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

DEPARTMENT OF INFORMATION TECHNOLOGY

B.Tech INFORMATION TECHNOLOGY

AUTONOMOUS SYLLABUS

REGULATION 2024

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DEPARTMENT OF INFORMATION TECHNOLOGY

AUTONOMOUS CURRICULUM & SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

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 application for the betterment of humanity

MISSION

M1	To produce competent and disciplined high-quality professionals with the practical skills necessary to excel as innovative professionals and entrepreneurs for the benefit of the society.
M2	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.
M3	To provide excellent infrastructure, serene and stimulating environment that is most conducive to learning.
M4	To strive for productive partnership between the Industry and the Institute for research and development in the emerging fields and creating opportunities for employability.
M5	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

The department will be an excellent centre to impart futuristic and innovative technological education to facilitate the evolution of problem-solving skills along with knowledge application in the field of Information Technology, understanding industrial and global requirements and societal needs for the benefit of humanity.

MISSION

M1	Produce competent and high-quality professional computing graduates in software development considering global requirements and societal needs thereby maximizing employability
M2	Enhance evolution of professional skills and development of leadership traits among the students by providing favourable infrastructure and environment to grow into successful entrepreneurs.
M3	Training in multidisciplinary skills needed by industries, higher educational institutions, research establishments and Entrepreneurship.
M4	Impart human values and ethical responsibilities in professional activities.

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1	The graduates will use fundamental knowledge in science, mathematics and computing skills for creative and innovative application.
PEO 2	Graduates will be competent and employable by providing excellent infrastructure to learn and contribute for the welfare of the society.
PEO 3	Graduates will undertake research and higher education
PEO 4	Graduates will work in multidisciplinary setup and maximize job opportunities.
PEO 5	Graduates grow as professionals with values and integrity.

PROGRAM OUTCOMES

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO3	**Design/development of solutions**: 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
PO4	**Conduct investigations of complex problems**: 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.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: 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.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO9	**Individual Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** 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
PO11	**Project management and finance:** 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
PO12	**Life-long learning**: 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

PSO 1	Students are able to analyse, design, implement and test any software with the programming and testing skills they have acquired.
PSO 2	Students are able to design and develop algorithms for real time problems, scientific and business applications through analytical, logical and problem solving skills.
PSO 3	Students are able to provide security solutions for networks components and data storage and management which will enable them to work efficiently in the industry.

DEPARTMENT OF INFORMATION TECHNOLOGY

AUTONOMOUS CURRICULUM R2024 (CBCS)

S.No	Subject Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences including Management Courses(HSMC)	1	1	3	0	0	0	0	0	5
2	Basic Science Courses(BSC)	9	7	0	0	0	0	0	0	16
3	Engineering Science Courses(ESC)	5	10	0	0	0	0	0	0	15
4	Professional Core Courses(PCC)	3	3	10	15	5	10	5	0	51
5	Professional Elective Courses(PEC)	0	0	0	3	6	3	3	6	21
6	Open Electives(OE)	0	0	0	0	3	0	3	0	6
7	Employment Enhancement Courses(EEC)	1	1	1	1	1	1	7	13	26
8	Mandatory Courses(MC) - No Credit	EE, PE& HV	IC & LE	EV Eng	SS	0	0	0	0	0
	Total	19	22	14	19	15	16	18	19	140

DEPARTMENT OF INFORMATION TECHNOLOGY

CURRICULUM AND SYLLABI FOR SEMESTERS I TO VIII

SEMESTER – I

S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
1	AIP001	Induction Program		0	0	0				
THEORY										
2	AMA101	Matrices and Calculus	BS	3	1	0	4	40	60	100
3	APH101	Computational Physics	BS	3	0	0	3	40	60	100
4	ACS101	Principles of Programming	PC	3	0	0	3	40	60	100
5	ACS102	Python Programming	ES	3	0	0	3	40	60	100
6	AMC101	Employment Enhancement Skills	MC	3	0	0	3	40	60	100
7	AMC102	Professional Ethics and Human Values	MC	2	0	0	0	-	-	100
8	AHS101	Language Enhancement	HS	1	0	0	1	40	60	100
PRACTICALS										
9	APH301	Computational Physics Laboratory	BS	0	0	4	2	60	40	100
10	ACS301	Python Programming Laboratory	ES	0	0	4	2	60	40	100
11	AEEC301	Mini Project /Professional Practices	EEC	0	0	2	1	60	40	100
			Total	18	1	10	22			

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	AEC103	Basics of Electrical and Electronics Engineering	BS	3	0	0	3	40	60	100
3	AAI101	Introduction to Data Science	ES	3	0	0	3	40	60	100
4	ACS109	Computer Organization	PC	3	0	0	3	40	60	100
5	ACS104	Fundamentals of Cloud Computing	ES	3	0	0	3	40	60	100
6	AMC103	Indian Constitution	MC	2	0	0	0	-	-	100
PRACTICALS										
7	AEC302	Basic Electrical and Electronics Engineering Laboratory	ES	0	0	4	2	60	40	100
8	ACS302	Cloud Computing Laboratory	ES	0	0	4	2	60	40	100
9	AHS301	Communication Skills and Technical Writing	HS	0	0	2	1	60	40	100
10	AMC301	Yoga and Happy Living	MC	0	0	3	0	-	-	100
11	AEEC302	Mini Project / Professional Practices	EEC	0	0	2	1	60	40	100
			Total	17	1	15	22			

SEMESTER – III

S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	ACS105	Object Oriented Programming	PC	3	0	0	3	40	60	100
2	ACS106	Data Structures and Algorithms	PC	3	0	0	3	40	60	100
3	AMB152	Entrepreneurship and Innovation	PC	3	0	0	3	40	60	100
4	AMC108	Environmental Engineering and Sustainability	MC	2	0	0	0	-	-	100
PRACTICALS										
5	ACS303	Object Oriented Programming Laboratory	PC	0	0	4	2	60	40	100
6	ACS304	Data Structures and Algorithms Laboratory	PC	0	0	4	2	60	40	100
7	AHS302	Soft Skills I	HS	0	0	2	0	60	40	100
8	AEEC303	Mini Project /Professional Practices	EEC	0	0	2	1	60	40	100
			Total	11	0	10	14			

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	0	0	3	40	60	100
3	ACS109	Computer Networks	PC	3	0	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	AHS303	Soft Skills II	HS	0	0	2	0	60	40	100
9	AEEC304	Mini Project / Internship/Professional Practices	EEC	0	0	2	1	60	40	100
			Total	12	0	13	19			

SEMESTER – V

S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AIT101	Cryptography and Network Security	PC	3	0	0	3	40	60	100
2		Professional Elective 2	PE	3	0	2	3	40	60	100
3		Professional Elective 3	PE	3	0	0	3	40	60	100
4		Open Elective 1	OE	3	0	0	3	40	60	100
PRACTICALS										
5	AIT301	Cryptography and Network Security Laboratory	PC	0	0	4	2	60	40	100
6	AEEC305	Mini Project/Professional Practices	EEC	0	0	2	1	60	40	100
			Total	12	0	8	15			

SEMESTER – VI

S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AIT102	Full Stack Web Development	PC	3	0	0	3	40	60	100
2	AIT103	Object Oriented Software Engineering	PC	3	0	0	3	40	60	100
3		Professional Elective 4	PE	3	0	0	3	40	60	100
PRACTICALS										
4	AIT302	Full Stack Web Development Laboratory	PC	0	0	4	2	60	40	100
5	AIT303	Object Oriented Software Engineering Laboratory	PC	0	0	4	2	60	40	100
6	AEEC306	Mini Project / Professional Practices /Internship	EEC	0	0	2	1	60	40	100
			Total	9	0	8	14			

SEMESTER – VII

S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AAI102	Artificial Intelligence & Machine Learning	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										
4	AAI301	Artificial Intelligence & Machine Learning Laboratory	PC	0	0	4	2	60	40	100
5	AIT304	Project I	EEC	0	0	12	6	60	40	100
6	AEEC307	Internship/Professional Practices	EEC	0	0	2	1	60	40	100
			Total	9	0	17	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	AIT305	Project II	EEC	0	0	24	12	60	40	100
4	AEEC308	Internship/Professional Practices	EEC	0	0	2	1	60	40	100
			Total	6	0	26	19			

PROFESSIONAL ELECTIVES

VERTICAL - I - Data Science

S.No	Course Code	Course Title	Periods			Total Contact Periods	Credits
			L	T	P		
1	AIT501	Big Data Analytics	3	0	0	3	3
2	AIT502	Information Security Management	3	0	0	3	3
3	AAI501	Data Visualization	3	0	0	3	3
4	AIT503	Exploratory Data Analysis	3	0	0	3	3
5	AMB118	Business Analytics	3	0	0	3	3
6	AIT504	Information Retrieval System	3	0	0	3	3

VERTICAL - II- Full Stack Development for IT

S.No	Course Code	Course Title	Periods			Total Contact Periods	Credits
			L	T	P		
1	AIT505	Web Application Security	3	0	0	3	3
2	AIT506	Software Testing and Automation	3	0	0	3	3
3	AIT507	DevOps	3	0	0	3	3
4	AIT508	UI and UX Design	3	0	0	3	3
5	AIT509	Cloud Services Management	3	0	0	3	3
6	AIT510	App Development	3	0	0	3	3

VERTICAL - III- Cloud Computing and Data Center Technologies

S.No	Course Code	Course Title	Periods			Total Contact Periods	Credits
			L	T	P		
1	AAI106	Data Mining and Warehousing	3	0	0	3	3
2	AIT511	Storage Technologies	3	0	0	3	3
3	AIT512	Software Defined Networks	3	0	0	3	3
4	AIT513	Internet of Things	3	0	0	3	3
5	AIT514	Security and Privacy in Cloud	3	0	0	3	3
6	AIT515	Stream Processing	3	0	0	3	3

VERTICAL - IV- Cyber Security and Data Privacy

S.No	Course Code	Course Title	Periods			Total Contact Periods	Credits
			L	T	P		
1	AIT516	Engineering Secure Software Systems	3	0	0	3	3
2	AIT517	Digital and Mobile Forensics	3	0	0	3	3
3	AIT518	Ethical Hacking	3	0	0	3	3
4	AIT519	Blockchain Technology	3	0	0	3	3
5	AIT520	Social Network Security	3	0	0	3	3
6	AIT521	Cyber Security	3	0	0	3	3

VERTICAL - V -Creative Media

S.No	Course Code	Course Title	Periods			Total Contact Periods	Credits
			L	T	P		
1	AIT522	Multimedia and Animation	3	0	0	3	3
2	AIT523	Augmented Reality/Virtual Reality	3	0	0	3	3
3	AIT524	Digital Marketing	3	0	0	3	3
4	AIT525	Game Development	3	0	0	3	3
5	AIT526	Visual Effects	3	0	0	3	3
6	AIT527	Computer Vision	3	0	0	3	3

VERTICAL - VI- Emerging Technologies

S.No	Course Code	Course Title	Periods			Total Contact Periods	Credits
			L	T	P		
1	AIT528	Quantum Computing	3	0	0	3	3
2	AIT529	Evolutionary Algorithms	3	0	0	3	3
3	AIT530	Brain Computer Interface	3	0	0	3	3
4	AIT531	Data Augmentation and Virtual Reality	3	0	0	3	3
5	AIT532	Nature Language Understanding	3	0	0	3	3
6	AIT533	Computational Neuroscience	3	0	0	3	3

VERTICAL - VII- Artificial Intelligence and Machine Learning							
S.No	**Course Code**	**Course Title**	**Periods**			**Total Contact Periods**	**Credits**
			L	**T**	**P**		
1	AIT534	Cognitive Science	3	0	0	3	3
2	AIT535	AI Techniques for Game Development	3	0	0	3	3
3	AIT536	Soft Computing	3	0	0	3	3
4	AIT537	Neural Networks and Deep learning	3	0	0	3	3
5	AIT538	Optimization Techniques	3	0	0	3	3
6	AIT539	Reinforcement learning	3	0	0	3	3

OPEN ELECTIVE

OPEN ELECTIVE										
S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AME701	Drone Technologies	OE	3	0	0	3	40	60	100
2	AME702	Additive Manufacturing	OE	3	0	0	3	40	60	100
3	AME703	Electric and Hybrid Vehicle Technology	OE	3	0	0	3	40	60	100
4	AEC701	Sensors and Actuators	OE	3	0	0	3	40	60	100
5	AEC702	Applied Design Thinking	OE	3	0	0	3	40	60	100
6	AEC703	Project Report Writing	OE	3	0	0	3	40	60	100
7	AMB701	Corporate Governance	OE	3	0	0	3	40	60	100
8	AMB702	Digital Marketing	OE	3	0	0	3	40	60	100
9	AMB703	Rural Marketing	OE	3	0	0	3	40	60	100
10	ACS701	System Engineering	OE	3	0	0	3	40	60	100
11	ACS702	Green Computing	OE	3	0	0	3	40	60	100
12	ACS703	Fintech Regulation	OE	3	0	0	3	40	60	100
13	AIT701	Network Essentials	OE	3	0	0	3	40	60	100
14	AIT702	Soft Computing Methodologies	OE	3	0	0	3	40	60	100
15	AIT703	Knowledge Engineering	OE	3	0	0	3	40	60	100
16	ACB701	Business Research Methods	OE	3	0	0	3	40	60	100
17	ACB702	Automation Testing Tools	OE	3	0	0	3	40	60	100
18	ACB703	Social Network Analysis	OE	3	0	0	3	40	60	100
19	AAI701	Drinking Water Supply and Treatment	OE	3	0	0	3	40	60	100
20	AAI702	Geographical Information System	OE	3	0	0	3	40	60	100
21	AAI703	IT in Agricultural System	OE	3	0	0	3	40	60	100

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DEPARTMENT OF INFORMATION TECHNOLOGY

AUTONOMOUS CURRICULUM & SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEMESTER I

AMA101 - MATRICES AND CALCULUS							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**BS**	**3**	**1**	**0**	**4**
Preamble	➢ Introduce the matrix techniques and to explain the nature of the matrix. ➢ Provide the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in Engineering and Technology. ➢ Familiarize the students with differential calculus. ➢ Understand techniques of calculus which are applied in the Engineering problems. ➢ Acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications						
Unit 1	**MATRICES**						**9+3**
Matrices - Eigen values and eigenvectors - Diagonalization of matrices using orthogonal transformation – Cayley Hamilton Theorem (without proof) - Quadratic forms - Reduction to canonical form using orthogonal transformation							
Unit 2	**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 3	**DIFFERENTIAL CALCULUS**						**9+3**
Limit of a function-Continuity-Derivatives-Differentiation rules (sum, product, quotient, chain rules)-Implicit Differentiation-Logarithmic Differentiation-Applications: Maximum and Minimum of functions of one variable							
Unit 4	**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 5	**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, 2001.
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: **At the end of the course, learners will be able to**		**Bloom's Taxonomy 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

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

APH101 - COMPUTATIONAL PHYSICS							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**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 nano materials						

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

CO1	Understand clearly of semiconductor physics and functioning of semiconductor devices.	K2
CO2	Solution of differential equations to understand the 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

CP/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	-	-	-

ACS101 PRINCIPLES OF PROGRAMMING							
Programme & Branch	**B.Tech & IT**	**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	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

CP/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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 & IT**	**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 Namdev Kamthane, Amit Ashok Kamthane "Programming and Problem Solving with Python" , 2nd edition , Mc Graw Hill
2	Dr.R.Nageswara Rao, "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

CP/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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 & IT**	**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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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

AMC102 - PROFESSIONAL ETHICS AND HUMAN VALUES							
Programme & Branch	**B.Tech & IT**	**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.						

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

APH301 COMPUTATIONAL PHYSICS LAB							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**BS**	**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.	K4

CO3	Use mathematical models as a medium for quantitative reasoning and describing physical reality.	K2
CO4	Access, process and analyze scientific information.	K4
CO5	Solve problems individually and collaborative.	K3

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

ACS301 - PYTHON PROGRAMMING LABORATORY

Programme & Branch	**B.Tech & IT**	**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

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

AHS301 - COMMUNICATION SKILLS AND TECHNICAL WRITING							
Programme & Branch	**B.Tech & IT**	**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

DEPARTMENT OF INFORMATION TECHNOLOGY

AUTONOMOUS CURRICULUM & SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEMESTER II

AMA102 DISCRETE MATHEMATICS							
Programme & Branch	**B.Tech & IT**	**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	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	https://home.iitk.ac.in/~arlal/book/mth202.pdf
4	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

CO/PO	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	-	-

AEC103 - BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**BS**	**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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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

AAI101 - INTRODUCTION TO DATA SCIENCE

Programme & Branch	B.Tech & IT	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 – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model–presenting findings and building applications - Data Mining - Data Warehousing – Basic Statistical descriptions of Data

Unit 2	DESCRIBING DATA	9

Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores

Unit 3	DESCRIBING RELATIONSHIPS	9

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error 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, Boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – 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 Base map - Visualization with Sea born.

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

CP/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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

ACS109 - COMPUTER ORGANIZATION

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

Preamble	➢ To identify the functional units in a digital computer system. ➢ To distinguish between the various ISA styles. ➢ To trace the execution sequence of an instruction through the processor. ➢ To evaluate different computer systems based on performance metrics. ➢ To understand the fundamentals of memory and I/O systems and their interface with the processor

Unit 1	FUNDAMENTALS OF COMPUTER SYSTEMS	9

Functional Units of a Digital Computer – Operation and Operands of Computer Hardware – Software Interface – Translation from a High Level Language to Machine Language – Instruction Set Architecture – RISC and CISC Architectures – Addressing Modes – Performance Metrics – Power Law – Amdahl's Law.

Unit 2	ARITHMETIC FOR COMPUTERS	9

Addition and Subtraction – Fast Adders – Multiplication: Booths Algorithm, Bit Pair Recoding – Division: Restoring and Non-Restoring – Floating Point Numbers: Single and Double Precision – Arithmetic Operations – ALU Design.

Unit 3	PROCESSOR	9

Design Convention of a Processor – Building a MIPS Datapath and designing a Control Unit – Execution of a Complete Instruction – Hardwired and Micro programmed Control – Introduction to Multicore – Graphics Processing Units- Case study: NVIDIA GPU

Unit 4	MEMORY AND I/O	9

Types of Memories – Need for a hierarchical memory system –Cache memories– Memory Mapping –

Improving Cache Performance – Virtual Memory – Memory Management Techniques – Accessing I/O devices – Programmed Input/output – Interrupts – Direct Memory Access.		
Unit 5	**PARALLEL ARCHITECTURE**	**9**
Exploitation of more ILP –Dynamic Scheduling: Tomasulo's Algorithm –Array Processor- Vector Processor – Basic Concepts of Pipelining – Pipelined Implementation of Datapath and Control Unit – Hazards – Structural, Data and Control Hazards–Overview of Next Generation Processors.		
		TOTAL: 45

TEXTBOOKS	
1	David A. Patterson, John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fifth Edition, Morgan Kaufmann/Elsevier, 2013.
2	Carl Hamacher, ZvonkoVranesic, SafwatZaky, NaraigManjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.
REFERENCES	
1	William Stallings, "Computer Organization and Architecture – Designing forPerformance", Tenth Edition, Pearson Education, 2016.
2	John L. Hennessey, David A. Patterson, "Computer Architecture – A QuantitativeApproach", Morgan Kaufmann / Elsevier Publishers, Fourth Edition, 2007.
3	V.P. Heuring, H.F. Jordan, "Computer Systems Design and Architecture", SecondEdition, Pearson Education, 2004.
4	Douglas E. Comer, "Essentials of Computer Architecture", Sixth Edition, Pearson Education, 2012

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Interpret assembly language instructions.	K2
CO2	Design the ALU circuits.	K3
CO3	Implement a control unit as per the functional specification.	K3
CO4	Analyze memory, I/O devices and cache structures for processor.	K3
CO5	Evaluate the performance of computer systems.	K5

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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

ACS104 - FUNDAMENTALS OF CLOUD COMPUTING

Programme & Branch	B.Tech & IT	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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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

AMC103 - INDIAN CONSTITUTION							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		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

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

AHS101 - தமிழர்மரபு

Programme & Branch	**B.Tech & IT**	**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.)	

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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

AHS101 -HERITAGE OF TAMILS							
Programme & Branch	**B.Tech & IT**	**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.)

AEC302 - BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

Programme & Branch	B.Tech & IT	Sem.	Category	L	T	P	C
		2	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

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
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

ACS302 CLOUD COMPUTING LABORATORY

Programme & Branch	**B.Tech & IT**	**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	K4
CO2	Apply the Virtualization for real-world applications	K3
CO3	Install & Configure the different VM platforms	K2

CO4	Experiment with the VM with various software	K4
CO5	Develop and deploy services on the cloud and setup a cloud environment	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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

DEPARTMENT OF INFORMATION TECHNOLOGY

AUTONOMOUS CURRICULUM & SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEMESTER III

ACS108 DATABASE MANAGEMENT SYSTEMS							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**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 1	**RELATIONAL DATABASES**						**9**
Purpose of Database System – Views of data – Data Models – Database System Architecture –							

Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL		
Unit 2	**DATABASE DESIGN**	**9**
Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form		
Unit 3	**TRANSACTIONS**	**9**
Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control –Two Phase Locking- Timestamp – Multiversion – Validation and Snapshot isolation– Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm		
Unit 4	**IMPLEMENTATION TECHNIQUES**	**9**
RAID – File Organization – Organization of Records in Files – Data dictionary Storage – Column Oriented Storage– Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for Selection, Sorting and join operations – Query optimization using Heuristics - Cost Estimation.		
Unit 5	**ADVANCED TOPICS**	**9**
Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL		
		TOTAL: 45

TEXTBOOKS	
1	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
2	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017
REFERENCES	
1	C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Construct SQL Queries using relational algebra	K2
CO2	Design database using ER model and normalize the database	K3
CO3	Construct queries to handle transaction processing and maintain consistency of the database	K2
CO4	Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database	K4
CO5	Appraise how advanced databases differ from Relational Databases and find a suitable database for the given requirement.	K4

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

ACS106 DATA STRUCTURES AND ALGORITHMS

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

Preamble	➢ To understand the concepts of ADTs ➢ To design linear data structures – lists, stacks, and queues ➢ To understand sorting, searching, and hashing algorithms ➢ To apply Tree and Graph structures

Unit 1	ABSTRACT DATA TYPES	9

Abstract Data Types (ADTs) – ADTs and classes – introduction to OOP – classes in Python – inheritance – namespaces – shallow and deep copying. Introduction to analysis of algorithms – asymptotic notations – divide & conquer – recursion – analyzing recursive algorithms

Unit 2	LINEAR STRUCTURES	9

List ADT – array-based implementations – linked list implementations – singly linked lists – circularly linked lists – doubly linked lists – Stack ADT – Queue ADT – double ended queues – applications

Unit 3	SORTING AND SEARCHING	9

Bubble sort – selection sort – insertion sort – merge sort – quick sort – analysis of sorting algorithms – linear search – binary search – hashing – hash functions – collision handling – load factors, rehashing, and efficiency

Unit 4	TREE STRUCTURES	9

Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – multi-way search trees

Unit 5	GRAPH STRUCTURES	9

Graph ADT – representations of graph – graph traversals – DAG – topological ordering – greedy algorithms – dynamic programming – shortest paths – minimum spanning trees – introduction to complexity classes and intractability

TOTAL: 45

TEXTBOOKS

1	Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", An Indian Adaptation, John Wiley & Sons Inc., 2021

REFERENCES

1	Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015

2	Rance D. Necaise, “Data Structures and Algorithms Using Python”, John Wiley & Sons, 2011
3	Aho, Hopcroft, and Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
4	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, “Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
5	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Fourth Edition, Pearson Education, 2014

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Explain abstract data types	K2
CO2	Design, implement, and analyze linear data structures, such as lists, queues, and stacks,	K3
CO3	Design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting	K3
CO4	Model problems as graph problems and implement efficient graph algorithms to solve them	K3
CO5	Analyze the given scenario and choose appropriate data structures for solving problems	K3

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

AMB152 ENTREPRENEURSHIP AND INNOVATION							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ Entrepreneurs are the innovators that stimulate job growth, economic						

	growth and development that allows any country to compete with and in the global economy. India, being far more developed and forward-looking country than some of the third world countries, can provide lead to entrepreneurial development activities. ➢ The purpose of exposing the students to Entrepreneurship is to motivate them to look at entrepreneurship as a viable, lucrative and preferred career. ➢ Entrepreneurs require a foundation in several key areas in order to be successful. This course will focus on multiple topics including: opportunities and challenges for new ventures, benefits/drawbacks of entrepreneurship, strategic management and forms of business ownership, marketing strategies, venture finance and human resource management.	
Unit 1	**INTRODUCTION TO ENTREPRENEURSHIP**	**9**
Meaning, Definition and concept of Enterprise, Entrepreneurship and Entrepreneurship Development, Evolution of Entrepreneurship, Theories of Entrepreneurship. Characteristics and Skills of Entrepreneurship, Concepts of Entrepreneurship, Emerging trends: Internet & E-commerce, Corporate Entrepreneurship – Nature, Concepts and Sustainability		
Unit 2	**ENTREPRENEURIAL COMPETENCY**	**9**
Meaning and concept of Entrepreneurial Competency, Developing Entrepreneurial Competencies, Entrepreneurial Motivation: Meaning and concept of Motivation, Entrepreneurship Development Program: Needs and Objectives of EDPs, Phases of EDPs, Evaluation of EDPs**.** Negotiations		
Unit 3	**GOVERNMENT INITIATIVES**	**9**
Role of Government in promoting Entrepreneurship, MSME policy in India, Agencies for Policy Formulation and Implementation: DIC, SISI, EDII, NEDB, Financial Support System: Forms of Financial support, Sources of Financial support, Development Financial Institutions**.**		
Unit 4	**INNOVATION & PROJECT MANAGEMENT**	**9**
Design Thinking, Business Design, The Adoption of Innovations, Idea Management. Project Management: Concept, Features, Classification of projects, Issues in Project Management, Project Identification, Project Formulation, Project Design and Network Analysis, Project Evaluation, Project Appraisal, Project Report Preparation, Specimen of a Project Report**.**		
Unit 5	**FORMS OF BUSINESS OWNERSHIP**	**9**
Forms of Business Ownership, Issues in selecting forms of ownership, Environmental Analysis, identifying problems and opportunities, Defining Business Idea, Business Plan, Business Process, Women Entrepreneurship, Family Business.		
		TOTAL: 45
TEXTBOOKS		
1	Khanna, S. S., Entrepreneurial Development, S. Chand, New Delhi.2020	
2	Kuratko, F. Donald, Richard M. Hodgetts, Entrepreneurship: Theory, Process, Practice, Thomson, 7ed,2020	
REFERENCES		
1	Entrepreneurship: Strategies and Resources, 3/E -: Marc Dollinger; Prentice Hall, 2017	
2	Bringing New Technology to Market- Kathleen R. Allen, Prentice Hall, 2020	

3	Entrepreneurship in Action, 2/E - Mary Coulter; Prentice Hall, 2021

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Have the ability to discern distinct entrepreneurial traits.	K3
CO2	Know the parameters to assess opportunities and constraints	K2
CO3	Understand the systematic process to select and screen a business idea	K2
CO4	Design strategies for successful implementation of ideas	K3
CO5	Analyze the way for write a business plan.	K4

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

AMC108 ENVIRONMENTAL ENGINEERING AND SUSTAINABILITY							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**BS**	**3**	**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 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 economical 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.
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.

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.	K3
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.	K3
CO4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K3
CO5	To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.	K3

CO/PO	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

ACS306 DATABASE MANAGEMENT SYSTEMS LABORATORY

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

Preamble

- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To be familiar with the use of a front end tool for GUI based application development.

LIST OF 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

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Create databases with different types of key constraints.	K1
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.	K3
CO4	Create an XML database and validate with meta-data (XML schema).	K3
CO5	Create and manipulate data using NOSQL database.	K3

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

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

ACS304 DATA STRUCTURES AND ALGORITHMS LABORATORY							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**PC**	**0**	**0**	**4**	**2**
Preamble	➢ To implement ADTs in Python ➢ To design and implement linear data structures – lists, stacks, and queues ➢ To implement sorting, searching and hashing algorithms ➢ To solve problems using tree and graph structures						
1. Implement simple ADTs as Python classes							
2. Implement recursive algorithms in Python							
3. Implement List ADT using Python arrays							
4. Linked list implementations of List							
5. Implementation of Stack and Queue ADTs							
6. Applications of List, Stack and Queue ADTs							
7. Implementation of sorting and searching algorithms							
8. Implementation of Hash tables							
9. Tree representation and traversal algorithms							
10. Implementation of Binary Search Trees							
11. Implementation of Heaps							
12. Graph representation and Traversal algorithms							
13. Implementation of single source shortest path algorithm							
14. Implementation of minimum spanning tree algorithms							
							TOTAL: 60

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Implement ADTs as Python classes	K3
CO2	Design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications	K4
CO3	Design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting	K4
CO4	Model problems as graph problems and implement efficient graph algorithms to solve them	K3

CO5	Analyze the given scenario and choose appropriate data structures for solving problems	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	3	1	2	1	2	1
CO2	3	3	2	-	1	-	-	-	2	3	1	2	2	2	1
CO3	2	2	2	1	1	-	-	-	2	3	1	2	1	3	1
CO4	3	1	2	1	1	-	-	-	2	3	1	2	1	3	1
CO5	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-

AHS302 SOFT SKILLS I (COMPREHENSIVE SOFT SKILLS DEVELOPMENT)							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**HS**	**0**	**0**	**2**	**0**
Preamble							
Unit 1	**FOUNDATIONS OF COMMUNICATION SKILLS**						**8**
o Introduction to Communication Skills o Understanding the Communicative Environment o Active Listening Skills o Effective Speaking Techniques o Initiating and Sustaining Conversations							
Unit 2	**ADVANCED COMMUNICATION TECHNIQUES**						**8**
o Presentation Skills – Structuring Content o Using Multimedia in Presentations o Understanding Communication Styles o Group Communication and Dynamics							
Unit 3	**CRITICAL THINKING AND COMMUNICATION**						**8**
o Introduction to Critical Thinking o Analyzing Arguments and Information o Constructing Clear and Persuasive Arguments o Problem-Solving and Decision-Making o Interactive Exercises and Case Studies							
Unit 4	**EMOTIONAL INTELLIGENCE IN COMMUNICATION**						**8**
o Introduction to Emotional Intelligence (EI) . o Self-Awareness and Self-Regulation Empathy and Social Skills o Managing Stress and Emotions in Communication. o Practical Exercises in EI							
Unit 5	**INTEGRATING SOFT SKILLS FOR EFFECTIVE**						**8**

	COMMUNICATION	
	○ 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	

DEPARTMENT OF INFORMATION TECHNOLOGY

AUTONOMOUS CURRICULUM & SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEMESTER IV

ACS107 OPERATING SYSTEMS							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		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 1	**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 2	**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 3	**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 4	**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 5	**VIRTUAL MACHINES AND MOBILE OS**	**7**
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: 45

TEXTBOOKS	
1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts” , 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: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Analyze various scheduling algorithms and process synchronization.	K4
CO2	Explain deadlock prevention and avoidance algorithms.	K2
CO3	Compare and contrast various memory management schemes.	K2
CO4	Explain the functionality of file systems, I/O systems, and Virtualization	K2

CO5	Compare iOS and Android Operating Systems.	K2

CO/PO	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	-	-	-

ACS105 OBJECT ORIENTED PROGRAMMING							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ To learn the basics of Object-Oriented Programming ➢ To know the principles of inheritance and polymorphism ➢ To learn the concepts of generic methods and generic collections.						
Unit 1	**INTRODUCTION**						**9**
Principles of OOP: Classes – Objects – Data hiding – Data encapsulation – Inheritance – Polymorphism; Definition of Classes: Objects – Methods – Access specifiers – Static and final classes and members; Object Construction and Destruction – Fundamental programming structures in Java; Streams: Input–Output, String handling – Examples in Java.							
Unit 2	**INHERITANCE**						**9**
Inheritance: Definition – Types of inheritance: Single – Multilevel – Multiple – Hierarchical; Subclass constructors – Interfaces in Java: Definition – Implementation – Extending interfaces – Inheritance versus delegation – Inheritance rules – Inner classes – Examples in Java.							
Unit 3	**POLYMORPHISM AND EXCEPTION HANDLING**						**9**
Polymorphism: Method overloading and overriding – Dynamic method dispatch; Exceptions: Hierarchy – Built-in exceptions – Creating own exception; Packages in Java – Examples in Java.							
Unit 4	**GENERIC TYPES AND METHODS**						**9**
Definition and concepts: Generic classes and generic methods – Generic types – Restrictions and limitations – Inheritance rules for generic types – Reflections – Examples in Java.							
Unit 5	**GENERIC COLLECTIONS FOR ADTS AND ALGORITHMS**						**9**
Introduction to collections – Collection Classes and Interfaces: Array list – Linked list – Queue – Set – Trees; Iterators for collections – Map class – Collection algorithms: Sorting – Searching – User-defined algorithms – Examples in Java.							
							TOTAL: 45
TEXTBOOKS							
1	Danny Poo, Derek Kiong, Swarnalatha Ashok, "Object-Oriented Programming and Java", 2nd Edition, Springer Publication, 2008.						

2	Herbert Schildt, "Java: The Complete Reference", 8th Edition, McGraw Hill Education, 2011.
REFERENCES	
1	Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
2	C Thomas Wu, "An introduction to Object-oriented programming with Java", 4th Edition, Tata McGraw-Hill Publishing company Ltd., 2006.
3	Cay S Horstmann, Gary Cornell, "Core Java Volume – I Fundamentals", 9th Edition, Prentice Hall, 2013.
4	Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
5	Steven Holzner, "Java 2 Black book", Dreamtech press, 2011.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Use classes and objects for problem solving.	K3
CO2	Develop programs using inheritance and interfaces	K3
CO3	Apply the concepts of polymorphism and exception handling	K3
CO4	Build applications using generic programming	K3
CO5	Apply the concepts of generic collections	K3

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

ACS109 COMPUTER NETWORKS

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**PC**	**3**	**0**	**0**	**3**

Preamble	➢ To understand the protocol layering and physical level communication. ➢ To analyze the performance of a network. ➢ To understand the various components required to build different networks. ➢ To learn the functions of network layer and the various routing protocols. ➢ To familiarize the functions and protocols of the Transport layer.

Unit 1	**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 2	**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 3	**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 4	**TRANSPORT LAYER**	**9**
Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.		
Unit 5	**APPLICATION LAYER**	**9**
WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.		
		TOTAL:45

TEXTBOOKS	
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: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the basic layers and its functions in computer networks.	K2
CO2	Evaluate the performance of a network.	K3
CO3	Understand the basics of how data flows from one node to another.	K2
CO4	Analyze and design routing algorithms.	K4
CO5	Design protocols for various functions in the network.	K3
CO6	Understand the working of various application layer protocols.	K2

CO/PO	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 & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**PC**	**0**	**0**	**3**	**2**
Preamble	➢ To install windows operating systems. ➢ To understand the basics of Unix command and shell programming. ➢ To implement various CPU scheduling algorithms. ➢ To implement Deadlock Avoidance and Deadlock Detection Algorithms ➢ To implement Page Replacement Algorithms ➢ To implement various memory allocation methods. ➢ To be familiar with File Organization and File Allocation Strategies.						
LIST OF 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							
10. 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: 45
COURSEOUTCOMES: **At the end of the course, learners will be able to**							**Bloom's Taxonomy Level**

CO1	Define and implement UNIX Commands.	K1
CO2	Compare the performance of various CPU Scheduling Algorithms.	K2
CO3	Compare and contrast various Memory Allocation Methods.	K2
CO4	Define File Organization and File Allocation Strategies.	K1
CO5	Implement various Disk Scheduling Algorithms.	K3

CO/PO	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

ACS303 OBJECT ORIENTED PROGRAMMING LABORATORY

Programme & Branch	B.Tech & IT	Sem.	Category	L	T	P	C
		4	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 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 with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. 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(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method 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

COURSEOUTCOMES: 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	K2
CO3	Implement multithreading, and generics concepts.	K3
CO4	Create GUIs and event driven programming applications for real world problems	K3
CO5	Implement and deploy web applications using Java	K4

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

ACS307	**COMPUTER NETWORKS LABORATORY**						
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		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 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

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Device various protocols using TCP and UDP.	K2
CO2	Compare the performance of different transport layerprotocols.	K2
CO3	Use simulation tools to analyze the performance of various network protocols.	K3
CO4	Analyze various routing algorithms.	K4
CO5	Implement error correction codes.	K4

CO/PO	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 (SKILL ENHANCEMENT COURSE)							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		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 1	**FOUNDATIONS OF PERSONAL DEVELOPMENT**	**8**
Attitude and Motivation-Significance –Positive and Negative Attitude Attitude-Advantages and Disadvantages of		

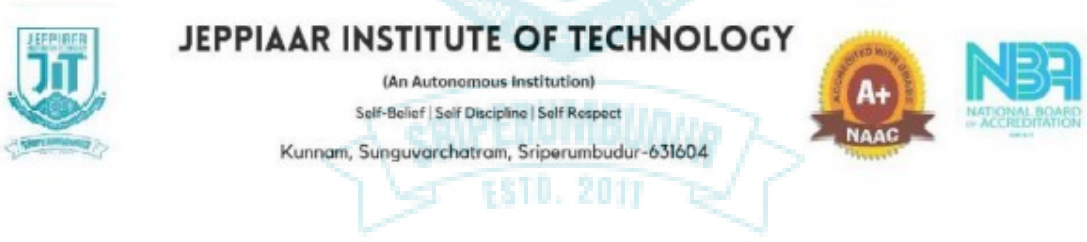
Attitude- Relationship between Attitude and Motivation- Concept, Significance and Importance of Self Motivation- De-motivation-Factors Affecting Motivation in Learning-Self and Identity-Distinction between Self- Respect and Ego-Transforming Ego to Self-Respect-Indian Perspective in Personality Development.		
Unit 2	**PERSONALITY DEVELOPMENT**	**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 3	**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 4	**ETIQUETTE AND GROOMING**	**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 5	**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: 40

RECOMMENDED BOOKS

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 Workbook 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	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	K2

	module is on the lines of the ‘finishing schools’.	



DEPARTMENT OF INFORMATION TECHNOLOGY

AUTONOMOUS CURRICULUM & SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEMESTER V

AIT101 CRYPTOGRAPHY AND NETWORK SECURITY							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		5	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ To understand Cryptography Theories, Algorithms and Systems. ➢ To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.						
Unit 1	**INTRODUCTION**						**9**
Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography).- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.							
Unit 2	**SYMMETRIC CRYPTOGRAPHY**						**9**

Mathematics of symmetric key cryptography: Algebraic structures - Modular arithmetic-Euclid‟s algorithm- Congruence and matrices - Groups, Rings, Fields-Finite fields- SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution.		
Unit 3	**PUBLIC KEY CRYPTOGRAPHY**	**9**
Mathematics of asymmetric key cryptography: Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.		
Unit 4	**MESSAGE AUTHENTICATION AND INTEGRITY**	**9**
Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509		
Unit 5	**SECURITY PRACTICE AND SYSTEM SECURITY**	**9**
Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.		
		Total: 45

TEXTBOOKS	
1	William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.

REFERENCES	
1	C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd
2	BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3	Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities	K2
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms	K3
CO3	Apply the different cryptographic operations of public key cryptography	K3
CO4	Apply the various Authentication schemes to simulate different applications.	K3

CO5	Understand various Security practices and System security standards	K2

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

AIT301 CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

Programme & Branch	B.Tech & IT	Sem.	Category	L	T	P	C
		5	PC	0	0	4	2

Preamble	➢ To learn the fundamentals of cryptography. ➢ To learn the key management techniques and authentication approaches. ➢ To explore the network and transport layer security techniques. ➢ To understand the application layer security standards. ➢ To learn the real time security practices

LIST OF EXPERIMENTS

1.	Implement symmetric key algorithms
2.	Implement asymmetric key algorithms and key exchange algorithms
3.	Implement digital signature schemes
4.	Installation of Wire shark, tcpdump and observe data transferred in client-server communication using UDP/TCP and identify the UDP/TCP datagram.
5.	Check message integrity and confidentiality using SSL
6.	Experiment Eavesdropping, Dictionary attacks, MITM attacks
7.	Experiment with Sniff Traffic using ARP Poisoning
8.	Demonstrate intrusion detection system using any tool.
9.	Explore network monitoring tools
10.	Study to configure Firewall, VPN

TOTAL: 60

COURSEOUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Classify the encryption techniques	K2

CO2	Illustrate the key management technique and authentication.	K3
CO3	Evaluate the security techniques applied to network and transport layer	K4
CO4	Discuss the application layer security standards.	K3
CO5	Apply security practices for real time applications	K3

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

DEPARTMENT OF INFORMATION TECHNOLOGY

AUTONOMOUS CURRICULUM & SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEMESTER VI

AIT102 FULL STACK WEB DEVELOPMENT							
Programme & Branch	**B.Tech & IT**	**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 1	**BASICS OF FULL STACK**						**9**
Introduction to big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data applications– big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.							
Unit 2	**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 3	**MONGO DB**						**9**

Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications.		
Unit 4	**EXPRESS AND ANGULAR**	**9**
Implementing Express in Node.js - Configuring routes - Using Request and Response objects - Angular - Typescript - Angular Components - Expressions - Data binding - Built-in directives		
Unit 5	**REACT**	**9**
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	MERN STACK – Basic React applications – React Components – React State – Express REST APIs - Modularization and Webpack - Routing with React Router – Server-side rendering
2	Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.
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
3	https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
4	https://www.coursera.org/specializations/full-stack-react
5	https://www.udemy.com/course/the-full-stack-web-development/

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	K2
CO2	Use Node.js for application development	K3
CO3	Develop applications with MongoDB	K3
CO4	Use the features of Angular and Express	K3
CO5	Develop React applications	K3

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

AIT103 OBJECT ORIENTED SOFTWARE ENGINEERING							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		6	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ To understand Software Engineering Lifecycle Models ➢ To Perform software requirements analysis ➢ To gain knowledge of the System Analysis and Design concepts using UML. ➢ To understand software testing and maintenance approaches ➢ To work on project management scheduling using DevOps						
Unit 1	**SOFTWARE PROCESS AND AGILE DEVELOPMENT**						**9**
Introduction to Software Engineering- Software Process, Perspective and Specialized Process Models – Introduction to Agility-Agile process-Extreme programming-XP Process-Case Study.							
Unit 2	**REQUIREMENTS ANALYSIS AND SPECIFICATION**						**9**
Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modeling – Data Flow Diagram- CASE TOOLS.							
Unit 3	**SOFTWARE DESIGN**						**9**
Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles – Layered - Client Server - Tiered - Pipe and filter- User interface design-Case Study							
Unit 4	**SOFTWARE TESTING AND MAINTENANCE**						**9**
Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking- Case Study							
Unit 5	**PROJECT MANAGEMENT**						**9**
Software Project Management- Software Configuration Management - Project Scheduling- DevOps: Motivation-Cloud as a platform-Operations- Deployment Pipeline:Overall Architecture Building and Testing-Deployment- Tools- Case Study							
							TOTAL: 45

TEXTBOOKS	
1	Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", Third Edition, Pearson Education, 2009.
2	Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014.
REFERENCES	
1	Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.
2	Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.

3	Len Bass, Ingo Weber and Liming Zhu, ―DevOps: A Software Architect‘s Perspective‖, Pearson Education, 2016
4	Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd., 2009.
5	Stephen Schach, Object-Oriented and Classical Software Engineering, 8th ed, McGraw- Hill, 2010.

COURSEOUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Compare various Software Development Lifecycle Models	K2
CO2	Evaluate project management approaches as well as cost and schedule estimation strategies.	K4
CO3	Perform formal analysis on specifications.	K3
CO4	Use UML diagrams for analysis and design.	K3
CO5	Architect and design using architectural styles and design patterns, and test the system.	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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

AIT302 FULL STACK WEB DEVELOPMENT LABORATORY

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		6	**PC**	**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	
The Instructor can choose the technology stack to develop the following full stack experiments – based on the Full Stack Web Development Theory Course	
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.	K3
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

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

AIT303 OBJECT ORIENTED SOFTWARE ENGINEERING LABORATORY							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		6	**PC**	**0**	**0**	**4**	**2**

LIST OF EXPERIMENTS

1	Identify a software system that needs to be developed.
2	Document the Software Requirements Specification (SRS) for the identified system.
3	Identify use cases and develop the Use Case model.
4	Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5	Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6	Draw relevant State Chart and Activity Diagrams for the same system
7	Implement the system as per the detailed design
8	Test the software system for all the scenarios identified as per the usecase diagram
9	Improve the reusability and maintainability of the software system by applying appropriate design patterns.
10	Implement the modified system and test it for various scenarios.

SUGGESTED DOMAINS FOR MINI PROJECT

1	Passport automation system.
2	Book bank
3	Exam registration
4	Stock maintenance system.
5	Online course reservation system
6	Airline/Railway reservation system
7	Software personnel management system
8	Credit card processing
9	e-book management system
10	Recruitment system
11	Foreign trading system
12	Conference management system

13	BPO management system
14	Library management system
15	Student information system
	TOTAL:60

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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

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AUTONOMOUS CURRICULUM & SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEMESTER VII

AAI102 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		7	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ Understand the importance, principles and search methods of AI ➢ Provide knowledge on predicate logic and Prolog. ➢ Learn techniques for reasoning under uncertainty ➢ Introduce Machine Learning and supervised learning algorithms ➢ Study about assembling and unsupervised learning algorithms						
Unit 1	**INTELLIGENTAGENT AND UNINFORMED SEARCH**						**9**
Introduction - Foundations of AI - History of AI - The state of the art - Risks and Benefits of AI - Intelligent Agents - Nature of Environment - Structure of Agent - Problem Solving Agents - FormulatingProblems-UninformedSearch-BreadthFirstSearch-Dijkstra'salgorithmoruniform- cost search-Depth First Search-Depth Limited Search							
Unit 2	**PROBLEM SOLVING WITH SEARCH TECHNIQUES**						**9**
Informed Search-Greedy Best First-A*algorithm-Adversarial Game and Search-Game theory -Optimal decisions in game-Min Max Search algorithm-Alpha-beta pruning-Constraint Satisfaction Problems (CSP) - Examples - Map Coloring - Job Scheduling - Backtracking Search for CSP							
Unit 3	**PROBABILISTIC REASONING**						**9**
Acting under uncertainty–Bayesian inference–naïve bayes models- Probabilistic reasoning–Bayesian networks–exact inference in BN –approximate inference in BN – causal networks.							
Unit 4	**SUPERVISED LEARNING**						**9**
Introduction to machine learning– Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function –Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes,Maximummarginclassifier–Supportvectormachine,DecisionTree,Randomforests.							
Unit 5	**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.							
							TOTAL: 45

TEXTBOOKS	
1	Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson Education, 2021.
2	Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Fourth Edition, 2020.
REFERENCES	
1	Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Pearson Education,2007
2	Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008
3	Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
4	Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013

5	Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
6	Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
7	Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014
8	Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
9	Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Use appropriate search algorithms for problem solving	K2
CO2	Apply reasoning under uncertainty	K3
CO3	Build supervised learning models	K2
CO4	Build ensembling and unsupervised models	K2
CO5	Build deep learning neural network models	K2

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

AAI301 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY

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

Preamble	➢ Study about uninformed and Heuristic search techniques ➢ Learn techniques for reasoning under uncertainty ➢ Introduce Machine Learning and supervised learning algorithms ➢ Study about assembling and unsupervised learning algorithms ➢ Learn the basics of deep learning using neural networks.

LIST OF EXPERIMENTS

1. Implementation of Uninformed search algorithms (BFS, DFS)
2. Implementation of Informed search algorithms (A*, memory-bounded A*)
3. Implement naïve Bayes models

4. Implement Bayesian Networks
5. Build Regression models
6. Build decision trees and random forests
7. Build SVM models
8. Implement ensembling techniques
9. Implement clustering algorithms
10. Implement EM for Bayesian networks
11. Build simple NN models
12. Build deep learning NN models
TOTAL: 60

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Use appropriate search algorithms for problem solving	K2
CO2	Apply reasoning under uncertainty	K3
CO3	Build supervised learning models	K2
CO4	Build assembling and unsupervised models	K2
CO5	Build deep learning neural network models	K3

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

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PROFESSIONAL ELECTIVE - 1

AIT501 BIG DATA ANALYTICS							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To understand big data. ➢ To learn and use NoSQL big data management. ➢ To learn map reduce analytics using Hadoop and related tools. ➢ To work with map reduce applications ➢ To understand the usage of Hadoop related tools for Big Data Analytics						
Unit 1	**UNDERSTANDING BIG DATA**						**9**
Introduction to big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data applications– big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.							
Unit 2	**NOSQL DATA MANAGEMENT**						**9**
Introduction to NoSQL – aggregate data models – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – master-slave replication – consistency - Cassandra – Cassandra data model – Cassandra examples – Cassandra clients.							
Unit 3	**MAP REDUCE 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 4	**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 - Cassandra – Hadoop integration.							
Unit 5	**HADOOP RELATED TOOLS**						**9**
Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. 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.						
3	Sadalage, Pramod J. “NoSQL distilled”, 2013.						
REFERENCES							
1	E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.						
2	Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.						
3	Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.						
4	Alan Gates, "Programming Pig", O'Reilley, 2011.						
COURSEOUTCOMES:							**Bloom’s Taxonomy**

At the end of the course, learners will be able to		Level
CO1	Describe big data and use cases from selected business domains.	K1
CO2	Explain NoSQL big data management.	K2
CO3	Install, configure, and run Hadoop and HDFS.	K2
CO4	Perform map-reduce analytics using Hadoop.	K2
CO5	Use Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.	K3

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

AIT502 INFORMATION SECURITY MANAGEMENT							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To understand the basics of Information Security ➢ To know the legal, ethical and professional issues in Information Security ➢ To equip the students' knowledge on digital signature, email security and web security						
Unit 1	**INTRODUCTION**						**9**
History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC .							
Unit 2	**SECURITY INVESTIGATION**						**9**
Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies .							
Unit 3	**DIGITAL SIGNATURE AND AUTHENTICATION**						**9**
Digital Signature and Authentication Schemes: Digital signature-Digital Signature Schemes and their Variants-Digital Signature Standards-Authentication: Overview- Requirements Protocols - Applications - Kerberos - X.509 Directory Services.							
Unit 4	**E-MAIL AND IP SECURITY**						**9**
E-mail and IP Security: Electronic mail security: Email Architecture -PGP – Operational Descriptions- Key management- Trust Model- S/MIME.IP Security: Overview- Architecture - ESP, AH Protocols IPSec Modes – Security association - Key management.							
Unit 5	**WEB SECURITY**						**9**
Web Security: Requirements- Secure Sockets Layer- Objectives-Layers -SSL secure communication-Protocols -							

Transport Level Security. Secure Electronic Transaction- Entities DS Verification-SET processing.	
TOTAL:45	
TEXTBOOKS	
1	Michael E Whitman and Herbert J Mattord, "Principles of Information Security, Course Technology, 6th Edition, 2017.
2	Stallings William. Cryptography and Network Security: Principles and Practice, Seventh Edition, Pearson Education, 2017.
REFERENCES	
1	Harold F. Tipton, Micki Krause Nozaki,, "Information Security Management Handbook, Volume 6, 6th Edition, 2016.
2	Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", McGraw- Hill, Seventh Edition, 2012.
3	Matt Bishop, "Computer Security Art and Science, Addison Wesley Reprint Edition, 2015.
4	Behrouz A Forouzan, Debdeep Mukhopadhyay, Cryptography And network security, 3rd Edition, . McGraw-Hill Education, 2015.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the basics of data and information security.	K2
CO2	Understand the legal, ethical and professional issues in information.	K2
CO3	Understand the various authentication schemes to simulate different applications.	K2
CO4	Understand various security practices and system security standards.	K2
CO5	Understand the Web security protocols for E-Commerce applications.	K2

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

AAI501 DATA VISUALIZATION							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To understand the fundamentals of data visualization. ➢ To know the working principles of various information visualization depth tools. ➢ To acquire knowledge about the issues in data representation. ➢ To visualize the Data using tools Tableau						

	➢ To gain skill in designing real time interactive information visualization system.	
Unit 1	**INTRODUCTION**	**9**
Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tools. Mapping - Time Series - Connections and Correlations - Scatterplot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs		
Unit 2	**VISUALIZATION TECHNIQUES FOR TIME-SERIES, TREES & GRAPHS**	**9**
Mapping - Time series - Connections and correlations – Indicator-Area chart-Pivot table- Scatter charts, Scatter maps - Tree maps, Space filling and non-space filling methods- Hierarchies and Recursion - Networks and Graphs-Displaying Arbitrary Graphs-node link graph-Matrix representation for graphs- Info graphics		
Unit 3	**TEXT AND DOCUMENT VISUALIZATION**	**9**
Acquiring data, -Where to Find Data, Tools for Acquiring Data from the Internet, Locating Files for Use with Processing, Loading Text Data, Dealing with Files and Folders, Listing Files in a Folder ,Asynchronous Image Downloads, Web Techniques, Parsing data - Levels of Effort, Tools for Gathering Clues, Text Markup Languages, Regular Expressions, Grammars and BNF Notation, Compressed Data, Vectors and Geometry, Binary Data Formats, Advanced Detective Work.		
Unit 4	**INTERACTIVE DATA VISUALIZATION**	**9**
Drawing with data – Scales – Axes – Updates, Transition and Motion – Interactivity - Layouts – Geomapping – Exporting, Framework – D3.js, Tableau Dashboards		
Unit 5	**SECURITY IN DATA VISUALIZATION**	**9**
Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization - Intrusion detection log visualization -Attacking and defending visualization systems – Creating secured visualization system		
		TOTAL:45

TEXTBOOKS	
1	Robert Spence, “Information Visualization An Introduction”, Third Edition, Pearson Education, 2014.
2	Colin Ware, “Information Visualization Perception for Design”, Third edition, Margon Kaufmann Publishers, 2012.
3	Robert Spence, “Information Visualization Design for Interaction”, Second Edition, Pearson Education, 2006.
REFERENCES	
1	Benjamin B. Bederson and Ben shneiderman, “The Craft of Information Visualization”, Morgan Kaufmann Publishers, 2003.
2	Thomas strothotte, “Computational Visualization: Graphics, Abstraction and Interactivity”, Springer, 1998.
3	Matthew O. Ward, George Grinstein, Daniel Keim, “Interactive Data Visualization: Foundation, Techniques and Applications”, Second Edition, A. K. Peters/CRC Press, 2015.
4	Joerg Osarek, “Virtual Reality Analytics”, Gordon’s Arcade, 2016.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Apply mathematics and basic science knowledge for designing information visualizing System.	K2
CO2	Collect data ethically and solve engineering problem in	K3

	visualizing the information.	
CO3	Implement algorithms and techniques for interactive information visualization.	K2
CO4	Conduct experiments by applying various modern visualization tool and solve the space layout problem.	K3
CO5	Analyze and design system to visualize multidisciplinary multivariate Data individually or in teams.	K3

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

AIT503 EXPLORATORY DATA ANALYSIS

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**

Preamble	➢ To outline an overview of exploratory data analysis. ➢ To implement data visualization using Matplotlib. ➢ To perform univariate data exploration and analysis. ➢ To apply bivariate data exploration and analysis. ➢ To use Data exploration and visualization techniques for multivariate and time series data.

Unit 1	**EXPLORATORY DATA ANALYSIS**	**9**

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.

Unit 2	**EDA USING PYTHON**	**9**

Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations.

Unit 3	**UNIVARIATE ANALYSIS**	**9**

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality.

Unit 4	**BIVARIATE ANALYSIS**	**9**

Relationship between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.

Unit 5	**MULTIVARIATE AND TIME SERIES ANALYSIS**	**9**

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

TOTAL:45

TEXTBOOKS	
1	Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020. (Unit 1).
2	Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016. (Unit 2).
3	Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5).
REFERENCES	
1	Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2	Claus O. Wilke, “Fundamentals of Data Visualization”, O’reilly publications, 2019.
3	Matthew O. Ward, Georges Grinstein, Daniel Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, 2nd Edition, CRC press, 2015.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Understand the fundamentals of exploratory data analysis.	K2
CO2	Implement the data visualization using Matplotlib.	K3
CO3	Perform univariate data exploration and analysis.	K3
CO4	Apply bivariate data exploration and analysis.	K3
CO5	Use Data exploration and visualization techniques for multivariate and time series data.	K3

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

AMB118 BUSINESS ANALYTICS							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**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 1	**INTRODUCTION TO BUSINESS ANALYTIC**						**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 2	**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 3	**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 4	**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 5	**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	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	Mahadevan B, “Operations Management -Theory and Practice”,3rd Edition, Pearson Education,2018.
REFERENCES	
1	Checkland, P. (1999) Systems Thinking, Systems Practice. Chichester: John Wiley.
2	Cadle, J., Paul, D. and Turner, P. (2014) Business Analysis Techniques: 99 Essential Tools for Success. Swindon: BCS.

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.	K2
CO2	Identify the business processes for extracting Business Intelligence.	K2
CO3	Apply predictive analytics for business fore-casting.	K3
CO4	Apply analytics for supply chain and logistics management.	K3
CO5	Use analytics for marketing and sales.	K3

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

AIT504 INFORMATION RETRIEVAL SYSTEM							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To understand the basics of information retrieval with pertinence to modeling ➢ To understand various components of IR system ➢ To understand machine learning techniques for text classification and clustering ➢ To explore various IR applications.						
Unit 1	**INTRODUCTION AND MODELING**						**9**
Basic Concepts: Retrieval process – Architecture – Boolean retrieval; IR Models: Taxonomy and characterization of IR models – Classical IR models – Alternative algebraic models – Models for Browsing – Retrieval Evaluation: Performance evaluation.							
Unit 2	**INDEXING AND QUERYING**						**9**
Indexing: Inverted indices – Suffix trees – Suffix arrays – Compression; Querying: Query languages; Query Operations: Relevance feedback and query expansion – Automatic local and global analysis.							
Unit 3	**SEARCHING**						**9**
Searching: Sequential searching – Pattern matching; Searching the Web: Characterizing the Web – Search engines – Browsing – Searching using hyperlinks.							
Unit 4	**CLASSIFICATION AND CLUSTERING**						**9**
Text Classification: Naive Bayes; Vector Space Classification: Rocchio – k-Nearest Neighbour; Flat Clustering: K-Means – Model-based clustering – Hierarchical clustering – Matrix decom- positions and latent semantic indexing.							
Unit 5	**APPLICATIONS**						**9**
XML Retrieval – Multimedia IR – Parallel and Distributed IR – Digital Libraries – Social Media Retrieval – Content-based Image Retrieval – Online Public Access Catalogs (OPACs).							
							TOTAL:45
TEXTBOOKS							
1	Ricardo Baeza Yates, Berthier Ribeiro Neto, “Modern Information Retrieval: The Concepts and Technology behind Search”, ACM Press Books, 2nd Edition, 2011.						
2	Christopher D Manning, Prabhakar Raghavan, Hinrich Schutze, “Introduction to Information Retrieval”, Cambridge University Press, 1st South Asian Edition, 2008.						
REFERENCES							
1	Stefan Buttcher, Charles L A Clarke, Gordon V Cormack, “Information Retrieval – Implementing and Evaluating Search Engines”, The MIT Press, Cambridge, Massachusetts						

	London, England, 2010.
2	Cheng Xiang Zhai, Sean Massung, “Text Data Management and Analysis: A Practical Introduction to Information Retrieval and Text Mining”, ACM Books, 2016.
3	Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, “Social Media Mining: An Introduction”, 1st Edition, Cambridge University Press, 2014.
4	Vipin Tyagi, “Content-Based Image Retrieval: Ideas, Influences, and Current Trends”, 1st Edition, Springer, 2017.
5	Marcia J Bates, “Understanding Information Retrieval Systems: Management, Types, and Standards”, CRC Press, 2012.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Apply the IR modeling techniques for the document retrieval problem and measure the performance of IR systems by making use of IR evaluation metrics.	K3
CO2	Construct the basic components of an IR system namely indexing and querying	K3
CO3	Explain the searching techniques for IR and Web.	K2
CO4	Apply machine learning techniques to text classification and clustering for efficient In- formation Retrieval.	K3
CO5	Develop an IR application by applying best practices with proper documentation in teams.	K4

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

PROFESSIONAL ELECTIVE 2

AIT505 WEB APPLICATION SECURITY							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To understand the fundamentals of web application security ➢ To focus on wide aspects of secure development and deployment of web applications ➢ To learn how to build secure APIs ➢ To learn the basics of vulnerability assessment and penetration testing ➢ To get an insight about Hacking techniques and Tools						
Unit 1	**FUNDAMENTALS OF WEB APPLICATION SECURITY**						**9**
The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation							
Unit 2	**SECURE DEVELOPMENT AND DEPLOYMENT**						**9**
Web Applications Security - Security Testing, Security Incident Response Planning, The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)							
Unit 3	**SECURE API DEVELOPMENT**						**9**
API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.							
Unit 4	**VULNERABILITY ASSESSMENT AND PENETRATION TESTING**						**9**
Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database-based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.							
Unit 5	**HACKING TECHNIQUES AND TOOLS**						**9**
Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc.							
							TOTAL:45
TEXTBOOKS							
1	Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, First Edition, 2020, O'Reilly Media, Inc.						
2	Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, The McGraw-Hill Companies.						
3	Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.						
REFERENCES							

1	Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing, Inc.
2	Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor & Francis Group, LLC.
3	Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA.
4	Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc.
5	Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Grey Hat Hacking: The Ethical Hacker's Handbook, Third Edition, 2011, The McGraw-Hill Companies.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understanding the basic concepts of web application security and the need for it	K2
CO2	Be acquainted with the process for secure development and deployment of web applications	K2
CO3	Acquire the skill to design and develop Secure Web Applications that use Secure APIs	K3
CO4	Be able to get the importance of carrying out vulnerability assessment and penetration testing	K3
CO5	Acquire the skill to think like a hacker and to use hackers tool sets	K3

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

AIT506 SOFTWARE TESTING AND AUTOMATION							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To understand the basics of software testing ➢ To learn how to do the testing and planning effectively ➢ To build test cases and execute them ➢ To focus on wide aspects of testing and understanding multiple facets of testing ➢ To get an insight about test automation and the tools used for test automation						

Unit 1	FOUNDATIONS OF SOFTWARE TESTING	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.		
Unit 2	**TEST PLANNING**	**9**
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 3	**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 4	**ADVANCED TESTING CONCEPTS**	**9**
Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.		
Unit 5	**TEST AUTOMATION AND TOOLS**	**9**
Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.		
		TOTAL:45

TEXTBOOKS	
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.
5	Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
6	Satya Avasarala, Selenium WebDriver Practical Guide, 2014, Packt Publishing.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Understand the basic concepts of software testing and the need for software testing	K2
CO2	Design Test planning and different activities involved in test planning	K4
CO3	Design effective test cases that can uncover critical defects in the application	K4

CO4	Carry out advanced types of testing	K3
CO5	Automate the software testing using Selenium and TestNG	K3

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

AIT507 DEVOPS							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To introduce DevOps terminology, definition & concepts ➢ To understand the different Version control tools like Git, Mercurial ➢ To understand the concepts of Continuous Integration/ Continuous Testing / Continuous Deployment) ➢ To understand Configuration management using Ansible ➢ Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems						
Unit 1	**INTRODUCTION TO DEVOPS**						**9**
Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.							
Unit 2	**COMPILE AND BUILD USING MAVEN & GRADLE**						**9**
Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle							
Unit 3	**CONTINUOUS INTEGRATION USING JENKINS**						**9**
Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.							
Unit 4	**CONFIGURATION MANAGEMENT USING ANSIBLE**						**9**

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible		
Unit 5	**BUILDING DEVOPS PIPELINES USING AZURE**	**9**
Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file		
		TOTAL:45

TEXTBOOKS	
1	Roberto Vormittag, “A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises”, Second Edition, Kindle Edition, 2016
2	Jason Cannon, “Linux for Beginners: An Introduction to the Linux Operating System and Command Line”, Kindle Edition, 2014.
REFERENCES	
1	Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020
2	Jeff Geerling, “Ansible for DevOps: Server and configuration management for humans”, First Edition, 2015.
3	David Johnson, “Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps”, Second Edition, 2016.
4	Mariot Tsitoara, “Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer”, Second Edition, 2019.
5	https://www.jenkins.io/user-handbook.pdf
6	https://maven.apache.org/guides/getting-started/

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Understand different actions performed through Version control tools like Git.	K2
CO2	Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.	K3
CO3	Ability to Perform Automated Continuous Deployment	K3
CO4	Ability to do configuration management using Ansible	K3
CO5	Understand to leverage Cloud-based DevOps tools using Azure DevOps	K2

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

AIT508 UI AND UX DESIGN							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**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 1	**FOUNDATIONS OF DESIGN**						**9**
UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.							
Unit 2	**FOUNDATIONS OF UI DESIGN**						**9**
Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides.							
Unit 3	**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 4	**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 5	**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	Joel Marsh, “UX for Beginners”, O’Reilly , 2022						
2	Jon Yablonski, “Laws of UX using Psychology to Design Better Product & Services” O’Reilly 2021						
REFERENCES							
1	Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3 rd Edition , O’Reilly 2020						
2	Steve Schoger, Adam Wathan “Refactoring UI”, 2018						
3	Steve Krug, “Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile”, Third Edition, 2015						
4	https://www.nngroup.com/articles/						
5	https://www.interaction-design.org/literature						

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Build UI for user Applications	K3
CO2	Evaluate UX design of any product or application	K5
CO3	Demonstrate UX Skills in product development	K3
CO4	Implement Sketching principles	K3
CO5	Create Wireframe and Prototype	K2

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

AIT509 CLOUD SERVICES MANAGEMENT							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ Introduce Cloud Service Management terminology, definition & concepts ➢ Compare and contrast cloud service management with traditional IT service management ➢ Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services ➢ Select appropriate structures for designing, deploying and running cloud-based services in a business environment ➢ Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems						
Unit 1	**CLOUD SERVICE MANAGEMENT FUNDAMENTALS**						**9**
Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models, Cloud Service Deployment Models.							
Unit 2	**CLOUD SERVICES STRATEGY**						**9**
Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture.							
Unit 3	**CLOUD SERVICE MANAGEMENT**						**9**
Cloud Service Reference Model, Cloud Service LifeCycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity							

Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management.		
Unit 4	**CLOUD SERVICE ECONOMICS**	**9**
Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models.		
Unit 5	**CLOUD SERVICE GOVERNANCE & VALUE**	**9**
IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership		
		TOTAL:45

TEXTBOOKS	
1	Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications
2	Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zaigham Mohammad 2013
3	Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour
REFERENCES	
1	Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing
2	Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Explain the foundations of distributed systems	K2
CO2	Solve synchronization and state consistency problems	K3
CO3	Use resource sharing techniques in distributed systems	K3
CO4	Apply working model of consensus and reliability of distributed systems	K3
CO5	Explain the fundamentals of cloud computing	K2

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

AIT510 APP DEVELOPMENT							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To learn development of native applications with basic GUI Components ➢ To develop cross-platform applications with event handling ➢ To develop applications with location and data storage capabilities ➢ To develop web applications with database access						
Unit 1	**FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT**						**9**
Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App, What is Progressive Web App, Responsive Web design.							
Unit 2	**NATIVE APP DEVELOPMENT USING JAVA**						**9**
Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Development Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props							
Unit 3	**HYBRID APP DEVELOPMENT**						**9**
Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova.							
Unit 4	**CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE**						**9**
What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross-platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props							
Unit 5	**NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS**						**9**
Comparison of different Ap p frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability							
							TOTAL:45

TEXTBOOKS	
1	Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition
2	Apache Cordova in Action, Raymond K. Camden, Manning. 2015
3	Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing
REFERENCES	
1	Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition
2	Native Mobile Development by Shaun Lewis, Mike Dunn
3	Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras
4	Apache Cordova 4 Programming, John M Wargo, 2015

5	React Native Cookbook, Daniel Ward, Packt Publishing, 2nd Edition

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Develop Native applications with GUI Components.	K3
CO2	Develop hybrid applications with basic event handling.	K3
CO3	Implement cross-platform applications with location and data storage capabilities.	K3
CO4	Implement cross platform applications with basic GUI and event handling.	K3
CO5	Develop web applications with cloud database access	K3

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

PROFESSIONAL ELECTIVE 3

AAI106 DATA MINING AND DATA WAREHOUSING							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To understand Data Warehouse concepts, Architecture, Business Analysis and Tools. ➢ To understand Data Preprocessing and Data Visualization techniques. ➢ To study algorithms for finding Hidden and Interesting patterns in Data. ➢ To understand and apply various Classification and Clustering techniques.						
Unit 1	**DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING**						**9**
Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support - Concept Hierarchies - Characteristics of OLAP Systems – Typical OLAP Operations - OLAP and OLTP.							
Unit 2	**INTRODUCTION TO DATA MINING**						**9**
Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – Applications- Data Objects and Attribute Types - Statistical Description of Data - Data Preprocessing – Cleaning - Integration - Reduction - Transformation and Discretization - Data Visualization – Data Similarity and Dissimilarity Measures.							
Unit 3	**FREQUENT PATTERN ANALYSIS**						**9**
Mining Frequent Patterns - Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel - Multi Dimensional Space – Constraint Based Frequent Pattern Mining - Classification Using Frequent Patterns.							
Unit 4	**CLASSIFICATION AND CLUSTERING**						**9**
Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Lazy Learners – Model Evaluation and Selection - Techniques to improve Classification Accuracy - Clustering Techniques – Cluster Analysis - Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of Clustering – Clustering High Dimensional Data - Clustering with Constraints - Outlier Analysis - Outlier Detection Methods.							
Unit 5	**DATA ANALYSIS TOOL**						**9**
Datasets – Introduction, Iris plants database, Breast cancer database, Auto Imports Database - Introduction to WEKA - Explorer – Getting started, Exploring the Explorer - Learning algorithms - Clustering algorithms - Association–Rule Learners.							
							TOTAL: 45

TEXTBOOKS

1	Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
2	Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, 35th Reprint 2016.

REFERENCES

1	K.P. Soman, Shyam Diwakar and V. Ajay, “Insight into Data Mining Theory and Practice”, Eastern Economy Edition, Prentice Hall of India, 2006.
2	Ian H.Witten and Eibe Frank, “Data Mining: Practical Machine Learning Tools and Techniques”, Elsevier, Second Edition, 2005.
3	Parteek Bhatia, “Data Mining and Data Warehousing: Principles and Practical Techniques”,

	Cambridge University Press, 2019.
4	Pranjali Deshpande, Soudamini Patil, "Data Warehousing and Data Mining", First Edition, Technical Publications, 2020.
5	Dr. B. Shadaksharappa,Mr. P.Ramkumar,Dr. T.N. Prabakar, " Data Warehousing and Data Mining", First Edition, Book Rivers, 2022.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Use a Data Warehouse system and perform Business Analysis with OLAP Tools.	K2
CO2	Recognize and identify suitable Pre-processing and Visualization techniques for Data Analysis.	K2
CO3	Apply frequent Pattern and Association Rule Mining techniques for Data Analysis.	K3
CO4	Apply appropriate Classification techniques for Data Analysis.	K3
CO5	Apply appropriate Clustering techniques for Data Analysis.	K3

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

AIT511 STORAGE TECHNOLOGIES

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**

Preamble	➢ Characterize the functionalities of logical and physical components of storage. ➢ Describe various storage networking technologies. ➢ Identify different storage virtualization technologies. ➢ Discuss the different backup and recovery strategies. ➢ Understand common storage management activities and solutions.

Unit 1	**STORAGE SYSTEMS**	**9**

Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics, Cloud services and cloud deployment models, Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure and Imperatives for third platform transformation. Data Center Environment: Building blocks of a data center, Compute systems and compute virtualization and

Software-defined data center.		
Unit 2	**INTELLIGENT STORAGE SYSTEMS AND RAID**	**5**
Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale-out storage Architecture**.**		
Unit 3	**STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION**	**13**
Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fibre Channel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, Link aggregation, switch aggregation, and VLAN, FCIP protocol, connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of FCoE SAN, FCoE SAN connectivity, Converged Enhanced Ethernet, FCoE architecture.		
Unit 4	**BACKUP, ARCHIVE AND REPLICATION**	**12**
Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS)**.**		
Unit 5	**SECURING STORAGE INFRASTRUCTURE**	**6**
Information security goals- Storage security domains- Threats to a storage infrastructure, Security controls to protect a storage infrastructure- Governance, risk, and compliance- Storage infrastructure management functions- Storage infrastructure management processes.		
		TOTAL: 45

TEXTBOOKS	
1	EMC Corporation, Information Storage and Management, Wiley, India
2	Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017
3	Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein ,Storage Networks Explained, Second Edition, Wiley, 2009

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment	K2
CO2	Illustrate the usage of advanced intelligent storage systems and RAID.	K2
CO3	Interpret various storage networking architectures - SAN, including storage subsystems and virtualization.	K2
CO4	Examine the different role in providing disaster recovery and remote replication technologies.	K2
CO5	Infer the security needs and security measures to be employed in information storage management.	K2

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

AIT512 SOFTWARE DEFINED NETWORKS

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**

Preamble	➢ To understand the need for SDN and its data plane operations. ➢ To understand the functions of control plane. ➢ To comprehend the migration of networking functions to SDN environment. ➢ To explore various techniques of network function virtualization. ➢ To comprehend the concepts behind network virtualization.

Unit 1	**SDN: INTRODUCTION**	**9**
Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane, Control plane and Application Plane .		
Unit 2	**SDN DATA PLANE AND CONTROL PLANE**	**9**
Data Plane functions and protocols - OpenFLow Protocol - Flow Table - Control Plane Functions - Southbound Interface, Northbound Interface – SDN Controllers - Ryu, OpenDaylight, ONOS - Distributed Controllers.		
Unit 3	**SDN APPLICATIONS**	**9**
SDN Application Plane Architecture – Network Services Abstraction Layer – Traffic Engineering – Measurement and Monitoring – Security – Data Center Networking .		
Unit 4	**NETWORK FUNCTION VIRTUALIZATION**	**9**
Network Virtualization - Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefits and Requirements – Reference Architecture.		
Unit 5	**NFV FUNCTIONALITY**	**9**
NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration – NFV Use cases – SDN and NFV.		
		TOTAL: 45

TEXTBOOKS

1	William Stallings, “Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud”, Pearson Education, 1st Edition, 2015.

REFERENCES

1	Ken Gray, Thomas D. Nadeau, “Network Function Virtualization”, Morgan Kauffman, 2016.
2	Thomas D Nadeau, Ken Gray, “SDN: Software Defined Networks”, O’Reilly Media, 2013.
3	Fei Hu, “Network Innovation through OpenFlow and SDN: Principles and Design”, 1st Edition, CRC Press, 2014.
4	Paul Goransson, Chuck Black Timothy Culver, “Software Defined Networks: A

	Comprehensive Approach", 2nd Edition, Morgan Kaufmann Press, 2016.
5	Oswald Coker, Siamak Azodolmolky, "Software-Defined Networking with OpenFlow", 2nd Edition, O'Reilly Media, 2017.

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Describe the motivation behind SDN.	K2
CO2	Identify the functions of the data plane and control plane.	K2
CO3	Design and develop network applications using SDN.	K2
CO4	Orchestrate network services using NFV.	K2
CO5	Explain various use cases of SDN and NFV.	K2

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

AIT513 INTERNET OF THINGS

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**

Preamble	➢ To understand Smart Objects, IoT Architectures and IoT protocols. ➢ To build simple IoT Systems using Arduino and Raspberry Pi. ➢ To understand Data Analytics and Cloud in the context of IoT. ➢ To develop IoT infrastructure for popular applications.

Unit 1	**FUNDAMENTALS OF INTERNET OF THINGS**	**9**

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M - IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack - Fog, Edge and Cloud in IoT – Functional Blocks of an IoT Ecosystem – Sensors - Actuators - Smart Objects and Connecting Smart Objects.

Unit 2	**IOT PROTOCOLS**	**9**

IoT Access Technologies - Physical and MAC Layers - Topology and Security of IEEE 802.15.4,802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer - IP Versions - Constrained Nodes and Constrained Networks – Optimizing IP for IoT - From 6LoWPAN to 6Lo - Routing Over Low Power and Lossy Networks – Application Transport Methods - Supervisory Control and Data Acquisition – Application Layer Protocols - CoAP and MQTT.

Unit 3	**DESIGN AND DEVELOPMENT**	**9**

Design Methodology - Embedded Computing Logic - Microcontroller – System on Chips - IoT System Building Blocks - Arduino - Board Details – IDE Programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

Unit 4	**IOT PHYSICAL SERVERS CLOUD**	**9**

Physical servers and cloud - XaaS, M2M , WAMP- AutoBahn for IoT – Xively Cloud for IoT – Django – Designing a RESTful Web API –Google cloud for IoT.

Unit 5	APPLICATIONS	9
Retail, Health care, Transportation, Agriculture and environmental, Smart city, Government and military, Smart home.		
		TOTAL: 45

TEXTBOOKS	
1	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, 2017.
2	Rajkamal,"Internet of Things: Architecture, Design Principles And Applications",McGraw Hill HigherEducation,2017.
3	Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key Applications and Protocols‖, Wiley, 2012.
REFERENCES	
1	Vijay Madisetti and ArshdeepBahga, ―Internet of Things (A Hands-on-Approach)‖,1st Edition,VPT, 2014.
2	Francis daCosta, ―Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything‖, 1st Edition, Apress Publications, 2013.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Interpret the concept of IoT, its Components and its architecture.	K2
CO2	Learn the design methods of various protocol.	K3
CO3	Build the design methodology for a IoT system using Raspberry.	K3
CO4	Apply the Data analytics and Support servicing tool related to IoT	K3
CO5	Experiment the case study and application of IoT in real time scenario.	K3

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

AIT514 SECURITY AND PRIVACY IN CLOUD							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To Introduce Cloud Computing terminology, definition & concepts. ➢ To understand the security design and architectural considerations for Cloud. ➢ To understand the Identity, Access control in Cloud. ➢ To follow best practices for Cloud security using various design patterns. ➢ To be able to monitor and audit cloud applications for security.						
Unit 1	**FUNDAMENTALS OF CLOUD SECURITY CONCEPTS**						**9**
Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non-repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.							
Unit 2	**SECURITY DESIGN AND ARCHITECTURE FOR CLOUD**						**9**
Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies – Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key.							
Unit 3	**ACCESS CONTROL AND IDENTITY MANAGEMENT**						**9**
Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention.							
Unit 4	**CLOUD SECURITY DESIGN PATTERNS**						**9**
Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud.							
Unit 5	**MONITORING, AUDITING AND MANAGEMENT**						**9**
Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management.							
							TOTAL: 45
TEXTBOOKS							
1	Raj Kumar Buyya , James Broberg, Andrzej Goscinski, ―Cloud Computing, Wiley 2013.						
2	Dave shackleford, ―Virtualization Security, SYBEX a wiley Brand 2013.						
3	Mather, Kumaraswamy and Latif, ―Cloud Security and Privacy‖, OREILLY 2011.						
REFERENCES							
1	Mark C. Chu-Carroll ―Code in the Cloud‖,CRC Press, 2011Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi						
COURSE OUTCOMES: **At the end of the course, learners will be able to**							**Bloom's Taxonomy Level**
CO1	Understand the cloud concepts and fundamentals.						K2

CO2	Explain the security challenges in the cloud.	K1
CO3	Define cloud policy and Identity and Access Management.	K1
CO4	Understand various risks and audit and monitoring mechanisms in the cloud.	K2
CO5	Define the various architectural and design considerations for security in the cloud.	K1

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

AIT515 STREAM PROCESSING

Programme & Branch	B.Tech & IT	Sem.	Category	L	T	P	C
			PE	3	0	0	3

Preamble	➢ Introduce Data Processing terminology, definition & concepts. ➢ Define different types of Data Processing. ➢ Explain the concepts of Real-time Data processing. ➢ Select appropriate structures for designing and running real-time data services in a business environment. ➢ Illustrate the benefits and drive the adoption of real-time data services to solve real world problems.

Unit 1	FOUNDATIONS OF DATA SYSTEMS	9

Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges .

Unit 2	REAL-TIME DATA PROCESSING	9

Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing,Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage .

Unit 3	DATA MODELS AND QUERY LANGUAGES	9

Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many-to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL

Unit 4	EVENT PROCESSING WITH APACHE KAFKA	9

Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions,

Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API		
Unit 5	**REAL-TIME PROCESSING USING SPARK STREAMING**	**9**
Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication.		
		TOTAL: 45

TEXTBOOKS	
1	Streaming Systems: The What, Where, When and How of Large-Scale Data Processing by Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication.
2	Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media.
3	Practical Real-time Data Processing and Analytics : Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing.
REFERENCES	
1	https://spark.apache.org/docs/latest/streaming-programming-guide.html.
2	Kafka.apache.org .

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the applicability and utility of different streaming algorithms.	K2
CO2	Describe and apply current research trends in data-stream processing.	K3
CO3	Analyze the suitability of stream mining algorithms for data stream systems.	K3
CO4	Program and build stream processing systems, services and applications.	K3
CO5	Solve problems in real-world applications that process data streams.	K3

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

PROFESSIONAL ELECTIVE 4

AIT516 ENGINEERING SECURE SOFTWARE SYSTEMS							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ Know the importance and need for software security. ➢ Know about various attacks. ➢ Learn about secure software design. ➢ Understand risk management in secure software development. ➢ Know the working of tools related to software security.						
Unit 1	**NEED OF SOFTWARE SECURITY AND LOW-LEVEL ATTACKS**						**9**
Software Assurance and Software Security - Threats to software security - Sources of software insecurity - Benefits of Detecting Software Security - Properties of Secure Software – Memory- Based Attacks: Low-Level Attacks Against Heap and Stack - Defense Against Memory-Based Attacks							
Unit 2	**SECURE SOFTWARE DESIGN**						**9**
Requirements Engineering for secure software - SQUARE process Model - Requirements elicitation and prioritization- Isolating The Effects of Untrusted Executable Content - Stack Inspection – Policy Specification Languages – Vulnerability Trends – Buffer Overflow – Code Injection - Session Hijacking. Secure Design - Threat Modeling and Security Design Principles							
Unit 3	**SECURITY RISK MANAGEMENT**						**9**
Risk Management Life Cycle – Risk Profiling – Risk Exposure Factors – Risk Evaluation and Mitigation – Risk Assessment Techniques – Threat and Vulnerability Management							
Unit 4	**SECURITY TESTING**						**9**
Traditional Software Testing – Comparison - Secure Software Development Life Cycle - Risk Based Security Testing – Prioritizing Security Testing With Threat Modeling – Penetration Testing – Planning and Scoping - Enumeration – Remote Exploitation – Web Application Exploitation - Exploits and Client Side Attacks – Post Exploitation – Bypassing Firewalls and Avoiding Detection - Tools for Penetration Testing							
Unit 5	**SECURE PROJECT MANAGEMENT**						**9**
Governance and security - Adopting an enterprise software security framework - Security and project management - Maturity of Practice							
							TOTAL: 45

TEXTBOOKS	
1	Julia H. Allen, “Software Security Engineering”, Pearson Education, 2008
2	Evan Wheeler, “Security Risk Management: Building an Information Security Risk Management Program from the Ground Up”, First edition, Syngress Publishing, 2011
3	Chris Wysopal, Lucas Nelson, Dino Dai Zovi, and Elfriede Dustin, “The Art of Software Security Testing: Identifying Software Security Flaws (Symantec Press)”, Addison-Wesley Professional, 2006
REFERENCES	
1	Robert C. Seacord, “Secure Coding in C and C++ (SEI Series in Software Engineering)”, Addison-Wesley Professional, 2005.
2	Jon Erickson, “Hacking: The Art of Exploitation”, 2nd Edition, No Starch Press, 2008.
3	Mike Shema, “Hacking Web Apps: Detecting and Preventing Web Application Security Problems”, First edition, Syngress Publishing, 2012
4	Bryan Sullivan and Vincent Liu, “Web Application Security, A Beginner's Guide”, Kindle Edition, McGraw Hill, 2012
5	Lee Allen, “Advanced Penetration Testing for Highly-Secured Environments: The Ultimate Security Guide (Open Source: Community Experience Distilled)”, Kindle Edition, Packt

	Publishing,2012
6	Jason Grembi, “Developing Secure Software”

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Identify various vulnerabilities related to memory attacks.	K2
CO2	Apply security principles in software development.	K2
CO3	Evaluate the extent of risks.	K2
CO4	Involve selection of testing techniques related to software security in the testing phase of software development.	K2
CO5	Use tools for securing software.	K2

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

AIT517 DIGITAL AND MOBILE FORENSICS

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**

Preamble	➢ To understand basic digital forensics and techniques. ➢ To understand digital crime and investigation. ➢ To understand how to be prepared for digital forensic readiness. ➢ To understand and use forensics tools for iOS devices. ➢ To understand and use forensics tools for Android devices.

Unit 1	**INTRODUCTION TO DIGITAL FORENSICS**	**9**

Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process – Introduction – The Identification Phase – The Collection Phase – The Examination Phase – The Analysis Phase – The Presentation Phase

Unit 2	**DIGITAL CRIME AND INVESTIGATION**	**9**

Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence

Unit 3	**DIGITAL FORENSIC READINESS**	**9**

Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics

Unit 4	**iOS FORENSICS**	**9**

Mobile Hardware and Operating Systems - iOS Fundamentals – Jailbreaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud

Unit 5	ANDROID FORENSICS	9
Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools – Dual Use Tools – Oxygen Forensics – MobilEdit – Android App Decompiling		
		TOTAL: 45

TEXTBOOKS	
1	Andre Arnes, “Digital Forensics”, Wiley, 2018.
2	Chuck Easttom, “An In-depth Guide to Mobile Device Forensics”, First Edition, CRC Press, 2022.
REFERENCES	
1	Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Have knowledge on digital forensics.	K2
CO2	Know about digital crime and investigations.	K2
CO3	Be forensic ready.	K2
CO4	Investigate, identify and extract digital evidence from iOS devices.	K2
CO5	Investigate, identify and extract digital evidence from Android devices	K2

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

AIT518 ETHICAL HACKING

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**

Preamble	➢ To understand the basics of computer based vulnerabilities. ➢ To explore different foot printing, reconnaissance and scanning methods. ➢ To expose the enumeration and vulnerability analysis methods. ➢ To understand hacking options available in Web and wireless applications. ➢ To explore the options for network protection. ➢ To practice tools to perform ethical hacking to expose the vulnerabilities

Unit 1	INTRODUCTION	9
Ethical Hacking Overview - Role of Security and Penetration Testers .- Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware - Protecting Against Malware Attacks.- Intruder		

Attacks - Addressing Physical Security		
Unit 2	**FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS**	**9**
Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall		
Unit 3	**ENUMERATION AND VULNERABILITY ANALYSIS**	**9**
Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss		
Unit 4	**SYSTEM HACKING**	**9**
Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade		
Unit 5	**NETWORK PROTECTION SYSTEMS**	**9**
Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network- Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.		
		TOTAL: 45

TEXTBOOKS	
1	Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2	The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.
3	The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Dafydd Stuttard and Marcus Pinto, 2011.
REFERENCES	
1	Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz , 2014.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	To express knowledge on basics of computer based vulnerabilities	K2
CO2	To gain understanding on different foot printing, reconnaissance and scanning methods.	K2
CO3	To demonstrate the enumeration and vulnerability analysis methods	K2
CO4	To gain knowledge on hacking options available in Web and wireless applications.	K2
CO5	To acquire knowledge on the options for network protection.	K2

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

AIT519 BLOCK CHAIN TECHNOLOGY

Programme & Branch	B.TECH&IT	Sem.	Category	L	T	P	C
			PE	3	0	0	3

Preamble	➢ To understand the basics of computer based vulnerabilities. ➢ To explore different foot printing, reconnaissance and scanning methods. ➢ To expose the enumeration and vulnerability analysis methods. ➢ To understand hacking options available in Web and wireless applications. ➢ To explore the options for network protection. ➢ To practice tools to perform ethical hacking to expose the vulnerabilities

Unit 1	**HISTORY**	**9**
Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy- : Block chain Architecture and Design-Basic crypto primitives: Hash, Signature Hash chain to Block chain-Basic consensus mechanisms.		
Unit 2	**CONSENSUS PROTOCOLS**	**9**
Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols: Permissioned Block chains-Design goals-Consensus protocols for Permissioned Block chains		
Unit 3	**CONSENSUS PROCESS**	**9**
Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II:-Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.		
Unit 4	**BLOCK CHAIN INFSS**	**9**
Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-Insurance- Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.		
Unit 5	**BLOCK CHAIN FOR GOVERNMENT**	**9**
Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems: Block chain Cryptography: Privacy and Security on Block chain.		
		TOTAL: 45

TEXTBOOKS

1	Mark Gates, "Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money", Wise Fox Publishing and Mark Gates 2017.
2	Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Block chain with Hyper ledger: Building decentralized applications with Hyperledger Fabric and Composer", 2018.
3	Bahga, Vijay Madisetti, "Block chain Applications: A Hands-On Approach", Arshdeep Bahga, Vijay Madisetti publishers 2017.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	State the basic concepts of block chain	K2
CO2	Paraphrase the list of consensus and Demonstrate and Interpret working of Hyper ledger Fabric	K2
CO3	Implement SDK composer tool and explain the Digital identity for government	K2
CO4	To understand the concepts of block chain technology	K2

CO5	To understand the consensus and hyper ledger fabric in block chain technology	K2

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

AIT520 SOCIAL NETWORK SECURITY							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To develop semantic web related simple applications ➢ To explain Privacy and Security issues in Social Networking ➢ To explain the data extraction and mining of social networks ➢ To discuss the prediction of human behavior in social communities ➢ To describe the Access Control, Privacy and Security management of social networks						
Unit 1	**FUNDAMENTALS OF SOCIAL NETWORKING**						**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, Historical overview of privacy and security, Major paradigms, for understanding privacy and security							
Unit 2	**SECURITY ISSUES IN SOCIAL NETWORKS**						**9**
The evolution of privacy and security concerns with networked technologies, Contextual influences on privacy attitudes and behaviors, Anonymity in a networked world							
Unit 3	**EXTRACTION AND MINING IN SOCIAL NETWORKING DATA**						**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, Big data and Privacy							
Unit 4	**PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES**						**9**
Understanding and predicting human behavior 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, What is Neo4j, Nodes, Relationships, Properties							
Unit 5	**ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMEN**						**9**
Understand the access control requirements for Social Network, Enforcing Access Control Strategies, Authentication and Authorization, Roles-based Access Control, Host, storage and network access control options, Firewalls, Authentication, and Authorization in Social Network, Identity & Access Management, Single Sign-on, Identity Federation, Identity providers and service consumers, The role of Identity provisioning							
							TOTAL: 45

TEXTBOOKS	
1	Peter Mika, Social Networks and the Semantic Web, First Edition, Springer 2007.
2	BorkoFurht, Handbook of Social Network Technologies and Application, First Edition, Springer, 2010.
3	Learning Neo4j 3.x –Second Edition By Jérôme Baton, Rik Van Bruggen, Packt publishing
REFERENCES	
1	Easley D. Kleinberg J., Networks, Crowds, and Markets – Reasoning about a Highly Connected World‖, Cambridge University Press, 2010.
2	Jackson, Matthew O., Social and Economic Networks‖, Princeton University Press, 2008.
3	GuandongXu ,Yanchun Zhang and Lin Li, Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
4	Dion Goh and Schubert Foo, Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.
5	Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling‖, IGI Global Snippet, 2009.
6	John G. Breslin, Alexander Passant and Stefan Decker, The Social Semantic Web‖, Springer, 2009.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Develop semantic web related simple applications	K2
CO2	Address Privacy and Security issues in Social Networking	K2
CO3	Explain the data extraction and mining of social networks	K2
CO4	Discuss the prediction of human behavior in social communities	K2
CO5	Describe the applications of social networks	K2

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

AIT521 CYBER SECURITY							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To learn cybercrime and cyber law. ➢ To understand the cyber attacks and tools for mitigating them. ➢ To understand information gathering. ➢ To learn how to detect a cyber attack. ➢ To learn how to prevent a cyber attack						
Unit 1	**INTRODUCTION**						**9**
Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment							
Unit 2	**ATTACKS AND COUNTER MEASURES**						**9**
OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.							
Unit 3	**RECONNAISSANCE**						**9**
Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.							
Unit 4	**INTRUSION DETECTION**						**9**
Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.							
Unit 5	**INTRUSION PREVENTION**						**9**
ewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.							
							TOTAL: 45
TEXTBOOKS							
1	Anand Shinde, “Introduction to Cyber Security Guide to the World of Cyber Security”, Notion Press, 2021 (Unit 1)						
2	Nina Godbole, Sunit Belapure, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley Publishers, 2011 (Unit 1)						
REFERENCES							
1	1. David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”, Jones & Bartlett Learning Publishers, 2013 (Unit 2)						
2	2. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy”, Elsevier, 2011 (Unit 3)						
3	3. Kimberly Graves, “CEH Official Certified Ethical hacker Review Guide”, Wiley Publishers, 2007 (Unit 3)						
4	4. William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015 (Units 4 and 5)						
COURSEOUTCOMES: **At the end of the course, learners will be able to**							**Bloom’s Taxonomy Level**
CO1	Explain the basics of cyber security, cyber crime and cyber law						K2

CO2	Classify various types of attacks and learn the tools to launch the attacks	K2
CO3	Apply various tools to perform information gathering	K3
CO4	Apply intrusion techniques to detect intrusion	K3
CO5	Apply intrusion prevention techniques to prevent intrusion	K3

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

PROFESSIONAL ELECTIVE 5

AIT522 MULTIMEDIA AND ANIMATION							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To grasp the fundamental knowledge of Multimedia elements and systems ➢ To get familiar with Multimedia file formats and standards ➢ To learn the process of Authoring multimedia presentations ➢ To learn the techniques of animation in 2D and 3D and for the mobile UI ➢ To explore different popular applications of multimedia						
Unit 1	**INTRODUCTION TO MULTIMEDIA**						**9**
Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing. Multimedia metadata- Multimedia databases- Hypermedia- Multimedia Learning.							
Unit 2	**MULTIMEDIA FILE FORMATS AND STANDARDS**						**9**
File formats – Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web.							
Unit 3	**MULTIMEDIA AUTHORING**						**9**
Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools, audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual learning, simulations.							
Unit 4	**ANIMATION**						**9**
Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D, 2 ½ D, and 3D animation, Animation techniques: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, , Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.							
Unit 5	**MULTIMEDIA APPLICATIONS**						**9**
Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, media on demand, security and forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries.							
							TOTAL:45

TEXTBOOKS	
1	Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia", Third Edition, Springer Texts in Computer Science, 2021.
REFERENCES	
1	John M Blain, The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC press, 3rd Edition, 2016.
2	Gerald Friedland, Ramesh Jain, "Multimedia Computing", Cambridge University Press, 2018.
3	Prabhat K.Andleigh, Kiran Thakrar, "Multimedia System Design", Pearson Education, 1st Edition, 2015.
4	Mohsen Amini Salehi, Xiangbo Li, "Multimedia Cloud Computing Systems", Springer Nature, 1st Edition, 2021.
5	Mark Gaimbruno, "3D Graphics and Animation", Second Edition, New Riders, 2002.

6	Rogers David, "Animation: Master – A Complete Guide (Graphics Series)", Charles River Media, 2006.
7	Rick parent, "Computer Animation: Algorithms and Techniques", Morgan Kauffman, 3rd Edition, 2012.
8	Emilio Rodriguez Martinez, Mireia Alegre Ruiz, "UI Animations with Lottie and After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native", Packt Publishing, 2022.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Get the bigger picture of the context of Multimedia and its applications	K3
CO2	Use the different types of media elements of different formats on content pages	K3
CO3	Author 2D and 3D creative and interactive presentations for different target multimedia applications.	K3
CO4	Use different standard animation techniques for 2D, 21/2 D, 3D applications	K3
CO5	Understand the complexity of multimedia applications in the context of cloud, security, bigdata streaming, social networking, CBIR etc.,	K3

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

AIT523 AUGMENTED REALITY /VIRTUAL REALITY

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**

Preamble	➢ To impart the fundamental aspects and principles of AR/VR technologies. ➢ To know the internals of the hardware and software components involved in the development of AR/VR enabled applications. ➢ To learn about the graphical processing units and their architectures. ➢ To gain knowledge about AR/VR application development. ➢ To know the technologies involved in the development of AR/VR based applications.

Unit 1	**INTRODUCTION**	**9**

Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies- Input Devices – 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System.		
Unit 2	**VR MODELING**	**9**
Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.		
Unit 3	**VR PROGRAMMING**	**9**
VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D		
Unit 4	**APPLICATIONS**	**9**
Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education.		
Unit 5	**AUGMENTED REALITY**	**9**
Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation-Navigation-Wearable devices		
		TOTAL:45

TEXTBOOKS	
1	Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, 2018
2	Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016
3	John Vince, "Introduction to Virtual Reality", Springer-Verlag, 2004.
4	William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design", Morgan Kaufmann, 2003
REFERENCES	
1	George Mather, Foundations of Sensation and Perception:Psychology Press; 2 edition, 2009.
2	The VR Book: HumanCentered Design for Virtual Reality, by Jason Jerald
3	Learning Virtual Reality by Tony Parisi, O' Reilly
4	Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition.Wiley-IEEE Press, 200 3/2006.
5	Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufma nn, 2013.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the basic concepts of AR and VR	K2
CO2	Understand the tools and technologies related to AR/VR	K2

CO3	Know the working principle of AR/VR related Sensor devices	K1
CO4	Design of various models using modeling techniques	K3
CO5	Develop AR/VR applications in different domains	K3

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

AIT524 DIGITAL MARKETING

Programme & Branch	B.Tech & IT	Sem.	Category	L	T	P	C
			PE	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 1	INTRODUCTION TO ONLINE MARKET	9

Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.

Unit 2	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 3	E- MAIL MARKETING	9

E- 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; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting

Unit 4	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 5	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	Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education, First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373.
2	Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press (April 2015). ISBN-10: 0199455449
3	Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.
REFERENCES	
1	Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited
2	Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.
3	Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education

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.	K2
CO2	To focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.	K2
CO3	To know the key elements of a digital marketing strategy.	K2
CO4	To study how the effectiveness of a digital marketing campaign can be measured.	K2
CO5	To demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.	K2

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

AIT525 GAME DEVELOPMENT							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To know the basics of 2D and 3D graphics for game development. ➢ To know the stages of game development. ➢ To understand the basics of a game engine. ➢ To survey the gaming development environment and tool kits. ➢ To learn and develop simple games using Pygame environment						
Unit 1	**3D GRAPHICS FOR GAME DESIGN**						**9**
Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.							
Unit 2	**GAME DESIGN PRINCIPLES**						**9**
Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction, Production and Post – Production.							
Unit 3	**GAME ENGINE DESIGN**						**9**
Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Path finding.							
Unit 4	**OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS**						**9**
Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity Single player and Multi-Player games.							
Unit 5	**GAME DEVELOPMENT USING PYGAME**						**9**
Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Games.							
							TOTAL:45
TEXTBOOKS							
1	Artificial Intelligence for Games by Ian Millington and John Funge (2009)						
2	Mathematics for 3D Game Programming and Computer Graphics by Eric Lengyel (2011)						
3	Game Coding Complete by Mike McShaffry and David Graham (Fourth Edition, 2012)						
REFERENCES							
1	Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison Wesley, 2013.						
2	Will McGugan, “Beginning Game Development with Python and Pygame: From Novice to Professional”, Apress, 2007.						
3	Paul Craven, “Python Arcade games”, Apress Publishers, 2016.						
4	David H. Eberly, “3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics”, Second Edition, CRC Press, 2006.						
5	Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC,						

	2011.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Explain the concepts of 2D and 3d Graphics	K1
CO2	Design game design documents.	K3
CO3	Implementation of gaming engines.	K2
CO4	Survey gaming environments and frameworks.	K2
CO5	Implement a simple game in Pygame	K2

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

AIT526 VISUAL EFFECTS

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**

Preamble	➢ To get a basic idea on animation principles and techniques ➢ To get exposure to CGI, color and light elements of VFX ➢ To have a better understanding of basic special effects techniques ➢ To have a knowledge of state of the art VFX techniques ➢ To become familiar with popular compositing techniques

Unit 1	**ANIMATION BASICS**	**9**

VFX production pipeline, Principles of animation, Techniques: Keyframe, kinematics, Full animation, limited animation, Rotoscoping, stop motion, object animation, pixilation, rigging, shape keys, motion paths.

Unit 2	**CGI, COLOR, LIGHT**	**9**

CGI – virtual worlds, Photorealism, physical realism, function realism, 3D Modeling and Rendering: color - Color spaces, color depth, Color grading, color effects, HDRI, Light – Area and mesh lights, image based lights, PBR lights, photometric light, BRDF shading model

Unit 3	**SPECIAL EFFECTS**	**9**

Special Effects – props, scaled models, animatronics, pyrotechniques, Schüfftan process, Particle effects – wind, rain, fog, fire

Unit 4	**VISUAL EFFECTS TECHNIQUES**	**9**

Motion Capture, Matt Painting, Rigging, Front Projection.Rotoscoping, Match Moving – Tracking, camera reconstruction, planar tracking, Calibration, Point Cloud Projection, Ground plane determination, 3D Match Moving		
Unit 5	**COMPOSITING**	**9**
Compositing – chroma key, blue screen/green screen, background projection, alpha compositing, deep image compositing, multiple exposure, matting, VFX tools - Blender, Natron, GIMP.		
		TOTAL:45

TEXTBOOKS	
1	Chris Roda, Real Time Visual Effects for the Technical Artist, CRC Press, 1st Edition, 2022.
2	Steve Wright, Digital Compositing for film and video, Routledge, 4th Edition, 2017.
3	John Gress, Digital Visual Effects and Compositing**,** New Riders Press, 1st Edition, 2014.
REFERENCES	
1	Jon Gress, “Digital Visual Effects and Compositing”, New Riders Press, 1st Edition, 2014.
2	Robin Brinkman, The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics”, Morgan Kauffman, 2008.
3	Luiz Velho, Bruno Madeira, “Introduction to Visual Effects A Computational Approach”, Routledge, 2023.
4	Jasmine Katatikarn, Michael Tanzillo, “Lighting for Animation: The art of visual story telling , Routledge, 1st Edition, 2016.
5	Eran Dinur, “The Complete guide to Photorealism, for Visual Effects, Visualization
6	https://www.blender.org/features/vfx/

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	To implement animation in 2D / 3D following the principles and techniques	K3
CO2	To use CGI, color and light elements in VFX applications	K3
CO3	To create special effects using any of the state of the art tools	K3
CO4	To apply popular visual effects techniques using advanced tools	K3
CO5	To use compositing tools for creating VFX for a variety of applications	K3

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

AIT527 COMPUTER VISION							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To understand the fundamental concepts related to Image formation and processing. ➢ To learn feature detection, matching and detection ➢ To become familiar with feature based alignment and motion estimation ➢ To develop skills on 3D reconstruction ➢ To understand image based rendering and recognition						
Unit 1	**INTRODUCTION TO IMAGE FORMATION AND PROCESSING**						**9**
Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.							
Unit 2	**FEATURE DETECTION, MATCHING AND SEGMENTATION**						**9**
Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods							
Unit 3	**FEATURE-BASED ALIGNMENT & MOTION ESTIMATION**						**9**
2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.							
Unit 4	**3D RECONSTRUCTION**						**9**
Shape from X - Active range finding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.							
Unit 5	**IMAGE-BASED RENDERING AND RECOGNITION**						**9**
View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets							
							TOTAL:45
TEXTBOOKS							
1	Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer- Texts in Computer Science, Second Edition, 2022.						
2	Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.						
REFERENCES							
1	Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.						
2	Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006						
3	E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.						

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	To understand basic knowledge, theories and methods in image processing and computer vision.	K1
CO2	To implement basic and some advanced image processing techniques in OpenCV.	K2
CO3	To apply 2D a feature-based based image alignment, segmentation and motion estimations.	K3
CO4	To apply 3D image reconstruction techniques	K3
CO5	To design and develop innovative image processing and computer vision applications.	K2

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

PROFESSIONAL ELECTIVE 6

AIT528 QUANTUM COMPUTING							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To learn the fundamental concepts behind quantum computation. ➢ To study the details of quantum mechanics and its relation to Computer Science. ➢ To gain knowledge about the basic hardware and mathematical models of quantum computation. ➢ To learn the basics of quantum information and the theory behind it.						
Unit 1	**QUANTUM COMPUTING BASIC CONCEPTS**						**9**
Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits – Superpositions.							
Unit 2	**QUANTUM GATES AND CIRCUITS**						**9**
Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development - Quantum error correction.							
Unit 3	**QUANTUM ALGORITHMS**						**9**
Quantum parallelism - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm .							
Unit 4	**QUANTUM INFORMATION THEORY**						**9**
Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantum noiseless channel coding theorem - Classical information over noisy quantum channels.							
Unit 5	**QUANTUM CRYPTOGRAPHY**						**9**
Classical cryptography basic concepts - Private key cryptography - Shor's Factoring Algorithm - Quantum Key Distribution - BB84 - Ekart 91.							
							TOTAL: 45
TEXTBOOKS							
1	. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction", First edition (1 November 2020).						
2	Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information", Tenth Edition, Cambridge University Press, 2010.						
3	Chris Bernhardt, The MIT Press; Reprint edition (8 September 2020), "Quantum Computing for Everyone".						
REFERENCES							
1	Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.						
2	N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.						

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the basics of quantum computing.	K1
CO2	Understand the background of Quantum Mechanics.	K1
CO3	Analyze the computation models.	K3
CO4	Model the circuits using quantum computation environments and frameworks.	K2
CO5	Understand the quantum operations such as noise and error–correction	K1

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

AIT529 EVOLUTIONARY ALGORITHMS							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	• To learn basic techniques used in evolutionary algorithms.						
Unit 1	**MODELS OF EVOLUTION AND GENETIC ALGORITHM**						**9**
Models of evolution- basic approaches and notions- Population- recombination- fitness evaluation- Genetic algorithms- solution encoding in a chromosome- basic operators of selection- mutation- crossover.							
Unit 2	**EVOLUTIONARY COMPUTATION**						**9**
Selection- objective function- dynamic vs. static- roulette-wheel selection- tournaments- elitism- Schema theorem- building block hypotheses- implicit parallelism.							
Unit 3	**PROBABILISTIC MODELS**						**9**
Quantum parallelism - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm .							
Unit 4	**MACHINE LEARNING**						**9**
Machine learning and data mining- evolution of expert systems- internal representation- Michigan vs. Pittsburg approach.							
Unit 5	**CLASSIFIER SYSTEMS**						**9**
Classifier systems, if-then rules, bucket brigade algorithm, Q-learning, production systems.							
							TOTAL: 45
TEXTBOOKS							
1	Mitchell, M.: Introduction to genetic algorithms. MIT Press, 1996.						
2	Goldberg, D.: Genetic algorithms in search optimization and machine learning, Addison-Wesley, 1989.						
3	Holland, J.: Adaptation in natural and artificial systems, MIT Press, 1992 (2nd ed).						
4	Holland, J.: Hidden order, Addison-Wesley, 1995.						
REFERENCES							
1	Introduction to Evolutionary Computing by Agoston E. Eiben and J.E. Smith (Second Edition, 2015)						
2	Genetic Programming: On the Programming of Computers by Means of Natural Selection by John R. Koza (1992)						
COURSE OUTCOMES: **At the end of the course, learners will be able to**							**Bloom's Taxonomy Level**
CO1	To know the history of models of evolution and genetic algorithm.						K1

CO2	To understand the concepts of evolutionary computation.	K2
CO3	To gain knowledge on probabilistic models.	K1
CO4	To understand the concepts of machine learning.	K2
CO5	To gain insight on classifier system.	K1

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO1	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

AIT530 BRAIN COMPUTER INTERFACE							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	• To learn basic techniques used in evolutionary algorithms.						
Unit 1	**INTRODUCTION TO BCI**						**9**
Introduction - Brain structure and function, Brain Computer Interface Types - Synchronous and Asynchronous -Invasive BCI -Partially Invasive BCI - Non Invasive BCI, Structure of BCI System, BCI Monitoring Hardware, EEG, ECoG, MEG, fMRI.							
Unit 2	**BRAIN ACTIVATION**						**9**
Brain activation patterns - Spikes, Oscillatory potential and ERD, slow cortical potentials, Movement related potentials-Mu rhythms, motor imagery, Stimulus related potentials - Visual Evoked Potentials – P300 and Auditory Evoked Potentials, Potentials related to cognitive tasks.							
Unit 3	**FEATURE EXTRACTION METHODS**						**9**
Data Processing – Spike sorting, Frequency domain analysis, Wavelet analysis, Time domain analysis, Spatial filtering -Principal Component Analysis (PCA), Independent Component Analysis (ICA), Artifacts reduction, Feature Extraction - Phase synchronization and coherence.							
Unit 4	**MACHINE LEARNING METHODS FOR BCI**						**9**
Classification techniques –Binary classification, Ensemble classification, Multiclass Classification, Evaluation of classification performance, Regression - Linear, Polynomial, RBF's, Perceptron's, Multilayer neural networks, Support vector machine, Graph theoretical functional connectivity analysis.							
Unit 5	**APPLICATIONS OF BCI**						**9**
Case Studies - Invasive BCIs: decoding and tracking arm (hand) position, controlling prosthetic devices such as orthotic hands, Cursor and robotic control using multi electrode array implant, Cortical control of muscles via functional electrical stimulation. Noninvasive BCIs: P300 Mind Speller, Visual cognitive BCI, Emotion detection, Ethics of Brain Computer Interfacing.							
							TOTAL: 45
TEXTBOOKS							
1	Rajesh.P.N.Rao, "Brain-Computer Interfacing: An Introduction", Cambridge University Press, First edition, 2013						
2	Jonathan Wolpaw, Elizabeth Winter Wolpaw, "Brain Computer Interfaces: Principles and practice", Oxford University Press, USA, Edition 1, January 2012						
3	Ella Hassianien, A ∧ Azar.A.T (Editors), "Brain-Computer Interfaces Current						

	Trends and Applications", Springer, 2015.
4	Bernhard Graimann, Brendan Allison, GertPfurtscheller, "Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction", Springer, 2010
REFERENCES	
1	Ali Bashashati, MehrdadFatourechi, Rabab K Ward, Gary E Birch," A survey of signal Processing algorithms in brain–computer interfaces based on electrical brain signals" Journal of Neural Engineering, Vol.4, 2007
2	Arnon Kohen, "Biomedical Signal Processing Vol I and II, CRC Press Inc, Boca Rato, Florida

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Comprehend and appreciate the significance and role of this course in the present contemporary world.	K1
CO2	Differentiate various concept of BCI.	K1
CO3	Allocate functions appropriately to the human and to the machine.	K1
CO4	Select appropriate for feature extraction methods.	K1
CO5	Design a system using machine learning algorithms for translation.	K2

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

AIT531 DATA AUGMENTATION AND VIRTUAL REALITY							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To Implement Data Augmentation Technique ➢ To Develop Virtual Reality Applications ➢ To Learn Integrate Data Augmentation with VR ➢ To Analyze and Optimize Performance ➢ To Conduct Research and Development						
Unit 1	**INTRODUCTION**						**9**
Introduction to Augmented-Virtual and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR ,VR and MR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality.							
Unit 2	**VR SYSTEMS**						**9**

VR as a discipline, Basic features of VR systems, Architecture of VR systems, VR hardware : VR input hardware: tracking systems, motion capture systems, data gloves, VR output hardware: visual displays.		
Unit 3	**STEREOSCOPIC VISION & HAPTIC RENDERING**	**9**
Fundamentals of the human visual system, Depth cues, Stereopsis, Retinal disparity, Haptic sense, Haptic devices, Algorithms for haptic rendering and parallax, Synthesis of stereo pairs, Pipeline for stereo images.		
Unit 4	**VR SOFTWARE DEVELOPMENT**	**9**
Challenges in VR software development, Master/slave and Client/server architectures, Cluster rendering, Game Engines and available sdk to develop VR applications for different hardware (HTC VIVE, Oculus, Google VR).		
Unit 5	**3D INTERACTION TECHNIQUES & AR SOFTWARE DEVELOPMENT**	**9**
3D Manipulation tasks, Manipulation Techniques and Interaction Techniques for 3D Manipulation. ARsoftware development : AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit. AR software development : AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit.		
		TOTAL: 45

TEXTBOOKS	
1	George Mather, Foundations of Sensation and Perception:Psychology Press; 2 edition, 2009. 2. The VR Book: Human-Centered Design for Virtual Reality, by Jason Jerald 3.
2	Learning Virtual Reality by Tony Parisi, O' Reilly
3	Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition.Wiley-IEEE Press, 2003/2006.
4	Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
REFERENCES	
1	Augmented Reality and Virtual Reality: Empowering Human, Place and Business edited by Timothy Jung and M. Claudia tom Dieck (2017)
2	Virtual Reality and Augmented Reality: Foundations and Applications edited by Z. Y. Zhang, M. T. Bailey, and R. Y. P. Lau (2021)

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Identify, examine, and develop software that reflects fundamental techniques for the design and deployment of VR and AR experiences.	K2
CO2	Describe how VR and AR systems work.	K2
CO3	Choose, develop, explain, and defend the use of particular designs for AR and VR experiences.	K2
CO4	Evaluate the benefits and drawbacks of specific AR and VR techniques on the human body.	K5
CO5	Identify and examine state-of-the-art AR and VR design problems and solutions from the industry and academia.	K1

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

AIT532 NATURE LANGAUAGE UNDERSTANDING							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To learn language models ➢ To learn text preprocessing techniques ➢ To understand the levels of knowledge in language processing ➢ To develop NLP applications. ➢ To apply traditional learning and deep learning for NLP applications.						
Unit 1	**TEXTPRE-PROCESSING AND LANGUAGE MODELLING**						**9**
Knowledge in language processing – NLP applications; – Regular Expressions – Words – Corpora –Text Normalization –Minimum Edit distance– N-gram language models–Neural language models RNN s as language models.							
Unit 2	**WORD LEVEL AND SYNTACTIC ANALYSIS**						**9**
Word Level Analysis: Word classes – Part-of-Speech Tagging: HMM POS tagging; Named Entities(NE): NE Tagging – Conditional Random Field NE recognizer; Syntactic Analysis: Constituency –Context-free grammar–Grammar rules– Tree banks; Parsing: Top-down –Bottom-up –Ambiguity CKY Parsing–Shallow parsing–Dependency parsing.							
Unit 3	**SEMANTIC ANALYSIS**						**9**
Vector Semantics – Words and Vectors – Cosine similarity – Tf-idf – Positive PMI – Word2vec– Semantic properties of embeddings; Lexical Semantics: Word Senses – Relations between senses –Word Net–Word Sense Disambiguation.							
Unit 4	**COREFERENCE RESOLUTION AND MACHINE TRANSLATION**						**9**
Coreference Resolution: Coreference phenomena – Mention detection – Mention-pair architecture; RNNs for sequence labeling and classification – Stacked and Bi-directional RNN – Machine Translation(MT):Lexicaldivergenceandtypology–Encoder-DecoderwithRNNs– MTEvaluation.							
Unit 5	**NLP APPLICATIONS**						**9**
Sentiment Classification: Naive Bayes classifier – Optimizing for Sentiment Analysis – Evaluation; Information Extraction: Relation extraction; Information Retrieval; IR-based Factoid Question Answering: IR-based QA Datasets– Answer span extraction.							
							TOTAL: 45

TEXTBOOKS

1	Daniel Jurafsky and James H Martin, “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, 2nd Edition, Prentice Hall, 2008.

REFERENCES

1	Cristopher D Manning, Hinrich Schutze, “Foundations of Statistical Natural Language Processing”,MIT Press,1999.
2	Steven Bird, Ewan Klien and Edward Loper, Natural Language Processing withPython,O’Reilly,2009.
3	Nitin Indurkhya, FredJ Damerau, "Handbook of Natural Language Processing", 2nd Edition,CRC Press, 2010.
4	Yoav Goldberg,"Neural Network Methods for Natural Language Processing", Synthesis Lectures on Human Language Technologies, Morgan & Claypool publishers,2017.
5	LiDeng, Yang Liu,"DeepLearninginNaturalLanguageProcessing",Springer, 2018.
6	Taweh BeysolowII, "Applied Natural Language Processing-Implementing Machine LearnIng and Deep Learning Algorithms for Natural Language Processing", Apress,

	2018.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Apply text pre-processing techniques and build the language models	K3
CO2	Apply basic levels of knowledge at word level and syntax level in language processing	K3
CO3	Apply computational methods in lexical and vector semantics	K3
CO4	Explain discourse processing and machine translation systems	K2
CO5	Apply learning algorithms for various NLP applications	K3

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

AIT533 COMPUTATIONAL NEUROSCIENCE

Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**

Preamble		
Unit 1	**INTRODUCTION**	**9**

Domains in Computational Neuroscience - Brain metaphors-computer and brain - Basic neuroscience - Basic synaptic mechanisms and the generation of action potentials - Nernst Potential - Hodgkin-Huxley equations - The propagation of action potentials.

Unit 2	**SPIKING NEURONS AND RESPONSE VARIABILITY**	**9**

Spiking neurons- concept neurons- the neural code - Spike trains- cable theory- Spike time variability - Post synaptic potential(PSP) - firing threshold and action potential - Neurons in a Network- Population Dynamics - Rate code and Information in spike trains - Population coding and decoding- single neuron models - Hodgkin-Huxley Model, spiking neuron models - Integrate and firing model - Noise in spiking neuron models- compartmental modelling.

Unit 3	**FEED-FORWARD MAPPING NETWORKS**	**9**

From artificial neural network to realistic neural networks - Perception, function representation, and look-up tables - The sigma node as perception - Multi-layer mapping networks - Learning, generalization and biological interpretations - Self-organizing network architectures and genetic algorithms - Mapping networks with context units - Probabilistic mapping networks - Associators and

synaptic plasticity - Associative memory and Hebbian learning - Hebian plasticity- features of associators and Hebbian learning.		
Unit 4	**AUTO-ASSOCIATIVE MEMORY AND NETWORK DYNAMICS**	**9**
Associative memory networks- Short-term memory and reverberating network activity - Long-term memory and auto-associators - Point attractor networks - The Grossberg-Hopfield model - Sparse attractor neural networks - Chaotic networks, biologically more realistic variations of attractor networks - Continuous attractor and competitive networks.		
Unit 5	**SUPERVISED LEARNING AND REWARDS SYSTEMS**	**9**
Motor learning and control, supervised learning - The delta rule and back propagation - Generalized delta rules, plasticity and coding - Reward learning, System level organization and coupled networks - System level anatomy of the brain, Modular mapping networks - Coupled attractor networks, working memory - Attentive vision, an interconnecting workspace hypothesis.		
		TOTAL: 45

TEXTBOOKS	
1	Thomas Trappenberg, Fundamentals of Computational Neuroscience, oxford University Press, June 2002.
2	Lytton, William W, From Computer to Brain - Foundations of Computational Neuroscience, Springer publications, 2002.
REFERENCES	
1	Gerstner and Kistler, Spiking Neuron Models. Single Neurons, Populations, Plasticity -Cambridge University Press, 2002.
2	Eric L. Schwartz, Computational Neuroscience, MIT Press, 1993

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Utilize mathematical tools and computational techniques to create models of neural processes, including differential equations, statistical methods, and machine learning algorithms.	K2
CO2	Analyze, and interpret neural data using computational tools, effectively applying data analysis techniques to draw meaningful conclusions from experimental results	K2
CO3	Assess the accuracy and predictive power of different neural models.	K2
CO4	Demonstrate a deep understanding of neurobiological processes such as neural coding, synaptic plasticity, and neural dynamics, and model these processes computationally.	K2
CO5	Understand the practical applications of computational neuroscience in neuro engineering, artificial intelligence, and medicine.	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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

PROFESSIONAL ELECTIVE 7

AIT535 AI TECHNIQUES FOR GAME DEVELOPMENT							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To have an introduction into the Game programming and rendering. ➢ To learn the principles, mechanics and logics of Game Design. ➢ To learn the various Game Development process and its design attributes. ➢ To gain working knowledge in various game platforms. ➢ To learn to design games using python.						
UNIT I	**INTRODUCTION**						**9**
Elements of Game Play — Artificial Intelligence — Getting Input from the Player - Sprite Programming — Sprite Animation - Multithreading — Importance of Game Design — Game Loop, Software and Hardware Rendering.							
Unit 2	**GAME DESIGN PRINCIPLES**						**9**
Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence							
Unit 3	**DIGITAL FORENSIC READINESS**						**9**
Game development: Developing 2D and 3D interactive games using OpenGL, DirectX — Puzzle games, Single /Multi-player games-Games using HTML and Java Script, Scratch 2.0, Unity 3D - Introduction, Creating games and Designing and Coding game play systems							
Unit 4	**GAMING PLATFORMS AND FRAMEWORKS**						**9**
Mobile Hardware and Operating Systems - iOS Fundamentals – Jailbreaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud							
Unit 5	**GAME PROGRAMMING USING PYTHON**						**9**
Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools – Dual Use Tools – Oxygen Forensics – MobilEdit – Android App Decompiling							
							TOTAL: 45
TEXTBOOKS							
1	Jeannie Novak, Game Development Essentials, Third Edition, Delmar Cengage Learning, ISBN-13:978-1111307653, 2011.						
2	Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, Game Design: Principles, Practice, and Techniques - The Ultimate Guide for the Aspiring Game, Designer, First edition, Wiley, ISBN 0471968943, 2007.						
3	Joseph Howse, Alejandro Rodas de Paz, Python Game Programming by Example, Packt Publishing,First edition, 2015.						
REFERENCES							
1	1 Jeremy Gibson, "Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#", Addison-Wesley Professional, 3rd edition 2016.						
2	John Horton, ―Learning Java by Building Android Games‖, Packt Publishing Limited, 1st edition, 2015.						
3	Jorge Palacios, ―Unity 5.x Game AI Programming Cookbook‖, Packt Publishing Limited, 1st edition, 2016						
COURSEOUTCOMES: **At the end of the course, learners will be able to**							**Bloom's Taxonomy Level**
CO1	Identify the need for Game programming.						K2

CO2	Have knowledge on the concepts and techniques used in Game design.	K2
CO3	Design and model interactive game.	K2
CO4	Understand the need for advanced game development platforms.	K2
CO5	Design and develop games with open source components	K2

CO/PO	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	-

AIT536 SOFT COMPUTING

Programme & Branch	B.Tech & IT	Sem.	Category	L	T	P	C
			PE	3	0	0	3

Preamble	➢ To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience. ➢ To provide the mathematical background for carrying out the optimization associated with neural network learning ➢ To learn various evolutionary Algorithms. ➢ To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems. ➢ To introduce case studies utilizing the above and illustrate the Intelligent behavior of programs based on soft computing

UNIT I	INTRODUCTION TO SOFT COMPUTING AND FUZZY LOGIC	9
Introduction - Fuzzy Logic - Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Operations on Fuzzy Relations, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems		
Unit 2	**NEURAL NETWORKS**	**9**
Supervised Learning Neural Networks – Perceptrons - Backpropagation -Multilayer Perceptrons – Unsupervised Learning Neural Networks – Kohonen Self-Organizing Networks		
Unit 3	**GENETIC ALGORITHMS**	**9**
Chromosome Encoding Schemes -Population initialization and selection methods - Evaluation function - Genetic operators- Cross over – Mutation - Fitness Function – Maximizing function		
Unit 4	**NEURO FUZZY MODELING**	**9**
ANFIS architecture – hybrid learning – ANFIS as universal approximator – Coactive Neuro fuzzy modeling – Framework – Neuron functions for adaptive networks – Neuro fuzzy spectrum - Analysis of Adaptive Learning Capability		
Unit 5	**APPLICATIONS**	**9**
Modeling a two input sine function - Printed Character Recognition – Fuzzy filtered neural networks – Plasma		

Spectrum Analysis – Hand written neural recognition - Soft Computing for Color Recipe Prediction	
TOTAL: 45	
TEXTBOOKS	
1	Sa JANG, J.-S. R., SUN, C.-T., & MIZUTANI, E. (1997). Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence. Upper Saddle River, NJ, Prentice Hall,1997
2	Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Fuzzy Systems with Python
3	With Case Studies and Applications from the Industry, Apress, 2020
REFERENCES	
1	Roj Kaushik and Sunita Tiwari, Soft Computing-Fundamentals Techniques and Applications, 1st Edition, McGraw Hill, 2018.
2	S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
3	Samir Roy, Udit Chakraborthy, Introduction to Soft Computing, Neuro Fuzzy and Genetic Algorithms, Pearson Education, 2013.
4	S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, Third Edition, Wiley India Pvt Ltd, 2019.
5	R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Understand the fundamentals of fuzzy logic operators and inference mechanisms	K2
CO2	Understand neural network architecture for AI applications such as classification and clustering	K2
CO3	Learn the functionality of Genetic Algorithms in Optimization problems	K2
CO4	Use hybrid techniques involving Neural networks and Fuzzy logic	K2
CO5	Apply soft computing techniques in real world applications	K2

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

AIT537 NEURAL NETWORKS AND DEEP LEARNING							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ To understand the basics in deep neural networks ➢ To understand the basics of associative memory and unsupervised learning networks						

	➢ To apply CNN architectures of deep neural networks ➢ To analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks. ➢ To apply autoencoders and generative models for suitable applications.	
UNIT I	**INTRODUCTION**	**9**
Elements of Game Play — Artificial Intelligence — Getting Input from the Player - Sprite Programming — Sprite Animation - Multithreading — Importance of Game Design — Game Loop, Software and Hardware Rendering.		
Unit 2	**ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS**	**9**
Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.		
Unit 3	**THIRD-GENERATION NEURAL NETWORKS**	**9**
Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.		
Unit 4	**DEEP FEEDFORWARD NETWORKS**	**9**
History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.		
Unit 5	**RECURRENT NEURAL NETWORKS**	**9**
Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders		
		TOTAL: 45

TEXTBOOKS	
1	Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
2	Francois Chollet, “Deep Learning with Python”, Second Edition, Manning Publications, 2021
REFERENCES	
1	Aurelien Geron, “Hands-On Machine Learning with Scikit-Learn and Tensor Flow”, Oreilly, 2018.
2	Josh Patterson, Adam Gibson, “Deep Learning: A Practitioner’s Approach”, O’Reilly Media, 2017.
3	Charu C. Aggarwal, “Neural Networks and Deep Learning: A Textbook”, Springer International Publishing, 1st Edition, 2018.
4	Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
5	Deep Learning Projects Using Tensor Flow 2, Vinita Silaparasetty, A press, 2020
6	Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND,2017.
7	S Rajasekaran, G A Vijayalakshmi Pai, “Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications”, PHI Learning, 2017.
8	Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017
9	James A Freeman, David M S Kapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Addison Wesley, 2003.

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

CO1	Apply Convolution Neural Network for image processing.	K2
CO2	Understand the basics of associative memory and unsupervised learning networks.	K2
CO3	Apply CNN and its variants for suitable applications.	K2
CO4	Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.	K2
CO5	Apply auto encoders and generative models for suitable applications.	K2

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

AIT538 OPTIMIZATION TECHNIQUES							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ Formulate and solve linear programming problems (LPP) ➢ Evaluate Integer Programming Problems, Transportation and Assignment Problems. ➢ Obtain a solution to network problems using CPM and PERT techniques. ➢ Able to optimize the function subject to the constraints. ➢ Identify and solve problems under Markovian queuing models.						
UNIT I	**LINEAR MODELS**						**9**
Introduction of Operations Research - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Two-Phase method							
Unit 2	**INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS**						**9**
Integer programming: Branch and bound method- Transportation and Assignment problems - Traveling salesman problem							
Unit 3	**PROJECT SCHEDULING**						**9**
Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM							
Unit 4	**CLASSICAL OPTIMIZATION THEORY**						**9**
Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions.							
Unit 5	**QUEUING MODELS**						**9**
Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system,							

Service facility, Queue discipline, Single channel models, multiple service channels.	
Total: 45	
TEXTBOOKS	
1	Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.
REFERENCES	
1	ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.
2	J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.
3	Hiller F.S, Liberman G.J, Introduction to Operations Research, 10th Edition McGraw Hill, 2017.
4	Jit. S. Chandran, Mahendran P. Kawatra, KiHoKim, Essentials of Linear Programming, Vikas Publishing House Pvt.Ltd. New Delhi, 1994.
5	Ravindran A., Philip D.T., and Solberg J.J., Operations Research, John Wiley, 2nd Edition, 2007.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Formulate and solve linear programming problems (LPP)	K2
CO2	Evaluate Integer Programming Problems, Transportation and Assignment Problems.	K2
CO3	Obtain a solution to network problems using CPM and PERT techniques.	K2
CO4	Able to optimize the function subject to the constraints.	K2
CO5	Identify and solve problems under Markovian queuing models	K2

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

AIT539 REINFORCEMENT LEARNING							
Programme & Branch	**B.Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
			PE	**3**	**0**	**0**	**3**
Preamble	➢ Introduce the different basic elements of Reinforcement Learning (RL). ➢ Study about Tabular methods and Q-networks. ➢ Study about policy optimization. ➢ Learn current advancements and applications in RL.						
UNIT I	**BASICS OF REINFORCEMENT LEARNING (RL)**						**9**

Elements of RL- RL framework- Markov property- Partially Observable Markov Decision Process- policies value functions and Bellman equations.		
Unit 2	**TABULAR METHODS**	**9**
Planning with dynamic Programming- Monte Carlo control- and Temporal-Difference learning methods - TD (0), SARSA, and Q-Learning.		
Unit 3	**Q-NETWORKS**	**9**
Deep Q-networks - DQN, DDQN, Dueling DQN, Prioritized Experience Replay		
Unit 4	**POLICY OPTIMIZATIONS**	**9**
Optimal policies and optimal value functions- Bellman optimality equations- Vanilla Policy Gradient- REINFORCE algorithm and stochastic policy search- Actor-critic methods - A2C and A3C- Advanced policy gradient - PPO, TRPO, DDPG.		
Unit 5	**RECENT ADVANCEMENTS AND APPLICATIONS**	**9**
Meta-learning, Multi-Agent RL, Model-based RL approach, Code Standards and Python Libraries used in RL: SuperSuit, Stable Baselines3, Pistonball and MAgent. RL for real-world problems: Autonomous Driving- Train an RL agent to navigate a self-driving car through complex urban environments, obeying traffic rules, and making safe decisions.		
		TOTAL: 45

TEXTBOOKS	
1	Richard S. Sutton and Andrew G. Barto, “Reinforcement Learning: An Introduction”, MIT Press, 2nd edition, 2018.
REFERENCES	
1	Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach. “Pearson Education Limited, 2022.
2	Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective",2012.
3	Csaba Szepesvari, “Algorithms for Reinforcement learning”,2009.
4	Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning." Adaptation, learning, and optimization 12 (2012).
5	Li, Yuxi. "Deep reinforcement learning." arXiv preprint arXiv:1810.06339 (2018**).** Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep learning." MIT press, 2016.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Explain the elements of reinforcement learning.	K2
CO2	Apply tabular methods and Q-networks to solve classical problems.	K2
CO3	Interpret policy gradient methods from vanilla to more complex cases.	K2
CO4	Implement real-world problems applying code standards.	K2
CO5		

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

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:							**Bloom’s Taxonomy Level**

At the end of the course, learners will be able to		
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	K2

	international transactions such as syndicated lending and international bond issues.	
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	cide about the appropriateness of various business structures.	K2
CO3	derstand the need for and importance of corporate governance with reference to Environment protection	K3
CO4	ke 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 CO2 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