar
5. Mortimer. J. Adler, – Whatman has made of man
6. William Lilly Introduction to Ethic Allied Publisher

GN10102A (3L +1T Hrs.)

LEARDERSHIP AND BEHAVIOUR MANAGEMENT

Questions to be set: 05 (All Compulsory)

Objectives: The aim of this course is to make students to improve personality by enhancing life skills for a meaningful contribution to self and society, understand the nature of emotions and feelings for better interpersonal relationships, develop constructive and empathetic global leaders. The completion of this course will enable the students to develop professional and personal skills for a successful life.

Pre-requisite: Basic knowledge in self-awareness, thinking and reasoning.

Module	Topics to be covered	Topics	Hrs
Module 1: SELF-AWARENESS AND SELF-MANAGEMENT	in class	Understanding self, dimensions of self, Concept and Importance of self-esteem, positive and negative self-esteem, Developing positive self-esteem, Self-development and happiness. Role of motivation in self-growth, nature and types of motivation, factors affecting motivation, Achievement motivation, Relationship between achievement motivation and emotions. Nature and Significance of self-management skills, Aspects of self-management, Social competency behavior.	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: VALUES & ETHICS: (6 Lectures)	in class	Meaning, types and determinants of Values, Concept of Ethics, Relationship between Values and Ethics Its implication in one's life. Concept of Moral Development, factors responsible for moral development. Ethical Decision making, Challenges in its implementation. Prevention of Corruption & Crime; Personal Values-Empathy, honesty, courage, commitment. Professional Values-Work ethics, respect for others, Its role in personality development.	[6]

	Assignment Topics	To be provided by the concern faculty members	
Module 3: THINKING AND REASONING	in class	Nature and types of thinking, Problem Solving- Types of problems, Approaches to problem solving, Steps and styles of problem solving, Hindrances to Problem Solving Process- Perception, Expression, Emotion, Intellect; Creative Thinking- Meaning, nature and characteristics of creativity, factors affecting creativity, stages of creativity, personality of a creative person, factors enhancing creativity. Reasoning-types of reasoning, Distortion in thinking and reasoning.	[5]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: EMOTIONAL INTELLIGENCE & COPING WITH STRESS AND COMMUNICATION	in class	**EMOTIONAL INTELLIGENCE & COPING WITH STRESS**: Nature of Emotions, biology of emotions, Need for and importance of Emotions, Emotion Anger: Introduction to Anger, types of anger, causes of anger, consequences of anger, Expression of anger-passive and aggressive anger, Anger management; Introduction to Emotional Intelligence, Competencies in emotional intelligence, Types of emotional intelligence, Strategies to enhance emotional intelligence; Expected outcomes of emotional intelligence; Nature of stress, relation between demands and coping, types and causes of stress, Indicators of stress, coping strategies to manage stress, Effective time management strategies. **COMMUNICATION:** Nature and importance of communication, types of communication- indicators of verbal and non-verbal communication, communication styles; Assertiveness-Introduction, types of behavior, nature of assertiveness, Assumptions and Rights in Interpersonal communication, strategies to become assertive, Assertiveness in daily life, Characteristics of an assertive person.	[10]

	Assignment Topics	To be provided by the concern faculty members	
Module 5: INTERPERSONAL RELATIONSHIPS AND LEADERSHIP & TEAM BUILDING:	in class	Importance of interpersonal relations, Types of Interpersonal Relationships, Barriers to effective communication in relationships, steps to improve interpersonal communication, Role of feedback in interpersonal communication, Conflict management, strategies for maintaining good interpersonal relations, relating to others in virtual world. Leadership- Definition, Meaning, Nature and Functions of leader, Types of leaders, Leadership styles, Functions of a Leader, Decision-making, personality traits of an effective leader; Significance and nature of team building, Stages of team building, types of teams, factors influencing the effectiveness of a team.	[9]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Ivancevich; John and Micheeol T.Matheson: Organisational Behaviour and Management, Business Publication Inc., Texas.
2. Steers, Richard M. and J. Stewart Black: Organizational Behavior, Harper Collins College Publishers, New York. Sukla, Madhukar: Understanding Organisations: Organisation Theory and Practice in India, Prentice Hall, New Delhi.

Reference Books:

1. Hammond, J. S., Keeney, R. L., & Raiffa, H. (1999). Random House LLC. Smart choices: a practical guide to making better life decisions.
2. Griffin, Ricky W: Organisational Behaviour, Houghton Mifflin Co., Boston.
3. Hellreigel, Don, John W. Slocum, Jr., and Richard W. Woodman: Organizational Behavior, South Western College Publishing, Ohio.
4. Hersey, Paul, Kenneth H. Blanchard and Dewey E. Johnson: Management of Organisational Behaviour: Utilising Human Resources, Prentice Hall, New Delhi.

CA10701A

SEMINAR

[Topic of this seminar will be based on any topic related to the minor specialization of the student.]

CA10503A

MINOR PROJECT

[This will be a research-based project.]

CA10601A

MAJOR PROJECT

[CA/External Agencies]

CA10301 (3L +1T Hrs.)

MOBILE APPLICATION DEVELOPMENT

Questions to be set: 05 (All Compulsory)

Objectives: The aim of this java programming language course is to make students solid foundation in programming with JAVA. It also highlights the creation of graphical user interfaces (GUIs), exceptions, file input/output (I/O), and threads; and network programming. The completion of this course will enable the students to design & develop mobile applications and become expert in deploying those applications in android.

Pre-requisites: Basic Programming Concept, Object Oriented Programming.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction	in class	Introduction to mobile applications, Embedded systems, Market and business drivers for mobile applications, Publishing and delivery of mobile applications, Requirements gathering and validation for mobile applications.	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Basic Design	in class	Introduction to basics of embedded systems design, Embedded OS, Design constraints for mobile applications, architecting mobile applications, User interfaces for mobile applications, touch events and gestures, Achieving quality constraints, performance, usability, security, availability and modifiability.	[6]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Advanced Design	in class	Designing applications with multimedia and web access capabilities, Integration with GPS and social media networking applications, Accessing applications hosted in a cloud computing environment, Design patterns for mobile applications.	[5]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Android Development Environment	in class	Introduction to Android Environment, Establishing the development environment, Android architecture, Activities and views, Interacting with UI, Persisting data using SQLite, Packaging and deployment, Interaction with server side applications, Using Google Maps, GPS and Wifi – Integration with social media applications.	[10]

	Assignment Topics	To be provided by the concern faculty members	
Module 5: IOS Development environment	in class	Introduction to Objective C, iOS features, UI implementation, Touch frameworks, Data persistence using Core Data and SQLite, Location aware applications using Core Location and Map Kit, Integrating calendar and address book with social media application, Using Wifi - iPhone marketplace.	[9]
	Assignment Topics	To be provided by the concern faculty members	

Text Books:

1. Jeff McWherter and Scott Gowell, Professional Mobile Application Development, Wrox Publishers.
2. Charlie Collins, Michael Galpin and Matthias Kappler, Android in Practice, DreamTech,

Reference Books:

1. James Dovey and Ash Furrow, Beginning Objective C, Apress.
2. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, Beginning iOS 6 Development: Exploring the iOS SDK, Apress.
3. DT Editorial Services, Mobile Application Development Black Book, Dreamtech Press.
4. Carmen Delessio, Lauren Darcey, Shane Conder, Sams Teach Yourself Android Application Development in 24 Hours, Sams Publishing.

CA10302 (3L +1T Hrs.)

ARTIFICIAL INTELLIGENCE

Questions to be set: 05 (All Compulsory)

Objectives: The aim of this course is to enable the students to gain basic knowledge about artificial intelligence and train the students on the various Heuristic Search Techniques and Expert Systems. The completion of this course will enable the students to understand the basic concept of AI and its applications.

Pre-requisites: Knowledge in searching techniques and basic programming knowledge.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction to AI	in class	What is Artificial Intelligence, Foundation of AI, History of AI, agents, Applications of AI, A.I Representation, Future of AI, Issues in Design of Search Programs – Blind Search or Depth First Search, Breadth First Search, Logic Programming	[12]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Introduction to Prolog	in class	Introduction to Logic Programming by Prolog, Writing a Prolog Program, Structure of Prolog Program, Types, Search, Backtracking in Prolog, Lists.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 3: Heuristic Search Techniques - I	in class	Heuristic Search, Heuristic Search Methods – Generate and Test, Hill Climbing, Sleepest Ancent Hill Climbing, Simulated Annealing	[8]
	Assignment Topics	To be provided by the concern faculty members	
Module 4: Heuristic Search Techniques - II	in class	Best First Search, The A* Algorithm, And-Or Graphs, The AO* Algorithm, Means-end Analysis, Constraint Satisfaction.	[5]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Expert Systems	in class	Utilization and Functionality, Architecture of Expert System, Steps to Build Expert Systems.	[5]
	Assignment Topics	To be provided by the concern faculty members	

Textbooks:

1. Neeta Deshpande (2008), “Artificial Intelligence”, Technical Publications.
2. V. S. Janakiraman, K. Sarukesi, P. Gopalakrishnan (2007),“Foundations of Artificial Intelligence and Expert Systems”, Trinity Press.

Reference Books:

1. Elaine Rich and Kevin Knight, (2003) “Artificial Intelligence”, Second Edition, Tata McGraw-Hill.
2. Ela Kumar, (2008),“Artificial Intelligence”, I.K. International Publishing House Pvt. Ltd., New Delhi.

CA10303 (3L +1T Hrs.)

WEB TECHNOLOGIES

Questions to be set: 05 (All Compulsory)

Objectives: To familiarize the student with the structure and use of Internet application programming languages and with the elements of user-interface design. The focus is on client-side scripting using DHTML, JavaScript, and an introduction to server-side scripting using PHP, CGI, and Servlet. The emphasis of this course will be on syntax and debugging, web form processes and data validation using common programming structures, dynamic content using JavaScript and DHTML, and working with objects and cookies.

Pre-requisites: Programming concepts using Java, HTML and Web Page Design.

Module	Topics to be covered	Topics	Hrs
Module 1: Web Fundamentals with Cascading Style Sheet [6Hrs]	in class	Understanding the Internet and Worldwide Web, History of the Web, Protocols governing the web, Web Architecture, Major issues in web solution developments. Introduction to cascading Style Sheet, Advantages, Adding CSS, Browser Compatibility, CSS and Page Layout, Selectors	[10]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Java Script [6 Hrs.]	in class	Introduction, Variables, Literals, Operators, control Structures, Conditional statements, Arrays, Functions, Objects (Using object literals, for/in, Constructor functions, This keyword, Using Object Constructor, Adding New methods, Function overloading), Predefined Objects, Object Hierarchy, Accessing Objects, Events, Event Handlers, Multiple Windows and Frames, Document object model, JavaScript Regular Expressions, Ajax.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: Java Network Programming & Common Gateway Interface	in class	Java and the Net, Java Networking classes and Interfaces, Looking up internet address, Client/Server Programs, Socket Programming, Email client, POP3 programs, Remote Method Invocation. Internet Programming Paradigm, Server-side programming, Languages for CGI,	[8]

[8 Hrs.]		Environment variables, CGI security, Alternatives, and enhancement to CGI	
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Servlet Java & Server Pages (JSP) [8 Hrs.]	in class	Server-side Java programming, Advantages, Servlet Alternatives, Servlet strengths, Servlet Architecture, Servlet lifecycle, Generic Servlet, and HTTP Servlet, passing parameters, Server side include Cookies, Filters, Problem with Servlet, Security Issues.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 5 Java Server Pages (JSP) [6 Hrs]	in class	Introduction, JSP and HTTP, JSP Engines, working principle, JSP and Servlet, Anatomy of JSP page, JSP syntax, JSP Components, Beans, Session Tracking, passing control and data between pages, sharing session and application data, Java Database Connectivity (JDBC), JDBC drivers, SQL statements and retrieving results.	[6]
	Assignment Topics	To be provided by the concerned faculty members	

Text Books:

1. Uttam K. Roy, Web Technologies, Oxford University Press.
2. Achyut Godbole, Web Technologies, Tata McGraw Hill Publication.
3. Hiren Joshi, Web Technologies and Application Development, Wiley publication

Reference Books:

1. Microsoft Commerce Solutions, Web technology, PHI.
2. Tom Negrino and Dori Smith, JavaScript for The World Wide Web.
3. Lovejoy, Essential of ASP for professionals, Pearson Education.
4. Kriss Jamsa, Konrad King, HTML & Web Design, Tata McGraw Hill.

CA10304 (3L +1T Hrs.)

C# PROGRAMMING

Questions to be set: 05 (All Compulsory)

Objectives: This course introduces fundamentals and basic principles of object-oriented programming using C#, object-oriented problem solving, program design and development, and managing input/output. By the end of this course, the students will be able to practice object-oriented programming concepts and techniques and develop C# classes for simple applications.

Pre-requisites: C/C++ Programming Concepts. Basic knowledge of Object Orientation concept.

Module	Topics to be covered	Topics	Hrs
Module 1: Introducing C# with Operators, Branching, and Looping [4 Hrs.]	in class	Evolution of C#, Characteristics of C#, Applications of C#, C# vs. C++, C# vs. Java., Namespaces, Adding Comments, Main returning a value, Using Aliases for Namespace Classes, Passing String objects to Write Line method, Command Line Arguments, Providing Interactive Input, Using Mathematical Functions, Multiple Mai Methods. Literals, Variables, Data Types, Value Types, Reference Types, Declaring Variables, Initialization of Variables, Default Values, Constant Variables, Scope of Variables, Boxing, and Unboxing. C# Operators, Decision making with if statement, The switch statement, The?: operator, The while statement, The do statement, The for statement, The for each statement, Jumps in loop.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 2: Methods in C# with Arrays and String [6 Hrs.]	in class	Declaring Methods, The main Methods, Invoking Methods, Nesting of Methods, Method Parameters, Pass by value and reference, The output parameters, Variable argument lists, Methods overloading. One-Dimensional arrays, Two Dimensional Arrays, Variable size arrays, The System Array class, ArrayList Class, Creating	[8]

		Strings, String Methods, Inserting and comparing strings, Finding Substrings, Mutable Strings, and Arrays of Strings, Regular Expressions.	
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: Classes and Objects	in class	Basic principles of OOP, defining a class, adding variables and methods, Member Access Modifiers, Creating Objects, Accessing Class Members, Constructors overloading, Static Members and constructors, Private and Copy constructors, Member Initialization, this reference, Constant and Read-Only Members, Properties.	[6]
	Assignment Topics	To be provided by the concerned faculty members.	
Module 4: Inheritance and Polymorphism	in class	Classical Inheritance, Containment Inheritance, defining a Subclass, Visibility Control, Defining Subclass Constructors, Multilevel and Hierarchical Inheritance, Overriding and Hiding Methods, Abstract Classes and Methods, Sealed Classes and Methods, Defining an Interface, Extending an Interface, Implementing Interfaces.	[10]
	Assignment Topics	To be provided by the concern faculty members	
Module 5: Managing errors and Exceptions	in class	Types of Errors, Exceptions, Exception handling code, Multiple catch statements, exception hierarchy, General catch handler, Using Finally statements, Nested Try Blocks, Throwing our own exceptions.	[6]
	Assignment Topics	To be provided by the concerned faculty members	

Text Books:

1. E Balagurusamy, Programming in C# A Primer Second Edition, Tata McGraw-Hill.

2. Selvi, S. Thamarai, Murugesan, R, R. Manohar, A textbook on C#: A systematic approach to object-oriented programming, Pearson Education.

Reference Books:

1. Leon S. Levy, C# programming language, Wiley.
2. Deitel , H. M & Deitel , P.J, Visual C# 2005 : How to program, Pearson Education.
3. Hejlerberg, Anders; Wiltamuth. Scott, C# programming language, Pearson Education.

CA10305 (3L +1T Hrs.)

FUNDAMENTALS OF DATA SCIENCE

Questions to be set: 05 (All Compulsory)

Objectives: This course will introduce students to this rapidly growing field and equip them with some of its basic principles and tools as well as its general mindset. Students will learn concepts, techniques, and tools they need to deal with various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication. The focus in the treatment of these topics will be on breadth, rather than depth, and emphasis will be placed on the integration and synthesis of concepts and their application to solving problems. To make the learning contextual, real datasets from a variety of disciplines will be used.

Module	Topics to be covered	Topics	Hrs
Module 1: Introducing Data Science with its Statical Inference	in class	Big Data and Data Science hype – and getting past the hype, why now? – Datafication, Current landscape of perspectives, Skillsets needed, Populations and samples, Statistical modeling, probability distributions, fitting a model - Intro to R.	[7]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Exploratory Data Analysis and the Data Science Process	in class	Basic tools (plots, graphs, and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: Real Direct (online real estate firm) Linear Regression, k-Nearest Neighbours (k-NN), k-means, motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web Providing Alternate Content with the No Frames Element, Using INLINE Frame Element to Create Inline Frames.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: Exploring and Navigating Dynamic HTML	in class	Feature Generation and Feature Selection [5 Hrs] Motivating application: user (customer) retention, Feature Generation (brainstorming, the role of domain expertise, and place for imagination) - Feature	[6]

		Selection algorithms, Filters; Wrappers; Decision Trees; Random Forests	
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Recommendation Systems, Social-Network as a graph	in class	Recommendation Systems: Building a User-Facing Data Product, Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system, Clustering of graphs, Direct discovery of communities in graphs, and Partitioning of graphs, Neighbourhood properties in graphs.	[10]
	Assignment Topics	To be provided by the concerned faculty members	
Module 5: Data Visualization and Ethical Issues of Data Science.	in class	Basic principles, ideas, and tools for data visualization, Examples of inspiring (industry) projects, Exercise: create your own visualization of a complex dataset. Discussions on privacy, security, ethics, A look back at Data Science, Next-generation data scientists	[10]
	Assignment Topics	To be provided by the concerned faculty members	

Text Books:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly. 2014.
2. Jure Leskovec, Anand Rajaraman, and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)

Reference Books:

1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)
4. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science, Cambridge University Press, ISBN: 978-1108485067

CA10306 (3L +1T Hrs.)

FUNDAMENTALS OF CLOUD COMPUTING

Questions to be set: 05 (All Compulsory)

Objectives: This course introduces cloud computing and its techniques – issues and its ecosystem.

Pre-requisites: Operating Systems and Computer Network.

Module	Topics to be covered	Topics	Hrs
Module 1: Distributed Computing Concepts	in class	Introduction to distributed computing, centralized vs distributed computing, advantages and disadvantages, types of distributed systems, parallel computing, ubiquitous computing, Utility computing model, cluster and grid computing, Distributed File Systems, NFS, AFS, Commodity hardware-based file systems, Hadoop Distributed File System (HDFS)	[10]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Introduction to Cloud Computing	in class	Introduction-Definition, Characteristics, Components, Applications, Pros and cons, Limitations. Need for cloud computing. History/ Evolution of cloud and related technologies- Multi-processing, Distributed computing, Parallel computing to ubiquitous computing. What cloud computing really is and what really isn't? Importance of cloud computing in the current era- why does cloud computing matter? Who should use cloud computing and who shouldn't use it? Types of cloud computing. Major players in cloud computing	[10]
	Assignment Topics	To be provided by the concerned faculty members	

Module 3: Cloud Computing Platforms and Technologies	in class	Migrating into the cloud platform- Issues and deployment considerations. NIST Cloud model, Exploring cloud service models- IaaS, PaaS, SaaS. Deployment models- Private, Public, Community and Hybrid clouds. Cloud computing platforms- Microsoft Azure, Hadoop, Map-reduce, Amazon Web services (AWS)	[6]
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Cloud Computing for Everyone	in class	Centralizing email communications, collaborating on schedules, Collaborating on To-Do Lists, collaborating with contact lists, Cloud computing for the community, Collaborating on group projects and events, and Cloud computing for the corporation.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 5: Using cloud services	in class	Collaborating on calendars, Schedules, and task management, exploring online scheduling applications, exploring online planning and task management, collaborating on event management, collaborating on contact management, collaborating on project management, collaborating on word processing, Collaborating on a spreadsheet, Storing and sharing files.	[6]
	Assignment Topics	To be provided by the concerned faculty members	

Text Books:

1. Barrie Sosinsky, Cloud Computing Bible, Wiley.
2. Rajkumar Buyya, James Broberg, AndrzejGoscinski, Cloud Computing– Principles and paradigms, Wiley.
3. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw Hill.
4. Kai Hwang, Geoffrey C Fox, Jack J. Dongarra, Distributed and Cloud Computing: From parallel processing to the Internet of Things, Elsevier.

Reference Books:

1. George Reese, Cloud Application Architectures, O'Reilly.
2. Michael Miller, Cloud computing: Web-based applications that change the way you work and collaborate online, Pearson.
3. Lee Gillam, Cloud Computing: Principles, Systems, and Applications, Springer.
4. Brian J. S. Chee, Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Centre, CRC Press.
5. Haley Beard, Cloud computing best practices for managing and measuring processes for on demand computing, Applications and data centres in the cloud with SLAs, Emereo.

CA10307 (3L +1T Hrs.)

CRYPTOGRAPHY FUNDAMENTALS

Questions to be set: 05 (All Compulsory)

Objectives: This course provides an overview of computer security principles using cryptography. The course will help to learn the principles of cyber information security in various computing environments. The goal of the course is to provide students with the necessary foundations to understand cryptography and its applications.

Pre-requisites: Computer Network.

Module	Topics to be covered	Topics	Hrs
Module 1: Foundations and Principles of Cryptography with Classical Encryption Techniques	in class	Introduction, History, Terminology, Confidentiality, Authentication, Integrity, Non-repudiation, OSI Security Architecture: Attacks, Services and Mechanisms, A model of internetwork conventional encryption model. Substitution techniques and Transposition techniques. Stream Ciphers: Caesar Cipher, Mono-alphabetic cipher, Playfair cipher, Poly-alphabetic cipher.	[11]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Symmetric Key Cryptography	in class	Symmetric key encryption model, Fiestal Cipher structure, Block cipher principles, Simplified DES, Data Encryption Standard, Differential and linear cryptanalysis algorithms, Confusion and Diffusion, Triple DES, Confidentiality using conventional encryption, Placement of encryption function, Traffic confidentiality, Key distribution,.	[9]
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: Basics Number Theory for Cryptography	in class	Principles of prime and relatively prime numbers, Greatest Common Devisor, Modular arithmetic, Fermat's and Euler's theorems, Random number, and a pseudo-random number.	[6]
	Assignment Topics	To be provided by the concerned faculty members	

Module 4: Asymmetric Key Cryptography	in class	Public key cryptography model. Principles of public-key cryptography, The RSA algorithm, Public Key management, Diffie-Hellman key exchange protocol. Confidentiality and authentication using public-key cryptography.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 5: Message Authentication and Hash Functions	in class	Authentication Requirements, Authentication Functions, Message Authentication Codes (MAC), MD5 Message-Digest Algorithm, Hash Function, Secure Hash Algorithm (SHA). Digital Signature and Authentication Protocols: Digital Signatures, Authentication protocols, Digital Signature Standard (DSS).	[6]
	Assignment Topics	To be provided by the concerned faculty members	

Text Books:

1. William Stallings, “Cryptography and Network Security”, Pearson.
2. Behrouz A Frouzan, “Cryptography and Network Security”, Tata McGraw Hill.

Reference Books:

1. Richard E. Smith, “Internet Cryptography”, Pearson.
2. D. Chapman and E. Zwicky, “Building Internet Firewalls”, O’Reilly.
3. Derek Atkins et al., “Internet Security, Professional Reference”, Techmedia.
4. AtulKahate, “Cryptography and Network Security”, McGraw Hill.

CA10308A (3L +1T Hrs.)

DATA ANALYTICS USING PYTHON

Questions to be set: 05 (All Compulsory)

Objectives: Data, which is available in abundance and in accessible forms, if analysed in an efficient manner unfolds many patterns and promising solutions. Data has to be pre-processed, converted to required format and fed to appropriately chosen algorithm to yield better results. This course aims at applying such techniques to raw data, using Python, to arrive at meaningful results.

Pre-requisites: Programming knowledge in any OO language

Module	Topics to be covered	Topics	Hrs
Module 1: Python Concepts, Data Structures, Classes	in class	Interpreter, Program Execution, Statements, Expressions, Flow Controls, Functions -Numeric Types, Sequences - Strings, Tuples, Lists and - Class Definition, Constructors, Inheritance, Overloading, Text & Binary Files - Reading and Writing.	[10]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Data Wrangling	in class	Combining and Merging DataSets, Reshaping and Pivoting, Data Transformation, String Manipulation, Regular Expressions.	[7]
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: Data Aggregation, Group Operations & Time Series	in class	Data Aggregation, Group Operations: GoupBy Mechanics, Data Aggregation, Group wise Operations and Transformations, Pivot, Tables and Cross Tabulations. Time Series: Date and Time Date Type tools, Time Series Basics, Data, Ranges, Frequencies and Shifting.	[7]
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Web Scraping	in class	Web Scraping: Data Acquisition by Scraping web applications –Submitting a form - Fetching web pages, Downloading web pages through form submission, CSS Selectors.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 5: Visualization in Python	in class	Visualization in Python: Matplotlib package, Plotting Graphs, Controlling Graph, Adding Text, More Graph Types, Getting and setting values,	[8]

		Patches.	
	Assignment Topics	To be provided by the concerned faculty members	

Text Books

1. Mark Lutz, “Programming Python”, O'Reilly Media, 4th edition, 2010.
2. Mark Lutz, “Learning Python”, O'Reilly Media, 5th Edition, 2013.

Reference Books

1. Tim Hall and J-P Stacey, “Python 3 for Absolute Beginners”, Apress, 1st edition, 2009.
2. Magnus Lie Hetland, “Beginning Python: From Novice to Professional”, Apress, Second Edition, 2005.
3. Shai Vaingast, “Beginning Python Visualization Crafting Visual Transformation Scripts”, Apress, 2nd edition, 2014.
4. Wes Mc Kinney, “Python for Data Analysis”, O'Reilly Media, 2012.

CA10309A **(3L + 1 T Hrs./week)**

SECURITY AND PRIVACY FOR DATA SCIENCE

Questions to be set: 05 (All Compulsory)

Objectives: Data collection and data analysis have become ubiquitous in modern world. Along with this trend, the need to protect private and sensitive information in data has become an important issue. This course will study a few state-of-the-art techniques in protecting data privacy and data security when the data is released to public or is subject to computer-based analysis, such as data mining.

Pre-requisite: Programming knowledge, Data mining basic concepts.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction to data mining	in class	Commercial viewpoint and Scientific viewpoint for mining data, Motivation behind mining large datasets, Origin of data mining, Datamining tasks, Classification, Clustering, Association rule mining, Sequential pattern discovery, Regression, Anomaly Detection, Challenges of Data mining, Support Vector Machine, k-means clustering algorithm.	[10]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Privacy	in class	Basic Concepts, Difference between PPDM and DM, Need for privacy preserving data mining, Technology behind privacy preserving data mining, Distributed and Centralized data, privacy attacks, challenges, Deriving Private Information from Randomized Data.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: Tabular privacy-preserving publishing	in class	k-ANONYMITY: A MODEL FOR PROTECTING PRIVACY, Protecting Respondents' Identities in Microdata Release. Efficient Full-Domain K-Anonymity, Mondrian Multidimensional K-Anonymity, Anatomy: Simple and Effective Privacy Preservation, Differential Privacy	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Incognito & Wavelet analysis	in class	Need for matrix decomposition, Compact representation of original data, Singular Value Decomposition, Nonnegative Matrix Factorization, Applications in Privacy-Preserving Data Mining. Wavelet analysis in privacy-preserving data	[8]

		analysis: Privacy preserving in Collaborative Data Analysis, Advantages of Wavelets, Introduction to Wavelet Analysis, Maintaining Statistical Analysis, Experimental Analysis	
	Assignment Topics	To be provided by the concerned faculty members	
Module 5: Matrix decomposition in privacy-preserving data mining	in class	Privacy attacks: Background on privacy attacks, General data perturbation model, Data privacy attacks. Privacy-preserving in social network analysis: Social Network Background, Privacy Challenges, Data Privacy and Data Utility, Clustering-Based and Heuristic Algorithms	[6]
	Assignment Topics	To be provided by the concerned faculty members	

Textbooks:

1. Rajendra Akerkar, Priti Srinivas Sajja, Intelligent Techniques for Data Science, Springer.
2. Yaniv Altshuler, Yuval Elovici, Armin B. Cremers, Nadav Aharony, Alex Pentland, Security and Privacy in Social Networks, Springer.

Reference Books:

1. David Salomon, Data Privacy and Security, Springer.
2. Bhavani Thuraisingham, Pallabi Parveen, Mohammad Mehedy Masud, Latifur Khan, Big Data Analytics with Applications in Insider Threat Detection, CRC Press.
3. Usha Mujoo Munshi, Neeta Verma, Data Science Landscape: Towards Research Standards and Protocols, Springer.
4. Liehuang Zhu, Zijian Zhang, Chang Xu, Secure and Privacy-Preserving Data Communication in Internet of Things, Springer.
5. Clarence Chio, David Freeman, Machine Learning and Security: Protecting Systems with Data and Algorithms, O'Reilly.

CA10310A **(3L + 1 T Hrs./week)**

DATABASE ADMINISTRATION

Questions to be set: 05 (All Compulsory)

Objectives: The primary objective of this course is to provide each student with the knowledge and secrets to be successful as a practicing SQL Server DBA. The student will gain confidence in their SQL Server DBA knowledge. Using a proven training combination of intense instruction and practicum the student should have a firm understanding of SQL Server Database Administration. The student will successfully install and configure a working SQL Server database, create tablespaces and files, manage security and user access, and create tables and write SQL Server queries.

Pre-requisite: Basic knowledge of the Microsoft Windows operating system and its core functionality, Working knowledge of Transact-SQL, Working knowledge of relational databases, Some experience with database design.

Module	Topics to be covered	Topics	Hrs
Module 1: SQL Server Overview & Configuration SQL Server 2008	in class	Availability and Scalability Features, Security Features, Data Management Features, Administration and Maintenance Features, Development Features, To enable SQLiMail, Testing mail delivery. Installing and Configuring SQL Server 2008: SQL Server 2008 Editions, Installing Microsoft SQL Server, System Requirements, Preparing for a SQL 2008 Installation, Installation Checklist, Setup Features, Using the System Consistency Checker, Component Install, Unattended Installation, Upgrading from previous versions of SQL Server, To verify the Installation, Administrative Tools. Installing and Configuring SQL Server 2008: SQL Server 2008 Editions, Installing Microsoft SQL Server, System Requirements, Preparing for a SQL 2008 Installation, Installation Checklist, Setup Features, Using the System Consistency Checker, Component Install, Unattended Installation, Upgrading from previous versions of SQL Server, To verify the Installation, Administrative Tools.	[8]
	Assignment Topics	To be provided by the concerned faculty members	

Module 2: SQL Server Management Studio and other tools	in class	SQL Server Management Studio and other tools: Management Studio Windows, Registered Servers, Object Explorer, Review Database Objects, Modify Database Properties, Create Database Scripts, The Maintenance Plans Node, Solution Explorer, Query Editor, Upgrading to SQL Server Computer Manager, SQL Server 2008 Services node, SQL Server 2008 Network Configuration node, SQL Server 2008 Native Client Configuration node, The SQLCMD Management Utility, SQLCMD Syntax, SQLCMD Variables, Dedicated Administrative Connection, SQL Server Management Studio SQLCMD Mode, Using SQL Management Objects, BCP in and out with Format files and Bulk Insert, Import Export Wizard Monitoring the Database Server, Managing Metadata Views, Metadata Storage, System Views, Information Schema, Catalog Views, Sys All, Dynamic Management Views, System Stored Procedures	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: Database and Index & Securing SQL Server 2008	in class	Database and Index Maintenance: Index Management, New Index Features, Creating Indexes, Online Index Maintenance, Parallel (multiple CPU) Index Operations, Lock Options, Included Columns in Indexes, Partitioned Tables and Indexes, Altering an Index, Rebuilding an Index, Reorganising an Index, Disabling an Index, Dropping an Index, Index Fragmentation, Using the Database Tuning Advisor.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Securing SQL Server 2008	in class	Securing SQL Server 2008: Implementing Securables, New Security Features, Principals, Securables, Permissions, Permission Types, Managing Logins, Managing Users, Managing Schemas, Schema Definition, Using Schemas, Managing Execution Context, Managing Permissions, Manage Server Permissions, Manage Server-Scope Securable Permissions, Manage Database Permissions, Manage Database-Scope Securable Permissions, Managing Certificates, Native Data Encryption, TDE, Code and Module Signing, SQL Server Auditing	[8]

	Assignment Topics	To be provided by the concerned faculty members	
Module 5: SQL Server Backup & Recovery, Monitoring & Performance	in class	SQL Server Backup & Recovery: Disaster Recovery, SQL 2008 Disaster Recovery Feature, Enhanced Features, Database Snapshots, Creating a Snapshot, Common Snapshot Applications, Undeleting table rows, Undoing a table update, Recovering a dropped object, Backup and Restore concept and types, Backup and Restore options, Media Integrity Changes, Recovering the MASTER Database, Create a mirrored backup. Monitoring and Performance: SQL Server Profiler, Optimal Data Storage, Windows Perfmon Monitors, DMV's, Diagnostic Tools, Query Analyzer, Database Engine Tuning Advisor, Index Optimisation, Partitioned Indexes, Lock optimization	[8]
	Assignment Topics	To be provided by the concerned faculty members	

Textbooks

1. Bradley Beard, Practical Maintenance Plans in SQL Server: Automation for the DBA, Apress publishers.
2. Peter A. Carter, Securing SQL Server: DBAs Defending the Database, Apress Publishers

Reference Books

1. Tom Carpenter, Microsoft SQL Server 2012 Administration, Google Books
2. Robert Walters, Grant Fritchey, Beginning SQL Server 2012 Administration, Apress publishers
3. Y Adam Jorgensen, Bradley Ball, Steven Wort, Ross Loforte, Brian Knight, Professional Microsoft SQL Server 2014 Administration, Wiley & Sons

CA10311A **(3L + 1 T hrs./week)**

CLOUD COMPUTING AND SECURITY

Questions to be set: 05 (All Compulsory)

Objectives: This course introduces cloud computing and its techniques - issues, ecosystem.

Pre-requisite: Operating Systems and Computer Network.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction about cloud computing	in class	Cloud Computing Concepts: Introduction, Cloud Services model, Deployment Model, Service Primitives, Cloud Reference Model, Cloud Cube Model	[4]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Virtualization	in class	Virtualization- definition, Implementation levels of virtualization, Virtualization architecture and software. Virtual clustering, Virtual Infrastructure, Virtualization of CPU, Memory, I/O Devices, Application virtualization, Virtualization for data-centre automation. Virtualization and cloud computing, Migrating virtual machines, Pros and cons of virtualization. Para-virtualization, Full-virtualization. Examples- Xen, Microsoft Hyper-V, VMware.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: Cloud Computing Architecture	in class	Service Level Agreement (SLA), Understanding cloud architecture, Service Oriented Architecture (SOA), Cloud abstraction and virtualization, Cloud federation, Cloud meshup, Cloud life cycle.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Cloud Service Development and Applications:	in class	Web-based application, Pros and cons of cloud service development, Types of cloud service development, cloud development life cycle. Discovering cloud services, Development services and tools, Amazon EC2, Amazon Web services	[10]

		(AWS), Google app engine, IBM blue cloud, Microsoft Azure, Hadoop, Map-reduce, Force.com.	
	Assignment Topics	To be provided by the concerned faculty members	
Module 5: Cloud Security and Privacy	in class	Infrastructure security: Network level, Host level, Application level, Data security and storage: aspects of data security, data security mitigation, provider data and its security, Security management in cloud, Privacy: privacy, data life cycle, key privacy concerns in the cloud, changes to the privacy risk management and compliance in relation to cloud computing, legal and regulatory implications	[10]
	Assignment Topics	To be provided by the concerned faculty members	

Text Books:

1. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy", O'reilly,SPD,
2. Barrie Sosinsky, Cloud Computing Bible, Wiley.
3. Rajkumar Buyya, James Broberg, AndrzejGoscinski, Cloud Computing– Principles and paradigms, Wiley.
4. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw Hill.
5. Kai Hwang, Geoffrey C Fox, Jack J. Dongarra, Distributed and Cloud Computing: From parallel processing to the Internet of Things, Elsevier.

Reference Books:

1. George Reese, Cloud Application Architectures, O'Reilly.
2. Michael Miller, Cloud computing: Web based applications that change the way you work and collaborate online, Pearson.
3. Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer.
4. Brian J. S. Chee, Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press.
5. Haley Beard, Cloud computing best practices for managing and measuring processes for on demand computing, Applications and data centres in the cloud with SLAs, Emereo.

CA10312A **(3L + 1 T hrs./week)**

BIG DATA AND ITS APPLICATIONS IN CLOUD

Questions to be set: 05 (All Compulsory)

Objectives: This course provides an overview of the concept of Big Data, Machine Learning and Cloud Computing. It provides different aspect of knowledge discovery for Big data and various data mining process for climate data and multilevel text mining. It also presents the Hodoop framework for distributed computing and MapReduce for parallel processing and stream processing with Spark for data management.

Pre-requisites: Fundamentals of data mining concepts.

Module	Topics to be covered	Topics	Hrs
Module 1: Introduction to Big Data & Machine Learning	in class	Introduction to Big Data: Understanding Big Data, capturing Big Data: Volume of Data, Velocity of Data, variety of Data, Veracity of Data. Benefitting from Big Data, Management of Big Data, Organising and Analyzing Big Data. Machine Learning and Incremental Learning with Bigdata: Machine learning concepts, Bigdata and machine learning, Incremental learning, Incremental learning for knowledge building, Incremental technique to handle bigdata, Applications	[10]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Knowledge discovery for big data	in class	Opinion Mining: Aspect and entity extraction, Data Mining for climate data , Multilevel Text Mining. Introduction to cloud computing: Need for cloud computing, Business and IT perspectives, Benefits and challenges of cloud computing, cloud module: Public, private, Hybrid, community cloud. Cloud application architecture: Grid computing, transaction computing. Cloud computing architecture, cloud services: Database as a service, infrastructure as a service, platform as a service.	[10]
	Assignment Topics	To be provided by the concerned faculty members	

Module 3: Distributed computing using Hadoop	in class	Hadoop Framework, HDFS Design goals, Master-slave architecture, Block system, sequence files, YARN	[5]
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Parallel processing with Map Reduce	in class	MapReduce overview, Sample Map Reduce Application: WordCount. MapReduce Programming: Data Types and Format, Writing MapReduce programming, Testing MapReduce programs. MapReduce Jobs Execution: Managing Failures, process & status updates. Hive Language and Pig language.	[5]
	Assignment Topics	To be provided by the concerned faculty members	
Module 5: Stream processing with Spark	in class	Stream processing with Spark: Spark Architecture, Resilient Distributed Datasets (RDDs), Directed Acylic GraPH(dag), Spark Ecosystem. Spark for Big Data processing: MLlib, Spark GraphX, Spark R, Spark SQL, Spark Streaming. Spark vs Hadoop.	[10]
	Assignment Topics	To be provided by the concerned faculty members	

Text Books:

1. Anil Maheshwari, Big Data, McGraw-Hill Education
2. M.N Rao, Cloud Computing PHI learning Pvt. Ltd.

Reference Books:

1. Wesley W. Chu Data Mining & Knowledge Discovery for Big Data: Methodologies, challenges and opportunities, Springer Science and Business Media.
2. VenkatAnkam, Bigdata Analytics, Packt Publishing Ltd.
3. Kim H. Pries, Robert Dunnigan, Big Data Analytics: A Practical Guide for Managers, CRC Press.
4. V. B. Aggarwal, VasudhaBhatnagar, Durgesh Kumar Mishra, Big Data Analytics: Proceedings of CSI 2015, Springer.

CA10314A **(3L + 1 T Hrs./week)**

NETWORK AND INFORMATION SECURITY

Questions to be set: 05 (All Compulsory)

Objectives: This course provides an insight into the real world scenario of network and information security risks and their solutions. The course will help to learn the implementation of cryptographic algorithms for network and information security. The goal of the course is to provide students with the necessary understanding of information security and network security risks and its solutions.

Pre-requisites: Computer Networks, Cryptography and Number Theory.

Module	Topics to be covered	Topics	Hrs
Module 1: Fundamentals of Network Security	in class	Network Security Fundamentals: Introduction to computer security, information security and network security. Security models. Security goals. Security principles Cryptology and steganography. OSI Security Architecture.	[6]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Authentication and Digital Signature	in class	Authentication, Types of authentications, Authentication applications, Kerberos, X.509 directory authentication service, Digital Signature, requirements for digital signatures, types of digital signature, dual signature, Digital Signature Algorithm (DSA)	[10]
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: E-Mail & IP Security	in class	Electronic mail security: Pretty Good Privacy (PGP), S/MIME. IP security: IP security overview, IP security architecture, Authentication header, Encapsulation, security, Payload, Combining security associations, Key management.	[9]
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Web security & Intrusion Detection System and Firewalls	in class	Web security: Web security requirements, secure socket and transport layer security, secure electronic transaction. Intrusion Detection System and Firewalls: Intruders, Intrusion and Intrusion Detection System (IDS), Types of IDS, Firewalls,	[9]

		Characteristics of firewalls, types of firewalls.	
	Assignment Topics	To be provided by the concerned faculty members	
Module 5: Malicious Software and Countermeasures	in class	Viruses, worms, trojans, spyware, malware, botnet, and related threats, types of virus, Anti-virus software, Anti-malware, Anti-phising and anti-spyware software.	[6]
	Assignment Topics	To be provided by the concerned faculty members	

Text Books:

1. William Stallings, "Cryptography and Network Security", Pearson.
2. Behrouz A Frouzan, "Cryptography and Network Security", Tata McGraw Hill.

Reference Books:

1. Richard E. Smith, "Internet Cryptography", Pearson.
2. D. Chapman and E. Zwicky, "Bulding Internet Firewalls", O'Reilly.
3. Derek Atkins et al., "Internet Security, Professional Reference", Techmedia.
4. AtulKahate, "Cryptography and Network Security", McGraw Hill.

CA10315A **(3L + 1 T Hrs./week)**

INTERNET SECURITY AND PRIVACY

Questions to be set: 05 (All Compulsory)

Objectives: This course provides an overview of internet security risks and their solutions. The course will help to learn the methods and techniques for information security and privacy concerns in internet technologies. The goal of the course is to provide students with the necessary understanding of information security and privacy issues in today's internet

Pre-requisites: Computer Networks, Cryptography and Web Application.

Module	Topics to be covered	Topics	Hrs
Module 1: Internet Security Protocols	in class	Basic Concepts, Security Socket Layer(SSL), Secure Hyper Text Transfer Protocol(SHTTP), Time stamping Protocol(TSP), Secure Electronic Transaction(SET),SSL Versus SET, 3-D Secure Protocol, Electronic Money , Email Security, Wireless Application Protocol(WAP) Security, Security in GSM.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Public Key Infrastructure	in class	Public Key Infrastructure (PKI): Introduction, Digital Certificates, Private Key Management, The PKIX Model, Public Key Cryptography standard(PKCS), XML, PKI and Security.	[6]
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: Network Security	in class	Brief Introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks (VPN)	[6]
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Administrating Security & Malicious Software and Countermeasures	in class	Administrating Security: Security planning, Risk analysis, Organization and security Policies, Physical Security. Malicious Software and Countermeasures: Viruses, worms, trojans, spyware, malware, botnet, and related threats, types of virus, Anti-virus software, Anti-malware, Anti-phising and anti-spyware software.	[10]

	Assignment Topics	To be provided by the concerned faculty members	
Module 5: Firewalls & Privacy related issuses	in class	Firewalls, Characteristics of firewalls, types of firewalls. Privacy and related issues in Internet Security: Privacy, Data Life cycle, privacy concerns. Legal and Ethical Issues in internet security, Protecting Programs and data.	[10]
	Assignment Topics	To be provided by the concerned faculty members	

Text Book:

1. Atul Kahate – Cryptography and Network Security, 2nd Edition Tata McGraw Hill Publication, New Delhi-2006

Reference Book:

1. Behrouz A. Forouzan and D. Mukhopadhyay- Cryptography & Network Security, 2nd Edition - 1st reprint 2010, McGraw Hill, New Delhi.
2. Wade Trapple, Lawrence C. Washington- Introduction to Cryptography with coding Theory, 2nd Edition pearson Education

CA10316A **(3L + 1 T hrs./week)**

SYSTEM AND NETWORK ADMINISTRATION

Questions to be set: 05 (All Compulsory)

Objective: This course focuses on administration of operating systems in a client-server technology (Windows and Linux on virtual machine), installation and maintenance. It prepares students to installation of Windows Server, NTFS file system and folder permissions, Domain Name System, Active Directory, local and domain Group Policy, Windows Terminal Services, Internet Security and Acceleration Server, Internet Information Services, communications and networking. An introduction to Linux, installing Ubuntu, advanced usage and managing Ubuntu, terminal, working with Windows, system administration, configuration of server: WWW, DHCP, DNS, Samba, NFS, emails and printers.

Pre-requisites: Communication Technique and Data Communication.

Module	Topics to be covered	Topics	Hrs
Module 1: Overview of Networking and System Administration	in class	Networking and System Administration Overview: History, Necessity of System Administration, Network Protocols and Standards, Reference Model (OSI, TCP/IP), Windows and Linux Networking Basics, File System, File Protection, File Sharing, Switching and Routing basics. Dynamic Host Configuration Protocol (DHCP): DHCP Principle, DHCP Server Configuration, DHCP Options, Scope, Reservation and Relaying, DHCP Troubleshooting.	[8]
	Assignment Topics	To be provided by the concerned faculty members	
Module 2: Basic Server Administration	in class	Server Administration Basics: Server and Client Installation, Boot Process and Startup Services:Xinetd/Inetd, Managing accounts: users, groups and other privileges, File Systems and Quota Management, Job Scheduling with cron, crontab, anacron and system log analysis, Process controlling and management, Online Server upgrade/update process.	[7]
	Assignment Topics	To be provided by the concerned faculty members	
Module 3: Basic System Commands & Mail Management and Network	in class	Basic System commands and Mail management: Ls, cd , dir, chmod, ifconfig, who, grep, iw, kill, ps, session recording, Key logger, Basic Mail Server Concepts and Configuration (Sendmail, postfix, qmail, exim.). Network Configuration Basics: IPv4 and IPv6 addressing, Network Interface	[9]

Configuration basics		Configuration, Diagnosing Network start-up issues, Linux and Windows Firewall configuration, Network troubleshooting commands.	
	Assignment Topics	To be provided by the concerned faculty members	
Module 4: Name Server, Web and Proxy Servery & Configuration	in class	Name Server and Configuration: DNS principles and Operations, Basic Name Server and Client Configuration. Web and Proxy Server Configuration: HTTP Server Configuration Basics, Virtual Hosting, HTTP Caching, Proxy Caching Server Configuration, Proxy-Authentication Mechanisms, NAT/PAT, Troubleshooting.	[9]
	Assignment Topics	To be provided by the concerned faculty members	
Module 5:	in class	FTP, File and Print Server: General Samba Configuration, SAMBA SWAT, NFS and NFS Client Configuration, FTP Principles, Troubleshooting. Remote Administration and Management: Router Configuration, Webmin/usermin, Team Viewer, Telnet, SSH.	[7]
	Assignment Topics	To be provided by the concerned faculty members	

Text Books:

1. Thomas A. Limoncelli, Christina J. Hogan , Strata R. Chalup, The Practice of System and Network Administration, Second Edition.
2. Advanced Linux Networking, Roderick W. Smith, Addison- Wesley Professional (Pearson Education), 2002.
3. Tony Bautts, Terry Dawson, Gregor N. Purdy, O'Reilly, Linux Network Administrator's Guide, Third Edition, 2005

Reference Books:

1. An Engineering Approach to Computer Networks, S. Keshav, ISBN 0-201-63442-2
2. High Performance Communication Networks, Jean Walrand, Pravin Varaiya, ISBN 1-55860-341-7