JEPPIAAR INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

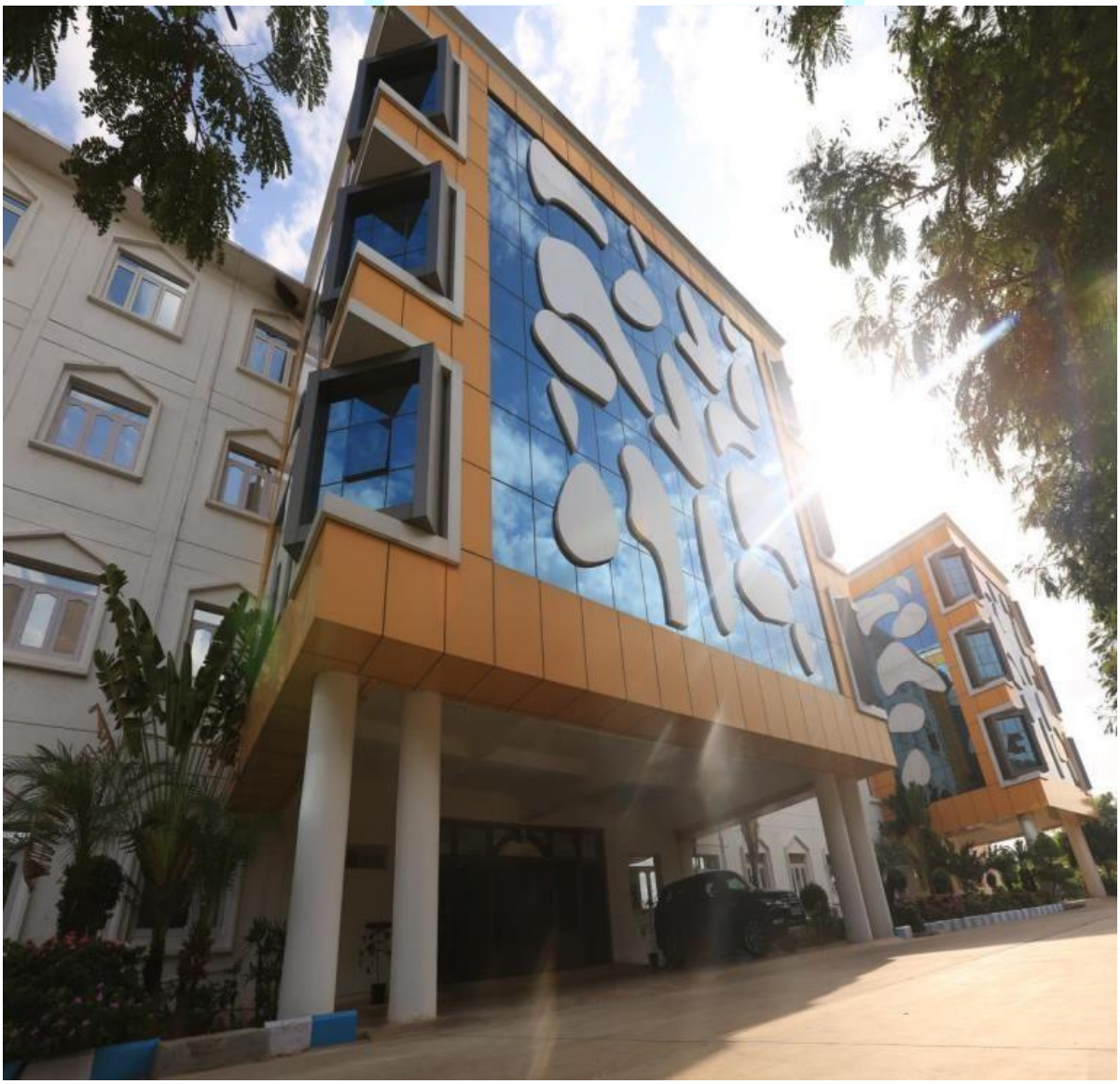
Self-Belief | Self Discipline | Self Respect

Kunnam, Sunguvarchatram, Sriperumbudur-631604

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

AUTONOMOUS SYLLABUS

REGULATION 2024



VISION AND MISSION OF THE INSTITUTION

VISION

- Jeppiaar Institute of Technology aspires to provide technical education in futuristic technologies with the perspective of innovative, industrial, and social applications for the betterment of humanity.

MISSION

- To produce competent and disciplined high-quality professionals with the practical skills necessary to excel as innovative professionals and entrepreneurs for the benefit of society.
- To improve the quality of education through excellence in teaching and learning, research, leadership, and by promoting the principles of scientific analysis, and creative thinking.
- To provide excellent infrastructure, serene, and stimulating environment that is most conducive to learning.
- To strive for productive partnership between the Industry and the Institute for research and development in the emerging fields and creating opportunities for employability.
- To serve the global community by instilling ethics, values, and life skills among the students needed to enrich their lives.

VISION AND MISSION OF THE DEPARTMENT

VISION

- To be the most preferred destination in the country for imparting education in Computer Science and Business Systems, at the undergraduate level.
- To transform learners into industry ready professionals at the global level to provide solutions for business problem and contribute to the society at large.

DEPARTMENT MISSION

- DM1: To provide an infrastructure and adopt creative teaching techniques to promote participatory learning.
- DM2: To develop high personal and professional values, business competence and a spirit of innovation and entrepreneurship.
- DM3: To encourage the desire for higher learning and research, to address global challenges.
- DM4: To collaborate with industry to inculcate varied skill sets that meets industry standards and to practice moral values.

PROGRAM EDUCATIONAL OBJECTIVES(PEO'S)

- PEO1 To ensure graduates will be proficient in utilizing the fundamental knowledge of basic sciences, mathematics, Computer Science and Business systems for the applications relevant to various streams of Engineering and Technology.
- PEO2 To enrich graduates with the core competencies necessary for applying knowledge of computer science and Data analytics tools to store, retrieve, implement and analyze data in the context of business enterprise

- ❖ PEO3 To enable graduates to gain employment in organizations and establish themselves as professionals by applying their technical skills and leadership qualities to solve real world problems and meet the diversified needs of industry, academia and research

- ❖ PEO4 To equip the graduates with entrepreneurial skills and qualities which help them to perceive the functioning of business, diagnose business problems, explore the entrepreneurial opportunities and prepare them to manage business efficiently

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** (K3) Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** (K4) Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** (K4) Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** (K5) Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** (K3, K5, K6) Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** (A3) Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** (A2) Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** (A3) Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** (A3) Function effectively as an individual, and as a member or leader in diverse

teams, and in multidisciplinary settings.

10. **Communication:** (A3) Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** (A3) Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** (A2) Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

- PSO1: To create, select, and apply appropriate techniques, resources, modern engineering and business tools including prediction and data analytics to complex engineering activities and business solutions.
- PSO2: To evolve computer science domain specific methodologies for effective decision making in several critical problem domains of the real world.
- PSO3: To be able to apply entrepreneurial skills and management tools for identifying, analyzing and creating business opportunities with smart business ideas.
- PSO4: To manage complex IT projects with consideration of the human, financial, ethical and environmental factors and an understanding of risk management processes, and operational and policy implications

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

AUTONOMOUS CURRICULUM R2024 (CBCS)

SEMESTER – I										
S.No	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**CIE**	**SEE**	**TOTAL**
				L	**T**	**P**				
1	AIP001	Induction Program	-	-	-	-	-	-	-	-
THEORY										
2	AMA101	Matrices and Calculus	BS	3	1	0	4	40	60	100
3	AEC103	Basic Electrical and Electronics Engineering	ES	3	0	0	3	40	60	100
4	ACS101	Principles of Programming	PC	2	0	2	3	40	60	100
5	ACS102	Python Programming	ES	3	0	0	3	40	60	100
6	AMC101	Employment Enhancement Skills	MC	2	0	0	0	-	-	100
7	AMC102	Professional Ethics and Human Values	MC	2	0	0	0	-	-	100
PRACTICALS										
8	AEC302	Basic Electrical and Electronics Engineering Laboratory	ES	0	0	4	2	60	40	100
9	ACS301	Python Programming Laboratory	ES	0	0	4	2	60	40	100
10	AHS301	Communication Skills and Technical Writing	HS	0	0	2	1	60	40	100
11	AEEC301	Mini Project/Professional practices	EEC	0	0	2	1	60	40	100
			Total	16	1	14	19			

SEMESTER – II										
S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AMA102	Discrete Mathematics	BS	3	1	0	4	40	60	100
2	APH101	Computational Physics	BS	3	0	0	3	40	60	100
3	AAI101	Introduction to Data Science	BS	3	0	0	3	40	60	100
4	AMB114	Design Thinking and Entrepreneurship	PC	3	0	0	3	40	60	100
5	ACS101	Fundamentals of Cloud Computing	CS	3	0	0	3	40	60	100
6	AHS101	Language Enhancement	HS	1	0	0	1	40	60	100
7	AMC103	Indian Constitution	MC	2	0	0	0	-	-	100
PRACTICALS										
8	APH301	Computational Physics Laboratory	BS	0	0	4	2	60	40	100
9	ACS302	Fundamentals of Cloud Computing Laboratory	ES	0	0	4	2	60	40	100
10	AMC301	Yoga and Happy Living	ES	0	0	3	0	-	-	100
11	AEEC302	Mini Project /Professional Practices	EEC	0	0	2	1	60	40	100
			Total	18	1	11	22			

SEMESTER – III										
S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AMA105	Probability and Statistics	ES	3	0	0	3	40	60	100
2	ACS106	Data Structures and Algorithms	PC	3	0	0	3	40	60	100
3	ACS105	Object Oriented Programming	HS	3	0	0	3	40	60	100

4	AMB117	E-Commerce	PC	3	0	0	3	40	60	100
5	AMC108	Environmental Engineering and Sustainability	MC	2	0	0	0	-	-	100
PRACTICALS										
6	ACS303	Object Oriented Programming Laboratory	PC	0	0	4	2	60	40	100
7	ACS304	Data Structures and Algorithms Laboratory	PC	0	0	4	2	60	40	100
8	AMB310	E-Commerce Laboratory	PC	0	0	2	1	60	40	100
9	AHS302	Soft Skills I	HS	0	0	2	0	-	-	100
10	AEEC303	Mini Project /Professional Practices	EEC	0	0	2	1	60	40	100
			Total	14	1	12	18			
SEMESTER – IV										
S.No	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**CIE**	**SEE**	**TOTAL**
				L	**T**	**P**				
THEORY										
1	ACS107	Operating Systems	PC	3	0	0	3	40	60	100
2	ACS108	Database Management Systems	PC	3	1	0	3	40	60	100
3	ACS109	Computer Networks	PC	3	1	0	3	40	60	100
4		Professional Elective 1	PE	3	0	0	3	40	60	100
PRACTICALS										
5	ACS305	Operating Systems Laboratory	PC	0	0	4	2	60	40	100
6	ACS306	Database Management Systems Laboratory	PC	0	0	4	2	60	40	100
7	ACS307	Computer Networks Laboratory	PC	0	0	4	2	60	40	100
8	AHS106	Soft Skills II	MC	0	0	2	0	-	-	100
9	AEEC304	Mini Project /Professional Practices	EEC	0	0	2	1	60	40	100
			Total	13	2	14	19			

SEMESTER – V										
S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AAI106	Data Mining and Warehousing	PC	3	-	-	3	40	60	100
2	ACS106	Software Engineering	PC	3	-	-	3	40	60	100
3		Professional Elective 2	PE	3	-	-	3	40	60	100
4	AOE701	Open Elective 1	OE	3	-	-	3	40	60	100
PRACTICALS										
5	AAI304	Data Mining and Warehousing Laboratory	PC	-	-	4	2	60	40	100
6	AEEC105	Internship	EEC	0	0	2	1	60	40	100
			Total	13	0	4	15			

SEMESTER – VI										
S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AIT102	Full Stack Development	PC	3	-	-	3	40	60	100
2		Professional Elective 3	PE	3	-	-	3	40	60	100
3		Professional Elective 4	PE	3	-	-	3	40	60	100
PRACTICALS										
4	AIT302	Full Stack Development Laboratory	PC	-	-	4	2	60	40	100
5	AEEC106	Mini Project/Summer Internship/Professional Practices	EEC	0	0	2	1	60	40	100
			Total	9	0	6	12			

SEMESTER – VII										
S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	ACB101	Usability Design	PC	3	0	0	3	40	60	100
2		Professional Elective 5	PE	3	0	0	3	40	60	100
3		Open Elective 2	OE	3	0	0	3	40	60	100

PRACTICALS										
6	ACB301	Usability Design Laboratory	PC	0	0	4	2	60	40	100
7	AEEC104	Project Phase I	EEC	0	0	12	6	40	60	100
8	AEEC107	Internship/Professional Practices	EEC	0	0	2	1	60	40	100
			Total	9	0	18	18			

SEMESTER – VIII										
S.No	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**CIE**	**SEE**	**TOTAL**
				L	**T**	**P**				
THEORY										
1		Professional Elective 6	PE	3	0	0	3	40	60	100
2		Professional Elective 7	PE	3	0	0	3	40	60	100
PRACTICALS										
3		Project Phase II	EEC	0	0	20	10	40	60	100
4		Mini Project/Summer Internship/Professional Practices	EEC	0	0	2	1	60	40	100
			Total	6	0	22	17			

PROFESSIONAL ELECTIVES

Vertical Names	PE	CODE	COURSE
Business Essentials	**PE1**	ACB501	Business Plan and Ethics
		ACB502	Business Analytics
		ACB503	Fundamentals of Management
		ACB504	Introduction to Business Systems
		ACB505	Business Strategy
Data Science and Business Intelligence	**PE2**	ACB506	Big data Technologies & Analytics
		ACB507	Data Analytics and Visualization withR-Programming
		ACB508	Digital Marketing
		ACB509	Machine Learning
		ACB510	Data Mining for Business Intelligence
Digital Security and Insights	**PE3**	ACB511	Web Scrapping Data Acquisition
		ACB512	Cryptography and Network Security
		ACB513	Marketing Research
		ACB514	Cloud application Development

		ACB515	Healthcare Analytics
Advanced Technology Integration	**PE4**	ACB516	Micro and Macro Economics
		ACB517	Web Technologies
		ACB518	Enterprises Systems
		ACB519	IoT and its applications
		ACB520	Cognitive Science and Analysis
Digital Business Technologies	**PE5**	ACB521	Marketing Analytics
		ACB522	Human Resource Management for Business
		ACB523	Mobile Application Development
		ACB524	Natural Language Processing
		ACB525	Deep Learning
Data-Driven Business Strategies	**PE6**	ACB526	Financial Analytics
		ACB527	Agile Methodologies and Devops
		ACB528	Supply Chain Management
		ACB529	Exploratory Data Analysis
		ACB530	Entrepreneurship Development
Emerging Technologies and Applications	**PE7**	ACB531	Quantum Computing
		ACB532	Text and media analytics
		ACB533	Computational finance & modelling
		ACB534	Software project management
		ACB535	Blockchain Technologies

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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEM
AUTONOMOUS SYLLABUS R2024
CHOICE BASED CREDIT SYSTEM

SEM- I

AMA101-MATRICES AND CALCULUS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**ES**	**3**	**1**	**0**	**4**
Preamble	➢ This course provides the foundation for understanding various aspects of electrical and electronics engineering. From the basics of circuit theory to the intricacies of semiconductor devices, this subject delves into the heart of electrical and electronic systems.						
UNIT I	**MATRICES**						**9+3**
Matrices - Eigenvalues and eigenvectors - Diagonalization of matrices using orthogonal transformation – Cayley Hamilton Theorem (without proof) - Quadratic forms - Reduction to canonical form using orthogonal transformation.							
UNIT II	**SOLUTION OF LINEAR SYSTEM OF EQUATIONS AND EIGENVALUE PROBLEMS**						**9+3**
Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Gauss Seidel iterative method - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method – Jacobi method							
UNIT III	**DIFFERENTIAL CALCULUS**						**9+3**
Limit of a function-Continuity-Derivatives-Differentiation rules (sum, product, quotient, chain rules)-Implicit Differentiation-Logarithmic Differentiation-Applications: Maxima and Minima of functions of one variable**.**							
UNIT IV	**INTEGRAL CALCULUS**						**9+3**
Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions – Improper integrals.							
UNIT V	**MULTIPLE INTEGRALS**						**9+3**
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications: Moments and centres of mass, moment of inertia							
							Total: 60
TEXTBOOKS							
1.	Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.						
2.	Erwin Kreyszig ," Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.						
3.	Grewal. B.S., and Grewal. J.S., Numerical methods in Engineering and Science, Khanna Publishers, 9th Edition, New Delhi, 2007.						
REFERENCES							
1.	Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.						
2.	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008						
COURSEOUTCOMES:							**Bloom's Taxonomy**

At the end of the course, learners will be able to		Level
CO1.	Demonstrate the matrix techniques in solving the related problems in engineering and technology.	K4
CO2.	Apply matrix methods to solve system of linear equations.	K3
CO3.	Apply differential calculus tools in solving various application problems.	K3
CO4.	Apply different methods of integration in solving practical problems	K3
CO5.	Evaluate multiple integrals to conduct investigations of complex problems.	K5

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	1		1	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-		1	1	-
CO3	3	3	3	-	-	-	-	-	-	-	-		1	1	-
CO4	3	2	3	-	-	-	-	-	-	-	1		-	1	-
CO5	3	2	3	-	-	-	-	-	-	-	-		1	-	-

AEC103 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**ES**	**3**	**0**	**0**	**3**
Preamble	➢ This course provides the foundation for understanding various aspects of electrical and electronics engineering. From the basics of circuit theory to the intricacies of semiconductor devices, this subject delves into the heart of electrical and electronic systems.						
Unit 1	**ELECTRICAL CIRCUITS**						**9**
DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)							
Unit 2	**ELECTRICAL MACHINES**						**9**
Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor							
Unit 3	**ANALOG ELECTRONICS**						**9**
Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters							

Unit 4	DIGITAL ELECTRONICS	9
Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only).		
Unit 5	**MEASUREMENTS AND INSTRUMENTATION**	**9**
Functional elements of an instrument, Standards and calibration, Operating Principle, types -Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.		
		Total: 45

TEXTBOOKS	
1	Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020
2	S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2011
3	Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008
4	James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5	.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', DhanpatRai and Co, 2015.
REFERENCES	
1	Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019
2	Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2011
3	Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 1th edition, 2011
4	Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Compute the electric circuit parameters for simple problems.	K2
CO2	Explain the working principle and applications of electrical machines.	K2
CO3	Analyze the characteristics of analog electronic devices.	K2
CO4	Explain the basic concepts of digital electronics.	K2
CO5	Explain the operating principles of measuring instruments	K2

	PO1	PO2	PO3	PO4	PO5	PO6	PO1	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
CO2	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
CO3	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
CO4	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
CO5	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1

ACS101 - PRINCIPLES OF PROGRAMMING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ Be exposed to the basics of computers and number systems. ➢ Learn to think logically and write pseudo code or draw flow charts for problems. ➢ Be familiar with syntax and programming in C. ➢ To develop modular applications in C using functions, pointers and structures ➢ To do input/output and file handling in C						
Unit 1	**INTRODUCTION TO COMPUTERS**						**9**
Introduction – Characteristics of Computers – Evolution of Computers – Computer Generations – Classification of Computers – Basic Computer organization – Number Systems-Number Conversion							
Unit 2	**PROBLEM SOLVING AND COMPUTER SOFTWARE**						**9**
Problem formulation – Problem Solving - Algorithm – Flow Charts – Pseudocode - Computer Software –Types of Software – Software Development Steps – Internet Evolution - Basic Internet Terminology – HTML -Getting connected to Internet Applications. Application Software Packages- Introduction to Office Packages							
Unit 3	**INTRODUCTION TO C**						**9**
Overview of C – structure of a C program – compilation and linking processes, Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making – Arrays, Branching and Looping, Handling of Character Strings.							
Unit 4	**FUNCTIONS, POINTERS AND STRUCTURES**						**9**
Built-in Functions-User-defined Functions – Definitions – Declarations -Call by reference – Call by value – Structures and Unions – Pointers – The Preprocessor – Developing a C Program							
Unit 5	**FILE MANIPULATION**						**9**
Introduction, Character Input output in Files, Command Line Arguments, String Input Output in Files, High level Disk I/O Functions, Direct Input Output, Error Handling functions, File Positioning, Introduction to Preprocessor, Macro substitution, File Inclusion.							
							Total 45
TEXTBOOKS							
1	Ashok.N.Kamthane,“ Computer Programming”, Pearson Education (India)						
2	Behrouz A.Forouzan and Richard.F.Gilberg, “A Structured						

	Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publication
REFERENCES	
1	Pradip Dey, Manas Ghoush, "Programming in C", Oxford University Press.
2	Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications
3	Stephen G.Kochan, "Programming in C", Third Edition, Pearson Education India.
4	Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc.
5	5.E.Balagurusamy, "Computing fundamentals and C Programming", Tata McGraw-Hill Publishing Company Limited.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	To enable the student to learn the major components of a computer system	K2
CO2	To demonstrate knowledge on logical thinking and problem solving	K3
CO3	Design and implement applications on C Programming constructs using arrays and strings	K3
CO4	Develop and implement modular applications in C using functions, structures and pointers.	K3
CO5	Design applications using sequential and random access file processing.	K3

POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO1	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	-	1	1	2	2	2	1
CO2	2	3	2	3	2	-	-	-	2	2	3	2	3	2	1
CO3	2	3	2	1	1	-	-	-	2	2	3	2	2	3	1
CO4	2	3	2	2	3	-	-	-	2	2	3	2	2	3	1
CO5	2	3	1	2	2	-	-	-	-	-	-	1	3	2	2

ACS102 - PYTHON PROGRAMMING

Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**ES**	**3**	**0**	**0**	**3**

Preamble	➢ To understand the basics of algorithmic problem solving. ➢ To learn to solve problems using Python conditionals and loops. ➢ To define Python functions and use function calls to solve problems. ➢ To use Python data structures - lists, tuples, dictionaries to represent

	complex data. ➢ To do input/output with files in Python.	
Unit 1	**BASICS OF PYTHON PROGRAMMING**	**9**
Overview of programming language- Python history-Interactive mode – script mode-Tokens:Literal-Keyword-Delimiter-Identifier-Data types: Integer-Floating-Complex-Boolean-String-Indentation-Input operation-Comments		
Unit 2	**CONTROL STRUCTURE, OPERATORS AND FUNCTIONS**	**9**
Statements: if, if-else, nested if, if –elif - Iterative statements: while, for, Nested loops, else in loops, break, continue and pass statements. Operators: Arithmetic-Membership-Identity-Bitwise Functions: Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions with arbitrary arguments, Scope of variables: Local and global scope, Recursion		
Unit 3	**COLLECTIONS, STRINGS AND REGULAR EXPRESSIONS**	**9**
List: Create Access, Negative Indices, Slicing, Splitting, List Methods, and comprehensions Tuples: Create, Indexing and Slicing, Operations on tuples. Dictionary: Create, add, traversing and replace values, operations on dictionaries. Sets: Create and operations on set. Strings: Formatting, Comparison, Slicing, Splitting, Stripping, Negative indices, String functions. Regular expression: Matching the patterns, Search and replace		
Unit 4	**FILE HANDLING AND EXCEPTIONS**	**9**
Files: Open, Read, Write, Append, Tell, Seek and Close. Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, Exception Chaining, Userdefined Exceptions, Defining Clean-Up actions		
Unit 5	**NUMPY, PANDAS, MATPLOTLIB**	**9**
Introduction - Basics of NumPy - N-dimensional Array in NumPy – Methods and Properties - Basics of SciPy - Broadcasting in NumPy Array Operations - Array Indexing in NumPy, Pandas - Introduction - Series - Data Frame - Matplotlib - Basics - Figures and Axes - Method subplot() - Axis container		
		Total: 45

TEXTBOOKS	
1	Ashok NamdevKamthane, Amit Ashok Kamthane “Programming and Problem Solving with Python” , 2nd edition , Mc Graw Hill
2	Dr,R,NageswaraRao, “Core Python Programming”,3rd edition, Deamtech Publisher
REFERENCES	
1	Paul Dietel, Harvey Deitel, “ Python for Programmers”, Pearson
2	Reema Thareja,” Problem Solving and programming with Python, Oxford University Press

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Develop algorithmic solutions to simple computational problems.	K3
CO2	Develop and execute simple Python programs.	K3
CO3	Write simple Python programs using conditionals and loops for solving problems.	K2

CO4	Decompose a Python program into functions.	K3
CO5	Represent compound data using Python lists, tuples, dictionaries etc.	K3

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

AMC101 - EMPLOYMENT ENCHANCEMENT SKILLS

Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**MC**	**2**	**0**	**0**	**0**

Preamble		
Unit 1	**RESUME WRITING**	**6**
Resume: Objective; Formats; Meticulous & Attention to Detail; Organizing Information; Highlight skills; Mistakes to avoid; Qualification & Skill; SWOT Analysis; Assignment – Draft Resume & Corrections		
Unit 2	**INTERVIEW SKILLS**	**6**
Types of Interviews; Preparation – Company, Role, Brush up Concepts, Technical Strengths; Strengths & Weakness; Importance of Grooming; Interview Questions – HR & Technical; Non Verbal Communication; Negotiation Skills; How to start/end an interview; Group Discussion; Assignment – Preparation for "Tell me about yourself", Mock Interviews.		
Unit 3	**PROFESSIONAL ETIQUETTES**	**6**
Workplace Etiquette – Global & Local; Culture Sensitivity; Gender Sensitivity; Communication Netiquettes – Phone, Email, Social Media; Avoid Gossip; How to be personable yet be professional. Meetings: Types of meetings; Agenda; Schedule & Participants; Materials required; Minutes of Meeting.		
Unit 4	**PRESENTATION SKILLS**	**6**
What is a Presentation; Develop an effective slide; Know your Slides; Know your Audience; Barriers in Presentation; Time Management; Listening to the silent audience; Question & Answer session; Feedback.		
Unit 5	**COMMUNICATION AT WORKPLACE**	**6**
Language & Communication; Types of Communication – Internal & External, Formal & Informal; Direction of Communication Flow – Downward, Upward, Lateral, Diagonal; Team Work; Emotional Intelligence		
		Total: 30

TEXTBOOKS

1	"Soft Skills & Employability Skills" by Sabina Pillai&Agna Fernandez
2	"Soft Skills" by Meenakshi Raman &ShaliniUpadhyay

3	"Campus Recruitment" by Ramanadhan Ramesh Babu, Israel Battu, Akash R Bhutada&Vijaya Lakshmi Krishnan
REFERENCES	
1	"Personality Development & Soft Skills (Old Edition)" by Barun K Mitra
2	"Soft Skills Training: A Workbook to develop Skills for Employment" by Frederick H Wentz
3	"Ten Soft Skills You Need to Advance Your Career(Andre Keys Book 9)" by Lisa Smith
4	"Get Your First Job: A Companion For Getting Your First Job – A Guide to Employability Skills & Career Planning" by AJ Balasubramanian&Dr J Sadakkadulla

AMC102 - PROFESSIONAL ETHICS AND HUMAN VALUES							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**MC**	**2**	**0**	**0**	**0**
Preamble	➢ To create an awareness on Engineering Ethics and Human Values. ➢ To understand social responsibility of an engineer. ➢ To appreciate ethical dilemma while discharging duties in professional life.						
Unit 1	**HUMAN VALUES**						**2**
Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Character							
Unit 2	**ENGINEERING ETHICS**						**4**
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment							
Unit 3	**ENGINEERING AS SOCIAL EXPERIMENTATION**						**3**
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study							
Unit 4	**SAFETY, RESPONSIBILITIES AND RIGHTS**						**3**
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies							
Unit 5	**GLOBAL ISSUES**						**3**
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership							
							Total: 15
TEXTBOOKS							
1	Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996						
2	Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice						

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

AEC302 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY							
Programme & Branch	**BE & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**ES**	**0**	**0**	**4**	**2**
Preamble	➢ Soldering and testing simple electronic circuits; ➢ Assembling and testing simple electronic components on PCB. ➢ Study of basic electrical and digital equipment.						
LIST OF EXPERIMENTS							
1. Soldering simple electronic circuits and checking continuity.							
2. Assembling and testing electronic components on a small PCB.							
3. Study of electronic components and equipment's.							
(a) Resistor Color coding using digital multi-meter.							
(b) Assembling electronic components on breadboard.							
4. Verification of Logic Gates							
5. Verification of Half Adder and Full Adder							
6. Measurement of electrical quantities-voltage current, power & power factor in RLC circuit							
7. Verification of KVL, KCL							
8. Verification of Thevenin, Norton, Superposition Theorem							
9. Fluorescent lamp wiring							
10. Stair case wiring							
11. Study of iron box wiring and working							
12. Assembly and dismantle of computer/ laptop							
Total: 60							

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.	K3

CO2	Demonstrate the wiring of various electrical joints in common household electrical wire work.	K3
CO3	Test the working of basic logic gates.	K3
CO4	Understand the working of basic electrical devices	K3
CO5	Apply basic electrical concepts to implement basic electrical circuits.	K3

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO2	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO3	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO4	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO5	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1

ACS301 - PYTHON PROGRAMMING LABORATORY

Programme & Branch	B.Tech & CSBS	Sem.	Category	L	T	P	C
		1	ES	0	0	4	2

Preamble

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

LIST OF EXPERIMENTS

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3 Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4.Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5.Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7.Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8.Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)

9.Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10.Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11.Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.
Total: 60

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Develop algorithmic solutions to simple computational problems	K3
CO2	Develop and execute simple Python programs.	K3
CO3	Implement programs in Python using conditionals and loops for solving problems.	K3
CO4	Deploy functions to decompose a Python program.	K3
CO5	Process compound data using Python data structures.	K3

Pos/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO1	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	-	1	1	2	2	2	1
CO2	2	3	2	3	2	-	-	-	2	2	3	2	3	2	1
CO3	2	3	2	1	1	-	-	-	2	2	3	2	2	3	1
CO4	2	3	2	2	3	-	-	-	2	2	3	2	2	3	1
CO5	2	3	1	2	2	-	-	-	-	-	-	1	3	2	2

AHS301 - COMMUNICATION SKILLS AND TECHNICAL WRITING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**HS**	**0**	**0**	**2**	**1**

Preamble	➢ Impart a thorough understanding of the principles underlying effective technical communication. ➢ Develop the skills necessary to tailor technical communication to diverse audience needs. ➢ Enhance proficiency in using language techniques and understanding genres related to technical communication. ➢ Equip students with the ability to utilize technological tools to improve technical communication practices. ➢ Foster an awareness of ethical considerations and global perspectives in

	technical communication.	
Unit 1	**PRINCIPLES OF TECHNICAL COMMUNICATION**	**12**
Listening -Brief video snippets of conversational moments from movies and short documentaries Speaking- Presenting oneself, introducing others, inviting people, and explaining places. Reading - Short passages that need understanding include inference and critical analysis. Writing-Finishing missing phrases and constructing suggestions based on supplied information. Grammar- Who-Questions and Yes/No Questions - Parts of Speech. Vocabulary development: prefixes, suffixes, articles, countable and uncountable nouns.		
Unit 2	**AUDIENCE-CENTERED COMMUNICATION**	**12**
Listening: Deep Listening - Talk Shows and Debates. Reading: In depth Reading: Scanning Passages Speaking: Describe current issues, happenings, etc. Writing: Instructions, Recommendations, Note Taking, and Paragraph Writing Grammar: Continuous tenses, prepositions and articles Vocabulary: Phrasal verbs and one-word substitutes		
Unit 3	**LANGUAGE TECHNIQUES AND GENRES IN TECHNICAL COMMUNICATION**	**12**
Listening: Listening to lectures, podcasts, audio books. Reading: Interpretation of Tables, Charts and Graphs Speaking: SWOT Analysis on oneself and Narrating incidents Writing: Formal Letter Writing, Covering Letter and Memos. Grammar: Perfect Tenses and Discourse Markers Vocabulary: Nouns, usage of keywords		
Unit 4	**TECHNOLOGICAL TOOLS USED IN COMMUNICATION**	**12**
Listening: Instructional videos, webinars on personal branding and networking and TED talks Reading: Manuals, Research papers or articles, Graphic narratives, AI tools used in reading Speaking: Participating in and conducting mock virtual meetings, focusing on presentation skills and etiquette. Mock networking events and Elevator Pitch Writing: E-Mails, drafting formal messages in social media handles, and Usage of AI prompts. Grammar: Adjectives, Verbs and Adverbs.		
Unit 5	**ETHICAL AND GLOBAL PERSPECTIVES IN TECHNICAL COMMUNICATION**	**12**
Listening: Podcasts, documentaries and webinars on digital ethics and cybersecurity. Reading: Articles on fundamental ethical principles and case studies. Speaking: Cultural sensitivity and representation ross-cultural communication strategies Mock meetings to practice global collaboration. Writing: Case study analysis reports on legal and ethical responsibilities. Proposals for implementing sustainable communication practices. Grammar: Reported Speech, Idioms and phrases and Loan words		
		Total: 60

TEXTBOOKS	
1	Effective Technical Communication by M. Ashraf Rizvi (Author) 2nd Edition Paperback 2017
2	Sylvan Barnet and Hugo Bedau, ‘Critical Thinking Reading and Writing’, Bedford/st.

	Martin's: Fifth Edition (June 28, 2004)
3	Meenakshi Upadhyay, Arun Sharma – Verbal Ability and Reading Comprehension.
4	Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine Chuen Meng Goh, Cambridge.
REFERENCES	
1	Technical Communication: A Reader-Centered Approach" by Paul V. Anderson
2	"Technical Writing: Process and Product" by Sharon J. Gerson and Steven M. Gerson
3	"English for Engineers and Technologists: A Skill Approach" by Jeyanthi G. and Ramasamy P
4	"A Handbook for Technical Writers and Editors" by M. Ragunathan and M. Sundararajan

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	To create clear and successful technical publications, use core technical communication concepts.	K2
CO2	Modify technical communication to the requirements and expectations of various audiences.	K2
CO3	Use proper language and genres to effectively communicate technical knowledge.	K2
CO4	Use technology technologies to improve the generation, management, and dissemination of technical material.	K2
CO5	Navigate ethical quandaries and explore global views in technological communication methods.	K2

JEPPIAAR INSTITUTE OF TECHNOLOGY
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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEM
AUTONOMOUS SYLLABUS R2024
CHOICE BASED CREDIT SYSTEM

SEM - II

AMA102 – DISCRETE MATHEMATICS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**BS**	**3**	**1**	**0**	**4**
Preamble	➢ Extend student's Logical and Mathematical ability to deal with abstraction ➢ Acquire basics of set theory, functions and counting, apply them in day to day problems ➢ Understand the fundamental concepts of the Graph theory and Network connectivity ➢ Gain the concepts to identify structures of algebraic nature, prove and use properties about them ➢ Learn relations, Lattice, Boolean algebras and their properties to comprehend problems in computer Science.						
Unit 1	**FOUNDATION OF LOGIC AND PROOFS**						**9+3**
Propositional Logic- Connectives - Propositional equivalences -Normal form –Predicates and Quantifiers – Nested Quantifiers -Validity of a well-formed formula– Rules of inference.							
Unit 2	**COMBINATORICS**						**9+3**
Counting: The basics of counting - The pigeonhole principle - Permutations and Combinations - Recurrence relations: solving recurrence relations, generating functions - Inclusion-Exclusion principle : application of inclusion-exclusion.							
Unit 3	**RELATIONS**						**9+3**
Relations - Equivalence relations – Functions - Bijections - Binary relations and graphs- Posets and Lattices - Hasse Diagrams – Boolean algebra.							
Unit 4	**GRAPH THEORY**						**9+3**
Graphs and Graph models- Graph terminology and special types of Graphs – Matrix representation of Graphs and Graph isomorphism – connectivity – Eulerian and Hamiltonian Graphs.							
Unit 5	**ALGEBRAIC STRUCTURE**						**9+3**
Algebraic structures with one binary operation – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Algebraic structures (Definitions and simple examples only) with two binary operation- Ring, Integral domain and field.							
							Total: 60
TEXTBOOKS							
1	J.P.Tremblay., R.Manohar., "Discrete Mathematical Structures with Applications" Tata MCGRAW Hill 38th edition 2010						
2	Kenneth.H. Rosen " Discrete Mathematics and its Applications" Tata MCGRAW Hill Special edition 2010						
3	T.Veerarajan "Discrete Mathematics with Graph Theory and Cominatorics" Tata MCGRAW Hill 33rd edition 2021						
REFERENCES							
1	1. Bernard Kolman., Robert Busby., Sharon C.Ross " Discrete Mathematical Structures " Pearson Publications 6th edition 2013.						
2	Varsha H.Patil., Seymour Lipschutz., Mare lars lipson., " Discrete Mathematics" Revised 3rd edition 2013						

3	**WEB LINK:** 1. https://home.iitk.ac.in/~arlal/book/mth202.pdf 2. https://archive.nptel.ac.in/courses/106/103/106103205

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Demonstrate the ability to write and evaluate a proof or outline the basic structure and give examples of each proof technique described.	K3
CO2	Apply counting principles to determine probabilities in engineering problems.	K3
CO3	Demonstrate the relations and functions and to determine their properties in solving engineering problems.	K3
CO4	Develop graph theory tools to map day-to-day applications.	K3
CO5	Expose to the concepts and properties of algebraic structures which provides solutions in design and analysis of algorithms.	K2

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	3	3	1	-	-	-	-	-	-	-	-	1	1	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	3	-	-	-	-	-	-	-	-	1	1	-	-

APH101 - COMPUTATIONAL PHYSICS							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**BS**	**3**	**0**	**0**	**3**
Preamble	• To instill knowledge on physics of semiconductors, determination of charge carriers and device applications. • The students will acquire knowledge on the concepts of Photonics. • To provide the basic concepts of quantum mechanics and various formalism of quantum mechanics • To acquire the knowledge of basic sciences required to understand the fundamentals of nanomaterials. • To motivate the students towards the applications of quantum mechanics and quantum computing						
Unit 1	**PHOTONICS AND SEMICONDUCTOR DEVICES**						**9**

Intrinsic Semiconductor- Energy Band Diagram- -Direct and Indirect Band Gap Semi-Conductors – Diode Laser-Hall Effect and Devices- Logic Gates- AND, OR, NOT, NAND, E-OR, E-NOR Gates. Introduction to theory of Laser-Characteristics-Spontaneous and Stimulated Emission- Einstein's Coefficients – Population Inversion- Applications of Photonics.		
Unit 2	**DIFFERENTIAL EQUATIONS IN COMPUTATIONAL PHYSICS**	**9**
Solution of differential equations: Taylor series method, Euler method, Runge-Kutta method, predictor-corrector method. Eigen values and Eigen vectors of matrix: Determinant of a matrix, characteristic equation of a matrix, eigen values and eigen vectors of a matrix, power method.		
Unit 3	**FUNDAMENTALS OF QUANTUM MECAHNICS**	**9**
Photons and light waves- Electrons and matter waves- The Schrodinger equation (Time dependent and time independent wave equation)- Physical significance of wave function- particle in an infinite potential well: 1D, 2D and 3D Boxes-Degeneracy and Non-Degeneracy.		
Unit 4	**INTRODUCTION TO NANO MATERIAL**	**9**
Introduction to nanomaterial -Electron density in bulk material - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterial- Properties and Applications of nano materials- Tunneling: single electron phenomena and single electron transistor-Quantum dot laser.		
Unit 5	**QUANTUM INFORMATION AND COMPUTING**	**9**
Quantum computing: Introduction - Postulates of quantum Mechanics- Differences between quantum and classical computation. Quantum system for information processing-quantum states-Classical bits-quantum bits or qubits - Density matrices- Entanglement-Quantum gates-C-NOT Gate-Bloch sphere.		
		Total: 45

TEXTBOOKS	
1	Hintendra K Malik, A K Singh, "Engineering Physics" Tata McGraw Hill Education Private Limited, New Delhi 2010.
2	Vanchna Singh, Sheetal Kumar, "Engineering Physics" Cengage Learning India Pvt. Ltd. Delhi 2010.
3	V Rajendran, "Engineering Physics" Tata McGraw Hill Education Private Limited, New Delhi 2011.
REFERENCES	
1	Dattu R Joshi, "Engineering Physics" Tata McGraw Hill Education Private Limited, New Delhi 2010.
2	A Marikani, "Engineering Physics" PHI Learning Private Limited New Delhi 2010.
3	Kenneth B. Howell, "Ordinary Differential Equations", CRC Press, 21 January 2023.

COURSEOUTCOMES: On completion of this course, the students will gain knowledge and will be able to		**Bloom's Taxonomy Level**
CO1	understand clearly of semiconductor physics and functioning of semiconductor devices.	K2
CO2	solve differential equations arising in computational physics	K2
CO3	understand the basic concepts and principles of quantum mechanics	K2

CO4	explain the effects of quantum confinement on the electronic structure and corresponding physical and chemical properties of materials.	K2
CO5	Apply the quantum mechanical principals and basic concept of quantum computing	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	1	1	1	1	1	1	1	-	-
CO2	3	3	2	2	1	1	1	1	1	1	1	1	-	-
CO3	3	3	2	2	1	1	1	1	1	1	1	1	-	-
CO4	3	3	3	3	1	1	1	1	1	1	1	1	-	-
CO5	3	3	3	3	1	1	1	1	1	1	1	1	-	-

AAI101 - INTRODUCTION TO DATA SCIENCE							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**ES**	**3**	**0**	**0**	**3**
Preamble	➢ To understand the data science fundamentals and process. ➢ To learn to describe the data for the data science process. ➢ To learn to describe the relationship between data. ➢ To utilize the Python libraries for Data Wrangling. ➢ To present and interpret data using visualization libraries in Python						

Unit 1	**INTRODUCTION**	**9**
Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Definingresearch goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model–presenting findings and building applications - Data Mining - Data Warehousing – Basic Statisticaldescriptions of Data		
Unit 2	**DESCRIBING DATA**	**9**
Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Datawith Averages - Describing Variability - Normal Distributions and Standard (z) Scores		
Unit 3	**DESCRIBING RELATIONSHIPS**	**9**
Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula forcorrelation coefficient – Regression –regression line –least squares regression line – Standarderror of estimate – interpretation of r2 –multiple regression equations –regression towards the mean		
Unit 4	**PYTHON LIBRARIES FOR DATA WRANGLING**	**9**
Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, booleanlogic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing andselection – operating on data – missing data – Hierarchical indexing – combining datasets –aggregation and grouping – pivot tables		
Unit 5	**DATA VISUALIZATION**	**9**
Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots –		

Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.	
	Total: 45
TEXTBOOKS	
1	David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)
2	Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.(Units II and III
3	Jake Vander Plas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)
REFERENCES	
1	Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014.

COURSEOUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Define the data science process	K1
CO2	Understand different types of data description for data science process	K2
CO3	Gain knowledge on relationships between data	K2
CO4	Use the Python Libraries for Data Wrangling	K3
CO5	Apply visualization Libraries in Python to interpret and explore data	K3

POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO1	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	-	1	1	2	2	2	1
CO2	2	3	2	3	2	-	-	-	2	2	3	2	3	2	1
CO3	2	3	2	1	1	-	-	-	2	2	3	2	2	3	1
CO4	2	3	2	2	3	-	-	-	2	2	3	2	2	3	1
CO5	2	3	1	2	2	-	-	-	-	-	-	1	3	2	2

AMB114- DESIGN THINKING AND ENTREPRENEURSHIP							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**PC**	**3**	**0**	**0**	**3**
Preamble	Creativity and innovation are the key drivers of success for many of today's						

	leading companies. Some of the most gains in shareholder value over the last few years (e.g., Google, Facebook) are due to a culture of creative innovation. This course examines the process of developing new product or service innovations	
Unit 1	**INTRODUCTION**	**9**
Meaning of Design Thinking, The rise of Design Thinking Market Research, Practical insights into conducting marketing research, Design thinking for competitive advantage. Power of Design Thinking in Entrepreneurship - The Need for Creative and Design, Thinking Mental Models of Creativity, Design Thinking in Entrepreneurship, Why design needs entrepreneurial mindset, combining entrepreneurial and design thinking, The seven steps of design thinking, Creative Thinking. Open Innovation, creative solutions to issues facing organizations, Company culture and architecture, from design thinking to funding.		
Unit 2	**DESIGN THINKING PARADIGM FOR STRATEGIC INNOVATION**	**9**
Strategies for creating value - Increment Value or True value creation, Design Thinking as a paradigm for innovation strategy, Design Research for understanding the needs of our users and clients, Theories of Innovation, Technology Forecasting, Conducting analysis - Economic justification, First Mover and late mover Advantage, Organizations and Innovation Process, Diffusion of Innovation. Case studies - How Indra Nooyi Turned Design Thinking Into Strategy? P&G, Pfizer, IDEO – SHIMANO.		
Unit 3	**PRODUCTIZING STARTUP IDEAS - PRODUCT / SERVICE BUSINESS MODEL DESIGN**	**9**
Lean start-up techniques for the design and refinement of business models. Customer Experience Strategy. From the Design of Services to Business Design. Customer Discovery & Validation. Business Model Canvas. How to create a winning Business Model Design & Lean Startup. Canvas Value Proposition. Lean Startup Machine. Hambrick and Fredrickson Strategy and Prototyping. Design thinking process in new product development, Three Box Model solution: strategy for innovation, Case study discussion - Vijay Govindrajan's - Reverse Innovation.		

Unit 4	**DESIGN THINKING FRAMEWORK**	**9**
Conducting market research for new a product offering, Levels of Product / Service, Identifying stakeholder needs for Product/service innovation. obtaining Insights, personal techniques and Foresight of Future Scenarios.Concept generation, identifying new business opportunities based on market needs – from product to service design, Designing and testing breakthrough concepts. Assign Teams and Introduce Small projects with Design Thinking framework – empathize, define, ideate, prototype and test. Design Thinking for the Greater Good - Conducting design thinking challenge for kids.		
Unit 5	**PRODUCTIZING STARTUP IDEAS - INTERNET BUSINESS DESIGN**	**9**
Market trend analysis, Business Design JAM, Digital/Internet Business Model, KPIs, Hypothesis and Experiments, Implementation, Design of Services and Customer Experience. Case study discussions – manufacturing and service sector. Service sector – IDEO, Lego, e-commerce market players design thinking strategies. Toward Sustainable Design Thinking.		
		Total: 45

TEXTBOOKS	
1	Jeanne Liedtka, Andre King, and Kevin Bennett (2013), Solving Problems with Design Thinking, Columbia Business School Publishing.
2	Shrutin N Shetty, (2018), Design the Future: Simplifying Design Thinking to Help You, Notion Press
REFERENCES	
1	The Three-Box Solution: A Strategy for Leading Innovation By Vijay Govindarajan
2	Design Thinking: New Product Development Essentials from the PDMA, By Abbie Griffin, Michael G. Luchs, and Scott Swan
3	Sketching User Experiences: Getting the Design Right and the Right Design, Bill Buxton
4	Harvard Business Review case studies, https://hbr.org/store/case-studies
5	Case Centre, https://www.thecasecentre.org/main

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand and apply the processes involved in Idea Productization.	K2
CO2	Awareness of the role of multiple functions in creating a new product (e.g. marketing, finance, industrial design, engineering, production).	K2
CO3	Ability to create and coordinate multiple, interdisciplinary tasks in order to achieve a common objective.	K4

POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO1	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2				-	-	-	2	3	1	1
CO2	3	2	2	1	2				-	-	-	2	3	1	1
CO3	3	2	2	1	2				-	-	-	2	3	1	2

ACS104 - FUNDAMENTALS OF CLOUD COMPUTING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**ES**	**3**	**0**	**0**	**3**
Preamble	➢ To understand the principles of cloud architecture, models and infrastructure. ➢ To understand the concepts of virtualization and virtual machines. ➢ To gain knowledge about virtualization Infrastructure. ➢ To explore and experiment with various Cloud deployment environments. ➢ To learn about the security issues in the cloud environment.						
Unit 1	**BASIC CONCEPTS OF CLOUD COMPUTING**						**9**
Network-Based Systems- Concepts of Distributed Systems. Definition of Cloud, Concepts of Cloud Computing. Cloud Service Providers, NIST Cloud Computing, Cloud Characteristics							

Unit 2	CLOUD INFRASTRUCTURE	9
Cloud Pros and Cons. Layered Architectural Design, Cloud Delivery Models. Cloud Deployment Models, Architectural Design Challenges, Cloud Storage - Storage-as-a-Service – Advantages of Cloud Storage - Cloud Storage Providers - S3.		
Unit 3	**VIRTUALIZATION BASICS**	**9**
Virtual Machine and its architecture–VM primitive operations- Virtual Infrastructures- Data Center Virtualization for Cloud Computing–Levels of Virtualization Implementation – VMM Design Requirements, Virtualization Support at the OS Level, Physical versus Virtual Clusters. Live VM Migration Steps		
Unit 4	**BUILDING CLOUD NETWORKS**	**9**
Designing and Implementing a Data Center-Based Cloud Installing Open Source Cloud service. Virtual Box – Eucalyptus Public Cloud Platforms: Google App Engine, Amazon Web Services (AWS). Google Cloud Platform. Emerging Cloud Software Environments		
Unit 5	**CLOUD SECURITY AND APPLICATIONS**	**9**
Cloud Security Infrastructure Security Network level security- Host level security, Application level security- Data privacy and security Issues. Access Control and Authentication in cloud computing, IAM Security Standards		
		Total: 45

TEXTBOOKS	
1	Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers, 2012.
2	Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi
REFERENCES	
1	Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zaigham Mohammad 2013
2	Krutz, R. L., Vines, R. D, “Cloud security. A Comprehensive Guide to Secure Cloud Computing”, Wiley Publishing, 2010

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Understand the design challenges in the cloud.	K2
CO2	Apply the concept of virtualization and its types.	K3
CO3	Experiment with virtualization of hardware resources.	K3
CO4	Develop and deploy services on the cloud and set up a cloud environment.	K3
CO5	Explain security challenges in the cloud environment.	K2

POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO1	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1	3	2	2	3	1	-	-	-	2	3	1	2	3	3	3
CO2	2	2	2	3	3	-	-	-	1	2	2	3	1	1	3
CO3	3	3	3	3	3	-	-	-	2	1	1	2	2	1	3
CO4	3	3	1	1	1	-	-	-	1	3	1	3	2	1	1
CO5	3	2	2	2	3	-	-	-	2	3	2	2	2	3	3

AHS101 - தமிழர்மரபு							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**HS**	**1**	**0**	**0**	**1**
Preamble							
அலகு I	**மொழிமற்றும்இலக்கியம்**						**3**
இந்திய மொழிக் குடும்பங்கள்-திராவிட மொழிகள்-தமிழ் ஒரு செம்மொழி தமிழ் செவ்விலக்கியங்கள்-சங்க இலக்கியத்தின் சமயச்சார் பற்ற தன்மை சங்க இலக்கியத்தில்பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள்-தமிழ்க் காப்பியங்கள்,தமிழகத்தில் சமணபௌத்த சமயங்களின் தாக்கம்-பக்தி இலக்கியம்,ஆழ்வார்கள் மற்றும் நாயன்மார்கள்-சிற்றிலக்கியங்கள்-தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி தமிழ் இலக்கியவளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.							
அலகு II	**மரபு –பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை சிற்பக்கலை**						**3**
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன்சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப்பொருட்கள், பொம்மைகள் – தேர்செய்யும்கலை – சுடுமண்சிற்பங்கள் – நாட்டுப்புறத்தெய்வங்கள் – குமரி முனையில் திருவள்ளுவர் சிலை – இசைக்கருவிகள் – மிருதங்கம் , பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூகபொருளாதார வாழ்வில் கோவில்களின் பங்கு.							
அலகு III	**நாட்டுப் புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்**						**3**
தெருக்கூத்து,கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்							
அலகு IV	**தமிழர்களின் திணைக் கோட்பாடுகள்**						**3**
தமிழகத்தின் தாவரங்களும்,விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் –							

சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.		
அலகு V	**இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**	**3**
இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின்பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சுவரலாறு.		
		Total: 15

TEXTBOOKS	
1	**தமிழகவரலாறு – மக்களும்பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).**
2	**கணினித்தமிழ் – முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).**
3	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
REFERENCES	
1	**கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல்துறைவெளியீடு)**
2	**பொருநை ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)**
3	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

AHS101 -HERITAGE OF TAMILS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**HS**	**1**	**0**	**0**	**1**
Preamble							

UNIT I	**LANGUAGE AND LITERATURE**	**3**
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.		
UNIT II	**HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	**3**
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making -		

Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.		
UNIT III	**FOLK AND MARTIAL ARTS**	**3**
Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.		
UNIT IV	**THINAI CONCEPT OF TAMILS**	**3**
Flora and Fauna of Tamils &Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas		
UNIT V	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	**3**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		
		Total: 15
TEXTBOOKS		
1	**தமிழகவரலாறு – மக்களும்பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).**	
2	**கணினித்தமிழ் – முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).**	
3	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)	
REFERENCES		
1	**கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல்துறைவெளியீடு)**	
2	**பொருநை ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)**	
3	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies	
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)	

AMC103 - INDIAN CONSTITUTION							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**Credit**
		2	**MC**	**2**	**0**	**0**	**0**
Preamble	➢ This Course intends to impart a comprehensive outlook about the nature of the Indian constitution; rights and duties of the citizens, Political Institutions of Central and State governments and its relationship with each other and the organization and functions of local government. ➢ A detailed analysis of the functions of the statutory bodies are incorporated in this course.						

Unit 1		**9**
Constitutional Assembly – Philosophy – Preamble – Salient Features of Indian Constitution		
Unit 2		**9**
Fundamental Rights – Directive Principles of State Policy – Fundamental Duties.		
Unit 3		**9**
Union Executive – President : Election – Powers and Functions – Council of Ministers – Prime Minister : Position and Powers – Relationship between Prime Minister and President. State Executive – Governor : Powers and functions – Chief Minister : Position and Powers – Relationship between Chief Minister and Governor.		
Unit 4		**9**
Union Legislature : Structure, Powers and Functions – Speaker : Power and Functions – Procedures of Constitutional Amendment – State Legislature : Structure, Powers and Functions.		
Unit 5		**9**
Judiciary – Supreme Court: Powers and Functions – High Court : Powers and Functions – Judicial Review		
		Total: 45

TEXTBOOKS	
1	Siwach,J.R, Dynamics of Indian Government and Politics, New Delhi: Sterling, 1985.
2	Narang, A.S., Indian Government and Politics New Delhi: Gitanjali ,1995
REFERENCES	
1	Thakur, R. The Government and Politics of India : London: Macmillan, 1995.
2	Gupta,D.C, Indian Government and Politic, New Delhi, 1996

APH301 - COMPUTATIONAL PHYSICS LABORATORY							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**ES**	**0**	**0**	**4**	**2**
Preamble	➢ To learn the proper use of various kinds of physics laboratory equipment. ➢ To learn how data can be collected, presented and interpreted in a clear and concise manner ➢ To make the student an active participant in each part of all exercises.						

LIST OF EXPERIMENTS
1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus
4. Uniform bending – Determination of Young's modulus
5. Laser- Determination of the wavelength of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle

b) Compact disc- Determination of width of the groove using laser.
8. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
Total: 60

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the functioning of various physics laboratory equipment.	K2
CO2	Use graphical models to analyze laboratory data.	K3
CO3	Use mathematical models as a medium for quantitative reasoning and describing physical reality.	K3
CO4	Access, process and analyze scientific information.	K3
CO5	Solve problems individually and collaborative.	K3

ACS302 - FUNDAMENTALS OF CLOUD COMPUTING LABORATORY							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**ES**	**0**	**0**	**4**	**2**
Preamble	➢ To learn the basics and types of Virtualization ➢ To understand the Hypervisors and its types ➢ To Explore the Virtualization Solutions ➢ To Experiment the virtualization platforms						

LIST OF EXPERIMENTS
1. Create type 2 virtualization in VMWARE or any equivalent Open Source Tool. Allocate memory and storage space as per requirement. Install Guest OS on that VMWARE.
2. Find a procedure for the following
a. Shrink and extend virtual disk
b. Create, Manage, Configure and schedule snapshots
c. Create Spanned, Mirrored and Striped volume
d. Create RAID 5 volume
3. Desktop Virtualization using VNC and Chrome Remote Desktop
4. Create type 2 virtualization on ESXI 6.5 server
5. Create a VLAN in CISCO packet tracer
6. Install KVM in Linux
7. Create Nested Virtual Machine(VM under another VM)
8. Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs
9. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
10.Find a procedure to transfer the files from one virtual machine to another virtual machine
Total: 60

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Analyze the virtualization concepts and Hypervisor	K3
CO2	Apply the Virtualization for real-world applications	K3
CO3	Install & Configure the different VM platforms	K3
CO4	Experiment with the VM with various software	K3

JEPPIAAR INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)
Self-Belief | Self Discipline | Self Respect
Kunnam, Sunguvarchatram, Sriperumbudur-631604

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEM
AUTONOMOUS SYLLABUS R2024
CHOICE BASED CREDIT SYSTEM

SEM - III

AMA105 - PROBABILITY AND STATISTICS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**ES**	**3**	**0**	**0**	**3**
Preamble	➢ Determine the probability value of one-dimensional random variables. ➢ Illustrate the concepts of covariance, correlation and regression. ➢ Discuss the concept of testing of hypothesis for small and large samples. ➢ Demonstrate the difference between the types of design to experiments. ➢ Identify and interpret the control charts for variables and attributes.						
Unit 1	**ONE DIMENSIONAL RANDOM VARIABLES**						**9**
Random variable – Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.							
Unit 2	**TWO DIMENSIONAL RANDOM VARIABLES**						**9**
Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables.							
Unit 3	**TESTING OF HYPOTHESIS**						**9**
Sampling distributions – Estimation of parameters – Statistical hypothesis – Large sample tests based on Normal distribution for single mean and difference of means – Tests based on t, Chi-square and F distributions for mean, variance, and proportion – Contingency table (test for independent) – Goodness of fit.							
Unit 4	**DESIGN OF EXPERIMENTS**						**9**
One way and Two-way classifications – Completely randomized design – Randomized block design – Latin square design.							

Unit 5	**STATISTICAL QUALITY CONTROL**	**9**
Control charts for measurements ($\bar{X}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.		
		Total: 45

TEXTBOOKS	
1	R.A. Johnson, I. Miller and J. Freund, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2	J.S. Milton and J.C. Arnold, "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.
REFERENCES	
1	J.L. Devore, "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2	A. Papoulis, and S. Unni Krishna pillai, Probability, "Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3	S.M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4	M.R. Spiegel, J. Schiller and R.A. Srinivasan, "Schaum's Outline of Theory and

	Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5	R.E.Walpole, R.H.Myers, S.L. Myers and K.Ye, "Probability and Statistics for Engineers and Scientists".Pearson Education, Asia, 9th Edition, 2012

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the fundamental knowledge of modern probability theory and standard distributions.	K2
CO2	Categorize the probability models and function of random variables based on one and two dimensional random variables.	K2
CO3	Employ the concept of testing the hypothesis in real life problems.	K2
CO4	Implement the analysis of variance for real life problems.	K2
CO5	Apply the statistical quality control in engineering and management problems.	K3

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	3	3	1	-	-	-	-	-	-	-	-	1	1	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	3	-	-	-	-	-	-	-	-	1	1	-	-

ACS106 - DATA STRUCTURES AND ALGORITHMS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites		**3**	**PC**	**3**	**0**	**0**	**3**

Preamble	➢ To understand concepts of linked list, searching and sorting techniques. ➢ To implement basic concepts of stacks and queues. ➢ To develop the ability to solve problems by choosing and applying the right data structures. ➢ To gain knowledge of the foundational mathematics needed to analyse algorithms and solve recurrence equations. ➢ To understand and apply the design strategies to real world problems.

Unit – I	**INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS**	**9**

Introduction to Data Structures - Need - Classification-Arrays - Singly linked list - Representation of a linked list in memory - Operations on a singly linked list - Circular linked list - Doubly linked list. Fundamentals of Algorithmic Problem Solving - Time Complexity - Space complexity with examples - Growth of Functions - Asymptotic Notations and its properties - Complexity Analysis Examples - Performance measurement - Instance Size, Test Data, Experimental setup.

Unit – II	**STACK AND QUEUES**	**9**

Basic Stack Operations - Representation of a Stack using Arrays - Algorithm for Stack Operations - Infix to postfix Transformation - Evaluating Arithmetic Expressions. Basic Queue Operations - Representation of a Queue using array - Enqueue - Dequeue - Circular Queues - Priority Queues. Solving Recurrence Equations - Substitution Method - Recursion Tree Method - Master Method - Sorting in Linear Time - Lower bounds for Sorting: Counting Sort.

Unit – III	**TREES AND GRAPHS**	**9**

Trees- Binary Trees - Properties of Binary trees -Implementation using Array and Linked list - Recursive and Non-Recursive Binary Tree traversals - Binary Search Tree - Insertion and Deletion. Graph - Representation using Array and Linked List - Types of graphs - Graph traversals - BFS and DFS -Minimum Spanning Tree - Kruskal‘s, Prim‘s Algorithm - Shortest path using Dijkstra‘s, Bellman Ford and Floyd Warshall Algorithm.

Unit – IV	**ALGORITHM DESIGN TECHNIQUES**	**9**

Divide and Conquer methodology: Finding maximum and minimum - Merge sort - Quick sort , Binary Search: Dynamic programming: Elements of dynamic programming - Multi stage graph — Optimal Binary Search Trees. Greedy Technique: Elements of the greedy strategy - Activity-selection problem –- Optimal Merge pattern — Huffman Trees.

Unit – V	**STATE SPACE SEARCH ALGORITHMS**	**9**

Backtracking: n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem – Graph colouring problem Branch and Bound: Solving 15-Puzzle problem - Assignment problem - Knapsack Problem - Travelling Salesman Problem- Polynomial time algorithms - NP Complete Problems.

Total:45

TEXTBOOK:

1.	Anany Levitin, ―Introduction to the Design and Analysis of Algorithms‖, 3rd Edition, Pearson Education, 2012.
2.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, ―Fundamentals of Computer Algorithms‖, 2nd Edition, Universities Press, 2007.
3.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, ―Introduction to Algorithms‖, 4th Edition, MIT Press, 2022.

REFERENCES:

1.	Goodrich MT, Tamassia R, Goldwasser MH., ― Data structures and Algorithms in Python‖, John Wiley and Sons Ltd; 2013.
2.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ―Data Structures and Algorithms David E. Goldberg, ―Genetic Algorithm In Search Optimization And Machine Learning‖ Pearson Education India, 2013

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Comprehend the concepts of data structures and analyze the efficiency of an algorithm based on time and space complexity.	K4
CO2	Design applications of linear data structures and apply appropriate algorithms for solving problems like sorting and searching.	K2
CO3	Demonstrate the representation and traversal techniques of graphs and their applications.	K4
CO4	Design a solution by using branch and bound, backtracking techniques and implement the various non-linear data structures and perform the intended operations.	K2
CO5	Utilize the state space tree method for solving problems.	K2

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	2	2	3	1	2	2	2	2	3	3	3
CO2	3	2	-	-	3	3	3	1	2	2	2	2	3	3	3
CO3	3	-	1	-	2	2	2	1	2	2	2	2	3	3	3
CO4	3	2	1	1	2	2	2	1	2	2	2	2	3	3	3
CO5	3	2	1	-	2	2	2	1	2	2	2	1	3	3	3

ACS105 - OBJECT ORIENTED PROGRAMMING

Programme & Branch	B.Tech & CSBS	Sem.	Category	L	T	P	C
Prerequisites		3	PC	3	0	0	3

Preamble	➢ To understand Object Oriented Programming concepts and basics of Java programming language ➢ To know the principles of packages, inheritance and interfaces ➢ To develop a java application with threads and generics classes ➢ To define exceptions and use I/O streams ➢ To design and build Graphical User Interface Application using JAVAFX

Unit – I	**INTRODUCTION TO OOP AND JAVA**	**9**

Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods -Access specifiers - Static members- Java Doc comments

Unit – II	**INHERITANCE, PACKAGES AND INTERFACES**	**9**

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

Unit – III	**EXCEPTION HANDLING AND MULTITHREADING**	**9**

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing.

Unit – IV	**I/O, GENERICS, STRING HANDLING**	**9**

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

Unit – V	**JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS**	**9**

JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus – Basics – Menu – Menu bars – MenuItem.

Total:45

TEXTBOOK:

1. Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCES:

1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018

COURSE OUTCOMES: At the end of the course, learners will be able to		Bloom's Taxonomy Level
CO1	Apply the concepts of classes and objects to solve simple problems.	K4

CO2	Develop programs using inheritance, packages and interfaces.	K2
CO3	Make use of exception handling mechanisms and multithreaded model to solve real world problems.	K4
CO4	Build Java applications with I/O packages, string classes, Collections and generics concepts.	K2
CO5	Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications.	K2

ACS105 - OBJECT ORIENTED PROGRAMMING

Programme & Branch	B.Tech & CSBS	Sem.	Category	L	T	P	C
Prerequisites		3	PC	3	0	0	3

Preamble	➢ To understand Object Oriented Programming concepts and basics of Java programming language ➢ To know the principles of packages, inheritance and interfaces ➢ To develop a java application with threads and generics classes ➢ To define exceptions and use I/O streams ➢ To design and build Graphical User Interface Application using JAVAFX

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Unit – IV	**I/O, GENERICS, STRING HANDLING**	**9**

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

Unit – V	**JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS**	**9**

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Total:45

TEXTBOOK:

1. Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCES:

1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018

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CO2	Develop programs using inheritance, packages and interfaces.	K2
CO3	Make use of exception handling mechanisms and multithreaded model to solve real world problems.	K4
CO4	Build Java applications with I/O packages, string classes, Collections and generics concepts.	K2
CO5	Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications.	K2

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	2	2	3	1	2	2	2	2	3	3	3
CO2	3	2	-	-	3	3	3	1	2	2	2	2	3	3	3
CO3	3	-	1	-	2	2	2	1	2	2	2	2	3	3	3
CO4	3	2	1	1	2	2	2	1	2	2	2	2	3	3	3
CO5	3	2	1	-	2	2	2	1	2	2	2	1	3	3	3

AMB117 - E-COMMERECE							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites		**3**	**PC**	**3**	**0**	**0**	**3**

Preamble	➢ Mechanism of business transactions through electronic media. ➢ Payment transactions in a secured network. ➢ Different modes of E-Commerce like Electronic data interchange. ➢ Web site establishment, electronic publishing and its importance.

Unit – I	**ELECTRONIC COMMERCE ENVIRONMENT AND OPPORTUNITIES**	**9**

Electronic Commerce Environment and Opportunities: The Electronic Commerce Environment, Electronic Marketplace Technologies. Modes of Electronic Commerce: Electronic Data Interchange, Migration to Open EDI, Electronic Commerce with www/Internet, Commerce Net Advocacy, web Commerce Going Forward.

Unit – II	**APPROACHES TO SAFE ELECTRONIC COMMERCE**	**9**

Secure Transport Protocols, Secure Transactions, Secure Electronic Payment Protocol (SEPP), Secure Electronic Transaction (SET), Certificates for authentication Security on web Servers and Enterprise Networks.

Unit – III	**ELECTRONIC CASH AND ELECTRONIC PAYMENT SCHEMES**	**9**

Electronic Cash and Electronic Payment Schemes: Internet Monetary Payment & Security Requirements. Payment and Purchase Order Process, On-line Electronic cash.

Internet/Intranet Security Issues and Solutions : The need for Computer Security, Specific Intruder Approaches, Security Strategies, Security Tools, Encryption.

Unit – IV	**SECURE ELECTRONIC TRANSACTION**	**9**

Master Card/Visa Secure Electronic Transaction: Introduction, Business Requirements, Concepts, payment Processing.

E-Mail and Secure E-mail Technologies for Electronic Commerce: The Means of Distribution, A model for Message Handling, Email working, Multipurpose Internet Mail Extensions, Message Object Security Services, Comparisons of Security Methods, MIME and Related Facilities for EDI over the Internet.

Unit – V	**INTERNET RESOURCES AND ADVERTISING**	**9**

Internet Resources for Commerce: Introduction, Technologies for web Servers, Internet Tools Relevant to Commerce, Internet Applications for Commerce, Internet Charges, Internet Access and Architecture, Searching the Internet.

Advertising on Internet: Issues and Technologies. Advertising on the Web, Marketing creating web site, Electronic Publishing Issues, Approaches and Technologies: EP and web based EP.

Total:30

TEXTBOOK:

1.	Daniel Minoli, Emma Minoli, Web Commerce Technology Handbook. TATA McGraw-Hill Edition.

REFERENCES:

1.	Ravi Kalakotar and Andrew B.Whinston, Frontiers of Electronic Commerce. Pearson Education - 1999.
2.	Achuyut S.Godbole and Atul Kahate, Web Technologies TCP/IP to Internet Application Architectures. Tata McGraw-Hill Publishing Company Limited.
3.	Schneider, Electronic Commerce, Cengage Publications.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the framework and anatomy of ecommerce applications and analyze ecommerce consumer, organizational applications	K2

CO2	Infer mercantile process models from both merchant's and consumer's view point)	K2
CO3	Study all the aspects of Intra-Organizational electronic commerce including supply chainmanagement	K1
CO4	Analyze different consumer, information searching methods and resource discovery and information retrieval techniques	K3

POs/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	-	-	-	-	-	-	-	-	-	-	1	1	1	1
CO2	3	2	-	-	-	-	-	-	-	-	-	-	1	1	1	1
CO3	3	-	1	-	-	-	-	-	-	-	-	-	1	1	1	1
CO4	3	2	1	1	-	-	-	-	-	-	-	-	1	1	1	1
CO5	3	2	1	-	-	-	-	-	-	-	-	-	1	1	1	1

AMC108 - ENVIRONMENTAL ENGINEERING AND SUSTAINABILITY							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**MC**	**2**	**0**	**0**	**0**
Preamble	➢ To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation. ➢ To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters. ➢ To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them. ➢ To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management. ➢ To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.						
Unit 1	**ENVIRONMENT AND BIODIVERSITY**						**6**
Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.							

Unit 2	ENVIRONMENTAL POLLUTION	6
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.		
Unit 3	**RENEWABLE SOURCES OF ENERGY**	**6**
Energy management and conservation, New Energy Sources: Need of new sources. Different types of new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.		
Unit 4	**SUSTAINABILITY AND MANAGEMENT**	**6**
Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.		
Unit 5	**SUSTAINABILITY PRACTICES**	**6**
Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles - carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio economic and technological change.		
		Total: 30

TEXTBOOKS	
1	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3	Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5	Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7	Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.
REFERENCES	
1	R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 . Edition 2010.
2	Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3	Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.

4	Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5	Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.	K2
CO2	To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.	K2
CO3	To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.	K2
CO4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K2
CO5	To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.	K2

POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1				2	3					2			
CO2	3	2				3	3					2			
CO3	3		1			2	2					2			
CO4	3	2	1	1		2	2					2			
CO5	3	2	1			2	2					1			

ACS303 - OBJECT ORIENTED PROGRAMMING LABORATORY							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites		**3**	**PC**	**0**	**0**	**4**	**2**
Preamble	➢ To build software development skills using java programming for real-world applications. ➢ To understand and apply the concepts of classes, packages, interfaces, inheritance, exception handling and file processing. ➢ To develop applications using generic programming and event handling						
List of Exercises / Experiments:							
1.	Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)						
2.	Develop stack and queue data structures using classes and objects.						
3.	Develop a java application with an Employee class and Generate pay slips for the employees with their gross and net salary.						
4.	Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Each one of the classes contains only the method printArea( ) that prints the area of the given shape.						
5.	Solve the above problem using an interface.						
6.	Implement exception handling and creation of user defined exceptions.						
7.	Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.						
8.	Write a program to perform file operations.						
9.	Develop applications to demonstrate the features of generics classes.						
10.	Develop applications using JavaFX controls, layouts and menus.						
11.	Develop a mini project for any application using Java concepts.						
	Total: 60						
REFERENCES/MANUAL/SOFTWARE:							
1.	Laboratory Manual						

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Design and develop java programs using object oriented programming concepts.	K3
CO2	Develop simple applications using object oriented concepts such as package, exceptions	K3
CO3	Implement multithreading, and generics concepts	K4
CO4	Create GUIs and event driven programming applications for real world problems.	K2
CO5	Implement and deploy web applications using Java.	K3

POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	2	2	3	1	2	2	2	2	3	3	3
CO2	3	2	-	-	3	3	3	1	2	2	2	2	3	3	3
CO3	3	-	1	-	2	2	2	1	2	2	2	2	3	3	3
CO4	3	2		1	2	2	2	1	2	2	2	2	3	3	3
CO5	3	2	1	-	2	2	2	1	2	2	2	1	3	3	3

ACS304- DATA STRUCTURES AND ALGORITHMS LABORATORY

Programme & Branch	B.Tech & CSBS	Sem.	Category	L	T	P	C
Prerequisites		3	PC	0	0	4	2

Preamble

- To demonstrate array implementation of linear data structure algorithms.
- To demonstrate linked list implementation of linear data structure algorithms
- To understand and apply the algorithm analysis techniques on searching and sorting algorithms
- To critically analyze the efficiency of graph algorithms
- To understand different algorithm design techniques

List of Exercises / Experiments:

1.	Implement Linear Search and recursive Binary Search. Determine the time required to search for an element. Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.
2.	Given a text txt [0...n-1] and a pattern pat [0...m-1], write a function search (char pat [ ], char txt [ ]) that prints all occurrences of pat [ ] in txt [ ]. You may assume that n > m.
3.	Sort a given set of elements using the Insertion sort and Heap sort methods and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
4.	Develop a program to implement graph traversal using Breadth First Search and Depth First Search.
5.	From a given vertex in a weighted connected graph, develop a program to find the shortest paths to other vertices using Dijkstra's algorithm.
6.	Find the minimum cost spanning tree of a given undirected graph using Prim's algorithm.
7.	Develop a program to find out the maximum and minimum numbers in a given list of n numbers using the divide and conquer technique.
8.	Implement Merge sort and Quick sort methods to sort an array of elements and determine the time required to sort. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
9.	Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem.
	Total: 60

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Implement Linear data structure algorithms using arrays and Linked lists.	K3
CO2	Analyze the efficiency of algorithms using various frameworks	K3
CO3	Analyze the various searching and sorting algorithms.	K4
CO4	Apply graph algorithms to solve problems and analyze their efficiency.	K2
CO5	Make use of algorithm design techniques like divide and conquer, dynamic programming and greedy techniques to solve problems.	K3

POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	2	2	3	1	2	2	2	2	3	3	3
CO2	3	2	-	-	3	3	3	1	2	2	2	2	3	3	3
CO3	3	-	1	-	2	2	2	1	2	2	2	2	3	3	3
CO4	3	2	1	1	2	2	2	1	2	2	2	2	3	3	3
CO5	3	2	1	-	2	2	2	1	2	2	2	1	3	3	3

AHS302 - SOFT SKILLS - I (COMPREHENSIVE SOFT SKILLS DEVELOPMENT)							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites		**3**	**HS**	**0**	**0**	**2**	**0**

Unit – I	**FOUNDATIONS OF COMMUNICATION SKILLS**	**8**

- Introduction to Communication Skills
- Understanding the Communicative Environment
- Active Listening Skills
- Effective Speaking Techniques
- Initiating and Sustaining Conversations

Unit – II	**ADVANCED COMMUNICATION TECHNIQUES**	**6**

- Presentation Skills – Structuring Content
- Using Multimedia in Presentations
- Understanding Communication Styles
- Group Communication and Dynamics

Unit – III	**CRITICAL THINKING AND COMMUNICATION**	**8**

- Introduction to Critical Thinking
- Analyzing Arguments and Information
- Constructing Clear and Persuasive Arguments
- Problem-Solving and Decision-Making
- Interactive Exercises and Case Studies

Unit – IV	**EMOTIONAL INTELLIGENCE IN COMMUNICATION**	**8**

- Introduction to Emotional Intelligence (EI) .
- Self-Awareness and Self-Regulation Empathy and Social Skills
- Managing Stress and Emotions in Communication.
- Practical Exercises in EI

Unit – V	**INTEGRATING SOFT SKILLS FOR EFFECTIVE COMMUNICATION**	**8**

- Motivation and Persuasion Techniques
- Negotiation Skills
- Leadership Communication
- Applying Soft Skills in the Workplace
- Final Project and Presentations

Total:40

REFERENCES:

1.	Business Communication: Making Connections in a Digital World by Raymond V. Lesikar, Marie E. Flatley, Kathryn Rentz.
2.	Everyone Communicates, Few Connect: What the Most Effective People Do Differently by John C. Maxwell.
3.	Emotional Intelligence: Why It Can Matter More Than IQ by Daniel Goleman.
4.	Leaders Eat Last: Why Some Teams Pull Together and Others Don't by Simon Sinek.

JEPPIAAR INSTITUTE OF TECHNOLOGY
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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEM
AUTONOMOUS SYLLABUS R2024
CHOICE BASED CREDIT SYSTEM

SEM - IV

ACS107 - OPERATING SYSTEMS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites		4	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ To understand the basics and functions of operating systems. ➢ To understand Processes and Threads ➢ To analyze Scheduling algorithms and process synchronization. ➢ To understand the concept of Deadlocks. ➢ To analyze various memory management schemes. ➢ To be familiar with I/O management and File systems. ➢ To be familiar with the basics of virtual machines and Mobile OS like iOS and Android.						
Unit – I	**INTRODUCTION**						**7**
Operating System Overview - Objectives and Functions - Evolution of Operating System; Operating System Structures - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.							
Unit – II	**PROCESS MANAGEMENT**						**11**
Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads -Multithread Models – Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.							
Unit – III	**MEMORY MANAGEMENT**						**10**
Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write – Page Replacement - Allocation of Frames –Thrashing.							
Unit – IV	**STORAGE MANAGEMENT**						**10**
Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure - File system mounting - File Sharing and Protection; File System Implementation - File System Structure – Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.							
Unit – V	**VIRTUAL MACHINES AND MOBILE OS**						**7**
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.							
							Total:45

TEXTBOOK:

1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”ǁ, 10th Edition, John Wiley and Sons Inc., 2018.
2.	Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.

REFERENCES:

1.	Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, Tata McGraw Hill Edition, 2010.
2.	William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
3.	Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016.

COURSE OUTCOMES: Upon successful completion of the course the student will be able to		**Bloom’s Taxonomy Level**
CO1	Analyze various scheduling algorithms and process synchronization.	K4
CO2	Explain deadlock prevention and avoidance algorithms.	K4
CO3	Compare and contrast various memory management schemes.	K4
CO4	Explain the functionality of file systems, I/O systems, and Virtualization.	K4
CO5	Compare iOS and Android Operating Systems.	K4

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	1	-	-	-	1	3	3	3	2	1	3
CO2	3	1	1	2	2	-	-	-	3	2	1	1	3	1	2
CO3	3	3	2	1	2	-	-	-	3	3	1	2	2	2	2
CO4	1	2	2	3	2	-	-	-	3	1	3	1	1	2	1
CO5	2	2	1	1	3	-	-	-	1	2	2	3	1	3	3

ACS108 - DATABASE MANAGEMENT SYSTEMS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**PC**	**3**	**0**	**0**	**3**

Preamble	➢ To learn the fundamentals of data models, relational algebra and SQL ➢ To represent a database system using ER diagrams and to learn normalization techniques ➢ To understand the fundamental concepts of transaction, concurrency and recovery processing ➢ To understand the internal storage structures using different file and indexing techniques which will help in physical DB design ➢ To have an introductory knowledge about the Distributed databases, NOSQL and database security

Unit – I	RELATIONAL DATABASES	9
Introduction: Overview of DBMS fundamentals – Overview of Relational Databases and Keys. Relational Data Model: Structure of relational databases – Database schema – Formal Relational Query Languages – Overview of Relational Algebra and Relational Operations. Database Design: Overview of the design process - The E-R Models – Constraints - Removing Redundant Attributes in Entity Sets - E-R Diagrams - Reduction to Relational Schemas - Entity Relationship Design Issues - Extended E-R Features – Alternative E-R Notations – Overview of Unified Modeling Language (UML).		

Unit – II	DATABASE DESIGN	9
Relational Database Design: Features of Good Relational Designs - Atomic Domains and 1NF - Decomposition using Functional Dependencies: 2NF, 3NF, BCNF and Higher Normal Forms. Functional Dependency Theory - Algorithm for Decomposition – Decomposition using multi-valued dependency: 4NF and 4NF decomposition. Database design process and its issues. SQL: review of SQL – Intermediate SQL – Advanced SQL.		
Unit – III	**TRANSACTIONS**	**9**
Transaction concept – A simple transaction model - Storage structure - Transaction atomicity and durability – Transaction isolation – Serializability – Recoverable schedules, Cascadeless schedules. Concurrency control: Lock-based protocols – Locks, granting of locks, The two-phase locking protocol, implementation of locking, Graph-based protocols. Deadlock handling: Deadlock prevention, Deadlock detection and recovery.		
Unit – IV	**DISTRIBUTED DATABASE**	**9**
Distributed Database concepts, Data Fragmentation, Replication, Allocation Techniques for Distributed Database Design, Distributed Database Architectures, Types of distributed database Distributed Catalog Management, Transaction Management, Concurrency Control and Recovery, Query processor and optimization in distributed database, Views - Integrity Procedures, Functions, Cursor and Triggers.		
Unit – V	**NOSQL DATABASES**	**9**
Introduction to NOSQL, CAP Theorem, Document-Based NOSQL System and MongoDB, NOSQL Key-Value Stores, Column-Based, NOSQL Graph Database and Neo4j, Big Data Technologies Based on MapReduce and Hadoop: Introduction, HDFS, MapReduce, HadoopV2 alias YARN. Case Study: Different types of high level databases – MongoDB, Hadoop/Hbase, Redis, IBM Cloudant, DynamoDB, Cassandra and CouchDB etc . Tips for choosing the right database for the given problem.		
		Total:45

TEXTBOOK:

1.	Silberschatz A, Korth HF, Sudharshan S. Database System Concepts. Sixth Edition, TMH publishing company limited; 2011. (unit 1,2,3)
2.	Elmasri R, Navathe SB. Fundamentals of Database Systems. Seventh Edition, Addison Wesley;2017. (unit 4&5)

REFERENCES:

1.	Garcia-Molina H, Ullman JD, Widom J. Database System ; The complete book. Second Edition, Pearson Education India, 2011.
2.	Ramakrishnan R, Gehrke J. Database Management Systems. Third Edition, TMH; 2003.

COURSE OUTCOMES: Upon successful completion of the course the student will be able to		Bloom's Taxonomy Level
CO1	Formulate and apply relational algebraic expressions, SQL and PL/SQL statements to query relational databases.	K4
CO2	Design and build ER models for real world databases.	K4
CO3	Design and build a normalized database management system for real world databases.	K4
CO4	Understand and apply the principles of transaction processing and concurrency control.	K4
CO5	To learn different high level databases and selection of right database.	K4

POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	1	-	-	-	1	3	3	3	2	1	3
CO2	3	1	1	2	2	-	-	-	3	2	1	1	3	1	2
CO3	3	3	2	1	2	-	-	-	3	3	1	2	2	2	2
CO4	1	2	2	3	2	-	-	-	3	1	3	1	1	2	1
CO5	2	2	1	1	3	-	-	-	1	2	2	3	1	3	3

ACS109 - COMPUTER NETWORKS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites		**4**	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ Understand the network types and protocol layering ➢ Analyse the Wired LAN and wireless LAN ➢ Implement packet switching.						
Unit – I	**INTRODUCTION AND PHYSICAL LAYER**						**9**
Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.							
Unit – II	**DATA-LINK LAYER & MEDIA ACCESS**						**9**
Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC– PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.							
Unit – III	**NETWORK LAYER**						**9**
Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.							
Unit – IV	**TRANSPORT LAYER**						**9**

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.		
Unit – V	**APPLICATION LAYER**	**9**
WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP		
Total:45 Periods		

TEXTBOOK:

1.	Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH,2013.

REFERENCES:

1.	Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2.	William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3.	Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4.	Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
5.	James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach
6.	Featuring the Internet, Sixth Edition, Pearson Education, 2013.

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the basic layers and its functions in computer networks.	K4
CO2	Evaluate the performance of a network. Understand the basics of how data flows from one node to another.	K4
CO3	Analyze and design routing algorithms.	K4
CO4	Design protocols for various functions in the network.	K4
CO5	Understand the working of various application layer protocols.	K4

POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	1	-	-	-	1	3	3	3	2	1	3
CO2	3	1	1	2	2	-	-	-	3	2	1	1	3	1	2
CO3	3	3	2	1	2	-	-	-	3	3	1	2	2	2	2
CO4	1	2	2	3	2	-	-	-	3	1	3	1	1	2	1
CO5	2	2	1	1	3	-	-	-	1	2	2	3	1	3	3

ACS306 - DATABASE MANAGEMENT SYSTEMS LABORATORY

Programme & Branch	B.Tech & CSBS	Sem.	Category	L	T	P	C
Prerequisites		3	PC	0	0	4	2
Preamble	To provide hands on training to the students in: •						

List of Exercises / Experiments:

1.	Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2.	Create a set of tables, add foreign key constraints and incorporate referential integrity.
3.	Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4.	Query the database tables and explore sub queries and simple join operations.
5.	Query the database tables and explore natural, equi and outer joins.
6.	Write user defined functions and stored procedures in SQL.
7.	Execute complex transactions and realize DCL and TCL commands.
8.	Write SQL Triggers for insert, delete, and update operations in a database table.
9.	Create View and index for database tables with a large number of records.
10.	Create an XML database and validate it using XML schema.
11.	Create Document, column and graph based data using NOSQL database tools.
12.	Develop a simple GUI based database application and incorporate all the above mentioned features.
13.	Case Study using any of the real life database applications from the following list a) Inventory Management for a EMart Grocery Shop b) Society Financial Management c) Cop Friendly App – Eseva d) Property Management – eMall e) Star Small and Medium Banking and Finance ● Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application. ● Apply Normalization rules in designing the tables in scope. ● Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features. ● Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer. ● Ability to showcase ACID Properties with sample queries with appropriate settings
	Total: 60

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Create databases with different types of key constraints.	K3
CO2	Construct simple and complex SQL queries using DML and DCL commands.	K3

CO3	Use advanced features such as stored procedures and triggers and incorporate in GUI based application development.	K4
CO4	Create an XML database and validate with meta-data (XML schema).	K2
CO5	Create and manipulate data using NOSQL database.	K3

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	1	-	-	-	1	3	3	3	2	1	3
CO2	3	1	1	2	2	-	-	-	3	2	1	1	3	1	2
CO3	3	3	2	1	2	-	-	-	3	3	1	2	2	2	2
CO4	1	2	2	3	2	-	-	-	3	1	3	1	1	2	1
CO5	2	2	1	1	3	-	-	-	1	2	2	3	1	3	3

ACS307 COMPUTER NETWORKS LABORATORY

Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites		**4**	**PC**	**0**	**0**	**4**	**2**

Preamble

- To understand the concept of layering in networks.
- To know the functions of protocols of each layer of TCP/IP protocol suite.
- To visualize the end-to-end flow of information.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.

List of Exercises/Experiments:

1.	Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyzer and examine.
2.	Write a HTTP web client program to download a web page using TCP sockets.
3.	Applications using TCP sockets like: a) Echo client and echo server b) Chat
4.	Simulation of DNS using UDP sockets.
5.	Use a tool like Wireshark to capture packets and examine the packets
6.	Write a code simulating ARP /RARP protocols.
7.	Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8.	Study of TCP/UDP performance using Simulation tool.
9.	Simulation of Distance Vector/ Link State Routing algorithm.
10.	Simulation of an error correction code (like CRC)
	Total:60

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSEOUTCOMES: At the end of the course ,learners will be able to		**Bloom's Taxonomy Level**
CO1	Apply the concept of layering in networks.	K3
CO2	Analyze the functions of protocols of each layer of TCP/IP protocol suite.	K3
CO3	Visualize the end-to-end flow of information.	K4
CO4	Apply the functions of network layer and the various routing protocols	K2
CO5	Familiarize the functions and protocols of the Transport layer	K3

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	1	-	-	-	1	3	3	3	2	1	3
CO2	3	1	1	2	2	-	-	-	3	2	1	1	3	1	2
CO3	3	3	2	1	2	-	-	-	3	3	1	2	2	2	2
CO4	1	2	2	3	2	-	-	-	3	1	3	1	1	2	1
CO5	2	2	1	1	3	-	-	-	1	2	2	3	1	3	3

ACS305 - OPERATING SYSTEMS LABORATORY							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites		**3**	**PC**	**0**	**0**	**4**	**2**
Preamble	To Provide Hands-on training in the concepts of operating system						
List of Exercises / Experiments:							
1.	Installation of windows operating system						
2.	Install any guest operating system like Linux using VMware.						
3.	Illustrate UNIX commands and Shell Programming.						
4.	Process Management using System Calls : Fork, Exit, Getpid, Wait, Close						
5.	Write C programs to implement the various CPU Scheduling Algorithms						
6.	Illustrate the inter process communication strategy.						
7.	Implement mutual exclusion by Semaphore						
8.	Write C programs to avoid Deadlock using Banker's Algorithm and to Implement Deadlock Detection Algorithm.						
9.	Write C programs to implement the following Memory Allocation Methods a.First Fit b. Worst Fit c. Best Fit						
1.0.	Write C programs to implement the various Page Replacement Algorithms.						
11.	Implement the following File Allocation Strategies using C programs a.Sequential b. Indexed c. Linked						

12.	Write C programs for the implementation of various disk scheduling algorithms
	Total: 60

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Define and implement UNIX Commands.	K3
CO2	Compare the performance of various CPU Scheduling Algorithms	K3
CO3	Compare and contrast various Memory Allocation Methods.	K4
CO4	Define File Organization and File Allocation Strategies.	K2
CO5	Implement various Disk Scheduling Algorithms.	K3

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	1	-	-	-	1	3	3	3	2	1	3
CO2	3	1	1	2	2	-	-	-	3	2	1	1	3	1	2
CO3	3	3	2	1	2	-	-	-	3	3	1	2	2	2	2
CO4	1	2	2	3	2	-	-	-	3	1	3	1	1	2	1
CO5	2	2	1	1	3	-	-	-	1	2	2	3	1	3	3

AHS303 SOFT SKILLS-II

NATURE OF THE COURSE: SKILL ENHANCEMENT COURSE (SEC)

Programme &Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites		4	**HS**	**0**	**0**	**2**	**0**

Preamble	➢ To acquaint the students with some very relevant and necessary soft skills and also to help them to develop their personality as well as to be self motivated. ➢ The different units are designed in such a manner so as to give the students inputs on personality development, social skills, etiquette, communication skills, attitude, appearing and grooming.

Unit–I	**FOUNDATIONS OF PERSONAL DEVELOPMENT**	**8**

Attitude and Motivation-Significance –Positive and Negative Attitude Attitude-Advantages and Disadvantages of Attitude- Relationship between Attitude and Motivation- Concept, Significance and Importance of Self Motivation- De-motivation-Factors Affecting Motivation in Learning-Self and Identity-Distinction between Self- Respect and Ego-Transforming Ego to Self-Respect-Indian

Perspective in Personality Development.		
Unit–II	**PERSONALITYDEVELOPMENT**	**8**
Concept of Personality and Personality Development Definition-Determinants of Personality Development- Deterrents to Personality Development-Types of Personality-Introvert, Extrovert, and Ambivert- Dimensions of Personality-Physical, Intellectual, Emotional, Moral, Social, and Spiritual-Perception- Concept and Definition- Perceptual Process-Self.		
Unit–III	**MORAL OF ESTEEM AND LEADERSHIP**	**8**
Esteem-Maslow and Eric Erikson's Idea of Self-Esteem- Mind Mapping, Competency Mapping, and 360Degree Assessment-Cultivating Assertiveness-Leadership: Concept, Dimensions, and Types of Leadership.		
Unit–IV	**ETIQUETTEANDGROOMING**	**8**
Etiquette-Importance in Personal and Professional Life- Principles and their Significance-Culture and Gender Sensitivity in Communication-Conversation Skills and Small Talk-Email and Telephone Etiquette-Online Etiquette: Managing Digital Presence and Reputation- Dress Code and Professional Appearance.		
Unit–V	**EXPERIENTIAL PARADIGM IN PRACTICE**	**8**
Self Awareness Definition and Development- SWOT Analysis-Interpersonal and Communication Skills-Self-Management Skills Definition and Examples-Goal Setting-Definition, Process and Examples-Positive Emotions and Well-being Resilience, Optimism, Compassion, Forgiveness, Gratitude.		
		Total:45

REFERENCES:

1.	Atherton,J.B.(2002) Learning and teaching:Teaching from experience, Columbus. Ohio: Merrill. Carr, A. (2011). Positive Psychology: The Science of happiness and human strength. Routledge.
2.	Cornelissen, R. M. M., Misra, G., & Varma, S., (2011). Foundation of Indian Psychology: Concepts and Theories. (Vol. 1), New Delhi: Pearson.
3.	Covey, S. R. (2013). The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change. Simon & Schuster.
4.	Exeter,D.J.(2001).Learning in the outdoors. London: Outward Bound.
5.	Salmon, D & Maslow, J., (2007). Yoga Psychology and the Transformation of Consciousness: Seeing through the eyes of infinity. St. Paul, MN., USA: Paragon House
6.	Vohra, S. S. & Kailash. S. (2010). Experiential learning (section III) in Psychology of Turbulent Relationships. New Delhi: Icon Publishers.
7.	Wentz, Frederick H. (2012). Soft Skills Training: A Work book to Develop Skills for Employment. Create Space Independent Publishing Platform.

COURSE OUTCOMES: **At the end of the course, learners will be able to**	**Bloom's Taxonomy Level**

CO1	On the completion of this course, the students will be able to appreciate the significance of soft skills and personality augmentation with reference to their personal as well as their professional lives. This course module will enhance the employability quotient of the students as well. In a nutshell, the module is on the lines of the 'finishing schools'.	K3

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SEM – V

AAI106 - DATA MINING AND WAREHOUSING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		5	**PC**	**3**	**0**	**0**	**3**
Preamble	To understand the principles of Data warehousing and Data Mining. To be familiar with the Data warehouse architecture and its Implementation. To know the Architecture of a Data Mining system. To understand the various Data preprocessing Methods. To perform classification and prediction of data.						
UNIT I	**DATA WAREHOUSING AND BUSINESS ANALYSIS**						**9**
Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP an Multidimensional Data Analysis.							
UNIT II	**DATA MINING**						**9**
Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.							
UNIT III	**CLASSIFICATION AND PREDICTION**						**9**
Issues Regarding Classification and Prediction – Classification by Decision Tre Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensembl Methods – Model Section.							
UNIT IV	**CLUSTER ANALYSIS:**						**9**
Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.							
UNIT V	**MINING OBJECT, SPATIAL, MULTIMEDIA, TEXT AND WEB DATA**						**9**
Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.							
							Total: 45
TEXTBOOKS							
1.	Jiawei Han, Micheline Kamber and Jian Pei"Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011						
REFERENCES							

1.	Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2.	K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3.	G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4.	Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1.	Technical know how of the Data Mining principles and techniques for real time applications.	K4
CO2	Understand the data mining functionalities and data preprocessing.	K3
CO3	Analyse the different categories in cluster analysis.	K3
C04	Apply back propagation algorithm for support vector machine	K3
C05	Analyse multimedia,text and web data.	K5

POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	3	1	-	-	-	2	3	1	2	3	3	3
2	2	2	2	3	3	-	-	-	1	2	2	3	1	1	3
3	3	3	3	3	3	-	-	-	2	1	1	2	2	1	3
4	3	3	1	1	1	-	-	-	1	3	1	3	2	1	1
5	3	2	2	2	3	-	-	-	2	3	2	2	2	3	3

ACS106 - SOFTWARE ENGINEERING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		5	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ Understand the basic concepts, principles, and methodologies of software engineering. ➢ Learn the software development lifecycle (SDLC) and its various models (e.g., Waterfall, Agile, Spiral). ➢ Understand the principles of project management within the context of software development. ➢ Learn how to plan, execute, and monitor software projects, including resource allocation and risk management.						
UNIT I	**INTRODUCTION TO SOFTWARE ENGINEERING**			**10**			
Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.							
UNIT II	**REQUIREMENT ENGINEERING PROCESS**			**9**			
Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS, Architectural design, component level design, user interface design, WebApp Design.							
UNIT III	**QUALITY CONCEPTS**			**8**			
Review techniques, Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.							
UNIT IV	**TESTING OBJECTIVES**			**10**			
Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing, Software Testing Strategies - Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Testing conventional applications, object oriented applications, and Web applications, Formal modelling and verification, Software configuration management, Product metrics.							
UNIT V	**PROJECT MANAGEMENT CONCEPTS**			**8**			
Process and Project Metrics, Estimation for Software projects, Project Scheduling, Risk Management, Maintenance and Reengineering.							
							Total: 45

TEXTBOOKS	
1.	R. S. Pressman, “Software Engineering: A Practitioners Approach”, McGraw Hill, 7th edition, 2010
2.	Rajib Mall, “Fundamentals of Software Engineering”, PHI Publication, 3rd edition, 2009
REFERENCES	
1.	Software Engineering: A Practitioner's Approach, McGraw Hill , New York, NY.
2.	Software Engineering, Addison-Wesley , Boston, MA.
3.	Beginning Software Engineering, Wrox.
4.	Tsui, Frank , Orlando Karam and Barbara Bernal (2013) Essentials of Software Engineering, Jones & Bartlett Learning , Sudbury, MA

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment	K4
CO2	An ability to work in one or more significant application domains	K3
CO3	Work as an individual and as part of a multidisciplinary team to develop and deliver quality software	K3
CO4	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle	K3
CO5	Demonstrate an ability to use the techniques and tools necessary for engineering practice	K4

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	1	-	-	-	-	-	-	3	3	1	1
CO2	3	3	2	2	2	1	-	-	-	-	-	-	3	3	1	1
CO3	3	3	3	2	2	1	-	-	-	-	-	-	3	3	1	1
CO4	3	3	2	2	2	1	-	-	-	-	-	-	3	3	1	1
CO5	3	3	3	2	2	1	-	-	-	-	-	-	3	3	1	1

AAI304 DATA MINING AND WAREHOUSING LABORATORY							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		5	**PC**	**0**	**0**	**4**	**2**
Preamble	➢ Data mining is primarily used by the companies with a strong consumer focus. It enables these companies to determine the factors such as price, product positioning, or staff skills, and economic indicators, competition, and customer demographics						
LIST OF EXPERIMENTS							
1.Listing applications for mining							
2.File format for data mining							
3.conversion of various data files							
4.Training the given dataset for an application							
5.Testing the given dataset for an application							
6.Generating accurate models							
7.Data pre-processing – data filters							
8.Feature selection							
9.Web mining							
10.Text mining							
11.Design of fact & dimension tables							
12.Generating graphs for star schema							
							Total: 60

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Provide efficient distribution of information and easy access to data	K2
CO2	Create user friendly reporting environment.	K3
CO3	Find the unseen pattern in large volume of historical data that helps to manage an organization efficiently.	K3
CO4	Understand the concepts of various data mining Techniques.	K3
CO5	Understand the concepts of Preprocessing.	K3

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	1	-	-	-	-	-	-	3	3	1	1
CO2	3	3	2	2	2	1	-	-	-	-	-	-	3	3	1	1
CO3	3	3	3	2	2	1	-	-	-	-	-	-	3	3	1	1
CO4	3	3	2	2	2	1	-	-	-	-	-	-	3	3	1	1
CO5	3	3	3	2	2	1	-	-	-	-	-	-	3	3	1	1

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SEM - VI

AIT102 - FULL STACK WEB DEVELOPMENT							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		6	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ To understand the various components of full stack development ➢ To learn Node.js features and applications ➢ To develop applications with MongoDB ➢ To understand the role of Angular and Express in web applications ➢ To develop simple web applications with React.						
UNIT I	**BASICS OF FULL STACK**						**10**
Understanding the Basic Web Development Framework - User - Browser – Webserver - Backend Services – MVC Architecture - Understanding the different stacks –The role of Express – Angular – Node – Mongo DB – React.							
UNIT II	**NODE JS**						**9**
Basics of Node JS – Installation – Working with Node packages – Using Node package manager – Creating a simple Node.js application – Using Events – Listeners –Timers - Callbacks – Handling Data I/O – Implementing HTTP services in Node.js							
UNIT III	**MONGO DB**						**8**
Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications							
UNIT IV	**EXPRESS AND ANGULAR**						**10**
Implementing Express in Node.js - Configuring routes - Using Request and Response objects - Angular - Typescript - Angular Components - Expressions - Data binding - Built-in directives							
UNIT V	**REACT**						**8**
MERN STACK – Basic React applications – React Components – React State – Express REST APIs - Modularization and Webpack - Routing with React Router – Server-side rendering.							
							Total: 45
TEXTBOOKS							
1.	Brad Dayley, Brendan Dayley, Caleb Dayley, ‘Node.js, MongoDB and Angular Web Development’, Addison-Wesley, Second Edition, 2018						
REFERENCES							
1.	Chris Northwood, ‘The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer’, Apress; 1st edition, 2018						
2.	Kirupa Chinnathambi, ‘Learning React: A Hands-On Guide to Building Web Applications Using React and Redux’, Addison-Wesley Professional, 2nd edition, 2018						
COURSEOUTCOMES: **At the end of the course, learners will be able to**							**Bloom’s Taxonomy Level**

CO1	Understand the various stacks available for web application development	K4
CO2	Use Node.js for application development	K3
C03	Develop applications with MongoDB CO4: Use the features of Angular and Express CO5: Develop React applications	K3

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	0	0	0	0	0	0	1	1	1	1	1	1	0
CO2	3	3	3	3	2	1	0	0	2	0	2	3	2	2	1
CO3	3	3	2	2	2	2	0	0	2	2	2	3	2	2	1
CO4	3	3	2	2	2	1	0	0	1	1	2	2	2	1	1
CO5	3	3	3	3	3	1	0	0	0	0	2	2	2	2	1

AIT302-FULL STACK WEB DEVELOPMENT LABORATORY							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		6	**ES**	**0**	**0**	**4**	**2**
Preamble	➢To develop full stack applications with clear understanding of user interface, business logic and data storage. ➢To design and develop user interface screens for a given scenario ➢To develop the functionalities as web components as per the requirements ➢To implement the database according to the functional requirements ➢To integrate the user interface with the functionalities and data storage						
LIST OF EXPERIMENTS							
1.Develop a portfolio website for yourself which gives details about yourself for a potential recruiter.							
2.Create a web application to manage the TO-DO list of users, where users can login and manage their to-do items							
3.Create a simple micro blogging application (like twitter) that allows people to post their content which can be viewed by people who follow them.							
4.Create a food delivery website where users can order food from a particular restaurant listed in the website.							
5.Develop a classifieds web application to buy and sell used products.							
6.Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days.							

7.Develop a simple dashboard for project management where the statuses of various tasks are available. New tasks can be added and the status of existing tasks can be changed among Pending, InProgress or Completed.
8.Develop an online survey application where a collection of questions is available and users are asked to answer any random 5 questions.
Total: 60

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Design full stack applications with clear understanding of user interface, business logic and data storage.	K2
CO2	Design and develop user interface screens	K3
CO3	Implement the functional requirements using appropriate tool	K3
CO4	Design and develop database based on the requirements	K3
CO5	Integrate all the necessary components of the application	K3

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	0	0	0	0	0	0	1	1	1	1	1	1	0
CO2	3	3	3	3	2	1	0	0	2	0	2	3	2	2	1
CO3	3	3	2	2	2	2	0	0	2	2	2	3	2	2	1
CO4	3	3	2	2	2	1	0	0	1	1	2	2	2	1	1
CO5	3	3	3	3	3	1	0	0	0	0	2	2	2	2	1

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SEM - VII

ACB101 USABILITY DESIGN							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		7	**ES**	**3**	**0**	**0**	**3**

Preamble	➢ To provide a sound knowledge in UI & UX ➢ To understand the need for UI and UX ➢ To understand the various Research Methods used in Design ➢ To explore the various Tools used in UI & UX ➢ Creating a wireframe and prototype

UNIT I	**FOUNDATIONS OF DESIGN**	**9**
UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy		
UNIT II	**FOUNDATIONS OF UI DESIGN**	**9**
Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles –Branding - Style Guides		
UNIT III	**FOUNDATIONS OF UX DESIGN**	**9**
Introduction to User Experience - Why You Should Care about User Experience – Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals		
UNIT IV	**WIREFRAMING, PROTOTYPING AND TESTING**	**9**
Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools- Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods -Synthesizing Test Findings - Prototype Iteration		
UNIT V	**RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE**	**9**
Identifying and Writing Problem Statements - Identifying Appropriate Research Methods – Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture		
		Total: 45

TEXTBOOKS	
1.	Jennifer Preece, Helen Sharp, Yvonne Rogers, “Interaction Design: Beyond Human-Computer Interaction”, 2015, 4th Edition, Wiley publications
REFERENCES	
1.	Alan Cooper and Robert Riemann, “About Face The Essentials of Interaction Design”, 2014, 4th Edition, Wiley Publications.
2.	Elizabeth Goodman, Mike Kuniavsky, Andrea Moed , “ Observing the User Experience - A Practitioner's Guide to User Research” , 2012, Second Edition, Morgan Kaufmann Publications

COURSEOUTCOMES: **At the end of the course, learners will be able to**	**Bloom’s Taxonomy Level**

CO1.	know the steps in a web design process: Information architecture, writing for web, paperprototyping, wireframes and usability testing, GDPR, WCAG, image types ad uses, layout, composition and grids,and animatin. Trustworthiness, dark patterns, and ethics will be discussed.	K4
CO2.	understand principles for good design for each step in the process	K3
C03.	know the steps in a web design process: Information architecture, writing for web, paperprototyping, wireframes and usability testing, GDPR, WCAG, image types ad uses, layout, composition and grids,and animatin. Trustworthiness, dark patterns, and ethics will be discussed.	K3

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1											1	1		
CO2	1											1	1		
CO3	1	1	1									1	1		
CO4	1	1	1									1	1		
CO5	1	1	1									1	1		

ACB301 - USABILITY DESIGN LABORATORY							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		7	**PC**	**0**	**0**	**4**	**2**
Preamble	➢ Creative and detail-oriented UI Designer with a passion for user-centered design, seeking an entry-level position to apply my skills in wireframing, prototyping, and visual design to create engaging and intuitive digital experiences for users.						
LIST OF EXPERIMENTS							
1.Designing a Responsive layout for an societal application							
2.Exploring various UI Interaction Patterns							
3.Developing an interface with proper UI Style Guides							
4.Developing Wireflow diagram for application using open source software							

5.Exploring various open source collaborative interface Platform
6.Hands on Design Thinking Process for a new product
7.Brainstorming feature for proposed product
8.Defining the Look and Feel of the new Project
9.Create a Sample Pattern Library for that product (Mood board, Fonts, Colors based on UI principles)
10.Identify a customer problem to solve
11.Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping
12.Sketch, design with popular tool and build a prototype and perform usability testing
Total: 30

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Build UI for user Applications	K2
CO2	Evaluate UX design of any product or application	K3
CO3	Demonstrate UX Skills in product development	K3
CO4	Implement Sketching principles	K3

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1											1	1		
CO2	1											1	1		
CO3	1	1	1									1	1		
CO4	1	1	1									1	1		

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PROFESSIONAL ELECTIVES

ACB501 - BUSINESS PLAN AND ETHICS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**

Preamble	➢ Students who participate in this activity will be able to understand: - ➢ How do existing companies convert new ideas into ventures that enhance (or even change) their mission and goals. ➢ What are the key components of a successful venture ➢ Develop a solid understanding of moral philosophy and its application in business. ➢ Examine how ethical principles apply to various business practices and decisions

UNIT I	**INTRODUCTION TO BUSINESS PLANNING**	**9**

Defining the purpose, identifying customers and markets, describing products and services, setting strategies and tactics, relating numbers to text, developing the Plan, describing the company/venture, structuring the organization, building a management team, refining the business proposition, conducting feasibility analyses and outlining implementation

UNIT II	**STRATEGIC PLANNING**	**9**

Targeting customers, characterizing the market, forecasting sales, managing cash flow, understanding the financials, defining business goals, planning operations setting milestones, assigning responsibility, allocating resources, maintaining timelines and assessing results

UNIT III	**ETHICS THEORY AND BEYOND**	**9**

Management of Ethics - Ethics analysis - Ethics in practice - ethics for managers; Role and function of ethical managers- Comparative ethical behaviour of managers; Code of ethics; Competitiveness, organizational size, profitability and ethics; Cost of ethics in Corporate ethics evaluation. Business and ecological / environmental issues in the Indian context and case studies.

UNIT IV	**LEGAL ASPECTS OF ETHICS**	**9**

Political – legal environment; Provisions of the Indian constitution pertaining to Business; Political setup – major characteristics and their implications for business; Prominent features of MRTP & FERA. Social – cultural environment and their impact on business operations, Salient features of Indian culture and values.

UNIT V	**ENVIRONMENTAL ETHICS**	**9**

Economic Environment; Philosophy of economic grow and its implications for business, Main

features of Economic Planning with respect to business; Industrial policy and framework of government contract over Business; Role of chamber of commerce and confederation of Indian Industries.	
	Total: 45
TEXTBOOKS	
1.	"The One Page Business Plan for the Creative Entrepreneur" by Jim Horan
2.	Business Ethics: Ethical Decision Making and Cases" by O.C. Ferrell, John Fraedrich, and Linda Ferrell
REFERENCES	
1.	"The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company" by Steve Blank and Bob Dorf
2.	"Principles of Management" by OpenStax

COURSEOUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Articulate the fundamental concepts of business and identify different business models and their applications	K4
CO2	Realise the importance of ethical behaviour in business	K3
CO3	Handle ethical issues in business operations correctly and confidently	K3
CO4	Become individuals with desired qualities and humanistic approach	K3
CO5	Exhibit ethical behaviour towards employees	K3

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	0	1	1	0	0	0	1	1	1	1	1	0	0
CO2	2	3	3	0	2	1	0	0	2	0	2	3	2	3	1
CO3	2	3	2	2	2	2	0	0	2	2	2	3	2	2	1
CO4	2	2	2	2	1	1	0	0	1	1	2	2	2	2	2
CO5	3	3	3	3	0	1	0	0	0	0	2	2	2	3	1

ACB502 - BUSINESS ANALYTICS

Programme & Branch	B.Tech & CSBS	Sem.	Category	L	T	P	C
			PC	3	0	0	3

Preamble	➢ To understand the Analytics Life Cycle. ➢ To comprehend the process of acquiring Business Intelligence ➢ To understand various types of analytics for Business Forecasting ➢ To model the supply chain management for Analytics. ➢ To apply analytics for different functions of a business

UNIT I	**INTRODUCTION TO BUSINESS ANALYTICS**	**9**
Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration		
UNIT II	**BUSINESS INTELLIGENCE**	**9**
Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions		
UNIT III	**BUSINESS FORECASTING**	**9**
Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics.		
UNIT IV	**HR & SUPPLY CHAIN ANALYTICS**	**9**
Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain- Applying HR Analytics to make a prediction of the demand for hourly employees for a year.		
UNIT V	**MARKETING & SALES ANALYTICS**	**9**
Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process – Sales Planning – Analytics applications in Marketing and Sales - predictive analytics for customers' behaviour in marketing and sales.		
		Total: 45

TEXTBOOKS	
1.	R. Evans James, Business Analytics, 2nd Edition, Pearson, 2017
2.	2.R N Prasad, Seema Acharya, Fundamentals of Business Analytics, 2nd Edition, Wiley, 2016
3.	Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016
4.	VSP RAO, Human Resource Management, 3rd Edition, Excel Books, 2010.
5.	R. Evans James, Business Analytics, 2nd Edition, Pearson, 2017
REFERENCES	
1.	Mahadevan B, “Operations Management -Theory and Practice”,3rd Edition, Pearson Education,2018.

COURSEOUTCOMES: **At the end of the course, learners will be able to**	**Bloom’s Taxonomy Level**

CO1.	Explain the real world business problems and model with analytical solutions.	K4
CO2.	Identify the business processes for extracting Business Intelligence	K3
C03.	Apply predictive analytics for business fore-casting	K3
C04.	Apply analytics for supply chain and logistics management	K3
C05.	Use analytics for marketing and sales.	K2

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	0	1	1	0	0	0	1	1	1	1	1	0	0
CO2	3	2	3	0	2	1	0	0	2	0	2	3	2	1	2
CO3	3	3	2	2	2	2	0	0	2	2	2	3	2	1	1
CO4	3	2	2	2	1	1	0	0	1	1	2	2	2	2	2
CO5	3	2	3	3	0	1	0	0	0	0	2	2	2	1	2

ACB503	**FUNDAMENTALS OF MANAGEMENT**						
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ To acquaint the students to the fundamentals of management and organizational behaviour and help them to understand how organizations functions and apply the knowledge management and behaviour to real world situations. Also students get familiar with the theories of management and organizational behaviour which will help them make informed decisions						
UNIT I	**NATURE AND SCOPE OF MANAGEMENT**			**9**			
Definition, Nature, Functions and Importance of Management – Evolution of Management thought – Scientific management, administrative management, Haw throne experiments – systems approach - Levels of Management - Managerial Skills - Planning – Steps in Planning Process – importance and Limitations – Types of Plans - Characteristics of a sound Plan - Management By Objectives (MBO) - Techniques and Processes of Decision Making - Social Responsibilities of Business							
UNIT II	**ORGANIZING AND CONTROLLING**			**9**			

Organizing – Principles of organizing – Organization Structure and Design – Types of power-Delegation of Authority and factors affecting delegation – Span of control – Decentralization – Line and staff structure conflicts - Coordination definition and principles - Emerging Trends in Corporate Structure – Formal and Informal Organization- Nature and importance of Controlling, process of Controlling, Requirements of effective control and controlling techniques.

UNIT III	NATURE AND SCOPE OF ORGANZATIONAL BEHAVIOUR	9

Organizational behaviour: Nature and scope – Linkages with other social sciences Individual roles and organizational goals – perspectives of human behaviour – perception– perceptual process – Learning - Learning Process- Theories - Personality and Individual Differences - Determinants of Personality - Values, Attitudes and Beliefs - Creativity and Creative thinking

UNIT IV	MOTIVATION	9

Motivation and Job Performance – Content and process Theories of Motivation - Leadership- Styles - Approaches – Challenges of leaders in globalized era – Groups – stages formation of groups – Group Dynamics - Collaborative Processes in Work Groups - Johari Window- Transactional Analysis.

UNIT V	ORGANIZATIONAL CONFLICT	9

Organizational conflict-causes and consequences-conflict and Negotiation Team Building, Conflict Resolution in Groups and problem solving Techniques – Organizational change and Development-change process - resistance to change – OD Intervention Techniques. Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Total: 45

TEXTBOOKS

1.	Harold
2.	Dilip Kumar Battacharya, Principles of Management, Pearson, 2022.
3.	Kumar, Rao, Chhaalill ―Introduction to Management Science‖ Cengage Publications, New Delhi.
4.	V.S.P.Rao, Management Text and Cases, Excel, Second Edition, 2022.
5.	K.Anbuvelan, Principles of Management, University Science Press, 2023.

REFERENCES

1.	K.Aswathappa ― Organisational Behaviour-Text, Cases and Games‖, Himalaya Publishing House, New Delhi, 2018.
2.	Steven L Mc Shane, Mary Ann Von Glinow, Radha R Sharma: ―Organisational Behaviour‖, TMH Education, New Delhi, 2018

COURSEOUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	To expose students to basic concepts of management	K4
CO2	To enable students gain appreciation for emerging ideas, techniques, procedures & practices in the field of management	K3

C03	Apply controlling in problem solving and critical thinking abilities to initiate, manage and implement changes in organization.	K3
C04	To develop & understanding of individual and group behavior inside organization	K1
C05	Enhance skills in understanding & appreciating individual, interpersonal and group process for increased effectiveness within the outside the organization. Familiars students with behaviour dynamics of the organization	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	1	2	2	-	2	-	-	1	-	2	2	1
CO2	2	2	3	2	-	2	-	-	-	2	1	-	2	3	1
CO3	2	-	1	-	2	2	-	-	-	-	-	-	1	2	-
CO4	2	-	3	2	3	2	-	-	-	3	-	-	2	2	1
CO5	2	1	2	2	-	2	-	3	-	2	-	-	1	-	2

ACB504 - INTRODUCTION TO BUSINESS SYSTEMS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ To develop and strengthen business quality and motivation in students ➢ To impart basic business skills ➢ To understanding to run a business efficiently and effectively.						
UNIT I	**OVERVIEW OF BUSINESS SYSTEM**			**9**			
Business environmental factors - Internal and External. System approach of management ProcessInput for the business, Transformational process and output. Objectives of the business system. System model of business management. Management functions – Planning, Organising, Staffing, Directing and Controlling							
UNIT II	**OUTLINE OF BUSINESS ORGANIZATION**			**9**			
Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises, Multinational and Global companies. Managing Global environment. Management levels and types							
UNIT III	**FUNCTIONS OF BUSINESS**			**9**			

Functions and Objectives – Production, Marketing, Finance, Human Resource, quality control and Research & development**.**		
UNIT IV	**MEASURING BUSINESS PERFORMANCE AND CONTROL PROCESS**	**9**
Key performance indicators. Financial statement analysis- Cash flow analysis, ROI, working capital, cost volume profit analysis. Customer - satisfaction Retention and acquisition. Employee Performance - Benchmarking, employee retention. Controlling Techniques - Budgetary and Non- Budgetary control measures		
UNIT V	**COMPUTER APPLICATIONS IN BUSINESS**	**9**
Introduction to business Software- Enterprise application and Business application. Overview on types of Business software. ERP. Business Intelligence, e-business and e-governance		
		Total: 45

TEXTBOOKS	
1.	Harold Koontz, Heinz Weihrich, Mark V. Cannice, "Essentials of Management", Tata McGraw-Hill, 11th Edition, 2020
2.	Stephen P. Robbins and David A. Decenzo, "Fundamentals of Management", Pearson Education,8th Edition, 2012.
REFERENCES	
1.	James A. O'Brien, "Management Information Systems: Managing Information Technology in the Business Enterprise", Tata McGraw Hill, 2004.
2.	Corey Schou and Dan Shoemaker, "Information Assurance for the Enterprise: A Roadmap to Information Security", Tata McGraw Hill, 2007.
3.	Bateman Snell, "Management: Competing in the new era", McGraw-Hill Irwin, 5th Edition,2002.

COURSEOUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	To demonstrate and strengthen business quality and motivation in students	K4
CO2	Examine basic business skills and measuring business performance	K3
C03	To demonstrate business Applications using business software	K3
C04	Apply Enterprise application and Business application	K1
C05	Use Business Intelligence in e-business for marketing and sales	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	1	1	2	1	2	1	2	1	3	2	2	1
CO2	3	3	3	2	1	1	2	1	2	1	2	1	3	2	2	1
CO3	3	2	2	2	1	1	2	1	2	1	2	1	3	2	2	1

CO4	3	2	2	2	1	1	2	1	2	1	2	1	3	2	2	1
CO5	3	2	2	2	1	1	2	1	2	1	2	1	3	2	2	1

ACB505 - BUSINESS STRATEGY							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ A business strategy is a course of action designed to aid executives in achieving organisational objectives. Teams are given a clear path to support the goals as it describes business requirements and resource allocation. This aids organisations in mobilising operations, boosting customer satisfaction, and securing a dominant position in the market						
UNIT I	**INTRODUCTION TO STRATEGIC MANAGEMENT**						**9**
Importance of Strategic Management-Vision and Objectives - Schools of thought in Strategic Management- Strategy Content, Process, and Practice - Fit Concept and Configuration Perspective in Strategic Management							
UNIT II	**INTERNAL ENVIRONMENT OF FIRM**						**9**
ecognizing a Firm's Intellectual Assets - Core Competence as the Root of Competitive Advantage - Sources of Sustained Competitive Advantage -Business Processes and Capabilities-based approach to Strategy							
UNIT III	**EXTERNAL ENVIRONMENTS OF FIRM**						**9**
Competitive Strategy - Five Forces of Industry Attractiveness that Shape Strategy- The concept of Strategic Groups, and Industry Life Cycle - Generic Strategies, Generic Strategies and the Value Chain							
UNIT IV	**CORPORATE STRATEGY AND GROWTH STRATEGIES**						**9**
The Motive for Diversification - Related and Unrelated Diversification- Business Portfolio Analysis - Expansion, Integration and Diversification - Strategic Alliances, Joint Ventures and Mergers & Acquisitions – case studies.							
UNIT V	**STRATEGY IMPLEMENTATION**						**9**
Structure and Systems - The 7S Framework -Mckinsey 7s framework example- How to Use the McKinsey 7S Model, Strategic Control and Corporate Governance.							
							Total: 45

TEXTBOOKS	
1.	Robert M. Grant , Contemporary Strategic Management, Blackwell, Seventh Edition,2012.
2.	Kazmi, Azhar, Business Policy and Strategic Management, Third Edition, Tata McGrawhill, New Delhi, 2008.

REFERENCES	
1.	Michael E.Porter, Competitive Advantage, The Free Press, New York, 1985. 3 Richard Rumelt , Good Strategy Bad Strategy: The Difference and Why It Matters. Profile Books, Fourth edition, 2011.
2.	Dislodging multinationals: India's strategy in comparative perspective (2019), Encarnation, D.Cornell, University Press

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the fundamental concepts of strategic management.	K4
CO2	Understand the interrelationships among business functions.	K3
C03	Apply the business functions in the industrial environment.	K3
C04	Apply the inter-relationships of business to individuals, other organizations, government and society.	K1
C05	Analyze complex, unstructured qualitative and quantitative problems, using appropriate tools.	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	3	2	1	3	3	2	2	2	3	3	2	1	1
CO2	2	3	2	3	2	2	2	2	2	2	2	3	3	2	2	2
CO3	3	3	2	3	2	2	3	3	3	2	3	2	3	2	2	2
CO4	3	3	2	3	2	2	3	2	2	3	3	3	3	2	1	2
CO5	3	3	3	3	2	3	3	2	2	0	3	3	3	2	2	1

ACB506 - BIG DATA TECHNOLOGIES AND ANALYTICS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ Understand the concept of big data. ➢ Learn and use NoSQL big data management. ➢ Learn MapReduce analytics using Hadoop and related tools. ➢ Work with map, reduce applications.						

	➢ Understand the usage of Hadoop related tools for Big Data Analytics	
UNIT I	**UNDERSTANDING BIG DATA**	**9**
What is big data – why big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – other big data applications– big data technologies – introduction to Hadoop – open-source technologies – cloud and big data – mobile business intelligence		
UNIT II	**NOSQL DATA MANAGEMENT**	**9**
Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – sharding – master-slave replication – peer-peer replication – sharding and replication – consistency – relaxing consistency – version stamps – mapreduce.`		
UNIT III	**BASICS OF HADOOP**	**9**
Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures.		
UNIT IV	**MAPREDUCE APPLICATIONS**	**9**
MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats.		
UNIT V	**HADOOP RELATED TOOLS**	**9**
Hbase – data model and implementations – Hbase clients – Hbase examples – praxis.Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.		
		Total: 45

TEXTBOOKS	
1.	Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2.	Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
REFERENCES	
1.	E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
2.	Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Describe big data and use cases from selected business domains.	K4
CO2	Apply NoSQL concepts in big data management.	K3
C03	Install, configure, and run Hadoop and HDFS.	K3
C04	Perform map-reduce analytics using Hadoop.	K1

C05	Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2	3	2	1	1	2	3	2	3	1	2	2
CO2	3	3	3	3	3	3	2	2	3	3	2	2	3	2	1	1
CO3	3	3	3	3	3	3	2	2	2	3	2	2	3	2	1	1
CO4	3	2	3	2	3	2	2	3	2	2	3	2	2	1	2	1
CO5	3	2	3	3	3	3	2	2	2	2	3	2	2	1	2	1

ACB507 - DATA ANALYTICS AND VISUALIZATION WITH R							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ To Introduce the concept of Data Analytics Lifecycle. ➢ To Develop Mathematical concepts required for advance regression. ➢ To Understand data modeling in time series and its process. ➢ To create awareness about Text analytics and its applications. ➢ To provide overview of Data analytics and visualization with R						
UNIT I	**INTRODUCTION TO DATA ANALYTICS AND LIFE CYCLE**						**9**
Learning the Business Domain, Resources Framing the Problem, Identifying Key Stakeholders. Interviewing the Analytics Sponsor, Developing Initial Hypotheses Identifying Potential Data Sources Data Preparation: Preparing the Analytic Sandbox, Performing ETLT, Learning About the Data, DataConditioning, Survey and visualize							
UNIT II	**REGRESSION MODELS**						**9**
Introduction to simple Linear Regression: The Regression Equation, Fittedvalue and Residuals, Least Square Introduction to Multiple Linear Regression: Assessing the Model, Cross-Validation, Model Selection and Stepwise Regression, Prediction Using Regression 2.2 Logistic Regression: Logistic Response function and logit, Logistic Regression and GLM, Generalized Linear model, Predicted values from Logistic Regression							
UNIT III	**TIME SERIES**						**9**

Overview of Time Series Analysis Box-Jenkins Methodology, ARIMA Model Autocorrelation Function (ACF),Autoregressive Models ,Moving Average Models ,ARMA and ARIMA Models , Building and Evaluating an ARIMA Model, Reasons to Choose and Cautions		
UNIT IV	**TEXT ANALYTICS**	**9**
History of text mining, Roots of text mining overview of seven practices of text analytic, Application and use cases for Text mining: extracting meaning from unstructured text, Summarizing Text. Text Analysis Steps, A Text Analysis Example , Collecting Raw Text Representing Text ,Term Frequency—Inverse Document Frequency		
UNIT V	**DATA ANALYTICS AND VISUALIZATION WITH R**	**9**
Introduction to R: Data Import and Export, Attribute and Data type, Descriptive statistics. Exploratory Data Analysis: Visualization before analysis, DirtyData, visualizing single variable, examining Multiple variable, Data Exploration versus presentation		
		Total: 45

TEXTBOOKS	
1.	"R for Data Science" by Hadley Wickham and Garrett Grolemund
2.	Data Science for Business" by Foster Provost and Tom Fawcett:
3.	Practical Data Science with R" by Nina Zumel and John Mount
REFERENCES	
1.	"R for Data Science: Import, Tidy, Transform, Visualize, and Model Data" by Hadley Wickham and GarrettGrolemund
2.	"Hands-On Programming with R: Write Your Own Functions and Simulations" by Garrett Grolemund
3.	"R for Data Science: Import, Tidy, Transform, Visualize, and Model Data" by Hadley Wickham and GarrettGrolemund

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1.	Comprehend basics of data analytics and visualization.	K4
CO2.	Apply various regression models on given data set and perform prediction.	K3
C03.	Demonstrate advance understanding of Time series concepts and analysis of data using various time series models.	K3
C04.	Analyze Text data and gain insights.	K2
CO5.	Experiment with different analytics techniques and visualization using R.	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	3	2	3	2	3	1	2	3	2	3	1	2	2
CO2	2	3	3	3	3	2	2	3	3	2	2	2	3	2	1	1
CO3	2	3	3	3	2	3	1	3	2	3	2	2	3	2	1	1
CO4	2	2	3	2	3	2	2	3	2	2	3	2	2	1	2	2
CO5	2	2	3	3	3	3	2	3	2	2	3	2	2	1	2	1

ACB508 - DIGITAL MARKETING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ The primary objective of this module is to examine and explore the role and importance of digital marketing in today's rapidly changing business environment. ➢ It also focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.						
UNIT I	**INTRODUCTION TO ONLINE MARKET**			**9**			
Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.							
UNIT II	**SEARCH ENGINE OPTIMISATION**			**9**			
Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement							
UNIT III	**E- MAIL MARKETING**			**9**			
- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Copons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting							
UNIT IV	**SOCIAL MEDIA MARKETING**			**9**			
Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.							
UNIT V	**DIGITAL TRANSFORMATION**			**9**			
Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.							

		Total: 45
TEXTBOOKS		
1.	Digital Marketing Strategy: An Integrated Approach to Online Marketing	
2.	Digital Marketing By Dave Chaffey & Fiona Ellis-Chadwick	
3.	Marketing Communications: Integrating Online and Offline, Customer Engagement and Digital Technologies By PR Smith & Ze Zook	
REFERENCES		
1.	Marketing 5.0: Technology for Humanity By Philip Kotler	
2.	Digital Marketing Analytics: In Theory And In Practice By Kevin Hartman	
3.	Digital Branding By Daniel Rowles	
COURSEOUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	To examine and explore the role and importance of digital marketing in today's rapidly changing business environment.	K4
CO2	To focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	3	2	3	2	3	1	2	3	2	3	1	2	2
CO2	2	3	2	3	3	2	2	3	3	2	2	2	3	2	1	2
CO3	2	2	2	3	2	2	1	3	2	3	2	2	3	2	1	2
CO4	2	3	2	2	3	2	2	3	2	2	3	2	2	1	2	2
CO5	2	3	2	3	3	2	2	3	2	2	3	2	3	2	2	1

ACB509 - MACHINE LEARNING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ To understand the basic concepts of machine learning. ➢ To understand and build supervised learning models. ➢ To understand and build unsupervised learning models. ➢ To evaluate the algorithms based on corresponding metrics identified.						

UNIT I	INTRODUCTION TO MACHINE LEARNING	9
Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.		
UNIT II	**SUPERVISED LEARNING**	**9**
Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random Forests		
UNIT III	**ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING**	**9**
Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.		
UNIT IV	**NEURAL NETWORKS**	**9**
Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.		
UNIT V	**DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS**	**9**
Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – *t* test, McNemar's test, K-fold CV paired *t* test		
		Total: 45

TEXTBOOKS

1.	Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2.	Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014

REFERENCES

1.	Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2.	Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
3.	Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2018.
4.	Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016 Sebastain Raschka, Vahid Mirjalili , "Python Machine Learning", Packt publishing 3rd Edition, 2019.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1.	Explain the basic concepts of machine learning.	K4
CO2.	Construct supervised learning models.	K3
CO3	Construct unsupervised learning algorithms.	K4
CO4	Evaluate and compare different models	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	1	3	2	1	2	3	3	3	3	2	1
CO2	3	3	3	2	2	1	3	2	1	2	3	3	3	3	2	1
CO3	3	3	3	2	2	1	3	2	1	1	2	3	3	3	2	1
CO4	3	3	3	2	2	1	3	2	1	2	3	3	3	3	2	1
CO5	3	3	3	2	2	1	3	2	1	2	3	3	3	3	2	1

ACB510-DATA MINING FOR BUSINESS INTELLIGENCE							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ The objective of the "Data Mining for Business Intelligence" course is to equip students with the knowledge and skills necessary to extract meaningful insights from large datasets to support business decision-making.						
UNIT I	**INTRODUCTION**					**9**	
Knowledge Discovery from Data (KDD) or Data mining – Data mining as a step in the process of knowledge discovery – Architecture of a typical data mining system – Data repositories such as Database Management System (DBMS), Data Warehouses, Transactional Databases – Data Mining Functionalities: Patterns – Data mining tasks – Classification of Data Mining Systems.							
UNIT II	**DATA CLEANING**					**9**	
Data Cleaning – Missing Values: methods – Noisy Data: data smoothing techniques such as Binning,							

Regression and Clustering – Data Cleaning as a Process: discrepancy detection and data transformations – Discrepancy detection tools such as Data scrubbing Data auditing – Data transformations tools such as Data migration and ETL (extraction/transformation/loading)		
UNIT III	**DATA QUALITY**	**9**
Data Quality: Meaning and Definition – End to-End Data Quality: The Data Quality Continuum – Data Quality Process – Measuring Data Quality: Components and Their Measurement – Data monitoring – Total Data Quality Management.		
UNIT IV	**DATA WAREHOUSE & NORMALIZATION**	**9**
Data integration such as a data warehouse – Extract/ Transform / Load (ETL) – OLTP and OLAP – From Data Warehousing to Data Mining; Data transformations, such as normalization – Methods for data normalization such as min-max normalization, z-score normalization and normalization by decimal scaling.		
UNIT V	**TOOLS & APPLICATIONS**	**9**
Data Mining tools: Classification and Prediction Method – Classification by Decision Tree, Neural networks, Association rules – Prediction by Regression – Clustering Analysis; Applications in various sectors		
		Total: 45

TEXTBOOKS	
1.	Jaiwei Ham and Micheline Kamber, Data Mining Concepts and techniques, KauffmannPublishers, 2006
2.	Tamraparni Dasu and Theodore Johnson, Exploratory Data Mining and Data Cleaning JohnWiley & Sons, Inc., Hoboken, New Jersey, 2003
REFERENCES	
1.	Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques. Morgan Kaufmann Publishers, 2006

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Describe the architecture of a typical data mining system and identify various data repositories such as DBMS, data warehouses, and transactional databases.	K4
CO2	Implement methods for handling missing values and smoothing noisy data through techniques such as binning, regression, and clustering.	K3

CO3	Measure and monitor data quality, and apply Total Data Quality Management principles to ensure high standards throughout the data lifecycle.	K2
CO4	Apply various data normalization methods such as min-max normalization, z-score normalization, and normalization by decimal scaling.	K3
CO5	Use data mining tools for classification, prediction, and clustering analysis, including decision trees, neural networks, association rules, and regression techniques.	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2			1								1				
CO2	2			1								1				
CO3	2	2	2	1					1			1	1		1	
CO4	2	2	2	1					1			1	1		1	
CO5	2	2	2	1					1			1	1		1	

ACB511-WEB SCRAPING AND DATA ACQUISITION							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**

Preamble	➢ Understand the basics of web scraping and data acquisition. ➢ Learn to use Python libraries for web scraping. ➢ Gain proficiency in handling and preprocessing the scraped data. ➢ Apply ethical practices in web scraping.

UNIT I	**INTRODUCTION TO WEB SCRAPING AND DATA ACQUISITION**	**9**

Definition and importance of web scraping- Legal and ethical considerations- Overview of data acquisitionmethods- Basics of HTML and CSS- HTML structure and tags-Introduction to CSS- Understanding the Document Object Model (DOM).

UNIT II	**PYTHON FOR WEB SCRAPING**	**9**

Introduction to key Python libraries (BeautifulSoup, Requests, Scrapy)- Using BeautifulSoup for HTMLParsing- Installing BeautifulSoup- Navigating and searching the DOM- Extracting data from HTML.

UNIT III	DATA ACQUISITION AND SCARPY	9

Introduction to HTTP requests- Sending GET and POST requests- Handling responses- Advanced WebScraping with Scrapy - Introduction to Scrapy - Setting up a Scrapy project - Writing spiders to scrape data.

UNIT IV	HANDLING DYNAMIC CONTENT AND DATA CLEANING	9

Introduction to JavaScript and AJAX - Using Selenium for scraping dynamic content - Extracting data fromAPIs- Importance of data cleaning, Handling missing values, Data normalization and transformation.

UNIT V	STORING SCRAPED DATA AND CASE STUDIES	9

Writing data to files (CSV, JSON), Introduction to databases (SQLite, MongoDB), Using SQL for data management, Case Studies and Real-world Applications: Scraping e-commerce websites, Data acquisition fromsocial media and Web scraping in financial markets.

Total: 45

TEXTBOOKS

1.	Automated Data Collection with R: A Practical Guide to Web Scraping and Text Mining 1st Edition
2.	Web Scraping with Python, 2nd Edition by Ryan Mitchell

REFERENCES

1.	Python Web Scraping Cookbook By Michael Heydt
2.	Learning Scrapy By Dimitrios Kouzis-Loukas
3.	Hands-On Web Scraping with Python By Anish Chapagain
4.	Go Web Scraping Quick Start Guide By Vincent Smith

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Have an overview of state-of-the-art research that draws on web-based data collection,	K2
CO2	Have a basic knowledge of web technologies,	K2
CO3	Assess the feasibility of conducting scraping projects in diverse settings,	K3
CO4	Scrape information from static and dynamic websites as well as web APIs using R,	K3
CO5	Tackle current research questions with original data in their own work	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2										2	1		
CO2	3	3	2	3	2								2	1		
CO3	2	3	3	2	1								2	1		
CO4	3	3	3	2	2								2	1		
CO5	3	2	2	2									2	1		

ACB512-CRYPTOGRAPHY AND NETWORK SECURITY							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ To understand basics of Cryptography and Network Security. ➢ To be able to secure a message over insecure channel by various means. ➢ To learn about how to maintain the Confidentiality, Integrity and Availability of a data. ➢ To understand various protocols for network security to protect against the threats in the networks.						
UNIT I	**Introduction to Cryptography and Block Ciphers**						**9**
Introduction to security attacks - services and mechanism - introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and blockciphers - Modern Block Ciphers: Block ciphers principals - Shannon's theory of confusion and diffusion - fiestal structure - data encryption standard(DES) - strength of DES - differential and linear crypt analysis of DES - block cipher modes of operations - triple DES – AES.							
UNIT II	**Confidentiality and Modular Arithmetic**						**9**
Confidentiality using conventional encryption - traffic confidentiality - key distribution - random number generation - Introduction to graph - ring and field - prime and relative prime numbers - modular arithmetic - Fermat's and Euler's theorem - primality testing - Euclid's Algorithm - Chinese Remainder theorem - discrete algorithms.							
UNIT III	**Public key cryptography and Authentication**						**9**

	requirements	
Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography – Elgamel encryption - Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks – security of hash functions and MACS.		
UNIT IV	**Integrity checks and Authentication algorithms**	**9**
MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME		
UNIT V	**(IP Security and Key Management) IP Security**	**9**
Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management. Unit VI (Web and System Security) Web Security: Secure socket layer and transport layer security - secure electronic transaction (SET) - System Security: Intruders - Viruses and related threads - firewall design principals – trusted systems.		
		Total: 45

TEXTBOOKS	
1.	William Stallings, "Crpyptography and Network security Principles and Practices", Pearson/PHI. 2. Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", Pearson. Reference Books 1. W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education.
2.	Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.
REFERENCES	
1.	Cryptography and Network Security: Principles and Practice, by William Stallings.(3rd edition)
2.	Applied Cryptography: Protocols, Algorithms, and Source Code in C, by Bruce Schneier
3.	Java Cryptography, by Jonathan B. Knudsen.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Provide security of the data over the network.	K4
CO2	Do research in the emerging areas of cryptography and network security.	K3
CO3	Implement various networking protocols.	K3
CO4	Protect any network from the threats in the world	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03	PS04
CO1	2		2						3				2	1	2	
CO2	2	3	2	3	2				3				2	1	3	
CO3	2	3	3	2	1				3				2	1	3	
CO4	2	3	3	2	2				2				2	1	3	

ACB513- MARKETING RESEARCH							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ Understand the changing business environment and the fundamental premise underlying market driven strategies. ➢ Identify the indicators of management thoughts and practices. ➢ Learn the nature of consumer buying behaviour ➢ Understand the marketing research ➢ Apply the new trends in the arena of marketing						
UNIT I	**INTRODUCTION**						**9**
Defining Marketing − Core concepts in Marketing – Evolution of Marketing − Marketing Planning Process − Scanning Business environment: Internal and External − Value chain − Core Competencies – PESTEL − SWOT Analysis − Marketing interface with other functional areas – Production, Finance, Human Relations Management, Information System − Marketing in global environment – International Marketing − Rural Marketing − Prospects and Challenges							
UNIT II	**MARKETING STRATEGY**						**9**
Marketing strategy formulations – Key Drivers of Marketing Strategies - Strategies for Industrial Marketing – Consumer Marketing − Services marketing – Competition Analysis − Analysis of consumer and industrial markets − Influence of Economic and Behavioral Factors − Strategic Marketing Mix components.							
UNIT III	**MARKETING MIX DECISIONS**						**9**
Product planning and development – Product life cycle – New product Development and Management – Defining Market Segmentation – Targeting and Positioning − Brand Positioning and Differentiation – Channel Management – Managing Integrated Marketing Channels − Managing Retailing, Wholesaling and Logistics − Advertising and Sales Promotions – Pricing Objectives, Policies and Methods.							
UNIT IV	**BUYER BEHAVIOUR**						**9**
Understanding Industrial and Consumer Buyer Behaviour − Influencing factors – Buyer Behaviour Models – Online buyer behaviour − Building and measuring customer satisfaction – Customer							

relationships management – Customer acquisition, Retaining, Defection − Creating Long Term Loyalty Relationships.		
UNIT V	**MARKETING RESEARCH & TRENDS IN MARKET**	**9**
Marketing Information System – Marketing Research Process – Concepts and applications: Product – Advertising – Promotion – Consumer Behaviour – Retail research – Customer driven organizations - Cause related marketing − Ethics in marketing – Online marketing trends - social media and digital marketing.		
		Total: 45

TEXTBOOKS	
1.	Philip. T. Kotler and Kevin Lane Keller, Marketing Management, Prentice Hall India, 15th Edition, 2017
REFERENCES	
1.	Lamb, Hair, Sharma, Mc Daniel– Marketing – An Innovative approach to learning and teaching- A south Asian perspective, Cengage Learning, 2012.
2.	Paul Baines, Chris Fill, Kelly Page, Marketing, Asian edition, Oxford University Press,5 th edition, 2019.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the contemporary marketing theories to the demands of business and management practice.	K2
CO2	Enhance the knowledge of marketing strategies for consumer and industrial marketing.	K3
CO3	Analyze the nature of consumer buying behaviour and managing integrated marketing channels.	K3
C04	**A**nalyze the nature of consumer buying behaviour.	K4
C05	Understanding of the marketing research and new trends in the arena of marketing.	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	1	2	2	3	2	3	1	3	3	3	2	1
CO2	3	2	2	1	2	2	2	3	2	3	2	3	3	3	2	1
CO3	3		2	3	2	3	2	3	1	3	3	3	3	3	2	1
CO4	3	3	2	3	2	3	2	3	3	3	3	3	3	3	2	1
CO5	3	3	2	3	3	3	2	3	3	3	3	3	3	3	2	1

ACB514- CLOUD APPLICATION DEVELOPMENT							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ Understand the fundamentals of cloud computing ➢ Understand the various cloud services ➢ Understand the concepts of web service and framework ➢ Learn to create and manage open-source cloud services ➢ Understand the various security issues in cloud services						
UNIT I	**INTRODUCTION**						**9**
Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges. Requirements for Cloud application development, Cloud computing Eco systems SaaS/PaaS/IaaS.							
UNIT II	**WEB SERVICES, FRAMEWORK AND CLOUD SERVICES**						**9**
Frameworks: Model View Controller (MVC), Struts, Spring, JQuery, API: Web, RESTFUL, JSON. Hybrid cloud services, Mobile cloud services, Database as a service, Load balancer as a service, Multi cloud.							
UNIT III	**ANALYTICS SERVICES**						**9**
AWS Introduction - EC2 – Amazon EMR - Amazon Kinesis - Amazon Kinesis Data Analytics - Amazon Quick Sight - Amazon Elastic search Service - Amazon Kinesis Data Firehose - AWS Glue							
UNIT IV	**APPLICATION DEVELOPMENT**						**9**
Google Cloud Platform (GCP) Introduction – Dataproc - Cloud Dataprep – Data Studio – Data Catalog – Google Marketing platform. AppAgile – cloud foundry							
UNIT V	**OPEN-SOURCE SECURITY**						**9**
OpenStack Introduction, Architecture, Components – Nova, Swift, Cinder, Neutron, Keystone, Glance – Heat.Cloud security issues – threats – Prevention. OWASP Top 10 Security Risks & Vulnerabilities. Case Studies.							
							Total: 45
TEXTBOOKS							
1.	Dan C. Marinescu, Cloud Computing: Theory and Practice, 2nd Edition, MK Publishers,2017.						
2.	Barrie Sos in sky, Cloud Computing Bible, 1st Edition, 2011.						
REFERENCES							
1.	Mark Wilkins, Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud, 1st Edition, 2019.						
2.	Legorie Rajan PS, Google Cloud Platform Cookbook: Implement, deploy, maintain, and migrate applications on Google Cloud Platform, 2018.						

COURSEOUTCOMES: At the end of the course, learners will be able to		Bloom's Taxonomy Level
CO1	Understand the fundamentals of cloud computing.	K2
CO2	Understand the concepts of web services and framework and various cloud services.	K2
CO3	Implement cloud application for business analytics and visualize the data.	K4
C04	Implement various applications, deploy and generate analysis with reports.	K4
C05	Create an open-source cloud services and understand the various security issues in cloud services.	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3								3			
CO2	3	3	3	3	3								3			
CO3	3	3	3	3	3								3			
CO4	3	3	3	2	3								3		2	
CO5	3	3	3	3	3							2	3		2	

ACB515-HEALTH CARE ANALYTICS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ To know the introduction about the benefits, challenges and opportunities in healthcare for data science ➢ To explore specific technologies used to improve healthcare data ➢ To implement innovative tool to gather health relevant data ➢ To analyze various data linkage method for supporting the adoption of healthy lifestyles ➢ To implement various data visualization techniques for healthcare domain						
UNITI	**INTRODUCTION**			**9**			
Data science in health care- Benefits -challenges and opportunities- Introduction to classification algorithm and their performance analysis using medical examples							
UNITII	**CLINICAL NATURAL PROCESSING**			**9**			

The role of deep learning in improving healthcare- making effective use of healthcare data using data-to text technology- Clinical natural processing with deep learning		
UNIT III	**HEALTHCARE ROBOTS**	**9**
Ontology based knowledge management for comprehensive geriatric assessment and reminiscence therapy on social robots- assistive robots for elderly: innovative tools to gather health relevant data		
UNITIV	**DATA LINKAGE**	**9**
Overview of data linkage methods for integrating separate health data resources- A flexible knowledge based architecture for supporting the adoption of health lifestyles with persuasive dialogs		
UNITV	**CLINICAL DATA VISUALIZATION**	**9**
Visual analytics for classifier construction and evaluation for medical data-Data visualization in clinical practice- using process analytics to improve healthcare process- a multi scale computational approach to understanding cancer Metabolism		
		Total: 45

TEXTBOOKS	
1.	Sergio Consoli, Diego and Melian petakovic, "Data science for healthcare
2.	methodologies and applications", springer,2019
REFERENCES	
1.	Ernest Adams and Andrew Rollings, "Fundamentals of healthcare analysis", 2 nd Edition Prentice Hall / New Riders, 2009.
2.	Eric Lengyel, "Mathematics for healthcare analysis", 3 rd Edition, Course Technology PTR, 2011.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Able to know the fundamentals of data science used for healthcare applications	K2
CO2	Apply the use some unique technologies which is applicable for healthcare domain.	K3
CO3	Able to develop simple robotic application in healthcare sectors	K3
C04	Able to integrate various data resources using data linkage approaches	K3
C05	Apply visualization techniques for better understanding of healthcare applications	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2		2			2			3		3	2	1
CO2	3	2	1	2		2			2			3		3	2	1
CO3	3	1	2	2		2			2			3		3	2	1
CO4	3	1	2	2		2			2			3		3	2	1
CO5	3	2	22	2		2			2			3		3	2	1

ACB516- MICRO and MACRO ECONOMICS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ Understanding how individuals, businesses, and governments make decisions about resource allocation. ➢ Understanding the principles of supply and demand and how they affect prices in markets. ➢ Exemplify the demand curves of households and supply curves of firms with the principles. ➢ Differentiate Price ceilings, price floors and compare income effects, substitute effects ➢ Analyze the Keynesian's process of multiplier theory in macro economics						
UNIT I	**MICRO ECONOMICS**						**9**
Principles of Demand and Supply Ã¢?? Supply Curves of Firms Ã¢?? Elasticity of Supply; Demand Curves of Households Ã¢?? Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve);							
UNIT II	**WELFARE ANALYSIS**						**9**
Consumers and Producers Surplus- Price Ceilings and Price Floors; Consumer Behaviour - Axioms of Choice-Budget Constraints and Indifference Curves; Consumers Equilibrium Effects of a Price Change, Income and Substitution Effects Derivation of a Demand Curv							
UNIT III	**APPLICATIONS**						**9**
Tax and Subsidies - Inter temporal Consumption -Suppliers- Income Effect; Theory of Production - Production Function and Isoquants - Cost Minimization; Cost Curves - Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition							
UNIT IV	**MACRO ECONOMICS**						**9**

National Income and its Components - GNP, NNP, GDP, NDP Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector - Taxes and Subsidies; External Sector - Exports and Imports; Money -Definitions; Demand for Money Transaction and Speculative Demand; Supply of Money - Banks Credit Creation Multiplier; Integrating Money and Commodity Markets - IS, LM Model		
UNIT V	**BUSINESS CYCLES AND STABILIZATION**	**9**
Monetary and Fiscal Policy - Central Bank and the Government; the Classical Paradigm - Price and Wage Rigidities - Voluntary and Involuntary Unemployment.		
		Total: 45

TEXTBOOKS	
1.	Pindyck, Robert S and Daniel L. Rubinfeld , Microeconomics, Eighth Edition, 2013.
2.	Dornbusch, Fischer and Startz, Macroeconomics, Tenth Edition, Tata Mcgraw Hill, 2012.
REFERENCES	
1.	Paul Anthony Samuelson, William D. Nordhaus, Economics, Nineteenth Edition, McGraw-Hill Education, 2010.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the functioning of elasticity of demand in micro economics.	K2
CO2	Analyze the supporting of price, income and substitution effects in the consumers and producer surplus.	K3
CO3	Analyse the equilibrium of a firm under perfect competition, monopoly and monopolistic competition.	K3
C04	Analyze the concepts of demand for money and supply of money with appropriate model in macro-economic analysis.	K4
C05	**E**xamine and evaluate the problems of voluntary and involuntary unemployment	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	2	2	3	3	3	3	1	3	1	3	2	1	1
CO2	2	2	2	1	2	3	3	3	3	2	3	2	3	2	2	1
CO3	1	2	2	2	2	3	2	3	2	3	3	1	3	1	2	1
CO4	2	2	3	2	2	3	3	3	3	2	3	2	2	3	1	1
CO5	2	2	3	2	2	3	2	2	2	3	3	2	2	3	1	1

ACB517- WEB TECHNOLOGIES							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ Understand different Internet Technologies ➢ Learn java-specific web services architecture ➢ Develop web applications using frameworks ➢ Enable innovation and experimentation ➢ Deliver personalized and contextual experiences						
UNIT I	**WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0**						**9**
Web Essentials: Clients, Servers and Communication – The Internet – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations. Bootstrap Framework							
UNIT II	**CLIENT-SIDE PROGRAMMING**						**9**
Java Script: An introduction to JavaScript–JavaScript DOM Model-Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files.							
UNIT III	**SERVER-SIDE PROGRAMMING**						**9**
Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- DATABASE CONNECTIVITY: JDBC.							
UNIT IV	**PHP and XML**						**9**
An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation. XML: Basic XML- Document Type Definition- XML Schema, XML Parsers and Validation, XSL							
UNIT V	**INTRODUCTION TO ANGULAR AND WEB APPLICATIONS FRAMEWORKS**						**9**
Introduction to AngularJS, MVC Architecture, understanding ng attributes, Expressions and data binding, Conditional Directives, Style Directives, Controllers, Filters, Forms, Routers, Modules, Services; Web Applications Frameworks and Tools – Firebase- Docker- Node JS- React- DjangoUI& UX							
							Total: 45

TEXTBOOKS	
1.	Deitel and Deitel and Nieto, Internet and World Wide Web - How to Program, PrenticeHall, 5th Edition, 2011.
2.	Angular for Enterprise-Ready Web Applications, DoguhanUluca, 1st edition, Packt Publishing.
REFERENCES	
1.	Jeffrey C and Jackson, Web Technologies A Computer Science Perspective, Pearson

	Education, 2011.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Create a basic website using HTML and Cascading Style Sheets.	K3
CO2	Understand the concept of dynamic web page with validation using Java Script objects	K2
CO3	Develop server-side programs using Servlets and JSP	K3
C04	Create simple web pages in PHP and to represent data in XML format	K3
C05	Develop interactive web applications	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2	2	2	2	3	2	3	3	3			
CO2	3	3	3	3	3	3	2	2	3	2	3		3	2		
CO3	3	3	3	3	3	2	2	2	3	3	3		3			
CO4	3	2	3	2	3	2	3	2	3	2	3	2	2	3		
CO5	3	2	3	3	3	3	3	2	3	2	3		2	3	1	

ACB518- ENTERPRISE SYSTEMS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ Understand the essential concepts of ERP involved in business processes ➢ Imparts kills in the design and implementation of ERP architecture ➢ Familiarize with various tools and technologies for developing ERP for large project ➢ Apply the advanced ERP technologies ➢ Analyses the marketing and sales process						
UNIT I	**MODEL-VIEW-CONTROL (MVC)ARCHITECTURE**					**6**	
OverviewofMVC-MVCmethodofsoftwaredevelopmentina3-tierenvironment-Control (MVC) developmentina3-tierenvironment.							
UNIT II	**TOOLS AND TECHNOLOGIES**					**11**	
Tools and Technologies: -Microsoft.NET frame work, PHP, Rubyon Rails, JavaScript, Ajaxand Overview of SAP and Oracle Applications							

UNIT III	ERP ARCHITECTURE AND GENERIC MODULES	10
Service Oriented Architecture (SOA)-Principles of loose coupling–encapsulation-Inter- operability-Enterprise Resource Planning (ERP) systems and their architecture-generic ERP Modules: Finance, HR, Materials Management, Investment-Examples of Domain Specific Modules		
UNIT IV	**ERP TECHNOLOGIES**	**9**
Business Process Reengineering- Decision Support System- On-Line Analytical Processing – Electronic Data Exchange-Customer Relationship Management (CRM)-Supplier Relationship Management (SRM)		
UNIT V	**MARKETING & SALES ANALYTICS**	**9**
Overview of MPLS-Virtual Private Networks (VPN)–Firewalls- Network monitoring and enforcement of policies-ERP Security Issues–Authentication–Authorization-Access control–Roles-single-sign- on-Directory servers-Audit trails-Digital signatures–Encryption-review of IP Sec–SSL		
		Total: 45

TEXTBOOKS

1.	Alexis Leon, EnterpriseResourcePlanning,2020,4thEdition, Tata Mc Graw Hill.

REFERENCES

1.	Kurbel,K.E.,EnterpriseResourcePlanningandSupplyChainManagement,2016, Springer.
2.	Ganesh K,Sanjay M, Anbuudayasankar S.P, Sivakumar P., Enterprise Resource Planning-FundamentalsofDesignandImplementation,2014,Springer

COURSEOUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Develop simple web applications using MVC architecture	K3
CO2	Implement simple web applications using SAP and Oracle Applications	K3
CO3	Understand the concepts of CRM models (Understand)	K2
C04	Implement interactive network and application	K3
C05	Analyse organizational opportunities and challenges in the design system	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	3	3	2	1	2	1	2	1	2	3	2	1
CO2	3	2	3	3	2	3	3	2	1	2	1	1	3	3	2	1
CO3	3	3	2	3	3	3	2	1	3	2	1	2	3	3	2	1
CO4	3	2	3	2	2	3	2	1	3	3	2	2	3	3	2	1
CO5	3	3	3	2	2	3	2	2	3	3	1	2	3	3	2	1

ACB519- IOT AND ITS APPLICATIONS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences ➢ Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations ➢ Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations						
UNIT I	**INTRODUCTION TO INTERNET OF THINGS**						**9**
IOT Fundamentals - Characteristics of IoT - Physical Design of IoT - IoT Protocols - IoT communication models - IOT Communication APIs -IOT enabled Technologies – Sensors in IoT- Wireless Sensor Networks, Cloud Computing, Big data analytics, and Communication protocols, Embedded Systems, IOT Levels and Templates							
UNIT II	**IOT REFERENCE ARCHITECTURE**						**9**
Introduction- State of the art - Architecture Reference Model- IOT reference Model-IOT Protocols: Zigbee, RFID, BLE, NFC, BACnet, 6LowPAN, RPL, XMPP, CoAP, and MQTT.							
UNIT III	**IOT DEVICES AND INTERFACING**						**9**
IOT components - Sensors - Actuators - Hardware Platforms - Interfacing with devices: Setting up the board -Programming for IOT - Reading from Sensors, Communication: Connecting microcontroller with mobile devices - communication through Bluetooth, wifi, Ethernet.							
UNIT IV	**IOT CLOUD, WEB SERVICES AND DATA ANALYTICS**						**9**
Introduction to Cloud Storage models - Cloud services and IOT - communication APIs -Cloud for IOT - Web server: Web server for IOT - Amazon Web services for IOT- Data analytics for IOT.							
UNIT V	**IOT SECURITY**						**9**
Security Requirements in IOT - Security Concerns in IOT Applications - Security Architecture in the Internet of Things - Insufficient Authentication and Authorization - Insecure Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IOT. Vulnerabilities - Secrecy and Secret- Key Capacity – Authentication and Authorization for Smart Devices - Transport Encryption.							
							Total: 45
TEXTBOOKS							
1.	Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.						
2.	Vijay Madisetti and ArshdeepBahga, Internet of Things (A Hands-on-Approach), 1stEdition, VPT, 2014.						

REFERENCES	
1.	Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things Key applications and Protocols, Wiley, 2012
2.	Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) [Kindle Edition] by CunoPfister,2011
3.	Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren
4.	Security and Privacy in Internet of Things (IOTs): Models, Algorithms, and Implementations

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Identify physical design, components and communication models used in IOT	K3
CO2	Understand the protocol architecture of IOT.	K3
CO3	Implement sensor interfacing and collaborate them with network devices.	K2
C04	Analyze protocols used for connecting devices to cloud and web servers.	K3
C05	Analyze the security requirements and threats in IOT	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	1	2	3	3	2	2	2	3	3	3	3
CO2	3	3	3	2	2	2	1	2	3	2	3	2	3	3	3	3
CO3	2	2	2	2	2	2	2	1	2	3	2	2	3	3	2	0
CO4	3	3	3	2	2	1	2	2	2	2	2	2	3	3	3	3
CO5	3	3	3	2	2	1	2	2	3	3	2	2	3	3	3	3

ACB520- COGNITIVE SCIENCE AND ANALYSIS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ To develop algorithms that use AI and machine learning along with human interaction and feedback. ➢ To help humans make choices/decisions and to understand how Cognitive computing supports human reasoning. ➢ To evaluating data in context and presenting relevant findings along with the evidence that justifies the answers with the help of machine						

	learning. ➢ To understand the advance analytics on a path to cognitive computing. ➢ To apply cognitive analytics on various applications	
UNIT I	**FOUNDATION OF COGNITIVE COMPUTING**	**9**
Cognitive science and cognitive Computing with AI, Cognitive Computing - Cognitive Psychology - The Architecture of the Mind - The Nature of Cognitive Psychology – Cognitive architecture – Cognitive processes – The Cognitive Modeling Paradigms - Declarative / Logic based Computational cognitive modeling – connectionist models – Bayesian models. Introduction to Knowledge-Based AI – Human Cognition on AI – Cognitive Architectures		
UNIT II	**COGNITIVE COMPUTING WITH INFERENCE AND DECISION SUPPORT SYSTEMS**	**9**
Intelligent Decision making, Fuzzy Cognitive Maps, Learning algorithms: Non linear Hebbian Learning – Data driven NHL - Hybrid learning, Fuzzy Grey cognitive maps, Dynamic Random fuzzy cognitive Maps.		
UNIT III	**COGNITIVE COMPUTING WITH MACHINE LEARNING**	**9**
Machine learning Techniques for cognitive decision making – Hypothesis Generation and Scoring - Natural Language Processing - Representing Knowledge - Taxonomies and Ontologies - Deep Learning.		
UNIT IV	**ADVANCED ANALYTICS AND COGNITIVE COMPUTING**	**9**
Advanced analytics is on path to cognitive computing- Key capabilities in advanced analytics- The relationship between statistics, data mining and machine learning- using machine learning in the analytic process-predictive analytics- text analytics-image analytics –speech analytics		
UNIT V	**APPLICATIONs OF COGNITIVE COMPUTING**	**9**
Cognitive Systems in health care – Cognitive Assistant for visually impaired – AI for cancer detection, Predictive Analytics - Text Analytics - Image Analytics -Speech Analytics – IBM Watson		
		Total: 45

TEXTBOOKS	
1.	Hurwitz, Kaufman, and Bowles, Cognitive Computing and Big Data Analytics, Wiley, Indianapolis, IN, 2005, ISBN: 978-1-118-89662-4.
2.	Masood, Adnan, Hashmi, Adnan ,Cognitive Computing Recipes-Artificial Intelligence Solutions Using Microsoft Cognitive Services andTensorFlow, 2015.
REFERENCES	
1.	Peter Fingar, Cognitive Computing: A Brief Guide for Game Changers, PHI Publication, 2015
2.	Gerardus Blokdyk ,Cognitive Computing Complete Self-Assessment Guide, 2018
3.	Rob High, Tanmay Bakshi, Cognitive Computing with IBM Watson: Build smart applications using Artificial Intelligence as a service, IBM Book Series, 2019

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand basics of Cognitive Computing and its differences from traditional Approaches of Computing	K3
CO2	Plan and use the primary tools associated with cognitive computing	K3

CO3	able to understand the basics of machine learning in cognitive analytics	K2
C04	able to understand the advanced analytics in a path of cognitive computing	K3
C05	Plan and execute a project that leverages Cognitive Computing	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3	1	2	0	0	0	1	1	1	1	1	2	1
CO2	3	2	2	3	2	2	1	1	2	0	1	2	1	2	1	1
CO3	3	2	2	3	1	2	1	1	2	2	1	0	2	2	2	2
CO4	3	2	2	3	1	2	2	2	3	2	2	2	2	2	2	1
CO5	3	2	2	3	1	2	2	1	2	2	2	1	3	2	2	1

ACB521 – MARKETING ANALYTICS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**PC**	**3**	**0**	**0**	**3**

Preamble	➢ Learn about the metrics in Marketing analytics ➢ Understand the Pilot product and market segmentation strategies ➢ Analyse the customer value and customer analytics ➢ Apply the root causes and not just the symptoms of why markets underperform for poor people. ➢ Analyse to get better results across your marketing channels.

UNIT I	**MARKETING ANALYTICS AND METRICS**	**9**

Basics of Marketing and Marketing Management – Analytics and Analysis – Why marketing analytics –Marketing decision models and marketing response models– Introduction to marketing metrics - Functional Marketing Measurement : Channel Management , Advertising Effectiveness ,Promotion Effectiveness - Result oriented metrics.

UNIT II	**MARKETING RESEARCH TOOLS EXPOSURE**	**9**

Understanding appropriateness of Marketing Research tools –Principal Component Analysis , Multi-dimensional Scaling, Discriminant Analysis , One way and Two way Analysis of Variance – Practical Case studies for Forecasting Tools : Simple Linear regression-– Multiple Regression.

UNIT III	**TOOLS FOR SEGMENTATION AND POSITIONING**	**9**

The segmentation process – Tools used for segmentation (Theory Only): Factor analysis , Clustering methods , Regression Analysis – Differentiation and Positioning : Analytical tools for differentiation and positioning – role of Perceptual Maps in segmentation – Models for Strategic marketing decision making.

UNIT IV	NEW PRODUCT DECISIONS	9
Conjoint Analysis for Forecasting Sales of New products – Advertising : Measuring the effectiveness of Advertising – Product Design Media Selection models – Channel Decision: Marketing Channel Decision models and tools – Pricing: Price Bundling – Price Skimming and Sales.		
UNIT V	**ERP SECURITY ISSUES**	**9**
Introduction to ERP Systems and Security Concepts, Common ERP Security Threats - Unauthorized access and authentication vulnerabilities, Data breaches and confidentiality risks, Insider threats and privilege abuse, social engineering attacks and phishing, System vulnerabilities and exploits.		
		Total:45 Periods

TEXTBOOK:

1.	Wayne L. Winston (2014). Marketing Analytics: Data-Driven Techniques with Microsoft Excel, Wiley. (Unit I – V)

REFERENCES:

1.	Stephan Sorger (2013). Marketing Analytics, Pearson Prentice Hall.
2.	Paul W. Farris (2010). Marketing Metrics, Pearson Education.
3	Gary L. Lilien (2004). Marketing Engineering: Computer-Assisted Marketing Analysis and Planning, Pearson Education, USA.
4	**Web Resources** 1. https://www.udemy.com/topic/marketing-analytics/ 2. https://www.coursera.org/learn/uva-darden-market-analytics **3.** https://www.upgrad.com/digital-marketing-courses/marketing-analytics/

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the basic business analytics.	K2
CO2	Apply the Marketing research tools in various environment.	K3
CO3	Apply tools for market segmentation and positioning.	K3
CO4	Analyse new product introduction decisions.	K3
CO5	Analyse the ERP security issues in the modern era.	K3

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	2	2	2					2	3		
CO2	2	2	2	2	3	2	2					2	3		
CO3	2	3	2	2	2	2	2					2	3		

CO4	2	3	2	2	3		2					2	3		
CO5		3	2	2	2		2	3				2	3		

ACB522 - HUMAN RESOURCE MANAGEMENT FOR BUSINESS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**PC**	**3**	**0**	**0**	**3**

Preamble	➢ Learn the basic concepts, structure and functions of human resource management for entrepreneurs. ➢ Create an awareness of the roles, functions and functioning of human resource department. ➢ Understand the methods and techniques followed by Human Resource Management practitioners.	
UNIT I	**INTRODUCTION TO HRM**	**9**
Concept, Definition, Objectives- Nature and Scope of HRM - Evolution of HRM - HR Manager Roles-Skills - Personnel Management Vs. HRM - Human Resource Policies - HR Accounting - HR Audit - Challenges in HRM.		
UNIT II	**HUMAN RESOURCE PLANNING**	**9**
HR Planning - Definition - Factors- Tools - Methods and Techniques - Job analysis- Job rotation- Job Description - Career Planning - Succession Planning - HRIS - Computer Applications in HR - Recent Trends		
UNIT III	**RECRUITMENT AND SELECTION**	**9**
Sources of recruitment- Internal Vs. External - Domestic Vs. Global Sources -eRecruitment - Selection Process- Selection techniques -eSelection- Interview Types- Employee Engagement.		
UNIT IV	**TRAINING AND EMPLOYEE DEVELOPMENT**	**9**
Types of Training - On-The-Job, Off-The-Job - Training Needs Analysis – Induction and Socialisation Process - Employee Compensation - Wages and Salary Administration – Health and Social Security Measures- Green HRM Practices		
UNIT V	**CONTROLLING HUMAN RESOURCES**	**9**
Performance Appraisal – Types - Methods - Collective Bargaining - Grievances Redressal Methods – Employee Discipline – Promotion – Demotion - Transfer – Dismissal - Retrenchment - Union Management Relationship - Recent Trends		
		Total:45 Periods

TEXTBOOK:

1.	Gary Dessler and Biju Varkkey, Human Resource Management, 14e , Pearson, 2015. (Unit I – III)
2.	Mathis and Jackson, Human Resource Management, Cengage Learning 15e, 2017. (Unit IV –V)

REFERENCES:	
1.	David A. Decenzo, Stephen.P.Robbins, and Susan L. Verhulst, Human Resource Management, Wiley, International Student Edition, 11th Edition, 2014
2.	R. Wayne Mondy, Human Resource Management, Pearson , 2015.
3	Luis R.Gomez-Mejia, David B.Balkin, Robert L Cardy. Managing Human Resource. PHI Learning. 2012
4	**Web Resources** https://archive.nptel.ac.in/courses/122/105/122105020/ https://onlinecourses.nptel.ac.in/noc20_mg15/preview

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the Evolution of HRM and Challenges faced by HR Managers.	K2
CO2	CO 2 Understand about the HR Planning Methods and practices.	K2
CO3	CO 3 Acquaint about the Recruitment and Selection Techniques followed in Industries.	K2
CO4	Known about the methods of Training and Employee Development.	K2
CO5	Comprehend the techniques of controlling human resources in organizations.	K3

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						2	3	3	3		2	2	3		
CO2						2	3	3	3		2	2	3		
CO3						2	3	3	3		2	2	3		
CO4						2	3	3	3		2	2	3		
CO5					2	2	2	3	3		2	2	3		

ACB523 – MOBILE APPLICATION DEVELOPMENT							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites	**Object Oriented Programming (Java).**		**PC**	**3**	**0**	**0**	**3**

Preamble	➢ Understand fundamentals and identify need and scope for mobile applications. ➢ Learn the technologies and frameworks for designing and deploying mobile applications in Android and iPhone marketplace for distribution. ➢ Study and take into account technical constraints, communication interfaces and user interfaces. ➢ Explore emerging technologies and tools used to design and implement feature-rich mobile applications. ➢ Develop mobile applications for Android.

UNIT I	**INTRODUCTION**	**6**
Mobile Applications – Characteristics and Benefits –Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Web vs Mobile App.		
UNIT II	**USER INTERFACE**	**12**
User Interface Design part 1: Views & View Groups, Views : Button, Text Field, Radio Button, Toggle Button, Checkbox, Spinner, Image View, Image switcher, Event Handling, Listeners, Layouts : Linear, Relative, List View, Grid View, Table View, Web View, Adapters. User Interface Design Part 2: Menus, Action Bars, and Notifications: Status, Toasts and Dialogs.		
UNIT III	**INTENTS AND BROADCAST RECEIVERS**	**9**
Introducing intents- Using intent to launch activities- Introducing Linkify- Using intents to Broadcast Events- Creating Intent filters and broadcast receivers –Using intent filters to services to implicit intent- Using Intent Filters for Plug-Ins and Extensibility- Monitoring Device State Changes using Broadcast Intents.		
UNIT IV	**CONTENT PROVIDERS AND DATA STORAGE**	**9**
Content Providers: Contents provider, Uri, CRUD access, Browser, CallLog, Contacts, Media Store, and Setting. Data Access and Storage: Shared Preferences, Storage External, Network Connection. SQLite - SQLite Databases.		
UNIT V	**ANDROID APPLICATION DEVELOPMENT**	**9**
Designing Real world android application –Mapping out the application flow- Application source code- Managing jobs- Sever code- Building android application without SDK. Case Study: EmojiCompat Sample using Kotlin Platform.		
		Total:45 Periods

TEXTBOOK:

1.	Joseph Annuzzi, Jr.,Lauren Darcey, Shane Conder “Introduction to Android Application Development”, Addision-Wesley, 4th Edition, 2015. (Unit – I)
2.	Reto Meier, “Professional Android 4 Development”, John Wiley and Sons, 2012. (Unit II – III)
3.	W. Frank Ableson, RobiSen, Chris King, C. Enrique Ortiz, “Android in Action”, 3 rd Edition, 2012. (Unit IV – V)

REFERENCES:	
1.	ZigurdMednieks, Laird Dornin, G.BlakeMeike and Masumi Nakamura, “Programming Android”, O‟Reilly, 2012.
2.	**Web Resources** 1. http://developer.android.com/guide/index.html. 2. https://swayam.gov.in/explorer?searchText=mobile+application+development

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom’s Taxonomy Level**
CO1	Understand the Concepts of Mobile Application. (Understand)	K2
CO2	Analyze and Design UI in the context of mobile application.	K3
CO3	Analyze how the Android platform uses Intents.	K3
CO4	Understand the concept of Data storage and Content providers.	K2
CO5	CO5: Develop mobile applications for Android.	K4

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3							2	2	2		
CO2	2	2	3	2							3	2	2		
CO3	3	2	2	2							2	2	2		
CO4	3	2	3	2							2	2	2		
CO5	3	2	3	2							2	2	2		

ACB524 - NATURAL LANGUAGE PROCESSING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites	**Object Oriented Programming**		**PC**	**3**	**0**	**0**	**3**

Preamble	➢ Understand Neural Language Models ➢ Understand conference and coherence by applying Encoder-Decoder and Transformer models ➢ Build question answering systems, Chabot’s and dialogue systems ➢ Develop a speech recognition system ➢ Develop a speech synthesizer

UNIT I	**DEEP LEARNING ARCHITECTURES FOR LANGUAGE PROCESSING**	**9**
Foundations of Natural Language Processing – Recurrent Neural Networks, RNN for language modelling , Semantic Embeddings – GRU, LSTM, BLSTM – Attention Models and Transformers – Machine Translation – The Encoder-Decoder Model, Bidirectional Transformer Encoders - Transfer Learning.		
UNIT II	**COREFERENCE AND COHERENCE**	**9**
Coreference phenomena – Coreference Tasks and Datasets – Mention Detection – Coreference Algorithms – Neural Mention - Ranking Algorithm – Evaluation of Coreference – Gender bias in Coreference – Coherence Relations – Discourse Structure Parsing – Centering and Entity-based Coherence – Local Coherence – Global Coherence.		
UNIT III	**QUESTION ANSWERING AND DIALOGUE SYSTEMS**	**9**
Information Retrieval – Relation Extraction – Extraction of Time – Extracting Events – Template Filling – Review of SRL – Lexicons – IR-based Factoid Question Answering – Entity Linking – Knowledge-based question answering – Language Models for QA – Classic QA Models – Evaluation of Factoid Answers Properties of Human Conversation – Chabot's – GUS a Frame-based Dialogue System – Dialogue-State Architecture – Evaluating Dialogue Systems – Design of Dialogue Systems.		
UNIT IV	**AUTOMATIC SPEECH RECOGNITION**	**9**
Speech Recognition: Acoustic Modelling – Deep Neural Network (DNN) Acoustic Modelling – HMM, HMM-DNN systems – Feature extraction; Connectionist Temporal Classification (CTC) – Listen, Attend & Spell (LAS) – Multi-task objectives for end-to-end ASR – ASR Evaluation: Word Error Rate.		
UNIT V	**TEXT TO SPEECH SYNTHESIS**	**9**
Text to Speech (TTS): Overview Text normalization – Letter-to-sound – Prosody, Getting TTS working well: Data collection, Evaluation – Signal processing – Concatenative and parametric approaches – WaveNet and other Deep Learning based TTS systems.		
		Total:45 Periods

TEXTBOOK:

1.	Chris Manning and Hinrich Schütze, Foundations of Statistical Natural Language Processing, MIT Press. Cambridge, MA: May 1999. (Unit 1,2,3)
2.	Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Third Edition, 2022. (Unit 4,Unit 5)

REFERENCES:

1.	Tanveer Siddiqui, Tiwary U S, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2.	Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, "Fundamentals of Speech Recognition" 1st Edition, Pearson, 2009.
3.	Shrikanth Narayanan, Abeer Alwan, "Text To Speech Synthesis – New Paradigms and Advances", Prentice Hall, 2005.
4.	Steven Bird, Ewan Klein, and Edward Loper, "Natural language processing with Python", O'REILLY.
5.	Dipanjan Sarkar, "Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data", APress.

6.	**Web Resources** 1. https://monkeylearn.com/text-analysis/ 2. https://www.ontotext.com/knowledgehub/fundamentals/text-analysis/ 3. https://study.com/learn/lesson/speech-analysis-elements-steps-examples.html 4. https://cloud.google.com/architecture/visualize-speech-data-with-framework

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Understand Emerging Deep Learning architectures for text and speech processing (Understand)	K2
CO2	Analyse deep learning techniques for NLP tasks, language modelling and machine translation	K3
CO3	Explore coreference and coherence for text processing.	K3
CO4	Implement question answering systems, Chabot's and dialogue systems	K4
CO5	Apply deep learning models for building speech recognition and text-to-speech systems.	K4

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2						2	2	2		
CO2	3	3	2	2	2						2	2	2		
CO3	3	3	2	2	2						2	2	2		
CO4	3	3	2		2						2	2	2		
CO5	3	3	2		2						2	2	2		

ACB525-DEEP LEARNING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PC	**3**	**0**	**0**	**3**
Preamble	➢ To understand and need and principles of deep neural networks ➢ To understand CNN and RNN architectures of deep neural networks ➢ To comprehend advanced deep learning models ➢ To learn the evaluation metrics for deep learning models						
UNIT I	**DEEP NETWORKS BASICS**			**9**			

Linear Algebra: Scalars – Vectors – Matrices and tensors; Probability Distributions – Gradient based Optimization – Machine Learning Basics: Capacity – Overfitting and underfitting –Hyperparameters and validation sets – Estimators – Bias and variance – Stochastic gradient descent – Challenges motivating deep learning; Deep Networks: Deep feedforward networks; Regularization – Optimization.		
UNIT II	**CONVOLUTIONAL NEURAL NETWORKS**	**9**
Convolution Operation – Sparse Interactions – Parameter Sharing – Equivariance – Pooling – Convolution Variants: Strided – Tiled – Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions – Loss Functions – Regularization – Optimizers – Gradient Computation.		
UNIT III	**RECURRENT NEURAL NETWORKS**	**9**
Unfolding Graphs – RNN Design Patterns: Acceptor – Encoder – Transducer; Gradient Computation – Sequence Modeling Conditioned on Contexts – Bidirectional RNN – Sequence to Sequence RNN – Deep Recurrent Networks – Recursive Neural Networks – Long Term Dependencies; Leaky Units: Skip connections and dropouts; Gated Architecture: LSTM.		
UNIT IV	**MODEL EVALUATION**	**9**
Performance metrics – Baseline Models – Hyperparameters: Manual Hyperparameter – Automatic Hyperparameter – Grid search – Random search – Debugging strategies		
UNIT V	**AUTOENCODERS AND GENERATIVE MODELS**	**9**
Autoencoders: Undercomplete autoencoders – Regularized autoencoders – Stochastic encoders and decoders – Learning with autoencoders; Deep Generative Models: Variational autoencoders – Generative adversarial networks		
		Total: 45

TEXTBOOKS	
1.	Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
2.	Andrew Glassner, “Deep Learning: A Visual Approach”, No Starch Press, 2021.
3.	
REFERENCES	
1.	Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, “A Guide to Convolutional Neural Networks for Computer Vision”, Synthesis Lectures on Computer Vision, Morgan & Claypool Publishers, 2018.
2.	Yoav Goldberg, “Neural Network Methods for Natural Language Processing”, Synthesis Lectures on Human Language Technologies, Morgan & Claypool Publishers, 2017.
3.	Francois Chollet, “Deep Learning with Python”, Manning Publications Co, 2018.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1.	Able to understand the mathematics behind functioning of artificial neural networks	K4

CO2.	Able to analyze the given dataset for designing a neural network based solution	K3
C03.	Able to carry out design and implementation of deep learning models for signal/image processing applications	K3
C04.	Able to design and deploy simple TensorFlow-based deep learning solutions to classification problems	K3

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2						3	2	2		
CO2	3	2	2	3	2						3	2	2		
CO3	3	2	2	3	2						3	2	2		
CO4	3	2	2	3	2						3	2	2		
CO5	3	2	2	3	2						3	2	2		

ACB526 - FINANCIAL ANALYTICS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites	**Probability and Statistics**		**PC**	**3**	**0**	**0**	**3**
Preamble	➢ Understand the fundamental concepts of spreadsheet modelling and spreadsheet analysis ➢ Apply the business analytic concepts using spreadsheet ➢ Apply the concepts of regression, classification, clustering and other optimization algorithms in key analytical problems ➢ Developing proficiency in solving business analytics problems						
UNIT I	**INTRODUCTION TO SPREADSHEET MODELS AND SPREADSHEET MODELLING**						**9**
Introduction to Models – Modeling – Build Spread Sheet models – Simulate model – Test Models – Analysis using Spread Sheets – What-if analysis, Break even analysis – other analysis tools in Excel							
UNIT II	**DESCRIPTIVE ANALYTICS – SPREADSHEET**						**9**
Data Visualization and Analytics- Charts(Bars-Pie-Line-Scatter-Map-Bubble-Box & Whisker-Tree map - Heat map-Circle and Area) -Worksheet, Dashboard and Story Board creation							
UNIT III	**PREDICTIVE ANALYTICS AND CLUSTERING**						**9**
Linear Regression, Multi-linear Regression and Time Series Forecasting, Linear optimization, Integer optimization, Non-linear programming, Optimization of Network models and Monte Carlo Simulation							
UNIT IV	**DECISION ANALYSIS**						**9**
Introduction - Payoff Tables and Decision Criteria, Using Trees to Model Decisions - Decision Trees for a Series of Decisions, Principles for Building and Analyzing Decision Trees, The Cost of Uncertainty, Using Decision Tree Software, Maximizing Expected Utility with Decision Tree.							

UNIT V	OPTIMIZATION IN SIMULATION	9
Optimization with One or Two Decision Variables - Base-case Mode, Grid Search, Optimizing Using Simulation Sensitivity, Optimizing Using Solver, Stochastic Optimization, Chance Constraints, Two-Stage Problems with Recourse		
		Total:45 Periods

TEXTBOOK:

1.	Stephen G. Powell, Kenneth R. Baker, (2014), Business Analytics : The art of Modeling with Spreadsheets, John Wiley & Sons. (Unit I – V)

REFERENCES:

1.	Hair, J. F, Black W. C, Babin B. J, Anderson R. E, Tatham R. L, (2009), Multivariate data analysis, 7th edition, Pearson education.
2.	Gerald Knight (2006), Analysing Business data with excel, O'REILLY Media Incorporated.
3	Michael L. Middleton, Michael R. Middleton, Data Analysis using Excel 5.0, Wadsworth
4	**Web Resources** **1. https://www.udemy.com/topic/financial-analysis/**

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the skills in spreadsheet for exploring data.	K2
CO2	Develop models in spreadsheet to solve all type of business analytics problems ranging from regression to clustering and classification.	K4
CO3	Develop and apply prescriptive analytics models using spreadsheet and to solve various optimization problem.	K4
CO4	Analyse the decision taken based on decision tree methods.	K3
CO5	Apply the concept of optimization in simulation.	K4

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	3		2					2	3		
CO2	2	2	3	2	3		2					2	3		
CO3	2	3	3	2	2		2					2	3		
CO4	2	2	3	2	3		2					2	3		
CO5	2	2	3	2	3		2					2	3		

ACB527- AGILE METHODOLOGIES AND DEVOPS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites	**Software Engineering**	**VIII**	**PC**	**3**	**0**	**0**	**3**

Preamble	➢ To understand the differences between conventional and agile approaches ➢ To understand the incremental and iterative fashion using practical techniques ➢ To understand the agile process and requirement engineering ➢ To apply agile principles to a range of decision possibilities ➢ To apply Devops for CI/CD using containers, container orchestration and pipeline

UNIT I	**INTRODUCTION**	**9**

Overview - Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods- Scrum, XP, Lean, and Kanban, – Agile Manifesto and Principles.

UNIT II	**AGILE PROCESSES AND PROJECT MANAGEMENT**	**9**

Lifecycle – Work Products, Roles and Practices- Impact of Agile Processes in RE–Current Agile Practices – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agile Drivers, Capabilities and Values.

UNIT III	**REQUIREMENTS ENGINEERING**	**9**

Overview of RE Using Agile Requirements - story mapping - user stories - acceptance criteria – sprints - product backlog and backlog grooming - Agile Product Development – Agile Metrics – Feature Driven Development (FDD)

UNIT IV	**TESTING**	**9**

Testing: Functionality Testing - UI Testing - Performance Testing - Security Testing

Selenium Agile Testing: Principles of agile testers - The agile testing quadrants - Agile automation - Test automation pyramid

UNIT V	**DEVOPS**	**9**

Continuous Integration and Continuous Delivery CI/CD: Jenkins Creating pipelines - Setting up runners Containers and container orchestration (Dockers and Kubernetes) - Checking build status - Fully Automated Deployment - Continuous monitoring with Nagios - DevOps on Cloud

Total:45 Periods

TEXTBOOK:

1.	David J. Anderson and Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2013. (Unit I – IV)
2.	1. Sricharan, "DEVOPS: Continuous Delivery, Integration, and Deployment with DevOps", Vadapalli, Packt, 2018 (Unit V)

REFERENCES:

1.	Andrew Stellman, Jennifer Greene, "Learning Agile: Understanding Scrum, XP, Lean, and Kanban", O Reilly, 2015.

2.	James A. Crowder, Shelli Friess, "Agile Project Management: Managing for Success", Springer 2014.
3	Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide For Testers And Agile Teams", Pearson Education, 2010.
4	**Web Resources** 1. https://intellipaat.com/blog/tutorial/devops-tutorial/ 2. https://elearn.nptel.ac.in/shop/iit-workshops/completed/agile-testing-methodology-and-project-management-test-automation/

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the differences between Agile and other project management methodologies	K2
CO2	Understand the various principles, phases and activities of the Scrum methodology	K2
CO3	Understand the various tools for Agile development and CI/CD	K2
CO4	Apply the Agile Testing principles for real life situations CO5 – Apply and implement DEVOPS principles for CI/CD	K4

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1			1							3		
CO2	3	2	1		2	1						2	3		
CO3	2	2	1				3	3			1	1	3		
CO4	2	2	2		3			3				3	3		
CO5	2	2	2								1	2	3		

ACB528 - SUPPLY CHAIN MANAGEMENT							
Programme & Branch	**BE & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**PC**	**3**	**0**	**0**	**3**
Preamble	➢ This module provides an overview of logistics management in organizations based on the concept of supply chain management (SCM). ➢ The knowledge of the logistical implications in the functions of the organization we take an in- depth look at each of the traditional fields of logistics: sourcing and procurement, storage, distribution and reverse logistics.						

	➢ To identify and monitor products in the supply chain.	
Unit 1	**INTRODUCTION TO SUPPLY CHAIN MANAGEMENT**	**9**
Supply Chain – Objectives – Importance – Decision Phases – Process View – Competitive and Supply Chain Strategies – Achieving Strategic Fit – Supply Chain Drivers – Obstacles – Framework – Facilities– Inventory – Transportation – Information.		
Unit 2	**DESIGNING THE SUPPLY CHAIN NETWORK**	**9**
Designing The Distribution Network – Role of Distribution – Factors Influencing Distribution – Design Options – E-Business and Its Impact – Distribution Networks in Practice – Network Design in The Supply Chain – Role Of Network – Factors Affecting The Network Design Decisions – Modeling For Supply Chain.		
Unit 3	**DESIGNING AND PLANNING TRANSPORTATION NETWORKS**	**9**
Overview of Demand Forecasting in the Supply Chain, Aggregate Planning in the Supply Chain, CPFRP, Managing Predictable Variability, Managing Supply Chain Cycle Inventory, and Role of transportation and their performance, transportation infrastructure and policies, design options and their trade-offs, Tailored transportation, Outbound to customer logistics systems**.**		
Unit 4	**SOURCING AND PRICING**	**9**
Sourcing – In-house or Outsource – Types of Purchasing Strategies - 3rd and 4th PLs – supplier scoring and assessment, selection – design collaboration – procurement process – sourcing planning and analysis, Worldwide Sourcing. Pricing and revenue management for multiple customers, perishable products, seasonal demand, bulk and spot contracts.		
Unit 5	**COORDINATION IN SUPPLY CHAIN ACTIVITIES**	**9**
Uncertainty in the Supply Chain – Safety Inventory. Determination of Optimal Level of Product Availability, Lack of supply chain coordination and the Bullwhip effect – obstacle to coordination, managerial building partnerships and trust, continuous replenishment and vendor-managed inventories, collaborative planning, forecasting and replenishment**.** Blockchain.		
		Total: 45

TEXTBOOKS	
1	Sunil Chopra and Peter Meindl, Supply Chain Management – Strategy, Planning and Operation, Pearson/PHI, 3rd Edition, 2017.
2	Coyle, Bardi, Longley, The management of Business Logistics – A supply Chain Perspective, Thomson Press, 2015.
REFERENCES	
1	Donald J Bowersox, Dand J Closs, M Bixby Coluper, Supply Chain Logistics Management, TMH, Fourth Edition, 2015.
2	Supply Chain Management by Janat Shah Pearson Publication, 2015.
3	Wisner, Keong Leong and Keah-Choon Tan, Principles of Supply Chain Management A Balanced Approach, Thomson Press, 2015.

COURSE OUTCOMES: **At the end of the course, learners will be able to**	**Bloom's Taxonomy Level**

CO1	Explain concept of Supply Chain Management and propose the main performance drivers of supply chain performance.	K2
CO2	Express the major slacks in supply chains and formulate the approaches to manage them and construct a mode to generate forecasts for a company's products.	K2
CO3	Conceptualize the phenomenon of bull-whip effect in supply chains and propose the methods to mitigate its effect in supply chain.	K2
CO4	Evaluate modes of transportation, assess the selection criteria, and select transportation options and analysis the various factors to select an appropriate location for a facility.	K5
CO5	Evaluate the sourcing decisions and prepare the supplier selection and interpret the strategic framework and synthesis for supply chain operational (SCOR) model.	K5

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1		1			1	2	2	1	1	2	2	2
CO2	3	2	1	1	1	1		1	2	2	1	1	2	2	2
CO3	3	2	1	1	1	1	2	1	2	2	1	1	2	2	2
CO4	3	2	1	1	1		2	1	2	2	1	1	2	2	2
CO5	3	2	1	1		1	2	1	2	2	1	1	2	2	2

ACB529 - EXPLORATORY DATA ANALYSIS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**PC**	**3**	**0**	**0**	**3**
Preamble	➢ To introduce the methods for data preparation and data understanding. ➢ Covers essential exploratory techniques for understanding multivariate data by summarizing it through statistical methods and graphical methods. ➢ To Summarize the insurers use of predictive analytics, data science and Data Visualization ➢ Know about outlier analysis.						
UNIT I	**Introduction To Exploratory Data Analysis**						**9**
Data Analytics lifecycle, Exploratory Data Analysis (EDA)– Definition, Motivation, Steps in data exploration, The basic data types Data Type Portability							
UNIT II	**Pre processing-Traditional Methods and Maximum Likelihood Estimation**						**9**

Introduction to Missing data, Traditional methods for dealing with missing data, Maximum Likelihood Estimation – Basics, Missing data handling, Improving the accuracy of analysis		
UNIT III	**Preprocessing Bayesian Estimation**	**9**
Introduction to Bayesian Estimation ,Multiple Imputation-Imputation Phase, Analysis and Pooling Phase,Practical Issues in Multiple Imputation, Models for Missing Notation Random Data		
UNIT IV	**Data Summarization & Visualization**	**10**
Statistical data elaboration, 1-D Statistical data analysis, 2-D Statistical data Analysis, N- D Statistical data analysis		
UNIT V	**Outlier Analysis**	**8**
Introduction, Extreme Value Analysis, Clustering based, Distance Based and Density Based outlier analysis, Outlier Detection in Categorical Data		
		Total:45 Periods

TEXTBOOK:

1.	Michael Jambu, “Exploratory and multivariate data analysis”, Academic Press Inc. 1990.
2.	Roger S. Pressman, “Software Engineering: A Practitioner's Approach”, 8th Edition, Tata McGraw Hill Edition, 2015.

REFERENCES:

1.	Charu C. Aggarwal, “Data Mining The Text book”, Springer, 2015.
2.	Craig K. Enders, “Applied Missing Data Analysis”, The Guilford Press, 2010.
3.	Inge Koch, “Analysis of Multivariate and High dimensional data”, Cambridge University Press, 2014.
4.	Charu C. Aggarwal, “Data Classification Algorithms and Applications”, CRC press, 2015
5.	**Web Resources:** 1. https://www.tutorialspoint.com/software_engineering/index.htm 2. https://nptel.ac.in/courses/106/105/106105182/ 3. https://www.javatpoint.com/software-engineering-tutorial 4. www.mhhe.com/pressmanWeb Resources

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom’s Taxonomy Level**
CO1	Handle missing data in the real world data sets by choosing appropriate methods.	K4
CO2	Summarize the data using basic statistics. Visualize the data using basic graphs and plots.	K2

CO3	Identify the outliers if any in the data set.	K3
CO4	Choose appropriate feature selection and dimensionality reduction	K4
CO5	Techniques for handling multi-dimensional data	K4

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3							2	2	2		
CO2	2	2	3	2							3	2	2		
CO3	3	2	2	2							2	2	2		
CO4	3	2	3	2							2	2	2		
CO5	3	2	3	2							2	2	2		

ACB530 - ENTREPRENEURSHIP DEVELOPMENT							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**PC**	**3**	**0**	**0**	**3**

Preamble	➢ Understand entrepreneurial skills and qualities essential to undertake business. ➢ Understand entrepreneurial competencies needed for managing business efficiently and effectively. ➢ Understand to run a business efficiently and effectively ➢ Identify and discover market needs ➢ Understand the opportunities and challenges for entrepreneurs

UNIT I	**ENTREPRENEURAL COMPETENCE**	**9**

Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneurial Personality - Entrepreneur – Types of Entrepreneurs – Characteristics of Successful Entrepreneurs – Knowledge and Skills of an Entrepreneur.

UNIT II	**ENTREPRENEURAL ENVIRONMENT**	**7**

Business Environment - Role of Family and Society - Entrepreneurship Development Training and Other Support Organisational Services - Central and State Government Industrial Policies and Regulations.

UNIT III	**BUSINESS PLAN PREPARATION**	**9**

Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Capital Budgeting- Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria

UNIT IV	**LAUNCHING OF SMALL BUSINESS**	**11**

Small Enterprises – Characteristics, Ownership Structures – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic

Feasibility Assessment – Preparation of Preliminary Project Reports – Finance and Human Resource Mobilisation - Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching, Start-ups. Government Policies: Atal Incubation Centre (AIC), Refinancing by NABARD, Coir Udyami Yojana, MUDRA Loans, MSME Market Development Program.		
UNIT V	**MANAGEMENT OF SMALL BUSINESS**	**9**
Monitoring and Evaluation of Business - Business Sickness - Prevention and Rehabilitation of Business Units - Effective Management of small Business - Case Studies.		
		Total:45 Periods

TEXTBOOK:

1.	Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013. (Unit I – II)
2.	Donald F Kuratko, "Entreprenuership – Theory, Process and Practice", 9 th Edition, Cengage Learning, 2014. (Unit III – V)

REFERENCES:

1.	S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi, 2016.
2.	R.D.Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2018. Rajeev Roy, Entrepreneurship, Oxford University Press, 2nd Edition, 2011.
3	**Web Recourses** 1.https://leverageedu.com/blog/entrepreneurship-development/ 2.https://www.udemy.com/courses/business/entrepreneurship/

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Gain entrepreneurial competence to run the business efficiently.	K2
CO2	Undertake businesses in the entrepreneurial environment.	K4
CO3	Capable of preparing business plans and undertake feasible projects.	K4
CO4	Launch and develop their business ventures successfully.	K4
CO5	Monitor the business effectively towards growth and development.	K4

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			3			3	3	2	2			2	2		
CO2			3			2	2	2	2			2	2		
CO3		2	3		2	2	2	2	2			2	2		
CO4	1	2	1	1	1	1	1		1		1	1	2		
CO5			3	2	2	2	3	2				2	2		

ACB531 - QUANTUM COMPUTING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites	**Matrices and Calculus, Physics, Principles of Programming**	**VIII**	**PC**	**3**	**0**	**0**	**3**

Preamble	➢ To understand the background of classical computing and quantum computing. ➢ To understand the fundamental concepts behind quantum computation. ➢ To understand the details of quantum mechanics and the relation to Computer Science. ➢ To analyze the knowledge of hardware and software mathematical models of quantum computation. ➢ To analyze the quantum information and the theory behind it.

UNIT I	**INTRODUCTION**	**9**
Global Perspectives – Quantum Bits – Quantum Computation – Quantum Algorithms – Experimental Quantum Information Processing – Quantum Information.		
UNIT II	**MECHANICS AND COMPUTATIONAL MODELS**	**9**
Quantum Mechanics: Linear Algebra – Postulates of Quantum Mechanics – Application: Super dense Coding – Density Operator – The Schmidt Decomposition and Purifications – EPR and the Bell Inequality – Computational Models: Turing Machines – Circuits – Analysis of Computational Problems.		
UNIT III	**QUANTUM COMPUTATION**	**9**
Quantum Circuits: Quantum Algorithms – Universal Quantum Gates – Quantum Circuit Model of Computation – Simulation – Quantum Fourier Transform and Applications – Quantum Search Algorithms – Quantum Computers		
UNIT IV	**QUANTUM INFORMATION**	**9**
Quantum Noise and Quantum Operations: Classical Noise and Markov processes – Quantum Operations – Examples – Applications – Distance Measures for Quantum Information – Quantum Error Correction – Entropy		
UNIT V	**QUANTUM INFORMATION THEORY**	**9**
Quantum States and Accessible Information – Data Compression – Classical Information Over Noisy Quantum Channels – Quantum Information Over Noisy Quantum Channels – Entanglement as a Physical Resource – Quantum Cryptography.		
		Total:45 Periods

TEXTBOOK:

1.	Michael A. Nielsen, Isaac L. Chuang, "Quantum Computation and Quantum Information", Cambridge University Press, 2016.

REFERENCES:

1.	Zygelman, Bernard, "A First Introduction to Quantum Computing and Information. Germany", Springer International Publishing, 2018.
4	**Web Resources** https://nptel.ac.in/courses/106106232 (Unit IV – Quantum Error Correction (Week 4))

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the basics of quantum computing.	K2
CO2	Understand the background of Quantum Mechanics and the computation models.	K2
CO3	Understand the quantum computation in circuit design.	K2
CO4	Analyze the quantum noise and quantum operations.	K3
CO5	Analyze the quantum mechanics and computation models to solve complex problems for classical computers.	K3-

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1									2	2	
CO2	2	2							1	2		2	1	1	
CO3	2	2	2		1				1	1			2	1	
CO4	2	2	1			1	1	1			1		2	1	
CO5	1	1	1	1	1			1	1	1		1	2	1	

ACB532 - TEXT AND MEDIA ANALYTICS							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites	**Data Structures and Data Science**		**PC**	**3**	**0**	**0**	**3**
Preamble	➢ Understand the basic issues and types of social, text and media mining. ➢ Familiarize the learners with the concept of social, text and media analytics and understand its significance. ➢ Familiarize the learners with the tools of social, text and media analytics. ➢ Enable the learners to develop skills required for analysing the effectiveness of social, text and media for business purpose. ➢ Enumerate the applications in real time systems.						
UNIT I	**INTRODUCTION TO SOCIAL MEDIA ANALYSIS**						**8**
Social media landscape-Need for SMA-SMA in Small organizations-SMA in large organizations; Application of SMA in different areas-Network fundamentals and models: The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks.							
UNIT II	**SOCIAL MEDIA TEXT MINING**						**11**

Overview of text mining- Definition- General Architecture– Algorithms– Core Operations – Pre-processing–Types of Problems- basics of document classification- information retrieval clustering and organizing documents- information extraction- prediction and evaluation.		
UNIT III	**TEXT MINING FOR INFORMATION RETRIEVAL AND INFORMATION EXTRACTION**	**10**
Information retrieval and text mining- keyword search- nearest-neighbour methods-. Information extraction Architecture - Named Entity and Relation Extraction- Template filling and database construction –Applications. Inductive -Unsupervised Algorithms for Information Extraction. Text Summarization Techniques - Topic Representation - Influence of Context - Indicator Representations – Pattern Extraction - Apriori Algorithm – FP Tree algorithm.		
UNIT IV	**WEB ANALYTICS TOOLS**	**7**
Click stream analysis, A/B testing, online surveys, Web crawling and Indexing. Natural Language Processing Techniques for Micro-text Analysis. Web Analytic Tools: Types, Tools - Google Analytics, Hotjar, Woopra, Chartbeat, SEMrush.		
UNIT V	**MARKETING RESEARCH & TRENDS IN MARKET**	**9**
Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB. Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. Case study: Identify Consumer Preferences and Market Positioning of a New Product.		
		Total:45 Periods

TEXTBOOK:

1.	Marshall Sponder, Social Media Analytics, McGraw Hill, 2011. (Unit I – IV)
2.	Jim Sterne, Social Media Metrics: How to Measure and Optimize Your Marketing Investment, Wiley, 2010. (Unit - V)

REFERENCES:

1.	Matthew Ganis, Avinash Kohirkar , Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media, Pearson, 2016.
2.	Charu C. Aggarwal ,ChengXiang Zhai, Mining Text Data, Springer; 2012
4	**Web Resources** https://www.udemy.com/course/web-and-social-media-analytics-with-r-2

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the basics of Social Media Analysis.	K2
CO2	Understand the significance of Text Mining and Data Mining.	K2
CO3	Analyse various Algorithms on Text Mining for Information Retrial and Information Extraction.	K3
CO4	Apply Various Web Analytics Tools on real Time Examples	K4
CO5	Analyse the trends in Market with the help of Research Tools.	K3

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2		2	2	2		2			2		
CO2	2	2	2	2		2	2	2		2		2	2		
CO3	2	3	3	2		2	2	2					2		
CO4	2	3	2	2	3		2					2	2		
CO5		3	2	2	2	3			2			2	2		

ACB533 - COMPUTATIONAL FINANCE & MODELING							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites	Marketing Analytics, Enterprises Systems	VIII	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ Understand existing financial models in a quantitative and mathematical way. ➢ Apply these quantitative tools to solve complex problems in the areas of portfolio management, risk management and financial engineering. ➢ Explain the approaches required to calculate the price of options. ➢ Identify the methods required to analyze information from financial data and trading systems.						
UNIT I	**NUMERICAL METHODS RELEVANT TO INTEGRATION**						**9**
Differentiation and solving the partial differential equations of mathematical finance- examples of exact solutions including Black Scholes and its relatives-finite difference methods including algorithms and question of stability and convergence- treatment of near and far boundary conditions- the connection with binomial models- interest rate models- early exercises.							
UNIT II	**BLACK-SCHOLES FRAMEWORK-DISCONTINUOUS PAYOFFS**						**9**
Black-Scholes PDE: simple European calls and puts- put-call parity-The PDE for pricing commodity and currency options- Discontinuous payoffs - Binary and Digital options-The Greeks: theta, delta, gamma, vega & rho and their role in hedging-The mathematics of early exercise - American options							
UNIT III	**SOCIAL MEDIA ANALYTICS FOR HEALTHCARE**						**9**
Variance reduction methods and statistical analysis of simulation output- Pseudo random Numbers- Linear congruential generator- Mersenne twister RNG- The use of Monte Carlo simulation in solving applied problems on derivative pricing discussed in the current finance literature.							
UNIT IV	**FINANCIAL PRODUCTS AND MARKETS**						**9**
Introduction to the financial markets and the products which are traded in them-Equities, indices, foreign exchange, and commodities- Options contracts and strategies for speculation and hedging-Application areas include the pricing of American options- pricing interest rate dependent claims- and credit risk.							
UNIT V	**STATISTICAL ANALYSIS OF FINANCIAL RETURNS**						**9**

Fat tailed and skewed distributions, outliers, stylized facts of volatility, implied volatility surface, and volatility estimation using high frequency data. Copulas, Hedging in incomplete markets, 228 American Options, Exotic options, Electronic trading, Jump Diffusion Processes, High dimensional covariance matrices.	
Total:45 Periods	
TEXTBOOK:	
1.	R. Seydel: Tools for Computational Finance, 2nd edition, Springer-Verlag, New York, 2004.
	P. Glasserman: Monte Carlo Methods in Financial Engineering, Springer-Verlag, New York, 2004.
REFERENCES:	
1.	A. Lewis: Option Valuation under Stochastic Volatility, Finance Press, Newport Beach, California, 2000.
2.	A. Pelsser: Efficient Methods for Valuing Interest Rate Derivatives, Springer-Verlag, New York, 2000.
3	**Web Resources** 1. https://nptel.ac.in/courses/111/103/111103126/ 2. https://www.youtube.com/watch?v=IRMn6JQvU8A 3. https://www.youtube.com/watch?v=Fwl0yPeOzOM

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Learn about numerical methods to be used in financial markets.	K2
CO2	Know about the various frameworks adopted in derivatives segment like option trading.	K2
CO3	Understand and apply the concept of mathematics to trade online like equity, crypto currency and in IPOs.	K2
CO4	Analyze the suitable methods to trade in ADRs, GDRs etc.	K3
CO5	Perform Statistical Analysis of financial returns.	K3

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1		3	2	3	2					2	2		
CO2	2	3	3	3	2	2	2					2	2		
CO3	2	1	2	2	2	2	3					2	2		
CO4	2	2	2	2	3	2	2					2	2		
CO5	2	2	3	2	2	2	2					2	2		

ACB534 - SOFTWARE PROJECT MANAGEMENT							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**Credit**
Prerequisites	Software Engineering	VIII	**PC**	**3**	**0**	**0**	**3**

Preamble	➢ To understand the maturity models and the process of software project management. ➢ To understand the management renaissance of the software project. ➢ To apply the workflows and estimations in the project plan. ➢ To analyze the process automations and evolution of organizations. ➢ To develop software product using conventional and modern principles of software project management.

Unit – I	**SOFTWARE PROCESS MATURITY**	**9**

Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process. Process Reference Models Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

Unit – II	**SOFTWARE PROJECT MANAGEMENT RENAISSANCE**	**9**

Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

UNIT III	**PROJECT PLANNING**	**9**

Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments. Process Planning Work breakdown structures, Planning guidelines, Timelines- GANTT Charts cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT IV	**PROJECT ORGANIZATIONS**	**9**

Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

UNIT V	**SOFTWARE MANAGEMENT PRACTICES**	**9**

SCRUM- CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

Total:45 Periods

TEXTBOOK:

1.	Bob Hughes, Mike Cotterel, Rajib Mall, "Software Project Management", 6th Edition, McGraw- Hill, 2018

REFERENCES:

1.	Robert K. Wysocki, "Effective Software Project Management" Wiley Publication,2011.
2.	Walker Royce,"Software Project Management",Addison-Wesley, 1998.

3	Gopalaswamy Ramesh, "Managing Global Software Projects" McGraw HillEducation (India), Fourteenth Reprint 2013
4	**Web Resources** https://www.geeksforgeeks.org/software-engineering-software-project-management- spm/

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the maturity models and the process of software project management.	K2
CO2	Understand the management renaissance of the software project.	K2
CO3	Apply the workflows and estimations in project plan.	K4
CO4	Analyze the process automations and evolution of organizations of various project organizations.	K3
CO5	Design software product using conventional and modern principles of software project management	K4

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3							2	2	2		
CO2	2	2	3	2							3	2	2		
CO3	3	2	2	2							2	2	2		
CO4	3	2	3	2							2	2	2		
CO5	3	2	3	2							2	2	2		

ACB535 - BLOCKCHAIN TECHNOLOGIES							
Programme & Branch	**B.Tech & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**Credit**
Prerequisites	Computer Networks	VIII	**PC**	**3**	**0**	**0**	**3**

Preamble	➢ To learn the concept of blockchain ➢ To learn the applications and design methodology of blockchain ➢ To learn the working of ethereum account. ➢ To learn the concept of decentralized applications,mining and whisper. ➢ To learn swarm and the advanced trends in blockchain
Unit – I	**BLOCKCHAIN TECHNOLOGY** — **9**

Blockchain Evolution –Structure –Characteristics - Blockchain stack- Decentralized computation platform-Decentralized Storage Platform-Decentralized Messaging Platform-Smart Contracts-Decentralized Applications-Domain Specific BlockChain Applications-Benefits-Challenges.		
UNIT II	**BLOCKCHAIN COMPONENTS AND APPLICATION**	**9**
Blockchain Application Templates-application components-Design Methodology for BlockchainApplications- Application Templates- Setting up Ethereum Development Tools- Ethereum Clients – Ethereum Languages-TestRPC-MistEthereum Wallet-MetaMask-Web3 JavaScriptAPI-Truffle.		
UNIT III	**ETHEREUM ACCOUNTS**	**9**
Ethereum Accounts-keypairs-working with EOA Accounts-Working with Contract Accounts-SmartContract- structure- setting up and interacting with a contract using GethClient-Setting up and interacting with a Contract using Mist Wallet-Smart Contract Examples-smart contract patterns.		
UNIT IV	**DECENTRALIZED APPLICATIONS, MINING, WHISPER**	**9**
Decentralized applications-implementing Dapps - Case studies- Mining-Consensus on Blockchain Network- Mining stages-Block validation-Stetting up Mining Node-State Storage in Ethereum- Whisper-Protocol-Whisper Routing approaches-API.		
UNIT V	**SWARM, ADVANCED TOPICS**	**9**
Swarm architecture and concepts-incentive mechanism in swarm—Swarm setup-working-case study. Advanced topics on block chain		
		Total:45 Periods

TEXTBOOK:

1.	Arshdeep Bahga, Vijay Madisetti, ”Block Chain Applications- A Hands-On Approach”UniversityPress,2017.

REFERENCES:

1.	Draft version of “S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, ‘Blockchain Technology: Cryptocurrency and Applications’, Oxford University Press,2019.
2.	Josh Thompson,‘Blockchain:TheBlockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform,2017.
3.	**Web Resources** https://onlinecourses.nptel.ac.in/noc22_cs44

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom’s Taxonomy Level**
CO1	Understand the concept of blockchain	K2
CO2	Understand the applications and design methodology of blockchain	K2
CO3	Apply the methods needed to create account in ethereum	K4

CO4	Analyze the applications in decentralized mining and Whisper Routing approaches	K3
CO5	Analyze the swarm architecture and Advanced topics on block chain	K3

COs/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	1						1			3	
CO2	3	1	2	1	1						1			3	
CO3	3	1	2	1	1						1			3	
CO4	3	1	2	1	1						1			3	
CO5	3	1	2	1	1						1			3	

OPEN ELECTIVES

AME701 - DRONE TECHNOLOGIES							
Programme & Branch	**BE & MECH**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			OE	**3**	**0**	**0**	**3**
Preamble	➢ To understand the basics of drone concepts. ➢ To learn and understand the fundaments of design, fabrication and programming of drone. ➢ To impart the knowledge of a flying and operation of drone. ➢ To know about the various applications of drone. ➢ To understand the safety risks and guidelines of fly safely.						
Unit 1	**INTRODUCTION TO DRONE TECHNOLOGY**						**9**
Drone Concept - Vocabulary Terminology- History of drone - Types of current generation of drones based on their method of propulsion- Drone technology impact on the businesses- Drone business through entrepreneurship- Opportunities/applications for entrepreneurship and employability							
Unit 2	**DRONE DESIGN, FABRICATION AND PROGRAMMING**						**9**
Classifications of the UAV -Overview of the main drone parts- Technical characteristics - Function of the components -Assembling a drone- The energy sources- Level of autonomy- Drones configurations - The methods of programming drone- Download program -Install program on computer- Running Programs- Multi rotor stabilization- Flight modes -Wi-Fi connection.							
Unit 3	**DRONE FLYING AND OPERATION**						**9**
Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment. Drone controls Flight operations –management tool –Sensors-Onboard storage capacity - Removable storage devices- Linked mobile devices and applications.							
Unit 4	**DRONE COMMERCIAL APPLICATIONS**						**9**
Choosing a drone based on the application -Drones in the insurance sector- Drones in delivering mail, parcels and other cargo- Drones in agriculture- Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing.							
Unit 5	**FUTURE DRONES AND SAFETY**						**9**
The safety risks- Guidelines to fly safely - Specific aviation regulation and standardization- Drone license- Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms.							
							Total: 45

TEXTBOOKS	
1	Daniel Tal and John Altschuld, “Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation”, John Wiley & Sons, Inc, 2021.
2	Terry Kilby and Belinda Kilby, “Make: Getting Started with Drones “, Maker Media, 1st Edition, 2016.
REFERENCES	
1	John Baichtal, “Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs”, Que Publishing, 2016

2	Zavrsnik, "Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance", Springer, 2018.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Know about a various type of drone technology, drone fabrication and programming.	K2
CO2	Execute the suitable operating procedures for functioning a drone.	K3
CO3	Select appropriate sensors and actuators for Drones.	K3
CO4	Develop a drone mechanism for specific applications.	K4
CO5	Create the programs for various drones.	K6

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	1	3	2						1	2	1	3
CO2	1	2	3	1	3	2						1	2	1	3
CO3	1	2	3	1	3	2						1	2	1	3
CO4	1	2	3	1	3	2						1	2	1	3
CO5	1	2	3	1	3	2						1	2	1	3

AME702 - ADDITIVE MANUFACTURING

Programme & Branch	**BE & MECH**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			OE	**3**	**0**	**0**	**3**

Preamble	➢ To introduce the development, capabilities, applications, of Additive Manufacturing (AM), and its business opportunities. ➢ To be acquainted with vat polymerization and material extrusion processes ➢ To be familiar with powder bed fusion and binder jetting processes. ➢ To gain knowledge on applications of direct energy deposition, and material jetting processes. ➢ To impart knowledge on sheet lamination and direct write technologies.	
Unit 1	**INTRODUCTION**	**9**
Overview - Need - Development of Additive Manufacturing (AM) Technology: Rapid Prototyping - Rapid Tooling - Rapid Manufacturing - Additive Manufacturing. AM Process Chain - ASTM/ISO 52900 Classification - Benefits - AM File formats: STL, AMF – Applications - Business Opportunities in AM.		

Unit 2	**VAT POLYMERIZATION AND MATERIAL EXTRUSION**	**9**
Photo polymerization: Stereolithography Apparatus (SLA)- Materials -Process - top down and bottom-up approach - Advantages - Limitations - Applications. Digital Light Processing (DLP) - Process - Advantages - Applications. Material Extrusion: Fused Deposition Modeling (FDM) - Process-Materials -Applications and Limitations.		
Unit 3	**POWDER BED FUSION AND BINDER JETTING**	**9**
Powder Bed Fusion: Selective Laser Sintering (SLS): Process - Powder Fusion Mechanism - Materials and Application. Selective Laser Melting (SLM), Electron Beam Melting (EBM): Materials - Process - Advantages and Applications. Binder Jetting: Three-Dimensional Printing - Materials - Process - Benefits - Limitations -Applications.		
Unit 4	**MATERIAL JETTING AND DIRECTED ENERGY DEPOSITION**	**9**
Material Jetting: Multijet Modeling- Materials - Process - Benefits - Applications. Directed Energy Deposition: Laser Engineered Net Shaping (LENS) - Process – Material Delivery - Materials -Benefits -Applications.		
Unit 5	**SHEET LAMINATION AND DIRECT WRITE TECHNOLOGY**	**9**
Sheet Lamination: Laminated Object Manufacturing (LOM)- Basic Principle- Mechanism: Gluing or Adhesive Bonding - Thermal Bonding - Materials - Application and Limitation. Ink-Based Direct Writing (DW): Nozzle Dispensing Processes, Inkjet Printing Processes, Aerosol DW - Applications of DW.		
		Total: 45

TEXTBOOKS	
1	Ian Gibson, David Rosen, Brent Stucker, Mahyar Khorasani, “Additive manufacturing technologies”, Springer Cham, 3rd edition, 2021.
2	Andreas Gebhardt and Jan-Steffen Hotter “Additive Manufacturing: 3D Printing for Prototyping and Manufacturing”, Hanser publications, 2016.
REFERENCES	
1	Andreas Gebhardt, “Understanding Additive Manufacturing: Rapid Prototyping, Rapid Manufacturing”, Hanser Gardner Publication, 1st Edition, 2012.
2	Milan Brandt, “Laser Additive Manufacturing: Materials, Design, Technologies, and Applications”, Woodhead Publishing, 1st Edition, 2016.
3	Amit Bandyopadhyay and Susmita Bose, “Additive Manufacturing”, 2nd Edition, CRC Press, 2021.
4	Kamrani A.K. and Nasr E.A, “Rapid Prototyping: Theory and practice”, Springer, 2006.
5	Liou, L.W. and Liou, F.W., “Rapid Prototyping and Engineering applications: A toolbox for prototype development”, CRC Press, 2019.

COURSE OUTCOMES: **At the end of the course, learners will be able to**	**Bloom’s Taxonomy Level**

CO1	Recognize the development of AM technology and how AM technology propagated into various businesses and developing opportunities.	K2
CO2	Acquire knowledge on process vat polymerization and material extrusion processes and its applications.	K2
CO3	Elaborate the process and applications of powder bed fusion and binder jetting.	K2
CO4	Evaluate the advantages, limitations, applications of material jetting and directed energy deposition processes.	K2
CO5	Acquire knowledge on sheet lamination and direct write technology.	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2							2	2	2	2
CO2	2	2	2	2	2							2	2	2	2
CO3	2	2	2	2	2							2	2	2	2
CO4	2	2	2	2	2							2	2	2	2
CO5	2	2	2	2	2							2	2	2	2

AME703 - ELECTRIC AND HYBRID VEHICLE TECHNOLOGY							
Programme & Branch	**BE & MECH**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			OE	**3**	**0**	**0**	**3**
Preamble	➢ To introduce the concept of hybrid and electric drive trains. ➢ To elaborate on the types and utilisation of hybrid and electric drive trains. ➢ To expose on different types of AC and DC drives for electric vehicles. ➢ To learn and utilise different types of energy storage systems. ➢ To introduce concept of energy management strategies and drive sizing.						
Unit 1	**INTRODUCTION**						**9**
Basics of vehicle performance, vehicle power source characterization, transmission characteristics, History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drivetrains on energy supplies.							
Unit 2	**HYBRID ELECTRIC DRIVE TRAINS**						**9**
Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Drivetrains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.							
Unit 3	**CONTROL OF AC & DC DRIVES**						**9**

Introduction to electric components used in hybrid and electric vehicles, Configuration, and control - DC Motor drives, Induction Motor drives, Permanent Magnet Motor drive, and Switch Reluctance Motor drives, drive system efficiency.		
Unit 4	**ENERGY STORAGE**	**9**
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Energy storage and its analysis - Battery based, Fuel Cell based, and Super Capacitor based, Hybridization of different energy storage devices.		
Unit 5	**DRIVE SIZING AND ENERGY MANAGEMENT STRATEGIES**	**9**
Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selection of appropriate energy storage technology, Energy Management Strategies: Energy management strategies used in hybrid and electric vehicles, classification, and comparison of energy management strategies, Implementation issues.		
		Total: 45

TEXTBOOKS	
1	Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals", Routledge publications, 3rd Edition, 2021
2	James Larminie and John Lowry, "Electric Vehicle Technology Explained", Wiley, 2nd Edition, 2012.
REFERENCES	
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 3rd Edition 2018.
2	Rand D.A.J, Woods, R & Ronald Dell, "Batteries for Electric vehicles", John Wiley & Sons, 1998.
3	Jack Erjavec, "Hybrid, Electric and Fuel-Cell Vehicles", Delmar Cengage Learning, 2nd Edition, 2012.
4	Christian Paar, "Energy Management in Hybrid Electric Vehicles using Co-Simulation", VDM Verlag, 2011.
5	Yangsheng Xu, Jingyu Yan, Huihuan Qian and Tin Lun Lam, "Hybrid Electric Vehicle Design and Control: Intelligent Omnidirectional Hybrids", McGraw Hill Eductaion, 1st Edition, 2014.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Discuss, categorize and configure hybrid drivetrains requirement for a vehicle.	K2
CO2	Design and apply appropriate hybrid and electric drive trains in a vehicle.	K5
CO3	Design and install suitable AC and DC drives for electric vehicles.	K5
CO4	Discuss arrive at a suitable energy storage system for a hybrid / electric vehicle.	K2
CO5	Apply energy management strategies to ensure better economy and efficiency.	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1		2						1	2	3
CO2	3	2	1	1	1		2						1	2	3
CO3	3	2	1	1	1		2						1	2	3
CO4	3	2	1	1	1		2						1	2	3
CO5	3	2	1	1	1		2						1	2	3

AEC701 - SENSORS AND ACTUATORS							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		-	**OE**	**3**	**0**	**0**	**3**
Preamble	The course is to make the students to list common types of sensor and actuators used in automotive vehicles.						
Unit – I	**INTRODUCTION TO MEASUREMENTS AND SENSORS**						**9**
Sensors: Functions- Classifications- Main technical requirement and trends Units and standards Calibration methods- Classification of errors- Error analysis- Limiting error- Probable error Propagation of error- Odds and uncertainty- principle of transduction-Classification. Static characteristics- mathematical model of transducers- Zero, First and Second order transducers Dynamic characteristics of first and second order transducers for standard test							
Unit – II	**VARIABLE RESISTANCE AND INDUTANCE SENSORS**						**9**
Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors Inductive potentiometer- Variable reluctance transducers: - EI pick up and LVDT							
Unit – III	**VARIABLE AND OTHER SPECIAL SENSORS**						**9**
Variable air gap type, variable area type and variable permittivity type- capacitor microphone Piezoelectric, Magneto strictive, Hall Effect, semiconductor sensor- digital transducers-Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor.							
Unit – IV	**AUTOMOTIVE ACTUATORS**						**9**
Electromechanical actuators- Fluid-mechanical actuators- Electrical machines- Direct-current machines- Three-phase machines- Single-phase alternating-current Machines - Duty-type ratings for electrical machines. Working principles, construction and location of actuators viz. Solenoid, relay, stepper motor etc.							
Unit – V	**AUTOMATIC TEMPERATURE CONTROL ACTUATORS**						**9**

Different types of actuators used in automatic temperature control- Fixed and variable displacement temperature control- Semi Automatic- Controller design for Fixed and variable displacement type air conditioning system.
Total:45

TEXTBOOK:	
1.	Doebelin's Measurement Systems: 7th Edition (SIE), Ernest O. Doebelin DhaneshN.Manik McGraw Hill Publishers, 2019.
2.	Robert Brandy, "Automotive Electronics and Computer System", Prentice Hall,2001
3.	William Kimberley," Bosch Automotive Handbook", 6th Edition, Robert Bosch GmbH, 2004.
4.	Bosch Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive, 5th Edition, 2007, ISBN No: 978-3-658-01783-5

REFERENCES:	
1.	James D Halderman, "Automotive Electrical and Electronics" , Prentice Hall, USA, 2013
2.	Tom Denton, "Automotive Electrical and Electronics Systems," Third Edition, 2004, SAE International.
3.	Patranabis.D, "Sensors and Transducers", 2nd Edition, Prentice Hall India Ltd,2003
4.	William Ribbens, "Understanding Automotive Electronics -An Engineering Perspective," 7th Edition, Elsevier Butterworth-Heinemann Publishers, 2012

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	List common types of sensor and actuators used in vehicles	K2
CO2	Design measuring equipment's for the measurement of pressure force, temperature and flow	K4
CO3	Generate new ideas in designing the sensors and actuators for automotive application.	K3
CO4	Understand the operation of the sensors, actuators and electronic control.	K2
CO5	Design temperature control actuators for vehicles.	K4

CO/PO	PO 1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	-	-	-	1	-	-	-	-	1	1
CO2	3	3	3	2	2	-	-	1	-	-	-	-	1	1
CO3	3	3	2	2	2	-	-	1	-	-	-	-	2	2
CO4	3	3	3	3	2	-	-	1	-	-	-	-	3	2
CO5	3	2	3	3	2	-	-	1	-	-	-	-	2	2

AEC702 - APPLIED DESIGN THINKING							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		-	**OE**	**3**	**0**	**0**	**3**
Preamble	➢ This course aims to provide to make the students Introduce tools & techniques of design thinking for innovative product, development. ➢ Illustrate customer-centric product innovation using simple, use cases. ➢ Demonstrate development of Minimum usable Prototypes, Outline principles of solution concepts & their evaluation. ➢ Describe system thinking principles as applied to complex systems						
Unit – I	**DESIGN THINKING PRINCIPLES**						**9**
Exploring Human-centered Design - Understanding the Innovation process, discovering areas of opportunity, Interviewing & empathy-building techniques, Mitigate validation risk with FIR [Forge Innovation rubric] - Case studies							
Unit – II	**ENDUSER-CENTRIC INNOVATION**						**9**
Importance of customer-centric innovation - Problem Validation and Customer Discovery - Understanding problem significance and problem incidence - Customer Validation. Target user, User persona & user stories. Activity: Customer development process - Customer interviews and field visit							
Unit – III	**APPLIED DESIGN THINKING TOOLS**						**9**
Concept of Minimum Usable Prototype [MUP] - MUP challenge brief - Designing & Crafting the value proposition - Designing and Testing Value Proposition; Design a compelling value proposition; Process, tools and techniques of Value Proposition Design							
Unit – IV	**CONCEPT GENERATION**						**9**
Solution Exploration, Concepts Generation and MUP design- Conceptualize the solution concept; explore, iterate and learn; build the right prototype; Assess capability, usability and feasibility. Systematic concept generation; evaluation of technology alternatives and the solution concepts							
Unit – V	**SYSTEM THINKING**						**9**
System Thinking, Understanding Systems, Examples and Understandings, Complex Systems.							
							Total:45
TEXTBOOK:							
1.	Steve Blank, (2013), The four steps to epiphany: Successful strategies for products that win, Wiley.						
2.	Steve Blank, (2013), The four steps to epiphany: Successful strategies for products that win, Wiley.						
3.	Proposition Design: How to Create Products and Services Customers Want, Wiley						
4.	Donella H. Meadows, (2015), “Thinking in Systems -A Primer”, Sustainability Institute						
5.	Tim Brown, (2012) “Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation”, Harper Business.						
REFERENCES:							

1.	https://www.ideou.com/pages/design-thinking#process
2.	https://blog.forgeforward.in/valuation-risk-versus-validation-risk-in-product-innovations49f253ca86 24
3.	https://blog.forgefor ward.in/product-innovation-rubric-adf5ebdfd356 4. https
4.	https://blog.forgefor ward.in/evaluating-product-innovations-e8178e58b86e
5.	https://blog.forgeforward.in/user-guide-for-product-innovation-rubric-857181b253dd
6.	https://blog.forgeforward.in/startup-failure-is-like-true-lie-7812cdfe9b85

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Define & test various hypotheses to mitigate the inherent risks in product innovations	K2
CO2	Design the solution concept based on the proposed value by exploring alternate solutions to achieve value-price fit.	K4
CO3	Develop skills in empathizing, critical thinking, analyzing, storytelling & pitching	K4
CO4	Develop skills in storytelling & pitching	K3
CO5	Apply system thinking in a real-world scenario	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	-	-	-	1	-	-	-	-	1	1
CO2	3	3	3	2	2	-	-	1	-	-	-	-	1	1
CO3	3	3	2	2	2	-	-	1	-	-	-	-	2	2
CO4	3	3	3	3	2	-	-	1	-	-	-	-	3	2
CO5	3	2	3	3	2	-	-	1	-	-	-	-	2	2

AEC703 - PROJECT REPORT WRITING

Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		-	**OE**	**3**	**0**	**0**	**3**

Preamble	➢ This course aims to provide essentials of project writing, Perceive the difference between general writing and technical writing. ➢ Assimilate the fundamental features of report writing, Learn the structure of a technical and project report.	
Unit – I		**9**
Writing Skills – Essential Grammar and Vocabulary – Passive Voice, Reported Speech, Concord, Signpost words, Cohesive Devices – Paragraph writing - Technical Writing vs. General Writing.		
Unit – II		**9**

Project Report – Definition, Structure, Types of Reports, Purpose – Intended Audience – Plagiarism – Report Writing in STEM fields – Experiment – Statistical Analysis.		
Unit – III		**9**
Structure of the Project Report: (Part 1) Framing a Title – Content – Acknowledgement – Funding Details -Abstract – Introduction – Aim of the Study – Background - Writing the research question - Need of the Study/Project Significance, Relevance – Determining the feasibility – Theoretical Framework.		
Unit – IV		**9**
Structure of the Project Report: (Part 2) – Literature Review, Research Design, Methods of Data Collection - Tools and Procedures - Data Analysis - Interpretation - Findings –Limitations - Recommendations – Conclusion – Bibliography.		
Unit – V		**9**
Proof reading a report – Avoiding Typographical Errors – Bibliography in required Format – Font – Spacing – Checking Tables and Illustrations – Presenting a Report Orally – Techniques.		
		Total:45

REFERENCES:

1.	Gerson and Gerson - Technical Communication: Process and Product, 7th Edition, Prentice Hall(2012)
2.	Virendra K. Pamecha - Guide to Project Reports, Project Appraisals and Project Finance(2012)
3.	Daniel Riordan - Technical Report Writing Today (1998) Darla-Jean Weatherford - Technical Writing for Engineering Professionals (2016) Penwell Publishers.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Write effective project reports.	K2
CO2	Use statistical tools with confidence	K2
CO3	Explain the purpose and intension of the proposed project coherently and with clarity.	K2
CO4	Create writing texts to suit achieve the intended purpose.	K2
CO5	Master the art of writing winning proposals and projects.	K2

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	3	2	2	3	3	3	3	-	-	
CO2	2	2	2	1	1	1	2	1	2	3	2	3	-	-	
CO3	2	2	2	2	2	3	2	2	2	3	2	3	-	-	
CO4	3	3	3	3	3	3	3	3	3	3	3	3	-	-	
CO5	3	2	3	3	3	3	3	3	3	3	3	3	-	-	

ACS701 - SYSTEMS ENGINEERING							
Programme & Branch	**B.E &CSE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	To introduce system engineering concepts to design the manufacturing system for optimum utilization of source for effective functioning.						
UNIT I	**INTRODUCTION**					**9**	
Definitions of Systems Engineering, Systems Engineering Knowledge, Life cycles, Life-cycle phases, logical steps of systems engineering, Frame works for systems engineering.							
Unit 2	**SYSTEMS ENGINEERING PROCESSES**					**9**	
Formulation of issues with a case study, Value system design, Functional analysis, Business Process Reengineering, Quality function deployment, System synthesis, Approaches for generation of alternatives.							
Unit 3	**ANALYSIS OF ALTERNATIVES- I**					**9**	
Cross-impact analysis, Structural modeling tools, System Dynamics models with case studies, Economic models: present value analysis – NPV, Benefits and costs over time, ROI, IRR; Work and Cost breakdown structure.							
Unit 4	**ANALYSIS OF ALTERNATIVES–II**					**9**	
Reliability, Availability, Maintainability, and Supportability models; Stochastic networks and Markov models, Queuing network optimization, Time series and Regression models, Evaluation of large scale models.							
Unit 5	**DECISION ASSESSMENT**					**9**	
Decision assessment types, Five types of decision assessment efforts, Utility theory, Group decision making and Voting approaches, Social welfare function; Systems Engineering methods for Systems Engineering Management.							
						Total: 45	
TEXTBOOKS							
1	Andrew P. Sage, James E. Armstrong Jr. “Introduction to Systems Engineering”, John Wiley and Sons, Inc,2000.						
COURSEOUTCOMES: **At the end of the course, learners will be able to**				**Bloom’s Taxonomy Level**			
CO1	The Student must be able to apply systems engineering principles to make decision for optimization.			K2			
CO2	Hence an understanding of the systems engineering discipline and be able to use the core principles and processes for designing effective system.			K2			
CO3	Analyze the various method to impact on system engineering			K2			
CO4	Decision capabilities identified with various analysis.			K2			

CO5	Management the system based on decision results.	K2

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1	-	-	-	3	2	2	2	2	2	2
CO2	2	3	2	1	1	-	-	-	3	2	3	2	2	2	2
CO3	2	3	2	2	2	-	-	-	-	-	-	2	2	3	2
CO4	2	-	-	2	3	-	-	-	-	-	-	-	2	2	-
CO5	2	2	-	3	3	-	1	2	3	2	1	3	2	3	-

ACS702- GREEN COMPUTING							
Programme & Branch	**B.E & CSE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			OE	**3**	**0**	**0**	**3**
Preamble	➢ To learn the fundamentals of Green Computing. ➢ To analyze the Green computing Grid Framework. ➢ To understand the issues related with Green compliance. ➢ To study and develop various case studies.						
UNIT I	**FUNDAMENTALS**						**9**
Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.							
Unit 2	**GREEN ASSETS AND MODELING**						**9**
Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models							
Unit 3	**GRID FRAMEWORK**						**9**
Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.							
Unit 4	**GREEN COMPLIANCE**						**9**
Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future. .							
Unit 5	**CASE STUDIES**						**9**
The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.							
							Total: 45
TEXTBOOKS							

1	Bhuvan Unhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2014
2	Woody Leonhard, Katherine Murray, "Green Home computing for dummies", August 2012.
REFERENCES	
1	Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey", Shroff/IBM rebook, 2011.
2	John Lamb, "The Greening of IT", Pearson Education, 2009.
3	Jason Harris, "Green Computing and Green IT- Best Practices on regulations & industry", Lulu.com, 2008
4	.Carl speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010. 5. Wu Chun Feng (editor), "Green computing: Large Scale energy efficiency", CRC Press

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment	K2
CO2	Enhance the skill in energy saving practices in their use of hardware.	K2
CO3	Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders.	K2
CO4	Understand the ways to minimize equipment disposal requirements.	K2
CO5	Discuss briefly about the use cases in various applications.	K2

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2						2		2			2	2	
CO2		2		2	2	2							3	2	
CO3				2		2							3	2	3
CO4	3	2			2			2	2	2	2		3	2	3
CO5		2	3	2			1					1		2	

ACS703 - FINTECH REGULATION							
Programme & Branch	**B.E & CSE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			OE	**3**	**0**	**0**	**3**

Preamble	➢ To learn about Laws and Regulation ➢ To acquire the knowledge of Regulations of Fintech firm and their role in Market	
UNIT I	**INTRODUCTION**	**9**
The Role of the Regulators, Equal Treatment and Competition, Need for a regulatory assessment of Fintech, India Regulations, The Risks to Consider, Regtech and SupTech, The rise of TechFins, Regulatory sandboxes, compliance and whistle blowing		
Unit 2	**INNOVATION AND REGULATION**	**9**
The technology, market and the law, Regulation and Innovation in Banking and Finance, Regulations of Fintech Firms and their role in Market-Based Chains, Current Regulatory Approach, Fintech Innovations in Banking, Asset Management, Insurance, Pensions and Healthcare Schemes, Patentability of FinTech inventions.		
Unit 3	**CROWDFUNDING AND DIGITAL ASSETS**	**9**
Types of crowd funding, The Jobs Act, Regulation crowd funding, Regulation A+, Regulation D crowd funding, Intrastate offerings, Digital Assets – Three uses of Digital Assets, A world of Altcoins, Stablecoins, Digital Asset Forks, Initial Coin Offerings, Regulatory Framework for Digital and Crypto Assets, Central Bank Digital Currencies		
Unit 4	**MARKETPLACE LENDING AND MOBILE PAYMENTS**	**9**
Online Lending Business Models, Payday Loans, Consumer Protection Laws, Debt Collection, Equal Credit Opportunity Act, Contract Formation and the E-Sign Act, Military Lending Act, Securities Laws Considerations, Mobile Devices, Payment Cards and the Law, Truth in Lending Act and Regulation Z, Card Act, Electronic Fund Transfer Act and Regulation E, Fair Credit Reporting Act, Federal Bank Secrecy Act, State Money Transmitter Laws.		
Unit 5	**ANTI-MONEY LAUNDERING AND CYBERSECURITY**	**9**
Reporting requirements under the Bank Secrecy Act, Patriot Act, Panalties for violating the BSA, Virtual currencies and the Bank Secrecy Act, Cybersecurity Frameworks, Cybersecurity Act of 2015, Contractual and Self Regulatory obligations		
		Total: 45

REFERENCES

1	Jelena Madir, FinTech – Law and Regulation, Edward Elgar Publishing Limited, 2019
2	Valerio Lemma, Fintech Regulation: Exploring New Challenges of the Capital Markets Union, Palgrave Macmillan, 2020
3	Chris Brummer, Fintech Law in a Nutshell, West Academic Publishing, 2020
4	Bernardo Nicoletti, The Future of Fintech, Integrating Finance and Technology in Financial Services, Springer Nature, 2017
5	Kevin C. Taylor, FinTech Law: A Guide to Technology Law in the Financial Services Industry, BNA Books, 2014
6	Lee Reiners, FinTech Law and Policy, 2018

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the role that financial regulation plays in key FinTech developments such as mobile payments, crowdfunding, crypto assets, private digital currencies, and decentralized finance.	K2
CO2	Know the role that law and technology play in facilitating international transactions such as syndicated lending and international bond issues.	K2
CO3	Be able to critically engage with the major theoretical legal debates surrounding international financing, financial markets and financial technology.	K2
CO4	Be able to deal with policy arguments on international financing, financial markets and financial technology law	K2
CO5	Demonstrate ability to apply critical and contextual approaches to the developing legal issues emanating from international financing, regulation of financial markets and financial technology.	K2

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2						2		2			2	2	
CO2		2		2	2	2							3	2	
CO3				2		2							3	2	3
CO4	3	2			2			2	2	2	2		3	2	3
CO5		2	3	2			1					1		2	

AMB701-CORPORATE GOVERNANCE							
Programme & Branch	**MBA**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			OEC	**3**	**0**	**0**	**3**
Preamble	➢ To understand the concepts, need and importance of Corporate Governance. ➢ To understand the relationship between Business, government and Society. ➢ To provide the learners with different organization structures. ➢ To provide the learners to integrate with business and society. ➢ To formulate and execute the plans at various levels of management.						
Unit 1	**CORPORATE GOVERNANCE**						**9**
Corporate governance: The concept, need and importance of corporate governance, The role and purpose of the corporation, separation of ownership and control, benefits of good corporate governance, OECD (Organization for economic co-operation and development) on corporate governance, Theoretical basis for corporate governance, environmental Concerns and Corporations, environmental preservation-role of stakeholders, sustainable development, industrial pollution, role of corporate in environmental management, waste management, pollution control and environmental audit.							
Unit 2	**BUSINESS, GOVERNMENT AND SOCIETY**						**9**
An introduction to Business, Government, and Society: The Connect between Business, Government, and Society, Importance of BGS relationship in management, models of BGS relationships-Market capitalism model, dominance model, countervailing forcer's model and stakeholder model.							
Unit 3	**BUSINESS STRUCTURES**						**9**
Business structures: Meaning and nature of business structures, types, nature, advantages, limitations and applicability of - single ownership, partnerships, private limited companies, public limited companies, co-operative societies.							
Unit 4	**BUSINESS ETHICS AND CSR**						**9**
Business Ethics and Corporate Social Responsibility: Meaning of business ethics, need and purpose, importance, approaches to business ethics, roots of unethical behavior, ethical decision making some unethical issues, benefits from managing ethics at workplace. Nature of CSR, arguments for and against CSR, models of CSR, best practices of CSR-Indian examples.							
Unit 5	**BOARD OF DIRECTORS**						**9**
Role of Board of Directors in Corporate Governance, Corporate board of Management, structure and composition of the board, Types of board and directors, Size of the board, Powers of the board of directors, responsibilities, functions of the board, code of conduct for board members, training for the board of directors, effectiveness of the board members, effectiveness and powers of the board.							
							Total: 45

REFERENCE BOOK	
1	Corporate Governance: Principles, policies and Practices by Fernando A.c. Pub: Pearson, 2014.
2	Business and Government by Francis Cherunilam, Pub: Himalayan Publishing House.
3	Corporate Governance, Ethics & Social Responsibility by Balachandran C.H, Pub: PHI Pvt Ltd, 2015.

4	Business Ethics and Corporate Governance: Ghosh B.N., TMH, 2015

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Understand to connect between the corporate, ethics and society.	K1
CO2	Decide about the appropriateness of various business structures.	K2
CO3	Understand the need for and importance of corporate governance with reference to Environment protection	K3
CO4	Make the students to understand the essence of business and how business could be mutually beneficial to the businessman and the society.	K4
CO5	Decide on the role and functions of Board of Directors in an Organization.	K5

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1		1			1	1	2	1	1	2	2	2
CO2	3	2	1	1	1	1		1	2	2	1	1	1	2	2
CO3	3	2	1	1	1	1	2	1	2	2	1	1	2	1	2
CO4	3	2	1	1	1		2	1	2	2	1	1	2	2	2
CO5	3	2	1	1		1	2	1	2	2	1	1	2	1	1

AMB702- DIGITAL MARKETING

Programme & Branch	MBA	Sem.	Category	L	T	P	C
			OE	3	0	0	3

Preamble	➢ To understand the concepts of Digital Marketing. ➢ To understand the Online Advertising and SEO. ➢ To analyse the Social media and email Marketing. ➢ To evaluate the concepts of email marketing. ➢ To formulate mobile marketing and e-marketing strategies.

Unit 1	OVERVIEW OF DIGITAL MARKETING	9

Digital marketing overview and meaning- benefits – platform & strategies- comparing digital with traditional marketing- latest digital marketing trends- case studies of digital marketing trends. Content Marketing, Handling Traffic.

Unit 2	ONLINE ADVERTISING AND SEO	9

Internet and Search Engine Basics, online Advertising, Importance of online Advertising, Types of online Marketing and advertising Methods. Importance of Search Engines, How the search engine works, Understanding the SERP, Using Search Operators, Search Engine Algorithms.

Unit 3	SOCIAL MEDIA AND EMAIL MARKETING	9

What is Social Media, SMM Vs. SMO, Benefits of using SMM, Social Media Strategy, and Impact of Social Media on SEO. Marketing strategy, Benefits, Promotional tools for- Facebook, YouTube, Twitter, Google, Linkedn. Email Marketing- Email Marketing concept, Importance, Popular Email Marketing Softwares, Email Marketing Goals and strategies, Types of Email marketing campaigns, Creating an Email Campaign, What is Newsletter, Design a Newsletter. Micro Blogging.

Unit 4	E COMMERCE	9

Ecommerce Business Planning, eCommerce Website, Product Placements, Product Grouping, Promoting eCommerce Website, Remarketing Products: Re-Marketing Flow, Email, Facebook Re-Marketing. Understanding Coupon System, Appointing Affiliates for Products, Cross/Up/Down Selling, Introduction to payment gateway- Application and Documentation.

Unit 5	MOBILE MARKETING AND REMARKETING	9

Overview of the B2B and B2C Mobile Marketing, Mobile Sites, Apps (Applications) and Widgets and their relevant to marketing, opportunities and pitfalls of Mobile Marketing, user interfaces and architectures. Trends in Mobile social media, Mobile Commerce, Mobile Payments and Billing, integration of mobile marketing into marketing plan.

Total: 45

REFERENCE BOOK

1	Digital Marketing: Strategy, Implementation & Practice, Dave Chaffey & Fiona Ellis-Chadwick, 2019
2	Convert!: Designing Websites For Traffic and Conversions, Ben Hunt, 2020
3	The Social Media Bible: Tactics, Tools, & Strategies for Business Success, Lon Safko, 2018
4	Digital Marketing: Strategies for Online Success ,Godfrey Parkin, 2015

5	Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Damian Ryan, 2018

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy.	K1
CO2	Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, email and social media.	K2
CO3	Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan.	K3
CO4	Explore the concepts of Remarketing strategies	K4
CO5	Develop various payment and billing gateways in digital marketing.	K5

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1		1			1	2	2	1	1	2	2	1
CO2	3	2	1	1	1	1	1	1	2	2	1	1	1	2	2
CO3	3	2	1	1	1	1	2	1	2	2	1	1	2	2	2
CO4	3	2	1	1	1		1	1	1	2	1	1	2	2	2
CO5	3	2	1	1		1	2	1	2	2	1	1	2	2	1

AMB703- RURAL MARKETING							
Programme & Branch	**MBA**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			OE	**3**	**0**	**0**	**3**
Preamble	➢ To understand the concepts of Rural Marketing ➢ To understand the types of Agricultural products for marketing. ➢ To analyse the issues in Rural Marketing. ➢ To evaluate the Rural Marketing Regulations. ➢ To formulate the strategies to satisfy rural consumers.						
Unit 1	**INTRODUCTION TO RURAL MARKETING**						**9**
Concept- Nature- Scope- Significance of Rural Marketing- Factors contributing to Growth of rural markets -Components and classification of Rural markets- Rural Market VS Urban Market- e.rural marketing.							
Unit 2	**AGRICULTURAL MARKETING**						**9**
Concept-Nature and Types of Agriculture produce- concept and types of Agricultural Markets- Marketing channels -Methods of Sales - Market functions							
Unit 3	**ISSUES IN RURAL MARKETING**						**9**
Rural Consumer behaviour- features- factors influencing- Lifestyle of rural consumer - FMCG sector in Rural India- concept and classification of consumer goods- Marketing Channels for FMCG – Fast growing FMCG -Marketing of consumer durables- The role of Advertising.							
Unit 4	**RURAL MARKETING AND MARKETING REGULATION**						**9**
Regulated Market- APMC Act 1963- Model bill Standardization and Grading - Inspection of quality control -Inspection of AGMARK - Indian Standers and Grade Specifications- Food Products order (FPO) 1955 –Consumer Protection Act 1986. The National Council for State Marketing Boards (NCOSAMB) State Trading corporation (STC), Public Distribution System (PDS).							
Unit 5	**INSTITUIONAL SUPPORT TO RURAL MARKETING**						**9**
Commission on Agriculture Costs and Prices (CACP), National Agriculture Co-operative Marketing Federation (NAFED), Agriculture and Processed Food Exports Development Authority (APEDA)							
							Total: 45

REFERENCE BOOK	
1	Badi R.V. Badi N.V.Rural Marketing Himalaya Publishing House – 2010
2	Rural Marketing- Gopalaswamy Vikas Publishing House, 2020.
3	Kashyp Pradeep, Rant Siddhartha The Rural Marketing, Biztantra, 2015.
4	Mishra and Puri Development Issues of Indian Economy Himalaya Publishing House, 2018

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the concepts of Rural Marketing	K1
CO2	Understand the nature of Rural Consumer Behaviour	K2

CO3	Analyse the nature of marketing rural products	K3
CO4	Identify the problems and issues in Rural Marketing	K4
CO5	Formulate the marketing strategies to satisfy the rural consumers.	K5

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1		1		1	1	2	2	1	1	1	2	2
CO2	3	2	1	1	1	1		1	1	2	1	1	2	2	1
CO3	3	2	1	1	1	1	2	1	2	1	1	1	2	2	2
CO4	3	2	1	1	1		2	1	2	2	1	1	2	2	1
CO5	3	2	1	1		1	2	1	2	2	2	1	1	2	2

AIT701 - NETWORKING ESSENTIALS							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			OE	**3**	**0**	**0**	**3**
Preamble	➢ Understand the division of network functionalities into layers. ➢ Be familiar with the components required to build different types of networks ➢ Be exposed to the required functionality at each layer ➢ Learn the flow control and congestion control algorithms. ➢ Learn the Classify the various soft computing frame works						
UNIT I	**FUNDAMENTALS & LINK LAYER**						**9**
Building a network – Requirements – Layering and protocols – Internet Architecture – Network software – Performance ; Link layer Services – Framing – Error Detection – Flow control							
Unit 2	**MEDIA ACCESS & INTERNETWORKING**						**9**
Media access control – Ethernet (802.3) – Wireless LANs – 802.11 – Bluetooth – Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP)							
Unit 3	**ROUTING**						**9**
Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM), Unicast Routing Algorithms							
Unit 4	**TRANSPORT LAYER**						**9**
Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements							
Unit 5	**APPLICATION LAYER**						**9**
Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS – SNMP, Telnet –SSH							
							Total: 45
TEXTBOOKS							
1	Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers, 2011.						

2	Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.
REFERENCES	
1	James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009
2	Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010
3	Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach",McGraw Hill Publisher, 2011
4	Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw – Hill, 2011.

COURSEOUTCOMES:

At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Identify the components required to build different types of networks	K2
CO2	Choose the required functionality at each layer for given application	K3
CO3	Identify solution for each functionality a t each layer	K1
CO4	Trace the flow of information from one node to another node in the network.	K2
CO5	Design protocols for various functions in the network and understand the working of various application layer protocols	K2

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	1	3	3	3	2	2	1	-	1			
CO2	3	3	2	-	-	-	1	-	-	-	-				
CO3	3	3	2	-	1	-	1	1	-	1	-	1			
CO4	3	3	2	-	-	-	1	1	-	1	-	-			
CO5	3	3	2	-	1	-	2	2	-	1	-	1			

AIT702 - SOFT COMPUTING METHODOLOGIES							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			OE	**3**	**0**	**0**	**3**
Preamble	➢ Classify the various soft computing frame works ➢ Be familiar with the design of neural networks, fuzzy logic and fuzzy systems ➢ Learn mathematical background for optimized genetic programming ➢ Be exposed to neuro-fuzzy hybrid systems and its applications						

UNIT I	INTRODUCTION TO SOFT COMPUTING	9
Soft Computing Constituents-From Conventional AI To Computational Intelligence- Artificial Neural Network: Introduction, Characteristics- Evolution Of Neural Networks - Basic Models - Important Technologies - Applications. Fuzzy Logic: Introduction - Crisp Sets- Fuzzy Sets - Crisp Relations And Fuzzy Relations: Cartesian Product Of Relation - Classical Relation, Fuzzy Relations, Tolerance And Equivalence Relations. Genetic Algorithm-Introduction - Biological Background - Traditional Optimization And Search Techniques – Genetic Basic Concepts.		
Unit 2	**NEURAL NETWORKS**	**9**
Mcculloch-Pitts Neuron - Linear Separability - Hebb Network - Supervised Learning Network: Perceptron Networks - Adaptive Linear Neuron, Multiple Adaptive Linear Neuron, BPN, RBF - Associative Memory Network: Auto- Associative Memory Network, Hetero-Associative Memory Network, Hopfield Networks, Iterative Auto Associative Memory Network – Unsupervised Learning Networks: Kohonen Self-Organizing Feature Maps, LVQ – CP Networks, ART Network.		
Unit 3	**FUZZY LOGIC**	**9**
Membership Functions: Features, Fuzzification, Methods Of Membership Value Assignments- Defuzzification: Lambda Cuts - Methods - Fuzzy Arithmetic And Fuzzy Measures: Fuzzy Arithmetic - Extension Principle - Fuzzy Measures - Measures Of Fuzziness -Fuzzy Integrals - Fuzzy Rule Base And Approximate Reasoning : Truth Values And Tables, Fuzzy Propositions, Formation Of Rules- Decomposition Of Rules, Aggregation Of Fuzzy Rules, Fuzzy Reasoning-Fuzzy Inference Systems Overview Of Fuzzy Expert System- Fuzzy Decision Making		
Unit 4	**GENETIC ALGORITHM**	**9**
Genetic Algorithm- Operators – Encoding Scheme – Fitness Evaluation –Crossover - Mutation – Classification Of Gnetic Algorithms- Genetic Programming – Advances In GA .		
Unit 5	**HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS**	**9**
Neuro-Fuzzy Hybrid Systems - Genetic Neuro Hybrid Systems - Genetic Fuzzy Hybrid And Fuzzy Genetic Hybrid Systems - Simplified Fuzzy ARTMAP - Applications: A Fusion Approach Of Multispectral Images With SAR, Optimization Of Traveling Salesman Problem Using Genetic Algorithm Approach, Soft Computing Based Hybrid Fuzzy Controllers.		
		Total: 45

TEXTBOOKS	
1	S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd, 2011
2	J.S.R.Jang, C.T. Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI
REFERENCES	
1	S.Rajasekaran and G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.
2	George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications” Prentice Hall, 1997.
3	David E. Goldberg, “Genetic Algorithm in Search Optimization and Machine Learning” Pearson Education India, 2013.
4	James A. Freeman, David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.

COURSEOUTCOMES:	
At the end of the course, learners will be able to	**Bloom’s Taxonomy Level**

CO1	Apply various soft computing concepts for practical applications	K2
CO2	Choose and design suitable neural network for real time problems	K2
CO3	Use fuzzy rules and reasoning to develop decision making and expert system	K2
CO4	Explain the importance of optimization techniques and genetic programming	K2
CO5	Review the various hybrid soft computing techniques and apply in real time problems	K2

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1	2	2	-	2	-	-	-	-	2	2	1	2	2
CO2	3	2	3	2	-	2	-	-	-	-	2	2	3	2	2
CO3	3	2	3	2	-	2	-	-	-	-	2	2	2	1	2
CO4	3	3	3	2	3	2	-	-	-	-	2	2	2	3	1
CO5	2	3	3	3	3	2	-	-	-	-	2	2	1	2	2

AIT703 - KNOWLEDGE ENGINEERING							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			OE	**3**	**0**	**0**	**3**
Preamble	➢ To understand the basics of Knowledge Engineering. ➢ To discuss methodologies and modeling for Agent Design and Development. ➢ To design and develop ontologies. ➢ To apply reasoning with ontologies and rules. ➢ To understand learning and rule learning						
UNIT I	**REASONING UNDER UNCERTAINTY**						**9**
Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning- Knowledge Engineering.							
Unit 2	**METHODOLOGY AND MODELING**						**9**
Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios.							
Unit 3	**ONTOLOGIES – DESIGN AND DEVELOPMENT**						**9**
Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features –							

Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification.		
Unit 4	**REASONING WITH ONTOLOGIES AND RULES**	**9**
Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge.		
Unit 5	**LEARNING AND RULE LEARNING**	**9**
Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning		
		Total: 45

TEXTBOOKS	
1	Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016. (Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4 / Unit 3 – Chapter 5, 6 / Unit 4 - 7 , Unit 5 Chapter 8, 9)
2	Jiawei Han and MichelineKamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
REFERENCES	
1	Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.
2	Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018.
3	Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw – Hill, 2011.
4	Jay Liebowitz, Knowledge Management Learning from Knowledge Engineering, 1st Edition,2001

COURSEOUTCOMES:

At the end of the course, learners will be able to		**Bloom’s Taxonomy Level**
CO1	Understand the basics of Knowledge Engineering.	K2
CO2	Apply methodologies and modelling for Agent Design and Development.	K3
CO3	Design and develop ontologies.	K3
CO4	Apply reasoning with ontologies and rules.	K3
CO5	Understand learning and rule learning.	K2

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1	1	1	1	1	-	-	1	2	1	2	1	1	1
CO2	3	2	3	2	2	-	-	-	2	1	2	1	3	3	1
CO3	2	2	3	2	2	-	-	-	3	2	2	2	3	2	3
CO4	2	2	3	1	1	-	-	-	2	2	2	2	2	1	1
CO5	2	2	2	1	1	-	-	-	2	1	1	1	2	1	1

ACB701 - BUSINESS RESEARCH METHODS							
Programme & Branch	**B.TECH & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**OE**	**3**	**0**	**0**	**3**
Preamble	➢ To make the students of tourism understand the principles of scientific methodology in business enquiry, develop analytical skills of business research and to prepare scientific business reports.						
UNIT I	**INTRODUCTION**						**9**
Business Research – Definition and Significance – the research process – Types of Research – Exploratory and causal Research – Theoretical and empirical Research – Cross –Sectional and time – series Research – Research questions / Problems – Research objectives – Research hypotheses – characteristics – Research in an evolutionary perspective – the role of theory in research.							
UNIT II	**RESEARCH DESIGN AND MEASUREMENT**						**9**
Research design – Definition – types of research design – exploratory and causal research design – Descriptive and experimental design – different types of experimental design – Validity of findings – internal and external validity – Variables in Research – Measurement and scaling – Different scales – Construction of instrument – Validity and Reliability of instrument.							
UNIT III	**DATA COLLECTION**						**9**
Types of data – Primary Vs Secondary data – Methods of primary data collection – Survey Vs Observation – Experiments – Construction of questionnaire and instrument – Types of Validity – Sampling plan – Sample size – determinants optimal sample size – sampling techniques – Sampling methods							
UNIT IV	**DATA PREPARATION AND ANALYSIS**						**9**
Data Preparation – editing – Coding –Data entry – Validity of data – Qualitative Vs Quantitative data analyses – Applications of Bivariate and Multivariate statistical techniques, Factor analysis, Discriminant analysis, Cluster analysis, Multiple regression and Correlation, Multidimensional scaling – Conjoint Analysis – Application of statistical software for data analysis.							
UNIT V	**REPORT DESIGN, WRITING AND ETHICS IN BUSINESS RESEARCH**						**9**
Research report –Types – Contents of report – need for executive summary – chapterization – contents of chapter – report writing – the role of audience – readability – comprehension –tone – final proof – report format – title of the report – ethics in research – Ethics in research Subjectivity and Objectivity in research.							
							Total:45 Periods
TEXTBOOK:							

1.	Donald R. Cooper, Pamela S. Schindler and J K Sharma, Business Research methods,11th Edition, Tata Mc Graw Hill, New Delhi, 2012.

REFERENCES:

1.	Alan Bryman and Emma Bell, Business Research methods, 3rd Edition, Oxford University Press, New Delhi, 2011.
2.	Uma Sekaran and Roger Bougie, Research methods for Business, 5th Edition, Wiley India, New Delhi, 2012.
3	William G Zikmund, Barry J Babin, Jon C.Carr, AtanuAdhikari,Mitch Griffin, Business Research methods, A South Asian Perspective, 8th Edition, Cengage Learning, New Delhi, 2012.
4	Panneerselvam. R, Research Methodology, 2nd Edition, PHI Learning, 2014.

COURSE OUTCOMES: Upon successful completion of the course the student will be able to		**Bloom's Taxonomy Level**
CO1	Understand and appreciate the scientific inquiry	K2
CO2	Undertake a systematic outlook towards business situations for the purpose of objective decision making.	K3
CO3	Ability to conduct a scientific inquiry to solve organizational problems	K3
CO4	Analyze data and find solutions to the problems.	K3
CO5	Prepare research reports	K4

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	3	2	2	2	2	2					2	3		
CO2	2	2	2	2	3	2	2					2	3		
CO3	2	3	2	2	2	2	2					2	3		
CO4	2	3	2	2	3		2					2	3		
CO5		3	2	2	2		2	3				2	3		

ACB702 - AUTOMATION TESTING TOOLS

Programme & Branch	**B.TECH & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**OE**	**3**	**0**	**0**	**3**

Preamble	➢ To understand the basics of software testing and test planning ➢ To build test cases and execute them ➢ To focus on automation testing using selenium ➢ To automate the testing using TestNG ➢ To get an insight about test automation using Cucumber	
UNIT I	**INTRODUCTION TO SOFTWARE TESTING AND TEST PLANNING**	**9**

Why do we test Software?, Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V-model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing-Performance Testing-The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.		
UNIT II	**TEST DESIGN AND EXECUTION**	**9**
Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.		
UNIT III	**SELENIUM**	**9**
me browsers, Identifying Web Elements using id, name, linkname, class, xpath, tagname- Handling Input box/buttons, list/selection/drop down boxes, radio buttons, check boxes- Extracting links and other Web-Elements-Extracting Data from WebTable-Capturing screenshots-Handling pop-ups, frames, and windows- Exceptions in Selenium - Data driving from csv and excel using Java APIs-Debugging Tests-Page Object Model		
UNIT IV	**TESTNG**	**9**
Introduction to TestNg-Advantages over Junit-Annotations in TestNg-Understand and Read TestNg Reports-Testng and its configuration-Grouping the testcases, Exclusion of groups, Partial Groups - TestSuite.xml/Suite creation-Types of parameterization-Parameter from TestNg.xml (pass value at Suite and Test level) - Assertion, Verification		
UNIT V	**CUCUMBER**	**9**
Introduction to Behavior Driven Development(BDD)-BDD framework using Cucumber-Preparing selenium and cucumber environment -creating a feature files using Gherkins and Gherkin syntax-writing features and scenario, Given – When -Then structure -Writing glue code -Cucumber and Java step definitions-writing step definition/ implementing scenarios steps-Cucumber data driven testing		
		Total:45 Periods

TEXTBOOK:

1.	Yogesh Singh, “Software Testing”, Cambridge University Press, 2012
2.	Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" - Second Edition 2018

REFERENCES:

1.	Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
2.	Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing
3	Paul C. Jorgensen, Software Testing: A Craftsman’s Approach, Fourth Edition, 2014, Taylor & Francis Group.
4	Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**	**Bloom’s Taxonomy Level**

CO1	Understand the basic concepts of software testing and test planning. Understand	K2
CO2	Design effective test cases that can uncover critical defects in the application.	K3
CO3	Automate the software testing using Selenium Apply	K3
CO4	Automate the software testing using TestNG Apply	K3
CO5	Automate the software testing using Cucumber	K3

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	3	2	2	2									2	
CO2	3	2	2	1	1									3	
CO3	2	3	3	3	3								2	3	
CO4	2	1	2	3	2								1	2	
CO5	2	2	1	2	1								2	2	

ACB703 - SOCIAL NETWORK ANALYSIS							
Programme & Branch	**B.TECH & CSBS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites		**-**	**OE**	**3**	**0**	**0**	**3**

Preamble	➢ To understand the concept of semantic web and related applications. ➢ To learn knowledge representation using ontology. ➢ To understand human behaviour in social web and related communities. ➢ To learn visualization of social networks.
UNIT I	**INTRODUCTION** **9**
Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.	
UNIT II	**MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION** **9**
Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations	
UNIT III	**EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS** **9**
Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-	

Relational characterization of dynamic social network communities.		
UNIT IV	**PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES**	**9**
Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.		
UNIT V	**VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS**	**9**
Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.		
		Total:45 Periods

TEXTBOOK:

1.	Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2.	Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.

REFERENCES:

1.	Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition, Springer, 2011.
2.	Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
3	Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.
4.	John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009

COURSE OUTCOMES: **Upon successful completion of the course the student will be able to**		**Bloom's Taxonomy Level**
CO1	Develop semantic web related applications.	K4
CO2	Represent knowledge using ontology.	K3
CO3	Predict human behaviour in social web and related communities.	K4
CO4	Visualize social networks.	K3

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	3	2	2	2									2	
CO2	3	2	2	1	1									3	
CO3	2	3	3	3	3								2	3	
CO4	2	1	2	3	2								1	2	
CO5	1	3	2	2	2									2	

AAI701 - DRINKING WATER SUPPLY AND TREATMENT							
Programme &Branch	**B.TECH & AIDS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**OE**	**3**	**0**	**0**	**3**

Preamble	To equip the students with the principles and design of water treatment units and distribution system.

UNIT I	**SOURCES OF WATER**	**9**

Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.

UNIT II	**CONVEYANCE FROM THE SOURCE**	**9**

Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.

UNIT III	**WATER TREATMENT**	**9**

Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation –- sand filters - Disinfection –– Construction, Operation and Maintenance aspects

UNIT IV	**ADVANCED WATER TREATMENT**	**9**

Water softening – Desalination- R.O. Plant – demineralization – Adsorption - Ion exchange– Membrane Systems - Iron and Manganese removal - Defluoridation - Construction and Operation and Maintenance aspects.

UNIT V	**WATER DISTRIBUTION AND SUPPLY**	**9**

Requirements of water distribution – Components – Selection of pipe material – Service reservoirs - Functions – Network design – Economics - Computer applications – Appurtenances – Leak detection - Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.

Total:45Periods

TEXTBOOK:

1. Garg. S.K., "Water Supply Engineering", Khanna Publishers, Delhi, September 2008.
2. Punmia B.C, Arun K.Jain, Ashok K.Jain, “ Water supply Engineering” Lakshmi publication private limited, New Delhi, 2016
3. Rangwala "Water Supply and Sanitary Engineering", February 2022 4. Birdie.G.S., "Water Supply and Sanitary Engineering", Dhanpat Rai and sons, 2018

REFERENCES:

1. Fair. G.M., Geyer.J.C., "Water Supply and Wastewater Disposal", John Wiley and Sons, 1954.

2.	Babbit.H.E, and Donald.J.J, "Water Supply Engineering" , McGraw Hill book Co, 1984.
3	Steel. E.W.et al., "Water Supply Engineering" , Mc Graw Hill International book Co, 1984.
4	Duggal. K.N., “Elememts of public Health Engineering”, S.Chand and Company Ltd, New Delhi, 1998.

COURSEOUTCOMES: Upon successful completion of the course the student will be able to		**Bloom’s Taxonomy Level**
CO1	An understanding of water quality criteria and standards, and their relation to public health	K2
CO2	The ability to design the water conveyance system 247	K3
CO3	The knowledge in various unit operations and processes in water treatment	K3
CO4	An ability to understand the various systems for advanced water treatment	K3
CO5	An insight into the structure of drinking water distribution system	K4

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	3	2	2	2	2	2					2	3		
CO2	2	2	2	2	3	2	2					2	3		
CO3	2	3	2	2	2	2	2					2	3		
CO4	2	3	2	2	3		2					2	3		
CO5		3	2	2	2		2	3				2	3		

AAI702 - GEOGRAPHICAL INFORMATION SYSTEM							
Programme &Branch	**B.TECH& AIDS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**OE**	**3**	**0**	**0**	**3**

Preamble	➢ To impart the knowledge on basic components, data preparation and implementation of Geographical Information System. To build test cases and execute them	
UNIT I	**FUNDAMENTALS OF GIS**	**9**
Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.		
UNIT II	**SPATIAL DATA MODELS**	**9**

Database Structures – Relational, Object Oriented – Entities – ER diagram - data models - conceptual, logical and physical models - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data models.		
UNIT III	**DATA INPUT AND TOPOLOGY**	**9**
Scanner - Raster Data Input – Raster Data File Formats – Georeferencing – Vector Data Input – Digitizer – Datum Projection and reprojection -Coordinate Transformation – Topology - Adjacency, connectivity and containment – Topological Consistency – Non topological file formats - Attribute Data linking – Linking External Databases – GPS Data Integration		
UNIT IV	**DATA QUALITY AND STANDARDS**	**9**
Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards –Interoperability - OGC - Spatial Data Infrastructur		
UNIT V	**DATA MANAGEMENT AND OUTPUT**	**9**
Import/Export – Data Management functions- Raster to Vector and Vector to Raster Conversion - Data Output - Map Compilation – Chart/Graphs – Multimedia – Enterprise Vs. Desktop GISdistributed GIS.		
		Total:45Periods

TEXTBOOK:

1.	Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011.
2.	Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction Geographical Information Systems, Pearson Education, 2nd Edition,2007.

REFERENCES:

1.	Lo. C. P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006

COURSEOUTCOMES: On completion of the course, the student is expected to		**Bloom's Taxonomy Level**
CO1	Have basic idea about the fundamentals of GIS.	K2
CO2	Understand the types of data models..	K3
CO3	Get knowledge about data input and topology	K3
CO4	Gain knowledge on data quality and standards	K3
CO5	Understand data management functions and data output	K3

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	3	2	2	2									2	
CO2	3	2	2	1	1									3	
CO3	2	3	3	3	3								2	3	
CO4	2	1	2	3	2								1	2	
CO5	2	2	1	2	1								2	2	

AAI703 - IT IN AGRICULTURAL SYSTEM							
Programme &Branch	**B.TECH& AIDS**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
Prerequisites			**OE**	**3**	**0**	**0**	**3**

Preamble	➢ To introduce the students to areas of agricultural systems in which IT and computers play a major role. ➢ To also expose the students to IT applications in precision farming, environmental control systems, agricultural systems management and weather prediction models

UNIT I	**PRECISION FARMING**	**9**

Precision agriculture and agricultural management – Ground based sensors, Remote sensing, GPS, GIS and mapping software, Yield mapping systems, Crop production modeling.

UNIT II	**ENVIRONMENT CONTROL SYSTEMS**	**9**

Artificial light systems, management of crop growth in greenhouses, simulation of CO_2 consumption in greenhouses, on-line measurement of plant growth in the greenhouse, models of plant production and expert systems in horticulture.

UNIT III	**AGRICULTURAL SYSTEMS MANAGEMENT**	**9**

Agricultural systems - managerial overview, Reliability of agricultural systems, Simulation of crop growth and field operations, Optimizing the use of resources, Linear programming, Project scheduling, Artificial intelligence and decision support systems.

UNIT IV	**WEATHER PREDICTION MODELS**	**9**

Importance of climate variability and seasonal forecasting, Understanding and predicting world's climate system, Global climatic models and their potential for seasonal climate forecasting, General systems approach to applying seasonal climate forecasts.

UNIT V	**E-GOVERNANCE IN AGRICULTURAL SYSTEMS**	**9**

Expert systems, decision support systems, Agricultural and biological databases, e-commerce, business systems & applications, Technology enhanced learning systems and solutions, eLearning, Rural development and information society

Total:45 Periods

TEXTBOOK:

1. National Research Council, "Precision Agriculture in the 21st Century", National Academies Press, Canada, 1997.
2. H. Krug, Liebig, H.P. "International Symposium on Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation", 1989.

REFERENCES:

1. Peart, R.M., and Shoup, W. D., "Agricultural Systems Management", Marcel Dekker, New York, 2004.
2. Hammer, G.L., Nicholls, N., and Mitchell, C., "Applications of Seasonal Climate", Springer, Germany, 2000.

COURSEOUTCOMES: **Upon successful completion of the course the student will be able to**	**Bloom's Taxonomy**

		Level
CO1	The students shall be able to understand the applications of IT in remote sensing applications such as Drones etc	K1
CO2	The students will be able to get a clear understanding of how a greenhouse can be automated and its advantages.	K2
CO3	The students will be able to apply IT principles and concepts for management of field operations	K4
CO4	The students will get an understanding about weather models, their inputs and applications.	K1
CO5	The students will get an understanding of how IT can be used for e-governance in agriculture	K4

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	3	2	2	2								1	1	1
CO2	3	2	2	1	1								1	1	1
CO3	2	3	3	3	3								2	2	2
CO4	2	1	2	3	2								2	2	2
CO5	2	2	1	2	1								3	3	3