B.E. (Information Science and Engineering)

Revised 2018 Regulations, Curriculum & Syllabi

(Candidates admitted during Academic Year 2021-2022)

Stay Ahead

BANNARI AMMAN INSTITUTE OF TECHNOLOGY

An Autonomous Institution Affiliated to Anna University - Chennai • Approved by AICTE • Accredited by NAAC with "A+" Grade

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CONTENTS

VISION

To promote innovative centric education through excellence in scientific & technical education and research aimed towards improvement of society.

MISSION

I. Develop human potential with sound knowledge in theory and practice of Information Science & Engineering.

II. Facilitate the development of Industry Institute collaborations and societal outreach programmes.

III. Promote research based activities in the emerging areas of technology convergence.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

I. Competent professional with the knowledge of Information Science and Engineering by designing innovative solutions to real life problems that are technically sound, economically viable and socially acceptable.

II. Capable of pursuing higher studies, research activities and entrepreneurial skills by adapting to new technologies and constantly upgrade their skills with an attitude towards lifelong learning.

III. Proficient team leaders, effective communicators and capable of working in multidisciplinary projects and diverse professional activities following ethical values.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

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

b. **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.

c. **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.

d. **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.

e. **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.

f. **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.

g. **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.

h. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. **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.

k. **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.

l. **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.

PROGRAMME SPECIFIC OUTCOMES (PSOS)

- Excel in processing the information using data management with security features.
- Demonstrate and develop applications on data analysis.

MAPPING OF PEOs AND POs

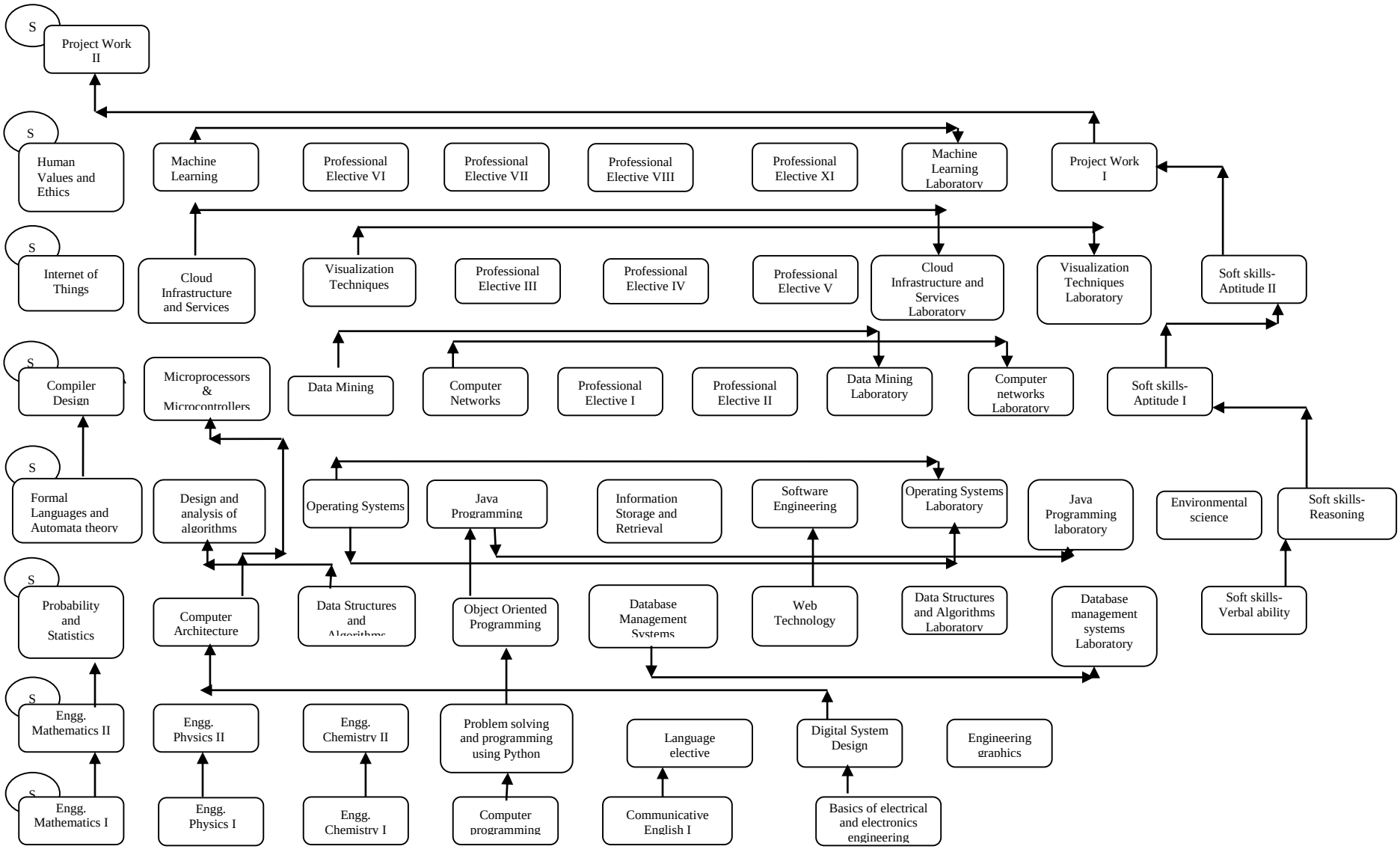
POs	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2
PEO 1	X	X	X	X	X	X	X							X
PEO 2	X	X	X	X	X	X					X	X	X	
PEO 3								X	X	X	X		X	X

CONNECTIVITY CHART

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

CURRICULUM DESIGN & INTERLINKING OF COURSES

360^0 FLEXIBLE LEARNING FRAMEWORK



DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING
Minimum Credits to be Earned : 163

I SEMESTER

Code No.	Course	L	T	P	C	Hours / Week	Maximum Marks			Category
							CA	ES	Total	
19IS101	ENGINEERING MATHEMATICS I	3	1	0	4	4	40	60	100	BS
19IS102	ENGINEERING PHYSICS I	2	0	2	3	4	50	50	100	BS
19IS103	ENGINEERING CHEMISTRY I	2	0	2	3	4	50	50	100	BS
19IS104	COMPUTER PROGRAMMING	2	0	2	3	4	50	50	100	ES
18HS101	COMMUNICATIVE ENGLISH I	1	0	2	2	3	100	0	100	HSS
19IS106	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	2	0	2	3	4	50	50	100	ES
Total		**12**	**1**	**10**	**18**	**23**	**-**	**-**	**-**	**-**

II SEMESTER

Code No.	Course	L	T	P	C	Hours/ Week	Maximum Marks			Category
							CA	ES	Total	
19IS201	ENGINEERING MATHEMATICS II	3	1	0	4	4	40	60	100	BS
19IS202	ENGINEERING PHYSICS II	2	0	2	3	4	50	50	100	BS
19IS203	ENGINEERING CHEMISTRY II	2	0	2	3	4	50	50	100	BS
19IS204	PROBLEM SOLVING AND PROGRAMMING USING PYTHON	3	0	2	4	5	50	50	100	ES
	LANGUAGE ELECTIVE	-	-	-	2	2	100	0	100	HSS
19IS206	DIGITAL SYSTEM DESIGN	3	0	2	4	5	50	50	100	ES
19IS207	ENGINEERING GRAPHICS	1	0	4	3	5	100	0	100	ES
Total		**14**	**1**	**12**	**23**	**29**	-	-	-	**-**

III SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
19IS301	PROBABILITY AND STATISTICS	3	1	0	4	4	40	60	100	BS
19IS302	COMPUTER ARCHITECTURE	3	0	0	3	3	40	60	100	PC
19IS303	DATA STRUCTURES AND ALGORITHMS	3	0	0	3	3	40	60	100	PC
19IS304	OBJECT ORIENTED PROGRAMMING	2	0	2	3	4	50	50	100	PC
19IS305	DATABASE MANAGEMENT SYSTEMS	3	0	0	3	3	40	60	100	PC
19IS306	WEB TECHNOLOGY	2	0	2	3	4	50	50	100	PC
19IS307	DATA STRUCTURES AND ALGORITHMS LABORATORY	0	0	4	2	4	100	0	100	PC
19IS308	DATABASE MANAGEMENT SYSTEMS LABORATORY	0	0	4	2	4	100	0	100	PC
18GE301	SOFT SKILLS - VERBAL ABILITY	0	0	2	-	2	100	0	100	EEC
Total		**16**	**1**	**14**	**23**	**31**	**-**	**-**	**-**	**-**
IV SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
19IS401	FORMAL LANGUAGES AND AUTOMATA THEORY	3	1	0	4	4	40	60	100	ES
19IS402	DESIGN AND ANALYSIS OF ALGORITHMS	3	0	0	3	3	40	60	100	PC
19IS403	OPERATING SYSTEMS	3	0	0	3	3	40	60	100	PC
19IS404	JAVA PROGRAMMING	3	0	0	3	3	40	60	100	PC
19IS405	INFORMATION STORAGE AND RETRIEVAL	3	0	0	3	3	40	60	100	PC
19IS406	SOFTWARE ENGINEERING	3	0	0	3	3	40	60	100	PC
19IS407	OPERATING SYSTEMS LABORATORY	0	0	4	2	4	100	0	100	PC
19IS408	JAVA PROGRAMMING LABORATORY	0	0	4	2	4	100	0	100	PC
18HS001	ENVIRONMENTAL SCIENCE	2	0	0	0	2	100	0	100	HSS
18GE401	SOFT SKILLS – REASONING	0	0	2	-	2	100	0	100	EEC

Total	**20**	**1**	**10**	**23**	**31**	**-**	**-**	**-**	**-**

V SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
21IS501	COMPILER DESIGN	3	1	0	4	4	40	60	100	PC
21IS502	MICROPROCESSORS AND MICROCONTROLLER	3	0	2	4	5	50	50	100	ES
21IS503	DATA MINING	3	0	0	3	3	40	60	100	PC
21IS504	COMPUTER NETWORKS	3	0	0	3	3	40	60	100	PC
	PROFESSIONAL ELECTIVE I	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE II	3	0	0	3	3	40	60	100	PE
21IS507	DATA MINING LABORATORY	0	0	4	2	4	100	0	100	PC
21IS508	COMPUTER NETWORKS LABORATORY	0	0	4	2	4	100	0	100	PC
21GE501	SOFT SKILLS - APTITUDE I	0	0	2	-	2	100	0	100	EEC
Total		**18**	**1**	**12**	**24**	**31**	**-**	**-**	**-**	**-**
VI SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
21IS601	INTERNET OF THINGS	2	0	0	2	2	40	60	100	HSS
21IS602	CLOUD INFRASTRUCTURE AND SERVICES	3	0	0	3	3	40	60	100	PC
21IS603	VISUALIZATION TECHNIQUES	3	0	0	3	3	40	60	100	PC
	PROFESSIONAL ELECTIVE III	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE IV	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE V	3	0	0	3	3	40	60	100	PE
21IS607	CLOUD INFRASTRUCTURE AND SERVICES LABORATORY	0	0	4	2	4	100	0	100	PC
21IS608	VISUALIZATION TECHNIQUES LABORATORY	0	0	4	2	4	100	0	100	PC
21GE601	SOFT SKILLS - APTITUDE II	0	0	2	-	2	100	0	100	EEC
Total		**17**	**0**	**10**	**21**	**27**	**-**	**-**	**-**	**-**

VII SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours /Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
21HS002	HUMAN VALUES AND ETHICS	2	0	0	2	2	40	60	100	HSS
21IS702	MACHINE LEARNING	3	0	0	3	3	40	60	100	EEC
	PROFESSIONAL ELECTIVE VI	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE VII	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE VIII	3	0	0	3	3	40	60	100	PE
	PROFESSIONAL ELECTIVE IX	3	0	0	3	3	40	60	100	PE
21IS707	MACHINE LEARNING LABORATORY	0	0	4	2	4	60	40	100	EEC
21IS708	PROJECT WORK I	0	0	6	3	6	60	40	100	EEC
Total		**17**	**0**	**10**	**22**	**27**	**-**	**-**	**-**	**-**
VIII SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours /Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
21IS801	PROJECT WORK II	0	0	18	9	18	60	40	100	EEC
Total		**0**	**0**	**18**	**9**	**18**	**-**	**-**	**-**	**-**

ELECTIVES										
LANGUAGE ELECTIVES										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
18HS201	COMMUNICATIVE ENGLISH II	1	0	2	2	3	100	0	100	HSS
18HSH01	HINDI	1	0	2	2	3	100	0	100	HSS
18HSG01	GERMAN	1	0	2	2	3	100	0	100	HSS
18HSJ01	JAPANESE	1	0	2	2	3	100	0	100	HSS
18HSC01	CHINESE	1	0	2	2	3	100	0	100	HSS
18HSF01	FRENCH	1	0	2	2	3	100	0	100	HSS
PROFESSIONAL ELECTIVE										
VERTICAL I - INFORMATION STORAGE AND RETRIEVAL										
21IS001	INFORMATION STORAGE AND MANAGEMENT	3	0	0	3	3	40	60	100	PE
21IS002	MANAGEMENT INFORMATION SYSTEM	3	0	0	3	3	40	60	100	PE
21IS003	NOSQL DATABASE	2	0	2	3	3	50	50	100	PE
21IS004	DATA COMPRESSION	3	0	0	3	3	40	60	100	PE
21IS005	DECISION SUPPORT SYSTEM	3	0	0	3	3	40	60	100	PE
21IS006	BUSINESS INTELLIGENCE	3	0	0	3	3	40	60	100	PE
VERTICAL II - CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES										
21IS007	VIRTUALIZATION IN CLOUD COMPUTING	3	0	0	3	3	40	60	100	PE
21IS008	CLOUD SERVICES AND DATA MANAGEMENT	3	0	0	3	3	40	60	100	PE
21IS009	CLOUD STORAGE TECHNOLOGIES	3	0	0	3	3	40	60	100	PE
21IS010	CLOUD AUTOMATION TOOLS AND APPLICATIONS	3	0	0	3	3	40	60	100	PE
21IS011	SOFTWARE DEFINED NETWORKS	2	0	2	3	3	50	50	100	PE
21IS012	SECURITY AND PRIVACY IN CLOUD	3	0	0	3	3	40	60	100	PE
VERTICAL III - CYBER SECURITY AND DATA PRIVACY										
21IS013	CYBER SECURITY	3	0	0	3	3	40	60	100	PE
21IS014	MODERN CRYPTOGRAPHY	3	0	0	3	3	40	60	100	PE
21IS015	CYBER FORENSICS	3	0	0	3	3	40	60	100	PE
21IS016	ETHICAL HACKING	3	0	0	3	3	40	60	100	PE
21IS017	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	2	0	2	3	3	50	50	100	PE
21IS018	MALWARE ANALYSIS	3	0	0	3	3	40	60	100	PE
VERTICAL IV - FULL STACK DEVELOPMENT										

21IS019	AGILE SOFTWARE DEVELOPMENT	3	0	0	3	3	40	60	100	PE
21IS020	UI AND UX DESIGN	3	0	0	3	3	40	60	100	PE
21IS021	WEB FRAMEWORKS	3	0	0	3	3	40	60	100	PE
21IS022	APP DEVELOPMENT	2	0	2	3	3	50	50	100	PE
21IS023	SOFTWARE TESTING AND AUTOMATION	3	0	0	3	3	40	60	100	PE
21IS024	DEVOPS	3	0	0	3	3	40	60	100	PE
VERTICAL V - DATA SCIENCE										
21IS025	EXPLORATORY DATA ANALYSIS	2	0	2	3	3	50	50	100	PE
21IS026	RECOMMENDER SYSTEMS	3	0	0	3	3	40	60	100	PE
21IS027	BIG DATA ANALYTICS	3	0	0	3	3	40	60	100	PE
21IS028	NEURAL NETWORKS AND DEEP LEARNING	2	0	2	3	3	50	50	100	PE
21IS029	NATURAL LANGUAGE PROCESSING	3	0	0	3	3	40	60	100	PE
21IS030	COMPUTER VISION	3	0	0	3	3	40	60	100	PE
VERTICAL VI - MEDIA PROCESSING										
21IS031	MULTIMEDIA DATA COMPRESSION AND STORAGE	3	0	0	3	3	40	60	100	PE
21IS032	STREAMING MEDIA TOOLS AND TECHNOLOGIES	2	0	2	3	3	50	50	100	PE
21IS033	METAVERSE	2	0	2	3	3	50	50	100	PE
21IS034	IMAGE AND VIDEO ANALYTICS	3	0	0	3	3	40	60	100	PE
21IS035	WEARABLE DEVICES APPLICATIONS	3	0	0	3	3	40	60	100	PE
21IS036	3D PRINTING AND DESIGN	3	0	0	3	3	40	60	100	PE
VERTICAL VII – DIVERSIFIED COURSES										
21IS037	OPEN SOURCE SOFTWARE	3	0	0	3	3	40	60	100	PE
21IS038	OPEN STACK ESSENTIALS	3	0	0	3	3	40	60	100	PE
21IS039	BIOINFORMATICS ALGORITHMS	3	0	0	3	3	40	60	100	PE
21IS040	FAULT TOLERANT COMPUTING	3	0	0	3	3	40	60	100	PE
21IS041	DIGITAL MARKETING	3	0	0	3	3	40	60	100	PE
21IS042	DESIGN THINKING	3	0	0	3	3	40	60	100	PE
HONOUR COURSES										
21ISH01	EXPLORATORY DATA ANALYSIS	2	0	2	3	3	50	50	100	PE
21ISH02	RECOMMENDER SYSTEMS	3	0	0	3	3	40	60	100	PE
21ISH03	BIG DATA ANALYTICS	3	0	0	3	3	40	60	100	PE
21ISH04	NEURAL NETWORKS AND DEEP LEARNING	2	0	2	3	3	50	50	100	PE
21ISH05	NATURAL LANGUAGE	3	0	0	3	3	40	60	100	PE

	PROCESSING									
21ISH06	COMPUTER VISION	3	0	0	3	3	40	60	100	PE
21ISH09	CLOUD STORAGE TECHNOLOGIES	3	0	0	3	3	40	60	100	PE
21ISH21	WEB FRAMEWORKS	3	0	0	3	3	40	60	100	PE
MINOR COURSES										
21ISM01	EXPLORATORY DATA ANALYSIS	2	0	2	3	3	50	50	100	PE
21ISM02	RECOMMENDER SYSTEMS	3	0	0	3	3	40	60	100	PE
21ISM03	BIG DATA ANALYTICS	3	0	0	3	3	40	60	100	PE
21ISM04	NEURAL NETWORKS AND DEEP LEARNING	2	0	2	3	3	50	50	100	PE
21ISM05	NATURAL LANGUAGE PROCESSING	3	0	0	3	3	40	60	100	PE
21ISM06	COMPUTER VISION	3	0	0	3	3	40	60	100	PE
OPEN ELECTIVES										
19IS0YA	WEB PROGRAMMING	3	0	0	3	3	40	60	100	PE
ADDITIONAL ONE CREDIT COURSES (I to III Semesters)										
18GE0XA	ETYMOLOGY	-	-	-	1	-	100	0	100	EEC
18GE0XB	GENERAL PSYCHOLOGY	-	-	-	1	-	100	0	100	EEC
18GE0XC	NEURO BEHAVIORAL SCIENCE	-	-	-	1	-	100	0	100	EEC
18GE0XD	VISUAL MEDIA AND FILM MAKING	-	-	-	1	-	100	0	100	EEC
18GE0XE	YOGA FOR HUMAN EXCELLENCE	-	-	-	1	-	100	0	100	EEC
18GE0XF	VEDIC MATHEMATICS	-	-	-	1	-	100	0	100	EEC
18GE0XG	HEALTH AND FITNESS	-	-	-	1	-	100	0	100	EEC
18GE0XH	CONCEPT, METHODOLOGY AND APPLICATIONS OF VERMICOMPOSTING	-	-	-	1	-	100	0	100	EEC
18GE0XI	BLOG WRITING	-	-	-	1	-	100	0	100	EEC
18GE0XJ	INTERPERSONAL SKILLS	-	-	-	1	-	100	0	100	EEC
18GE0XK	NEW AGE INNOVATION AND ENTREPRENEURSHIP	-	-	-	1	-	100	0	100	EEC
18GE0XL	NATIONAL CADET CORPS	-	-	-	1	-	100	0	100	EEC
18GE0XM	COMMUNITY SERVICE AND LEADERSHIP DEVELOPMENT	-	-	-	1	-	100	0	100	EEC
18GE0XN	DISRUPTIVE INNOVATION BASED STARTUP ACTIVITIES	-	-	-	1	-	100	0	100	EEC
18GE0XO	SOCIAL PSYCHOLOGY	-	-	-	1	-	100	0	100	EEC
18GE0XP	FM RADIO BROADCASTING TECHNOLOGY	-	-	-	1	-	100	0	100	EEC
ONE CREDIT COURSES										
19IS0XA	FULL STACK DEVELOPMENT	-	-	-	1	-	100	0	100	EEC

19IS0XB	GRAPHICAL PROCESSING UNIT PROGRAMMING	-	-	-	1	-	100	0	100	EEC
19IS0XC	PROJECT MANAGEMENT TOOLS AND TECHNIQUES	-	-	-	1	-	100	0	100	EEC
19IS0XD	GAME PROGRAMMING	-	-	-	1	-	100	0	100	EEC
19IS0XE	SALESFORCE APP BUILDER FUNDAMENTALS	-	-	-	1	-	100	0	100	EEC
19IS0XF	LARAVEL: A PHP WEB FRAMEWORK	-	-	-	1	-	100	0	100	EEC
19IS0XG	BUILDING UI USING FLASK	-	-	-	1	-	100	0	100	EEC
19IS0XH	IOT APPLICATION DESIGN USING EMBEDDED SYSTEM	-	-	-	1	-	100	0	100	EEC

S.No	CATEGORY	CREDITS PER SEMESTER								TOTAL CREDIT	CREDITS in %	Range of Total Credits	
		I	II	III	IV	V	VI	VII	VIII			Min	Max
1	BS	10	10	4	-	-	-	-	-	24	14.72	15%	20%
2	ES	6	11	-	4	4	-	-	-	25	15.33	15%	20%
3	HSS	2	2	-	-	-	2	2	-	8	4.9	5%	10%
4	PC	-	-	19	19	14	10	-		62	38.03	30%	40%
5	PE	-	-	-	-	6	9	12	-	27	16.56	10%	15%
6	EEC	-	-	-	-	-	-	8	9	17	10.42	7%	10%
Total		18	23	23	23	24	21	22	9	163	100	-	-

BS - Basic Sciences
ES - Engineering Sciences
HSS - Humanities and Social Sciences
PC - Professional Core
PE - Professional Elective
EEC - Employability Enhancement Course
CA - Continuous Assessment
ES - End Semester Examination

19IS101 ENGINEERING MATHEMATICS I 3 1 0 4

Course Objectives

- Understand the concepts of vectors and Eigenvectors for different matrices to describe the stability of the linear systems in engineering fields.
- Exemplify the concepts of differentiation and integration to identify the area of 2D and 3D surfaces in engineering problems.
- Explain the concepts of analytic functions in complex domain to predict the nature of different engineering systems.

Course Outcomes (COs)

1. Represent the different forms of coordinate system in complex plane and characteristics of linear systems by Eigenvalues and Eigenvectors.
2. Analyse various types of functions and their differentiation techniques involved in engineering fields.
3. Implement different methods of integration used in engineering problems.
4. Execute the suitable integration technique to calculate the area and volume of different surfaces.
5. Apply the concept of analytic function to estimate the integral in complex plane.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3												
2	3	1												
3	1													
4	2	-												
5		3												

UNIT I **9 Hours**

COMPLEX NUMBERS, VECTORS AND MATRICES

Complex plane, polar coordinates and polar form of complex numbers, powers and roots, fundamental theorem of algebra. Vector algebra in 2-D and 3-D space, dot product and cross product. Matrices: Eigen values and Eigen vectors, Properties of eigen values and eigen vectors.

UNIT II **9 Hours**

CALCULUS

Limits and Continuity of Functions: Limits of functions, types of limits, evaluation of limits, continuity of functions, properties of continuous functions. Derivatives: Derivatives, differentiability, rules and properties, differentiation of transcendental functions, higher order derivatives, implicit differentiation, and differentiation of hyperbolic functions. Integration: Anti-derivatives, Riemann Sum, indefinite and definite integration, Mean Value Theorem for definite integral, Fundamental Theorem of Calculus.

UNIT III **9 Hours**

INTEGRATION METHODS

Basic integration formulae for algebraic and transcendental functions. Integration by special devices: integration by parts, rationalizing substitution or trigonometric substitution, partial fractions, reduction formulas, improper integrals, convergence tests.

UNIT IV **9 Hours**

APPLICATIONS OF DERIVATIVES AND INTEGRATIONS

Extreme values, points of inflection and curve sketching, Rolles Theorem, Mean Value Theorem, optimization, indeterminate forms, L Hopitals Rule.
Area between curves, volume of a general solid by slicing and cylindrical shell methods, volume of a solid of revolution, length of plane curves, area of a surface of revolution.

UNIT V **9 Hours**

COMPLEX ANALYSIS

Analytic Functions- Properties of Analytic function - Determination of Analytic Function using Milne Thompson method. Cauchys Integral Formula - Classification of Singularities - Cauchys Residue Theorem.

FOR FURTHER READING

Applications of mass spring system in ordinary differential equations of higher order

Total: 45+15=60 Hours

Reference(s)

1. Finney RL, Weir MD and Giordano FR, Thomas Calculus, 10th edition, Addison-Wesley, 2001
2. Smith RT and Minton RB, Calculus, 2nd Edition, McGraw Hill, 2002.
3. Kreysgiz E, Advanced Engineering Mathematics, 8th edition, John Wiley & Sons, 1999.
4. Anton H, Calculus with Analytic Geometry, 5th edition, John Wiley & Sons, 1995.
5. Ayres F Jr and Mendelson E, Schaum s Outline of Theory and Problems of Calculus, 4th edition, McGraw Hill, 1999.
6. S.C. Gupta, Fundamentals of Statistics, 7th Edition, Himalaya Publishing House Pvt. Ltd. 2018.

19IS102 ENGINEERING PHYSICS I 2 0 2 3

Course Objectives

- Illustrate the Newtons laws of motion and wave motion with applications
- Understand the basic properties of electricity, magnetism and optics
- Differentiate the special theory of relativity and quantum physics from classical physics

Course Outcomes (COs)

1. Illustrate the Newtons three laws of motion and apply the same to solve the real world problems involving elevator, atwood machine and acceleration of objects
2. Exemplify the physical characteristics of simple harmonic motion, wave motion and find the solutions for wave equations
3. Infer the fundamental laws, properties of electricity and magnetism and apply the same to electric and magnetic elements
4. Apply the principles of physical and geometrical optics in the mirrors, lenses, microscopes and diffraction gratings
5. Outline the importance of special theory of relativity, quantum physics and analyse the wave and particle nature of matter

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1							2					
2	2								2					
3	2	2												
4	2	2							2					
5	2	1							2					

UNIT I **6 Hours**

MECHANICS

Newtons laws of motion: Concept of force and its nature-Newtons first law and inertial frames-definition of mass -Newtons second law-gravitational force and weight -Newtons third law. Applications of Newtons laws: particle in equilibrium, particle under net force-weighing a mass in an elevator, the atwood machine and acceleration of two objects connected by a cord

UNIT II **6 Hours**

OSCILLATIONS AND WAVES

Fundamentals of simple harmonic motion -energy of simple harmonic oscillator -spring mass system -time period of simple pendulum, compound pendulum and torsional pendulum - Damped oscillations. Travelling wave motion -sinusoidal waves on strings -speed of a wave -reflection and transmission -rate of energy transfer in wave motion

UNIT III **6 Hours**

ELECTRICITY AND MAGNETISM

Point charges-electric fields -Gauss law and its applications -electric potential -capacitance -energy stored in a capacitor.

Concept and source of magnetic fields -Amperes theorem -determination of magnetic field due to

different current distributions -Faradays law -self-induction and mutual induction -energy stored in an inductor

UNIT IV **6 Hours**

LIGHT AND OPTICS

Nature of light -laws of reflection and refraction -refractive index and Snells law -dispersion of light -total internal reflection -image formation:concave mirrors -convex mirrors -thin lenses -compound microscope -human eye.

Conditions of interference -Youngs double slit experiment - intensity distribution of interference - phase change due to reflection -diffraction-narrow slit diffraction -single slit and two slit -intensity distribution -diffraction grating -applications

UNIT V **6 Hours**

MODERN PHYSICS

Special theory of relativity -simultaneity and time dilation -twin paradox -length contraction -relativistic mass variation -space time graph.

Black body radiation and Planck hypothesis -allowed energy levels -thermal radiation from different objects -photoelectric and Compton effect. Matter waves -de-Broglie hypothesis -wave nature of particles -Davission-Germer experiment

5 Hours

EXPERIMENT 1

Determination of resultant of system of concurrent coplanar forces-Parallelogram law of forces

5 Hours

EXPERIMENT 2

Determination of moment of inertia-Torsional pendulum

5 Hours

EXPERIMENT 3

Determination of wavelength of mercury spectral lines-spectrometer

4 Hours

EXPERIMENT 4

Determination of refractive index of solid and liquid-travelling microscope

3 Hours

EXPERIMENT 5

Determination of wavelength of laser-diffraction grating

4 Hours

EXPERIMENT 6

Determination of frequency of a tuning fork-Meldes apparatus

4 Hours

EXPERIMENT 7

Thickness of a thin wire using interference of light-Air wedge method

Total: 30+30=60 Hours

Reference(s)

1. R A Serway and J W Jewitt, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2011
2. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011
3. H C Verma, Concepts of Physics (Vol I & II), BharathiBhawan Publishers & Distributors, New Delhi, 2017
4. H D Young and R A Freedman, Sears and Zemanskys University Physics with Modern Physics, Pearson education, 2016
5. R K Gaur and S L Gupta, Engineering Physics, DhanpatRai Publications, 2012

19IS103 ENGINEERING CHEMISTRY I 2 0 2 3

Course Objectives

- Identify the properties and applications of optical materials for smart screen
- Summarize the terminologies of electrochemistry and explain the applications of electrochemical instruments
- Summarize the terminologies of electrochemistry and explain the applications of electrochemical instruments
- Outline the applications of organic materials in data storage
- Choose the suitable materials for the fabrications of micro processors in electronic devices

Course Outcomes (COs)

1. Compare the inorganic and organic materials used for smart screen fabrication
2. Demonstrate the fabrication of smart screen using conducting material
3. Analyze the type of materials for data storage in electronic devices
4. Identify various organic nanoscale materials in data storage
5. Select suitable materials for fabrication of microprocesser

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2					1							
2	2	3												
3	2	2					1							
4	2	2												
5	2	2												

UNIT I **6 Hours**

OPTICAL MATERIAL FOR SMART SCREEN

Types: Inorganic: Rare earth metals [yttrium, lanthanum, cerium, praseodymium, neodymium, europium, terbium and dysprosium] - organic : Organic dielectric material [Polystyrene, PMMA] - organic light emitting diodes [polythiopene]

UNIT II **6 Hours**

CONDUCTING MATERIALS FOR SMART SCREEN

Conductive components: Indium tin oxide [properties and applications] - touch screen [resistive and capacitive]. Chemical components in glass - alumino silicate - gorilla glass

UNIT III **5 Hours**

MATERIALS FOR DATA STORAGE

Classification - magnetic storage [Iron oxide, cobalt alloy, chromium oxide and barium ferrite] - optical storage [photochromic materials] - solid storage

UNIT IV **5 Hours**

ORGANIC NANOSCALE MATERIAL FOR DATA STORAGE

Data Storage - classification [media, access, information and volatility] - flexible data storage [transistor Structure] - flexible floating gate - flexible charge trap- flexible ferroelectric- flexible resistive memory with organic material

UNIT V **8 Hours**

MATERIALS FOR MICROPROCESSOR FABRICATION

Micro electrical components: Fabrication (CVD method) and use of metal oxide materials. Integrated circuit manufacturing - preparation of silicon wafer - masking - photo-resistant materials - classification. Doping: Atomic diffusion, ion implantation, making successive layers. Microcapacitors: Types - electrochemical capacitors, electrolytic capacitors and supercapacitors. Soldering materials: copper, tin and silver

5 Hours

EXPERIMENT 1

Estimation of copper content in a sample solution prepared from copper doped optical light emitting diodes

5 Hours

EXPERIMENT 2

Determination of conductivity of aluminium chloride, aluminium silicate and tin oxide compounds using conductivity meter

5 Hours

EXPERIMENT 3

Estimation of barium content in a sample solution prepared from iron alloy used in magnetic storage material

4 Hours

EXPERIMENT 4

Estimation of iron content in sample solution prepared from ferro electric materials using spectrophotometer

6 Hours

EXPERIMENT 5

Electroless plating of copper on polymeric material used in IC fabrication

5 Hours

EXPERIMENT 6

Electroless plating of nickel on polymeric material used in IC fabrication

FURTHER READING

Applications of advanced data storage materials in electronic devices. Conducting materials for smart screen. Applications of smart material for microprocessor fabrication

Total: 30+30=60 Hours

Reference(s)

1. Smart Materials Taxonomy, Victor Goldade, Serge Shil"ko, Aleksander Neverov, CRC publication, 2015
2. https://www.dmccoltd.com/english/museum/touchscreens/technologies/projected.asp
3. Advanced Magnetic and Optical Materials, edited by Ashutosh Tiwari, Parameswar K. Iyer, Vijay Kumar, Hendrik Swart, wiley publication, 2016
4. Recent Advances of Flexible Data Storage Devices Based on Organic Nanoscaled Materials- Li Zhou, Jingyu Mao, Yi Ren, Su-Ting Han, V A. L. Roy and Ye Zhou, Small 1703126, 2018
5. Padma L Nayak, Polymer Science, 1st Edition, Kalyani Publishers, New Delhi, 2005
6. G.M. Crean, R. Stuck, J.A. Woollam . Semiconductor Materials Analysis and Fabrication Process Control Elsevierpublication, 2012

19IS104 COMPUTER PROGRAMMING 2 0 2 3

Course Objectives

- Understand the basics of C primitives, operators and expressions.
- Gain knowledge about the different primitive and user defined data types.
- Impart knowledge about the structural programming concepts.

Course Outcomes (COs)

1. Explain the basic C programming concepts
2. Implement C programs using control statements
3. Implement the concepts of Arrays and strings in C
4. Implement the concepts of functions and pointers in C
5. Analyze the concepts of structures, unions and files in C

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	2	2	2											
3	2	2	2											
4	2	3	3											
5	2	3	3											

UNIT I **6 Hours**

INTRODUCTORY CONCEPTS

C Primitives: Introduction to C- planning and writing a C program- Character Set - Keywords and Identifiers - Data Types - Variables and Constants - Compiling and executing the C program Operators and Expressions: Arithmetic - Relational - Logical - Increment and decrement - Conditional - Bitwise - Comma - Sizeof() - Assignment - Shift operator - Precedence and order of evaluation Ã¢??TypeConversion-Input and Output Operations: Formatted I/O functions - getchar and putchar function - gets and puts functions

UNIT II **6 Hours**

CONTROL STATEMENTS

Decision Making and Branching: simple if statement - if else statement - nesting of if else Statement – Switch Statement. Decision Making and Looping: while statement - do while statement - for statement - Nested for statement Jump Statements: goto - break - continue - return statement

UNIT III **6 Hours**

ARRAYS AND STRINGS

Arrays: Introduction, one dimensional array, declaration - Initialization of one dimensional array, two-dimensional arrays, initializing two dimensional arrays, multi-dimensional arrays. Strings: Declaring and initializing string variables- Reading strings from terminal - writing string to screen - String handling functions.

UNIT IV **6 Hours**

FUNCTIONS AND POINTERS

User Defined Functions: Elements of user defined functions - Definition of functions - return values and their types - function calls - function declaration - categories of function - call by value and call by reference -recursion - Pre-processor directives and macros.
Pointers: Understanding Pointers - accessing the address of the variable - declaring pointer variables - Initialization of pointer variables - Accessing a variable through its pointer

UNIT V **6 Hours**

STRUCTURES AND FILES

Storage Class Specifiers: Auto - registers - static - extern - typedef
Structures and Unions: Introduction - defining a structure - declaring structure variables - accessing structure members - structure initialization - Unions - Enumerated data type
File Management in C: Defining and opening a file - closing a file - Input/output operations on files - Command line arguments

4 Hours

EXPERIMENT 1

Write a C program to perform arithmetic operations on integers and floating point numbers.

4 Hours

EXPERIMENT 2

Write a C program to implement ternary operator and relational operators.

2 Hours

EXPERIMENT 3

Write a C program to read the values of A, B, C through the keyboard. Add them and after addition check if it is in the range of 100 to 200 or not. Print separate message for each.

2 Hours

EXPERIMENT 4

Write a C program to display the roots of a quadratic equation with their types using switch case.

2 Hours

EXPERIMENT 5

Write a C program to generate the following triangle.

1
1 2 3
1 2 3 4 5
1 2 3 4 5 6 7

4 Hours

EXPERIMENT 6

Write a C program to get a matrix of order 3x3 and display a matrix of order of 4x4, with the fourth row and column as the sum of rows and columns respectively.

2 Hours

EXPERIMENT 7

Write a c program to remove the occurrence of "the" word from entered string.

2 Hours

EXPERIMENT 8

Write a C program to find the factorial of given number.

4 Hours

EXPERIMENT 9

Design a structure to hold the following details of a student. Read the details of a student and display them in the following format Studentdetails: rollno, name, branch, year, section, cgpa.

****

NAME:
ROLL NO:
BRANCH:
YEAR:
SECTION:
CGPA:

4 Hours

EXPERIMENT 10

Create two files test1.txt and test2.txt and write a C program to read the file text1.txt character by character on the screen and paste it at the end of test2.txt

Total: 30+30=60 Hours

Reference(s)

1. Herbert Schildt, C -The complete Reference, Tata McGraw-Hill, 2013
2. Byron Gottfried, Programming with C, Schaum"s Outlines, Tata Mcgraw-Hill, 2013
3. E.Balagurusamy, Programming in ANSI C, Tata McGraw-Hill, 2012
4. Kernighan B W and Ritchie O M, The C programming Language. Prentice-Hall of India, 2009
5. Kelley A and I. Pohl, A Book on C: Programming in C, Pearson Education, 1998
6. Ashok.N.Kamthane,Programming in C,Pearson education,2013

18HS101 COMMUNICATIVE ENGLISH I 1 0 2 2

Course Objectives

- Read and understand the main points on familiar matters regularly encountered in work, school, or leisure
- Listen and respond in most common situations where English is spoken
- Write simple connected texts on topics which are familiar or of personal interest
- Describe experiences and events, hopes and ambitions and briefly give reasons and explanations for opinions and plans

Course Outcomes (COs)

1. Use appropriate grammar and vocabulary that is expected at the BEC Preliminary exam level
2. Understand the general meaning of non-routine letters within own work area, and short reports of a predictable nature
3. Write formal, routine letters of factual nature, and make notes on routine matters, such as taking/placing orders
4. Follow simple presentations/demonstrations
5. Deal with predictable requests from a visitor, state routine requirements, and offer advice within own job area on simple matters

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2									2					
3														
4										1				
5										2				

UNIT I **9 Hours**

GRAMMAR

Tenses Future continuous, Past continuous, Past perfect, Past simple, Past tense responses, Present perfect continuous, Present perfect/past simple Reported speech Adverbs intensifiers Comparatives and superlatives Conditionals 2nd and 3rd Connecting words expressing cause and effect, contrast Phrasal verbs Prepositions of place Simple passive - Wh-questions in the past Question tags Will and going to, for prediction.

UNIT II **9 Hours**

READING

Understanding short real-world notices, messages Detailed comprehension of factual material; skimming and scanning skills - Interpreting visual information Reading for detailed factual information Reading for gist and specific information - Grammatical accuracy and understanding of text structure - Reading and information transfer.

UNIT III **9 Hours**

WRITING

Internal communication including note, message, memo or email - arranging / rearranging appointments, asking for permission, giving instructions - Business correspondence including letter, fax, email apologising and offering compensation, making or altering reservations, dealing with requests, giving information about a product.

UNIT IV **9 Hours**

LISTENING

Listening for specific information Listening for numbers and letters Note completion Listening for gist listening to monologues (presentations, lectures, announcements and briefings) listening to interacting speakers (telephone conversations, face-to-face conversations, interviews and discussions).

UNIT V **9 Hours**

SPEAKING

Exchanging personal and factual information expressing and finding out about attitudes and opinions organise a larger unit of discourse Turn-taking, negotiating, collaborating, exchanging information, expressing and justifying opinions, agreeing and/or disagreeing, suggesting, speculating, comparing and contrasting, and decision-making. 1.Goodbye party for Miss Pushpa T S - Nissim Ezekiel 2.Our Casuarina Tree - Toru Dutt 3.Palanquin Bearers - Sarojini Naidu 4.The Tyger - William Blake 5.Ode on a Grecian Urn - John Keats

Total: 45 Hours

Reference(s)

1. Alexander Garrett, Cambridge BEC Preliminary Students Book with Answers, Cambridge University Press, 2016.
2. Lan Wood, Anne Williams and Anna Cowper. Pass Cambridge BEC Preliminary, Second Edition, New Delhi, 2014.
3. Norman Whitby. Cambridge Business Benchmark. Pre-Intermediate to Intermediate, Students Book. South Asian Edition, 2018.

19IS106 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

2 0 2 3

Course Objectives

- To understand the basic concepts of electric circuits and magnetic circuits.
- To illustrate the construction and operation of various electrical machines and semiconductor devices.
- To learn the fundamentals of communication systems.

Course Outcomes (COs)

1. Understand the basic concepts of electric and magnetic circuits.
2. Summarize the types of DC machines.
3. Classify the static and dynamic AC machines and explain their operation.
4. Interpret the operation of AC and DC drives
5. Illustrate the characteristics of semiconductor devices and communication systems.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3											1		
2	3			3										
3	3			3										
4	3	2	3											
5	3			3								3		

UNIT I **7 Hours**

ELECTRIC CIRCUITS

Definition of Voltage, Current, Electromotive force, Resistance, Power & Energy, Ohms law and Kirchoffs Law & its applications - Series and Parallel circuits - Voltage division and Current division techniques - Generation of alternating emf - RMS value, average value, peak factor and form factor- Definition of real, reactive and apparent power.

UNIT II **5 Hours**

DC MACHINES

Introduction of magnetic circuits - Law of Electromagnetic induction, Flemings Right & Left hand rule- Types of induced emf - Definition of Self and Mutual Inductance - DC Motor- Contruction - Working Principle- Applications.

UNIT III **6 Hours**

AC MACHINES

Single Phase Transformer - Alternator - Three phase induction motor - Single phase induction motor - Construction - Working Principle - Applications.

UNIT IV **5 Hours**

ELECTRICAL DRIVES

Speed control of dc shunt motor and series motor - Armature voltage control - Flux control - Construction and operation of DC servo motor - Construction and operation of DC servo motor stepper motor.

UNIT V **7 Hours**

ELECTRON DEVICES AND COMMUNICATION

Characteristics of PN Junction diode and Zener diode - Half wave and Full wave Rectifiers - Bipolar Junction Transistor - Operation of NPN and PNP transistors - Logic gates - Introduction to communication systems.

4 Hours

EXPERIMENT 1

Analyze the VI characteristics of a fixed resistor and a lamp by varying its temperature.

4 Hours

EXPERIMENT 2

Apply the voltage division and current division techniques for series and parallel connections of lamp loads.

4 Hours

EXPERIMENT 3

Understand the concept of electromagnetic induction using copper coil.

4 Hours

EXPERIMENT 4

Understand the construction and working principle of DC machines.

6 Hours

EXPERIMENT 5

Determine the VI Characteristics of PN Junction diode and plot the input and output wave shapes of a half wave rectifier.

4 Hours

EXPERIMENT 6

Realize the working of transistor as an electronic switch through experiments.

4 Hours

EXPERIMENT 7

Lighting applications using logic gates principle.

FOR FURTHER READING

Voltage Regulator - Stepper motor - Energy meter - SMPS, Satellite and Optical communication.

Total: 30+30=60 Hours

Reference(s)

1. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. Smarjith Ghosh, Fundamentals of Electrical and Electronics Engineering, Prentice Hall (India) Pvt. Ltd., 2010.
3. A. Sudhakar, Shyammohan S Palli, Circuits and Networks Analysis and Synthesis, Tata McGraw Hill, 2010
4. R. S. Sedha, A Textbook of Applied Electronics, S.Chand& Company Ltd, 2013

19IS201 ENGINEERING MATHEMATICS II 3 1 0 4

Course Objectives

- Understand the concepts of partial derivatives and multiple integrals to define the area, volume and extreme values of various surfaces in engineering fields.
- Classify the sequences and series in linear systems is convergent or divergent.
- Formulate the real time engineering problem into mathematical model using ordinary differential equation and solve it by appropriate method.

Course Outcomes (COs)

1. Illustrate the various parameters in partial differentiation and characterize the maxima and minima functions for signals and systems.
2. Apply multiple integral concepts to calculate the area and volume by appropriate vector integral theorems.
3. Analyse the convergence and divergence of sequences and series by various tests.
4. Construct first order differential equations from real time phenomena and solve it by suitable method.
5. Execute the appropriate method to solve the second order differential equations.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3												
2	3	1												
3	1													
4	2	-												
5		3												

UNIT I **9 Hours**

PARTIAL DIFFERENTIATION

Functions of several variables, plotting of 2-variable functions, introduction to cylindrical and spherical coordinates, chain rule, total differential, gradient, directional derivatives, normal lines and tangent planes, extreme of functions of two variables, applications.

UNIT II **9 Hours**

MULTIPLE INTEGRALS

Double integrals, regions of integrations, triple integrals, applications (Cartesian coordinates only- Greens theorem and Gauss Divergence theorem).

UNIT III **9 Hours**

SEQUENCES AND SERIES

Sequences and series, convergence and divergence of series, absolute convergence, conditional convergence, test for convergence and divergence. Power series for functions, interval of convergence, Taylor and Maclaurin series, Taylors Theorem with remainder.

UNIT IV **9 Hours**

FIRST ORDER DIFFERENTIAL EQUATIONS

Separable differential equations, homogeneous differential equations, exact differential equations, integrating factor, Bernoullis equation, applications

UNIT V **9 Hours**

SECOND ORDER DIFFERENTIAL EQUATIONS

Second order homogeneous and non-homogeneous equations with constant coefficients, variation of parameters, method of undetermined coefficients, series solutions of differential equations, applications.

FOR FURTHER READING

Applications of mass spring system in ordinary differential equations of higher order

Total: 45+15=60 Hours

Reference(s)

1. Finney RL, Weir MD and Giordano FR, Thomas Calculus, 10th edition, Addison-Wesley, 2001
2. Smith RT and Minton RB, Calculus, 2nd Edition, McGraw Hill, 2002.Kreysgiz E, Advanced Engineering Mathematics, 8th edition, John Wiley & Sons, 1999.
3. Ray Wylie and C Louis Barrett, Advanced Engineering Mathematics, Sixth Edition, Tata McGraw-Hill Publishing Company Ltd, 2003.
4. Peter V. O Neil , Advanced Engineering Mathematics, Seventh Edition , Cengage Learning India Private Limited, 2012.
5. Glyn James, Advanced Engineering Mathematics, Third Edition,Wiley India, 2014.

19IS202 ENGINEERING PHYSICS II 2 0 2 3

Course Objectives

- understand the applications of laser and fiber optics in the field of engineering
- impart knowledge in crystallography and semiconductors
- differentiate the different types of magnetic materials and their applications

Course Outcomes (COs)

1. Understand the principle, characteristics, different types of lasers and apply the same for optical data storage and retrieval techniques
2. Illustrate the propagation of light through different optical fibers, applications of optical fibers in communication and sensors
3. Identify the seven crystal systems, crystal planes and the stacking sequences in metallic crystal structures
4. Analyse the characteristics of semiconducting materials interms of crystal lattice, charge carriers and energy band diagrams
5. Outline the properties of magnetic materials, domain theory of ferromagnetism and the applications for recording and readout process

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1							2					
2	2	1							2					
3	2	1												
4	2	1							2					
5	2	1							2					

UNIT I **7 Hours**

LASER

Principle - interaction of radiation with matter - characteristics of laser radiation - pumping mechanisms -types: CO2 laser -homo junction GaAs laser -applications: optical data storage and retrieval techniques - holography: principle -types - comparison of holography with photography - construction - reconstruction of hologram -applications

UNIT II **7 Hours**

FIBER OPTICS

Principle- conditions to achieve total internal reflection- structure- acceptance angle and numerical aperture (qualitative treatment only)- types- modes of propagation- refractive index profile- block diagram of fiber optic communication system - visible light communication systems -fiber optic sensors- intensity modulated sensor - Displacement and pressure sensors -endoscopy - merits of fiber cables over conventional communication systems

UNIT III **5 Hours**

CRYSTAL PHYSICS

Crystalline and amorphous materials - lattice -lattice point -basis - unit cell - crystal systems - Bravais lattices -planes in crystals- Miller indices -procedure for finding Miller indices- important features of

Miller indices-unit cell characteristics of SC, BCC, FCC and HCP structures - crystal growth techniques

UNIT IV **6 Hours**

SEMICONDUCTING MATERIALS

Characteristics -elemental and compound semiconductors- energy band description and current conduction in intrinsic semiconductors- energy band description of n-type and p-type semiconductors- conductivity of extrinsic semiconductors - variation of Fermi level with temperature and impurity concentration- temperature dependence on carrier concentration - Hall effect-applications - solar cells - photodiodes

UNIT V **5 Hours**

MAGNETIC MATERIALS

Fundamental definitions -Bohr magneton- classification of dia, para and ferromagnetic materials - domain theory - hysteresis curve - soft and hard magnetic materials -energy product and its importance - anti-ferromagnetic materials - ferrites -giant magneto resistance (GMR) effect - application: Principles of Magnetic Recording- Magnetic Digital Recording- Magneto-Optic Recording

2 Hours

EXPERIMENT 1

Exposure to Engineering Physics Laboratory and precautionary measures

4 Hours

EXPERIMENT 2

Determine the wavelength of given laser source by applying the principle of diffraction

4 Hours

EXPERIMENT 3

Determination of acceptance angle and numerical aperture of a given fiber

4 Hours

EXPERIMENT 4

Evaluation of bandgap of given material using bandgap kit.

4 Hours

EXPERIMENT 5

Determine the V-I characteristics of a solar cell

4 Hours

EXPERIMENT 6

Using Hall Effect, determine the nature of given material

4 Hours

EXPERIMENT 7

Find the refractive index of a transparent solid with the aid of travelling microscope

4 Hours

EXPERIMENT 8

Determination of energy loss per cycle of a ferromagnetic material using hysteresis curve

Total: 30+30=60 Hours

Reference(s)

1. Balasubramaniam, R. Callisters Materials Science and Engineering Wiley India Pvt.Ltd, 2014
2. Kasap, S.O. Principles of Electronic Materials and Devices McGraw-Hill Education,2017
3. Wahab, M.A. Solid State Physics: Structure and Properties of Materials Alpha Science International Ltd., 2017
4. Donald A. Neamen. Semiconductor Physics and Devices, McGraw-Hill, 2011
5. K. Thiyagarajan and A. K. Ghatak, LASERS: Fundamentals and Applications, Springer, USA, 2015
6. B.D. Cullity, Introduction to Magnetic Materials, Addison-Wesley

19IS203 ENGINEERING CHEMISTRY II 2 0 2 3

Course Objectives

- Classify the traditional and advanced materials used to manage heat developed in electronic devices
- Summarize the terminologies of electrochemistry and explain the applications of energy storage devices for computers
- Indicate the types, properties and applications of nanochips and carbon nanotubes used in electronic devices
- Outline sources of e-wastes and its effects on environment and its management

Course Outcomes (COs)

1. Compare the metals and alloys used as thermal management materials in electronic devices
2. Interpret the advanced thermal management materials for microelectronics and optoelectronics
3. Analyze the importance of primary, secondary batteries and fuel cells used in energy storage devices in computers
4. Identify suitable nanomaterial used for diverse applications in electronic devices
5. Select a suitable technology to manage e-wastes from various electronic devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	-					-							
2	-	-												
3	-	-					1							
4	2	2												
5	2	2												

UNIT I **6 Hours**

THERMAL MANAGEMENT MATERIALS

Heat generation - purpose - classification of electronic packaging - types of thermal management materials - traditional thermal management materials: Metals [Cu, Al, W and Mo] - compounds [Al2O3, BeO, AlN, SiC and Kovar alloy]

UNIT II **7 Hours**

ADVANCED THERMAL MANAGEMENT MATERIALS

Alloys: W-Cu, Mo-Cu, Cu/MoCu/Cu, AlSiC, Cu/SiC and W85-Cu. Fiber-reinforced material - sandwich structure of composite - thermal management materials for microelectronics and optoelectronics: Carbon nanotubes and aluminium/diamond composites

UNIT III **7 Hours**

ENERGY STORAGE DEVICES FOR COMPUTERS

Cell - cell potential - determination of potential. Batteries - types: Primary battery [Zinc-carbon]. Secondary battery: lead-sulphur. Modern battery: lithium polymer battery and fuel cells

UNIT IV **5 Hours**

NANOMATERIALS

Nano chips - types of material - properties - applications. Carbon nanotubes - fullerene, graphene: Types and applications

UNIT V **5 Hours**

E- WASTE MANAGEMENTS

Sources - toxicity due hazardous substances - impact to environment. E-waste management- Hazardous materials recycling (Gallium and Arsenic)

8 Hours

EXPERIMENT 1

General introduction and Determination of thermal stability of aluminium oxide using thermo gravimetric analysis

4 Hours

EXPERIMENT 2

Determination of thermal stability of copper alloys using thermo gravimetric analysis

6 Hours

EXPERIMENT 3

Determination of single electrode potential of zinc and copper electrodes

6 Hours

EXPERIMENT 4

Preparation of cadmium nanoparticles and its characterization

6 Hours

EXPERIMENT 5

Estimation of chromium and lead content in sample solution prepared from e-waste [PCB] using spectrophotometer

Total: 30+30=60 Hours

Reference(s)

1. Ravi Kandasamy, Arun S. Mujumdar. Thermal Management of Electronic Components. Lap Lambert Academic Publishing GmbH KG, 2010.
2. Guosheng Jiang, Liyong Diao, Ken Kuang. Advanced Thermal Management Materials. Springer Science & Business Media, 2012.
3. Nihal Kularatna. Energy Storage Devices for Electronic Systems: Rechargeable Batteries and Supercapacitors. Academic Press, 2014.
4. Odne Stokke Burheim. Engineering Energy Storage. Academic Press, 2017.
5. M. S. Dresselhaus, G. Dresselhaus, P. C. Eklund. Science of Fullerenes and Carbon Nanotubes: Their Properties and Applications. Elsevier, 1996.
6. Kazuyoshi Tanaka, S. Iijima. Carbon Nanotubes and Graphene. Edition 2, Newnes, 2014.

19IS204 PROBLEM SOLVING AND PROGRAMMING USING PYTHON **3 0 2 4**

Course Objectives

- Develop a basic understanding Python programming language
- Solve problems requiring the writing of well-documented programs in the Python language, including use of the logical constructs of that language
- Demonstrate significant experience in data structures with the Python program

Course Outcomes (COs)

1. Explain the basic concepts of Python programming
2. Implement Python programs using control statement and functions
3. Develop Python programs for the data structures String, List and Set
4. Implement Python programs for tuples and dictionaries data structures
5. Develop Python programs for files, modules and packages

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	2	2	2											
3	2	2	2											
4	2	2	2											
5	3	3	3											

UNIT I **9 Hours**

THEORY COMPONENT CONTENTS BASICS OF PYTHON PROGRAMMING

Introduction-Python interpreter- interactive and script mode; values and types, operators, expressions, statements, precedence of operators, Multiple assignments, comments

UNIT II **9 Hours**

CONTROL STATEMENTS AND FUNCTIONS IN PYTHON

Conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, Break, continue, pass; Functions: Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion

UNIT III **9 Hours**

DATA STRUCTURES: STRINGS, LISTS, SET

Strings: string slices, immutability, string methods and operations; Lists: creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions ; list processing : list comprehension, searching and sorting, Sets: creating sets, set operations.

UNIT IV **8 Hours**

DATA STRUCTURES: TUPLES, DICTIONARIES, ARRAYS

Tuples: Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value; Dictionaries: operations and methods, Nested Dictionaries, Arrays : operations and methods

UNIT V **10 Hours**

FILES, MODULES, PACKAGES

Files and exception: text files, reading and writing files, format operator, exception handling, modules, packages

2 Hours

EXPERIMENT 1

Programs using expressions and input and output statements.

2 Hours

EXPERIMENT 2

Programs using operators and built in functions.

2 Hours

EXPERIMENT 3

Programs using conditional statements.

2 Hours

EXPERIMENT 4

Programs performing all string operations.

2 Hours

EXPERIMENT 5

Programs using functions

2 Hours

EXPERIMENT 6

Programs to find square root, GCD, exponentiation, sum an array of numbers

2 Hours

EXPERIMENT 7

Programs to perform linear search, binary search

2 Hours

EXPERIMENT 8

Programs to perform operations on list

2 Hours

EXPERIMENT 9

Programs using dictionary and set

2 Hours

EXPERIMENT 10

Programs to work with Tuples.

2 Hours

EXPERIMENT 11

Programs to sort elements (Selection, Insertion, Merge, Quick)

2 Hours

EXPERIMENT 12
Program to perform word count in file.

2 Hours

EXPERIMENT 13
Program to perform file operations

2 Hours

EXPERIMENT 14
Program to count the number of characters, words and lines in a text file

2 Hours

EXPERIMENT 15
Programs using modules and packages

Total: 45+30=75 Hours

Reference(s)

1. Ashok Namdev Kamthane,Amit Ashok Kamthane, Programming and Problem Solving with Python , Mc-Graw Hill Education,2018.
2. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Second edition, Updated for Python 3, Shroff / OÃ¢??Reilly Publishers, 2016
3. John V Guttag, Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press , 2013.
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
5. Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
6. Kenneth A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012.

19IS206 DIGITAL SYSTEM DESIGN 3 0 2 4

Course Objectives

- Understand the fundamentals of digital logic
- Understand the implementation of logic circuits.
- Analyse and design various combinational and sequential circuits.

Course Outcomes (COs)

1. Understand the boolean algebra and logic gates.
2. Design and analyze combinational circuits.
3. Implement synchronous sequential logic
4. Understand the procedures in Asynchronous sequential logic
5. Implement the design with MSI devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1												
2	2	2	3											
3	2	2	3											
4	2	1	1											
5	2	2	3											

UNIT I **9 Hours**

BOOLEAN ALGEBRA AND LOGIC GATES

Number systems and conversions - Boolean algebra - Minterm - Maxterm - SOP and POS forms - NAND and NOR implementation - Simplification of Boolean functions: K Map - Don''t care conditions - Five variable K map - Quine Maccluskey method - Logic gates.

UNIT II **9 Hours**

COMBINATIONAL LOGIC

Combinational circuits - Analysis procedures - Design procedures - Adders - Subtractors - Binary adder - Carry Look Ahead Adder - BCD Adder - Magnitude comparator - Code Converters - Multiplexers and Demultiplexers- Function realization using multiplexers - Decoders and encoders.

UNIT III **10 Hours**

SYNCHRONOUS SEQUENTIAL LOGIC

Sequential circuits - Flip flops - Flip Flop Conversion - Analysis procedures - Design procedures - Moore and Mealy models - State reduction and state assignment - Shift Registers - Counters.

UNIT IV **10 Hours**

ASYNCHRONOUS SEQUENTIAL LOGIC

Design of Asynchronous sequential circuits - Analysis procedure: Transition Table - Flow Table - Race Condition- stability, Design Procedure: Primitive Flow Table- Reduction- Transition Table- Race Free State Assignment- Hazards.

UNIT V **7 Hours**

DESIGN WITH MSI DEVICES

Programmable Logic Devices (PLD) - Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL.

2 Hours

EXPERIMENT 1

Implement Boolean Laws using Logic Gates

4 Hours

EXPERIMENT 2

Implement arithmetic circuits (Adder, Subtractor)

2 Hours

EXPERIMENT 3

Construct Code convertors (BCD, Gray, Excess -3)

4 Hours

EXPERIMENT 4

Construct Parity generator and parity checker

2 Hours

EXPERIMENT 5

Construct Magnitude comparator

4 Hours

EXPERIMENT 6

Demonstrate Multiplexer and Demultiplexers

2 Hours

EXPERIMENT 7

Function realization using multiplexers

4 Hours

EXPERIMENT 8

Demonstrate Encoder and Decoder

2 Hours

EXPERIMENT 9

Construct synchronous and Ripple counter

4 Hours

EXPERIMENT 10

Implement shift register (SISO, SIPO, PISO, PIPO)

FOR FURTHER READING

Design of a simple CPU - ASM charts - Hardware Description Language - RTL Design

Total: 45+30=75 Hours

Reference(s)

1. M.Morris Mano and Michael D Ciletti, Digital Design with an introduction to the VHDL, Pearson Education, 5th Edition, 2013
2. A Anand Kumar, Fundamentals of Digital Circuits, 3rd Edition,2014
3. Charles H.Roth, Jr., Fundamentals of Logic Design, 4th Edition, Jaico Publishing House, 2000
4. Mandal, Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
5. Donald D.Givone, Digital Principles and Design, Tata McGraw-Hill, 2003.
6. John M.Yarbrough, Digital Logic, Application & Design, Thomson, 2002.

19IS207 ENGINEERING GRAPHICS 1 0 4 3

Course Objectives

- Provide knowledge on projection of points and lines.
- Impart skill in drawing projection of simple solids
- Familiarize creation of orthographic views from isometric projections of simple solids and vice versa.
- Build the proficiency to create two dimensional sketches using software.
- Provide the skill to build three dimensional models and its orthographic views using software.
- Illustrate the projection of points and lines in different quadrants.

Course Outcomes (COs)

1. Illustrate the projection of points and lines in different quadrants.
2. Construct orthographic projections of simple solids.
3. Create the orthographic and isometric projections of simple solids.
4. Sketch the two dimensional views of engineering components using software.
5. Construct three dimensional models of engineering components and its orthographic views using software.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2								1					
2	2								1					
3	2								1					
4	2								1					
5	2								1					

UNIT I **10 Hours**

PROJECTION OF POINTS

Practices on lettering, numbering and dimensioning of drawings. Principles of projection, Projection of points in four quadrants, first angle projection of straight lines Ã¢?? Parallel, perpendicular and inclined to anyone plane.

UNIT II **12 Hours**

PROJECTION OF SOLIDS

Orthographic projection of simple solids Ã¢?? Parallel, perpendicular and inclined to one plane using change of position method.

UNIT III **14 Hours**

ISOMETRIC AND PERSPECTIVE PROJECTION

Conversion of isometric to orthographic projection and vice versa. Perspective projection of simple solids.

UNIT IV **10 Hours**

CREATION OF 2D SKETCHES USING SOFTWARE

Sketch Entities Ã¢?? Line, circle, arc, rectangle, slots, polygon, text, snap, and grid. Sketch Tools- fillet, chamfer, offset, convert entities, trim, extend, mirror, move, copy, rotate, scale, stretch, sketch pattern. Geometrical constraints, Dimensioning - smart, horizontal, vertical, ordinate.

UNIT V **14 Hours**

PART MODELING AND DRAFTING USING SOFTWARE

Part Modeling - extrude, cut, revolve, creation of planes, fillet, chamfer, shell, rib, pattern, mirror, loft, draft and swept. Drafting - Converting 3D models to orthographic views with dimensions.

Total: 60 Hours

Reference(s)

1. K Venugpoal, Engineering Drawing and Graphics, Third edition, New Age International, 2005.
2. BasantAgrawal, Mechanical drawing, Tata McGraw-Hill Education, 2008.
3. Engineering Drawing Practice for Schools & Colleges, Bureau of Indian Standards-Sp46, 2008.
4. N. D. Bhatt and V. M. Panchal, Engineering Drawing, Charotar Publishing House Pvt. Limited, 2008.
5. K.V. Natarajan, A Text Book of Engineering Graphics, Dhanalakshmi Publishers, 2013.

19IS301 PROBABILITY AND STATISTICS 3 1 0 4

Course Objectives

- Understand the basic concepts of probability and the distributions with characteristics and also two-dimensional random variables.
- Apply the basic rules and theorems of probability theory to determine probabilities that help to solve engineering problems.
- Determine the expectation and variance of a random variable from its distribution.
- Learn how to formulate and test hypotheses about means, variances and proportions and to draw conclusions based on the results of statistical tests.

Course Outcomes (COs)

1. Demonstrate and apply the basic probability axioms and concepts in their core areas of random phenomena in their core areas.
2. Calculate the relationship of two dimensional random variables using Correlation techniques and to study the properties of two dimensional random variables
3. Formulate the testing of hypothesis based on different types of hypothesis.
4. Implement one-way and two-way classifications.
5. Summarize the measurements for statistical quality control.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3												
2	3	1												
3	1													
4	2													
5		3												

UNIT I **9 Hours**

PROBABILITY AND RANDOM VARIABLES

Introduction to probability concepts, Types of Events, axioms, theorems, Conditional probability, Multiplication theorem, Applications. Characteristics of random variables - Discrete case, Probability Mass function, Cumulative distribution function, Applications ,Characteristics of random variables - Continuous case, , Probability density function, Cumulative distribution function, Applications, Central and Raw Moments, Expectation, variance, Applications, Moment generating function of discrete and continuous random variable

UNIT II **9 Hours**

TWO - DIMENSIONAL RANDOM VARIABLES

Joint Distributions - Marginal and Conditional Distributions - Covariance - Correlation And Linear Regression - Transformation Of Random Variables - Central Limit Theorem (For Independent And Identically Distributed Random Variables).

UNIT III **9 Hours**

TESTING OF HYPOTHESIS

Sampling Distributions - Estimation Of Parameters - Statistical Hypothesis - Large Sample Test Based On Normal Distribution For Single Mean And Difference Of Means -Tests Based On T, Chisquare And F Distributions For Mean, Variance And Proportion - Contingency Table (Test For Independent) - Goodness Of Fit.

UNIT IV **9 Hours**

DESIGN OF EXPERIMENTS

One Way And Two Way Classifications - Completely Randomized Design - Randomized Block Design - Latin Square Design - 22 Factorial Design.

UNIT V **9 Hours**

STATISTICAL QUALITY CONTROL

Control Charts For Measurements (X And R Charts) - Control Charts For Attributes (P, C And NP Charts) - Tolerance Limits - Acceptance Sampling.

Total: 45+15=60 Hours

Reference(s)

1. Devore. J.L., Probability And Statistics For Engineering And The Sciences, Cengage Learning, New Delhi, 8th Edition, 2012.
2. Walpole. R.E., Myers. R.H., Myers. S.L. And Ye. K., Ã¢??Probability And Statistics For Engineers And ScientistsÃ¢??, Pearson Education, Asia , 8th Edition, 2007.
3. Ross, S.M., Introduction To Probability And Statistics For Engineers And Scientists, 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. And Srinivasan. R.A., Schaum S Outline Of Theory And Problems Of Probability And Statistics, Tata McGraw Hill Edition, 2004.

19IS302 COMPUTER ARCHITECTURE 3 0 0 3

Course Objectives

- Understand of the basic structure and operation of a digital computer.
- Impart knowledge about the operation of the arithmetic unit including the algorithms & implementation addition, subtraction, multiplication & division.
- Acquire knowledge about the diverse ways of communicating with I/O devices and standard I/O interfaces.

Course Outcomes (COs)

1. Identify the basic structure of a digital computer and instruction sets with addressing modes.
2. Comprehend the arithmetic operations of binary number system.
3. Recognize the organization of the basic processing unit and examine the basic concepts of pipelining. 4. Explicate the standard I/O interfaces and peripheral devices.
4. Explicate the standard I/O interfaces and peripheral devices
5. Determine the performance of different types of memory.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2											
2	3	3	2											
3	2	3	3											
4	2	2	2											
5	2	2	2											

UNIT I **9 Hours**

STRUCTURE OF COMPUTERS

Functional units -Basic operational concepts -Bus structures -Software-performance-Memory locations and addresses -Memory operations-Instruction and instruction sequencing -Addressing modes-Assembly language-Basic I/O operations - Stacks and queues.

UNIT II **9 Hours**

ARITHMETIC OPERATIONS

Addition and subtraction of signed numbers-Design of fast adders-Multiplication of positive numbers Signed operand multiplication and fast multiplication-Integer division- Floating point Numbers and Operations.

UNIT III **9 Hours**

BASIC PROCESSING UNIT

Fundamental concepts-Execution of a complete instruction-Multiple bus organization-Hardwired control. Micro programmed control- Pipelining: Basic concepts-Data hazards-Instruction hazards-Influence on Instruction sets-Data path and control consideration-Superscalar operation.

UNIT IV **9 Hours**

INPUT/OUTPUT ORGANIZATION

Accessing I/O devices-Interrupts-Direct Memory Access-Buses-Interface circuits-Standard I/O Interfaces (PCI, SCSI, USB).

UNIT V **9 Hours**

MEMORY UNIT

Basic concepts-Semiconductor RAMs -ROMs- Speed -size and cost -Cache memories -Performance consideration-Virtual memory-Memory Management requirements-Secondary storage.

Total: 45 Hours

Reference(s)

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw-Hill, Third Reprint 2015.
2. William Stallings, Computer Organization and Architecture Designing for Performance, Pearson Education, 2003.
3. David A.Patterson and John L.Hennessy, Computer Organization and Design: The hardware / software interface, Morgan Kaufmann, 4th edition, 2014.
4. John P.Hayes, Computer Architecture and Organization, McGraw Hill, 3rd edition, 2002.

19IS303 DATA STRUCTURES AND ALGORITHMS 3 0 0 3

Course Objectives

- Implement abstract data types for linear data structures.
- Apply the different linear and non-linear data structures to problem solutions.
- Critically analyze the various sorting algorithms.

Course Outcomes (COs)

1. Identify the basic concept of data structure and identify the need for list data structures and its operations
2. Exemplify the concepts of stacks and queues with suitable applications.
3. Classify the types of tree data structures and explain its functionalities.
4. Outline the concept of graph data structure with examples.
5. Design the algorithms for searching ans sorting techniques.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3											1	
2	2	2	3										1	
3	2	3	3										2	
4	2	3	3										2	
5	2	3	3										2	

UNIT I **9 Hours**

LINEAR DATA STRUCTURES - LIST

Abstract Data Types (ADTs) - List ADT - array-based implementation - linked list implementation - singly linked lists- circularly linked lists- doubly-linked lists - applications of lists - Polynomial Manipulation - All operations (Insertion, Deletion, Merge, Traversal).

UNIT II **9 Hours**

LINEAR DATA STRUCTURES - STACKS, QUEUES

Stack ADT - Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT - Operations - Circular Queue - Priority Queue - deQueue - applications of queues.

UNIT III **9 Hours**

NON LINEAR DATA STRUCTURES - TREES

Tree ADT - tree traversals - Binary Tree ADT - expression trees - applications of trees - binary search tree ADT -Threaded Binary Trees- AVL Trees - B-Tree - B+ Tree - Heap - Applications of heap.

UNIT IV **9 Hours**

NON LINEAR DATA STRUCTURES - GRAPHS

Definition - Representation of Graph - Types of graph - Breadth-first traversal - Depth-first traversal - Topological Sort - Bi-connectivity - Cut vertex - Euler circuits - Applications of graphs.

UNIT V **9 Hours**

SEARCHING, SORTING AND HASHING TECHNIQUES

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Shell sort - Radix sort. Hashing- Hash Functions - Separate Chaining - Open Addressing - Rehashing - Extendible Hashing.

FOR FURTHER READING

Applications of list - Red-Black trees - Splay trees- Bucket hashing - Introduction to NP Completeness

Total: 45 Hours

Reference(s)

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms, Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, Data Structures and Algorithms, Pearson Education,1983.
3. Stephen G. Kochan, Programming in C, 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Fundamentals of Data Structures in C, Second Edition, University Press, 2008.

19IS304 OBJECT ORIENTED PROGRAMMING 2 0 2 3

Course Objectives

- Understand the features of Object oriented programming.
- Recognize the need of the concepts inheritance and polymorphism.
- Develop C++ applications using OOP concepts, files, templates and exceptions

Course Outcomes (COs)

1. Interpret the features of object oriented programming and basic structure of C++ program.
2. Develop a program using objects and classes.
3. Implement programs using operator overloading and inheritance.
4. Execute the concepts of polymorphism and File streams.
5. Develop applications with advanced concepts like files, templates and exceptions.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3			3								1	
2	1	3	2		3								1	
3	1	3	3		3								2	
4	1	3	3		3								2	
5	1	3	3		3								2	

UNIT I **6 Hours**

INTRODUCTION

Need for object oriented programming - Procedural Languages vs. Object oriented approach - Characteristics Object oriented programming - C++ Programming Basics: Basic Program Construction - Output Using cout - Input with cin - Data types - Variables and Constants - Operators - Control Statements-Manipulators - Type conversion.

UNIT II **6 Hours**

OBJECTS AND CLASSES

Objects and Classes Simple Class - C++ Objects as Physical Objects - C++ Object as Data types- Constructors and Destructors- Object as Function Arguments - Returning Objects from Functions - Structures and Classes - Arrays and Strings

UNIT III **6 Hours**

OPERATOR OVERLOADING AND INHERITANCE

Operator overloading and Inheritance Need of operator overloading- Overloading Unary Operators- Overloading binary Operators - Overloading Special Operators - Data Conversion Inheritance: Derived Class and Base Class - Derived Class Constructors-Overriding Member Functions-Class Hierarchies-Public and Private Inheritance-Levels of Inheritance-Multiple Inheritance.

UNIT IV **6 Hours**

POLYMORPHISM AND FILE STREAMS

Polymorphism and File Streams Virtual Function - Friend Function - Static Function-Assignment and Copy Initialization- Memory Management: new and delete Pointers to Objects, this Pointer- Streams -

String I/O - Character I/O - Object I/O - I/O with Multiple Objects - File Pointers - Disk I/O with Member Functions- Error Handling in File I/O.

UNIT V **6 Hours**

TEMPLATES AND EXCEPTION HANDLING

Templates: Introduction - Function Templates - Overloading Function Templates - Class Templates - Exception Handling - Syntax, multiple exceptions, exceptions with arguments

5 Hours

EXPERIMENT 1

Implementation of operator overloading with class and objects.

1. Write a program to find the square and cube of a number using class and object.
2. Write a program to find the area of rectangle and circle using class and object.
3. Write a program to find whether the given number is an Armstrong number using classes and objects.

5 Hours

EXPERIMENT 2

Implementation of operator and function overloading.

1. Write a program to perform conversion from integer to complex number by operator overloading.
2. Write a program to perform from complex number to integer using operator overloading.
3. Write a program to perform addition of two numbers using function overloading.

5 Hours

EXPERIMENT 3

Implementation of types of Inheritance.

1. Write a program to generate employee payroll using inheritance.
2. Write a program to student details using multilevel inheritances.

5 Hours

EXPERIMENT 4

Implementation of two different classes for adding a private data member using friend function.

1. Write a program to multiply two matrices using static member function with friend function.
2. Write a program to perform complex number subtraction by overloading an operator using friend function.
3. Write a program to perform arithmetic operations using friend function.

5 Hours

EXPERIMENT 5

Implementation of file handling operations.

1. Write a program to reading and writing a file contents.
2. Write a program to open a file and append data to the end of file.
3. Write a program to write the class objects to a file.

5 Hours

EXPERIMENT 6

Implementation of Class templates and Function templates. 1. Write a program to perform insertion sort using class template.

2. Write a program to perform quick sort using function template.
3. Write a program to perform merge sort using template.

Total: 30+30=60 Hours

Reference(s)

1. Robert Lafore, "Object Oriented Programming in C++", Galgotia Publication, 2010.
2. E.Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill Publishing, New Delhi, 2011.
3. B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2010.
4. H.M Deitel and P.J Deitel, "C++ How to Program", Seventh Edition, Prentice Hall, 2010.
5. Herbert Schildt, "C++: The Complete Reference", Fourth Edition, Tata McGraw-Hill, 2010.
6. K.R. Venugopal, Rajkumar and T.Ravishankar, "Mastering C++", Tata McGraw Hill Publishing, New Delhi, 2010.

19IS305 DATABASE MANAGEMENT SYSTEMS 3 0 0 3

Course Objectives

- Understand the data models, conceptualize and depict a database system using E-R diagram.
- Gain knowledge on the design principles of a relational database system and SQL.
- Impart knowledge in transaction processing, concurrency control and recovery techniques.

Course Outcomes (COs)

1. Differentiate database systems from file system by understanding the features of database system and design a ER model for a database system.
2. Develop solutions to a broad range of query and data update problems using relational algebra, relational calculus and SQL.
3. Apply the normalization theory in relational databases for removing anomalies.
4. Compare database storage and access techniques for file organizations, indexing methods and query processing.
5. Analyze the basic issues of transaction processing, concurrency control, deadlock and its recovery schemes.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3										2	2
2	1	2	3										2	2
3	2	3											2	2
4	2	3											2	2
5	1	3	2										2	2

UNIT I **8 Hours**

INTRODUCTION

Introduction: Database system application, purpose of database system View of Data -Database Languages-Data Storage and Querying-Database Architecture - Database design and ER model: Overview of the design process-The ER Model - Constraints - Removing redundant attributes in Entity Sets-ER Diagram - Reduction to Relational Schemas - ER Design Issues.

UNIT II **9 Hours**

RELATIONAL MODEL AND DATABASE DESIGN

Introduction to Relational Model - Formal Relational Query Languages - Introduction to SQL: Data definition-Basic structure of SQL Queries-Additional Basic operations -Set operations-Aggregate functions Nested sub queries-Intermediate SQL: Joins-Views-Integrity Constraints.

UNIT III **8 Hours**

NORMAL FORMS

Functional Dependencies - Normal Forms Based on primary Keys-General Definition of Second and Third Normal Form - Boyce Codd Normal Form - Algorithms for relational database schema design Multi valued dependencies and Fourth Normal Form.

UNIT IV **9 Hours**

DATA STORAGE AND QUERY PROCESSING

Overview of Physical Storage Media - Magnetic disk Flash storage -RAID-File and Record Organization -Indexing and Hashing :Ordered Indices - B+Tree Index File-Static Hashing -Dynamic Hashing-Query Processing: Overview-measures of Query Cost.

UNIT V **11 Hours**

TRANSACTION MANAGEMENT

Transactions: Transaction concept-Transaction Atomicity and Durability-Transaction IsolationSerializability-Transaction Isolation and Atomicity-Transaction Isolation levels-Implementation of Isolation Levels-Concurrency Control: Lock based protocols -Deadlock handling-Multiple GranularityTime stamp based protocols-Recovery system: Failure classification -Storage-Recovery and atomicity Recovery Algorithms.

Total: 45 Hours

Reference(s)

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts , McGraw Hill, 2015
2. Ramez Elmasri and Shamkant B. Navathe, Fundamental Database Systems,Pearson Education, 2008
3. Raghu Ramakrishnan, Database Management System, Tata McGraw-Hill Publishing Company, 2003 4. C.J.Date,An Introduction to Database system, Pearson Education, 2006
4. Peter Rob and Corlos Coronel, Database System, Design, Implementation and Management , Thompson Learning Course Technology, 2003

19IS306 WEB TECHNOLOGY 2 0 2 3

Course Objectives

- Understand the scripting languages XHTML, JavaScript and PHP.
- Familiar with the different server technologies.
- Gain knowledge about the concepts of web services.

Course Outcomes (COs)

1. Demonstrate the technologies used to create web pages.
2. Design dynamic and interactive web pages by embedding Java Script in XHTML.
3. Implement server side programming and build web applications using PHP.
4. Develop interactive web applications using ASP.Net.
5. Explain web services and its technologies

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		3		2	2								1
2	2		3		3	2								1
3	2		3		3	3								1
4	2		3		3	3								1
5	1		2		3	2								1

UNIT I **6 Hours**

INTRODUCTION TO WEB AND XHTML

Introduction - Blogging - Social Networking - Social media - Tagging - Software development - Introduction to XHTML and Editing XHTML Headings - Linking - Images - Special characters and Horizon rules - Lists - Tables - Forms -Internal Linking- Meta Elements - Cascading Style Sheets.

UNIT II **6 Hours**

JAVASCRIPT

Introduction to scripting - Control statements I, II - Functions: Definition - Random Number Generation - Global function - Recursion - Arrays: Declaring and allocating arrays Multidimensional arrays - Objects : Math object - String object - Date object - Boolean, Number object - Document object - Window object - Events.

UNIT III **6 Hours**

INTERNET APPLICATION SERVER TECHNOLOGIES

Web server (IIS and Apache): Multitier Architecture - Client/ Server side scripting - Accessing web services - Microsoft IIS - Apache HTTP server - Database: Relational database - SQL - PHP: Basics - String and Form Processing - connecting to database.

UNIT IV **6 Hours**

ASP .NET AND JSP WEB APPLICATIONS

Introduction - creating and running a simple web form - Web controls - session tracking - case study: Connecting to a database in ASP.NET. - Introduction to AJAX- AJAX XML Http request- AJAX

Events- Java web technologies(Servlets, JSP)-creating and running a simple application in Netbeans-JSF components.

UNIT V **6 Hours**

WEB SERVICES

Introduction - Java web services Basics - Creating Publishing, Testing and describing web service - Consuming web service - SOAP - Session Tracking in web services - Consuming a Database driven web service from a web application - Passing an object of a User defined type to a web service

3 Hours

EXPERIMENT 1

Create a XHTML document for the college website with Text styling, Linking, Images, Lists, Table by highlighting the facilities in the department.

3 Hours

EXPERIMENT 2

Create an XHTML document for an online Bookstore that has a Registration form with text box, Radio Button, Selection box, Checkbox, Submit and reset buttons.

3 Hours

EXPERIMENT 3

Design a web page using CSS which includes the following:
a) Use different font styles
b) Set background image for both the page and single elements on page.
c) Control the repetition of image with background-repeat property
d) Define style for links as a: link, a: active, a: hover, a: visited

3 Hours

EXPERIMENT 4

Write a java script to validate the following fields in a registration page
a) Name (should contains alphabets and the length should not be less than 6 characters)
b) Password (should not be less than 6 characters)
c) E-mail (should not contain invalid addresses)

3 Hours

EXPERIMENT 5

Write a JavaScript function to get nth largest element from an unsorted array.

3 Hours

EXPERIMENT 6

Create a web page with real time clock using Java script event handling mechanism.

3 Hours

EXPERIMENT 7

Write a JSP code to retrieve the xhtml form values and print those values in JSP pages.

3 Hours

EXPERIMENT 8

Write a program with ASP .net by connecting with SQL
a. Create login form to enter into website
b. Building web form that displays data from a database

3 Hours

EXPERIMENT 9

Write a PHP program for an web application that
a. takes a name as input and on submit it shows a hello page where is taken from the request
b. shows a start time at the right top corner of the page and
c. provides the logout button on clicking this button it should show a logout page with thank you message along with the duration of usage session

3 Hours

EXPERIMENT 10

Create a SOAP based web service for a simple Java Calculator class with operations add and subtract then create a web service client which then consumes the web service and displays the result of the invoked web service.

Total: 30+30=60 Hours

Reference(s)

1. P.J. Deitel and H.M. Deitel, Internet and World Wide Web - How to Program, Pearson Education, 2009.
2. Deitel, Deitel and Nieto, Internet and World Wide Web How to Program, Pearson Education,2002.
3. Uttam K.Roy, Web Technologies, Oxford University Press, 2010.
4. Rajkamal, Web Technology, Tata McGraw-Hill, 2009.
5. www.w3schools.com/ajax.

19IS307 DATA STRUCTURES AND ALGORITHMS LABORATORY

0 0 4 2

Course Objectives

- Understand the principles of linear and non linear data structures.
- Build an applications using sorting and searching.

Course Outcomes (COs)

1. Implement the concept of recursion using C programs.
2. Implement C programs to illustrate linear data structures.
3. Develop C programs to implement nonlinear data structures.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1					3								2	
2					3								2	
3					3								2	

4 Hours

EXPERIMENT 1

Program to Solve Tower-of-Hanoi Problem using Recursion.

4 Hours

EXPERIMENT 2

a) Write a C program to implement a Stack ADT using array and write the routine for push operation which represent a function PUSH(X, S), Check for the condition whether S-full or not, if yes display the message otherwise insert the elements into the Stack. Perform POP operation which represents a function POP(S), Check for the condition whether S-Empty, if stack is empty, display the message otherwise delete an element from the Stack. Test your program with at least 5 elements and provide the output.

b) Write a C program to implement the Queue ADT using array and write the routine to enqueue an element X into queue, Check for the conditions Q-full, if yes display the message otherwise insert the data into the queue and dequeue an element from queue, check for the conditions Q-empty, if yes display the message otherwise deleting the element from the queue and display the elements from the Queue ADT. Test your program with at least 6 elements and provide the output.

4 Hours

EXPERIMENT 3

Linked List Implementation of stack and queue.

6 Hours

EXPERIMENT 4
Write a function program to perform the following operations on a singly linked list
i. Create a list
ii. Insert an element to the list
iii. Delete the maximum element from the list iv. Arrange the list as sorted order
v. Display the elements of the list
Write a main method to demonstrate the above functionalities.

4 Hours

EXPERIMENT 5
Write a function program to perform the following operations on a doubly linked list.
i. Create a list
ii. Insert an element to the list
iii. Delete the maximum element from the list iv. Arrange the list as sorted order
v. Display the elements of the list
Write a main method to demonstrate the above functionalities.

4 Hours

EXPERIMENT 6
Program to sort the elements in ascending order using selection sort and bubble sort.

4 Hours

EXPERIMENT 7
Implementation of quick sort.

4 Hours

EXPERIMENT 8
Implementation of heap sort.

4 Hours

EXPERIMENT 9
Implementation of shell sort.

4 Hours

EXPERIMENT 10
Develop a program to perform linear and binary search.

6 Hours

EXPERIMENT 11
Program to construct an expression tree for a given expression and perform various tree traversal methods.

6 Hours

EXPERIMENT 12

i. Implement Prims algorithm with the following functionalities
ii. Read a set of vertices minimum of six from the keyboard ii. Get the number of edges and form the graph
iii. Find the value of each edge by using distance formula for two points. iv. Develop a Minimum Spanning Tree for the graph
iv. Find the total length of all edges.
v. Write a main method to execute the above functionalities

6 Hours

EXPERIMENT 13

Implementation of hashing technique.

Total: 60 Hours

Reference(s)

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education,2016.
2. Richard F. Gilberg, and Behrouz A. Forouzan, Data Structures - A Pseudocode Approach with C, Thomson 2011.
3. Aho, J.E.Hopcroft and J.D.Ullman, Data Structures and Algorithms, Pearson education, Asia, 2010.
4. Reema Thareja, Data Structures Using C, Second Edition, Oxford University Press, 2011.

19IS308 DATABASE MANAGEMENT SYSTEMS LABORATORY **0 0 4 2**

Course Objectives

- Understand the DDL, DML, TCL and DCL commands in SQL.
- Understand the design principles of a relational database system and SQL.
- Implement programs using SQL and PL/SQL.

Course Outcomes (COs)

1. Differentiate database systems from file system by understanding the features of database system and design a ER model for a database system.
2. Develop solutions to a broad range of query and data update problems using relational algebra, relational calculus and SQL.
3. Apply the normalization theory in relational databases for removing anomalies.
4. Compare database storage and access techniques for file organization, indexing methods and Query Processing.
5. Analyze the basic issues of transaction processing, concurrency control, deadlock and its recovery schemes.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	2										2	2
2	2	1	2		2								2	2
3	2	2	1		2								2	2
4	2	2	2		2								2	2
5	2	2	2										2	2

4 Hours

EXPERIMENT 1
Working with SQL commands like DDL, DML, TCL, and DCL.

8 Hours

EXPERIMENT 2
Performing Single- row functions and group functions in SQL.

4 Hours

EXPERIMENT 3
Execute simple queries using joins and Integrity constraints.

8 Hours

EXPERIMENT 4
Creation and manipulation of database objects.

4 Hours

EXPERIMENT 5
Simple programs using PL/SQL block.

8 Hours

EXPERIMENT 6
Implementation of cursor in PL/SQL block.

8 Hours

EXPERIMENT 7
Generate trigger in PL/SQL block.

8 Hours

EXPERIMENT 8
Write PL/SQL block Programs using exception handling.

8 Hours

EXPERIMENT 9
Design a PL/SQL blocks using subprograms namely functions and procedures.

Total: 60 Hours

Reference(s)

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, McGraw-Hill,2015.
2. C.J.Date,An Introduction to Database system, Pearson Education, 2006.

18GE301 SOFT SKILLS - VERBAL ABILITY 0 0 2 -

Course Objectives

- To help students gain adequate proficiency in vocabulary
- To help students become proficient in basic writing skills related to workplace communication
- To read and understand unabridged text

Course Outcomes (COs)

1. Take up verbal ability part of the placement tests with confidence
2. Write with confidence in professional and workplace communication
3. Distinguish fact from opinion by reading passages from a text

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										1				
2											2			
3									2					

UNIT I **15 Hours**

INTRODUCTION

Synonyms - Antonyms - Word Groups - Verbal Analogies - Etymology - Critical Reasoning - Cloze Test - One Word Substitution - Idioms and Phrases - Text & Paragraph Completion.

UNIT II **15 Hours**

BASICS OF VERBAL APTITUDE

Sentence Formation - Paragraph Formation - Change of Voice - Change of Speech - Reading Comprehension - Sentence Equivalence - Jumbled Sentences - Spotting Errors -Homophones Homonyms - Commonly Mispronounced/Misspelt Words.

Total: 30 Hours

Reference(s)

1. Murphy, Raymond. English Grammar in Use A Self-Study Reference and Practice Book for Intermediate Learners of English. IV Edition. United Kingdom: Cambridge University Press. 2012.
2. Lewis, Norman. Word Power Made Easy. New York: Pocket Books. 1991.
3. Baron"s The Official Guide for New GMAT Review, New Jersey: John Wiley & Sons, Inc. 2015.

19IS401 FORMAL LANGUAGES AND AUTOMATA THEORY

3 1 0 4

Course Objectives

- Understand the mathematical models of computation and design grammars and recognizer for different formal languages
- Identify the relation among regular language, context free language and the corresponding recognizers
- Determine the decidability and intractability of computational problems

Course Outcomes (COs)

1. Explain proofing techniques and construct finite automata
2. Generate finite automata for regular expression using its properties
3. Apply context free grammars and languages
4. Construct Push down Automata and Turing machine
5. Analyze the undecidability of languages

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1	1											
2	1		2											
3		1												
4		2	1											
5			2											

UNIT I **9 Hours**

AUTOMATA

Introduction to formal proof - Additional forms of proof - Inductive proofs - Finite Automata (FA) - Deterministic Finite Automata (DFA) - Non-deterministic Finite Automata (NFA) - Finite Automata with Epsilon transitions

UNIT II **9 Hours**

REGULAR EXPRESSIONS AND LANGUAGES

Regular Expression - FA and Regular Expressions -Arden"s theorem - Applications of Regular Expression - Algebraic Laws for Regular Expression - Proving languages not to be regular - Closure properties of regular languages

UNIT III **9 Hours**

CONTEXT-FREE GRAMMAR AND LANGUAGES

Grammar Introduction- Types of Grammar - Context-Free Grammar (CFG) - Parse Trees - Applications of Context-Free Grammar -Ambiguity in grammars and languages - Normal forms for CFG - Pumping Lemma for CFL - Closure Properties of CFL

UNIT IV **9 Hours**

PUSH DOWN AUTOMATA AND TURING MACHINES

Definition of the Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG. Turing Machines (TM)- Programming Techniques for TM - Storage in finite control - Multiple tracks - Checking off symbols - Subroutines

UNIT V **9 Hours**

UNDECIDABILITY

A language that is not Recursively Enumerable (RE) - An undecidable problem that is RE - Undecidable problems about Turing Machine - Post"s Correspondence Problem - Rice Theorem

Total: 45+15=60 Hours

Reference(s)

1. John E.Hopcroft, Rajeev Motwani and Jeffrey.D Ullman, Introduction to Automata Theory, Languages and Computations, Pearson Education, Third Edition, 2014
2. Harry R.Lewis and Christos.H.Papadimitriou, Elements of The theory of Computation,Pearson Education/PHI, 2007
3. C.Martin, Introduction to Languages and the Theory of Computation, TMH, 2007
4. Micheal Sipser, Introduction of the Theory and Computation, Thomson Brokecole, 2005

19IS402 DESIGN AND ANALYSIS OF ALGORITHMS 3 0 0 3

Course Objectives

- Identify various algorithm design techniques
- Impart knowledge on runtime analysis of algorithms
- Empathize the limits of computation

Course Outcomes (COs)

1. Classify the fundamentals of Algorithmic problem solving methods based on Data Structures
2. Analyze the algorithm efficiency by means of mathematical notations
3. Develop different types of sorting and searching algorithms
4. Analyze the different techniques in the design of Graph Algorithms
5. Differentiate algorithms design techniques of NP complete with NP hard problems

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	2											
2	3	3	3											
3	3	3	3											
4	2	2	3											
5	3	3	3											

UNIT I **7 Hours**

INTRODUCTION

Introduction Fundamentals of Algorithmic Problem Solving Important Problem types: Sorting problem- searching problems - string processing - graph problems - combinatorial problems- Geometric Problems - Numerical problems Fundamental Data structures-Trees and Graphs.

UNIT II **9 Hours**

FUNDAMENTALS OF THE ANALYSIS OF ALGORITHM EFFICIENCY

Analysis Framework - Asymptotic notations - Basic Efficiency classes - Mathematical Analysis of Non-recursive Algorithm - Mathematical Analysis of Recursive Algorithm - Example: Fibonacci Numbers - Empirical Analysis of Algorithms-Algorithm visualization

UNIT III **10 Hours**

ANALYSIS OF SORTING AND SEARCHING ALGORITHMS

Brute Force Strategy: Selection Sort and Bubble Sort, Sequential Search and Brute-force string matching - Divide and conquer: Merge sort, Quick Sort, Binary Search, Binary tree Traversal and Related Properties Decrease and Conquer: Insertion Sort, Depth first Search and Breadth First Search- Pair and Convex-Hull

UNIT IV **10 Hours**

ANALYSIS OF GRAPH ALGORITHMS

Transform and conquer: Presorting, Balanced Search trees AVL Trees, Heaps and Heap sort Dynamic Programming: Warshalls and Floyd Algorithm, Optimal Binary Search trees Greedy Technique: Prims Algorithm, Kruskals Algorithm, Dijkstra Algorithm Huffman trees-The Simplex Method-The Maximum- Flow Problem Maximum Matching in Bipartite Graphs- The Stable marriage Problem.

UNIT V **9 Hours**

ALGORITHM DESIGN TECHNIQUES TO NP COMPLETE AND NP HARD PROBLEMS

NP Complete problems Backtracking: n-Queens Problem Hamiltonian Circuit problem Subset-Sum problem Branch and bound: Assignment problem, Knapsack problem Traveling salesman problem-Approximation algorithms for NP hard problems: Travelling salesman and knapsack problem-Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems-Coping
with the Limitations.

Total: 45 Hours

Reference(s)

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education Asia, 2011
2. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, PHI Pvt.Ltd., 2009
3. Sara Baase and Allen Van Gelder, Computer Algorithms Introduction to Design and Analysis, Pearson Education Asia, 2010
4. A.V.Aho, J.E. Hopcroft and J.D.Ullman, The Design and Analysis of Computer Algorithms, Pearson Education Asia, 2003

19IS403 OPERATING SYSTEMS 3 0 0 3

Course Objectives

- To make the students to learn different types of operating systems along with the components and services provided.
- To understand the concept of process management and implementation of process scheduling in a multi-programming environment using scheduling algorithms.
- To provide knowledge on the structure and operations of memory management and storage management

Course Outcomes (COs)

1. Describe the evolution of operating systems over time from primitive batch systems to sophisticated multi-user systems and implement the usage of different system calls to manage the resources
2. Analyze the process scheduling algorithms used in a multi-programming environment and explore interprocess communication using shared memory and message passing
3. Analyze the activities of process synchronization and deadlock towards increasing the throughput of the system
4. Select the memory-management method for a specific system depends on the hardware design and explore the various memory management techniques of allocating memory to processes
5. Suggest an appropriate file system and disk organizations methods for a computing and storage scenario

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	2	2			1									
3	2	2			2									
4	2	2			3									
5	2	2			1									

UNIT I **10 Hours**

INTRODUCTION

Components of Computer System - Evolution of operating System. Operating System Components & Services: Process management -Memory Management- Storage Management - Protection & Security - Operating System Services. Computing Environments-Open source operating systems -System Calls & System programs

UNIT II **9 Hours**

PROCESS MANAGEMENT

Process Concepts: The process - Process State - Process Control Block. Process Scheduling: Scheduling Queues -Scheduler - Context Switch. Operations on Processes - Process creation - Process Termination - Cooperating Processes. Interprocess Communication.CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms

UNIT III **9 Hours**

PROCESS SYNCHRONIZATION AND DEADLOCK

Process Synchronization: The Critical-Section Problem - Synchronization Hardware - Semaphores - Classic problems of Synchronization. Deadlock: System Model - Deadlock Characterization - Methods for handling Deadlocks - Deadlocks prevention - Deadlock avoidance - Deadlock detection - Recovery from deadlocks.

UNIT IV **9 Hours**

MEMORY MANAGEMENT

Address Binding - Logical Versus Physical Address Space - Swapping- Contiguous Memory allocation - Fragmentation- Paging - Segmentation. Virtual Memory: Demand Paging - Page Replacement Algorithms - Allocation of frames-Thrashing.

UNIT V **8 Hours**

STORAGE MANAGEMENT

File Management: File Concept - Access Methods - Directory and Disk Structure - File System Mounting- File Sharing.File System Implementation: File system structure - Directory implementation- Allocation Methods - Free-space Management. Secondary Storage Structure: Disk Structure - Disk Scheduling - Disk Management.

Total: 45 Hours

Reference(s)

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, 9th Edition, John Wiley & Sons Pvt. Ltd, 2015
2. Andrew S. Tanenbaum, Modern Operating Systems, Fourth Edition, Prentice Hall of India Pvt. td, 2014
3. William Stallings, Operating System, Seventh Edition Prentice Hall of India, 2012
4. Harvey M. DeitelM ,Operating Systems, Pearson Education Pvt. Ltd, 2007

19IS404 JAVA PROGRAMMING **3 0 0 3**

Course Objectives

- Understand the basic features of OOP in Java
- Summarize the types of Inheritance supported by Java
- Recognize the multithreading process supported by Java.

Course Outcomes (COs)

1. Interpret the basic structure of Java program
2. Implement various types of inheritance and packages under different accessibility
3. Describe the concept of interfaces, exceptions and multithreading nature of Java
4. Develop applications in Java with files and Strings handling
5. Design desktop based java applications using Java Applet, AWT and its components

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	2	2	1											2
3	2	2	2											2
4	1	2	1											2
5	2	2	2											2

UNIT I **9 Hours**

JAVA BASICS

The Genesis of Java - Overview of Java - Data Types, Variables, and Arrays - Operators - Control Statements - Introducing Classes - Methods and Classes. I/O Basics - Reading console Input Writing Console output.

UNIT II **9 Hours**

INHERITANCE AND PACKAGES

Inheritance: Basics - Using Super - Creating a Multilevel Hierarchy - Method overriding - Using Abstract Classes - Packages and Interfaces: Packages - Access Protection - Importing Packages

UNIT III **9 Hours**

INTERFACES, EXCEPTIONS AND THREAD

Interfaces Definitions and Implementations - Exception Handling: Types - Try and Catch - Throw - Multi-threaded Programming: Creating Threads - Inter Thread Communication

UNIT IV **9 Hours**

STRING HANDLING AND FILES

File - The Byte Streams - The Character Streams - Using Stream I/ O - Serialization. String Handling:Special String operations and Methods - String Buffer - Exploring java.lang: Simple type Wrappers - System - Mah - Utility Classes: String Tokenizer - Date and Time - Collection Interfaces - Collection classes

UNIT V **9 Hours**

APPLETS, EVENT HANDLING AND AWT

Applet Basics - Applet Architecture - Applet Display Methods - Event Handling Mechanisms - Event Classes - Event Listener - Working with Windows , Graphics , Colors and Fonts - AWT Controls - Layout Managers and Menus - JDBC Concepts

Total: 45 Hours

Reference(s)

1. Herbert Schildt, Java 2-Complete Reference, Tata Mc Graw Hill, 2015
2. Deitel & Deitel, Java How to Program, Prentice Hall of India, 2010
3. Gary Cornell and Cay S.Horstmann, Core Java Vol.1 and Vol.2, Sun Microsystems Press, 2008
4. Jeff Linwood and Dave Minter, Beginning Hibernate Second Edition, Apress 2010
5. Rod Johnson, Juergen Hoeller, Alef Arendsen, Thomas Risberg, Colin Sampaleanu, Java Development with the Spring Framework, Wiley-India, 2012.

19IS405 INFORMATION STORAGE AND RETRIEVAL

3 0 0 3

Course Objectives

- To make the students to learn different types of storage and retrieval concept
- To understand the concept of indexing and clustering process and the data structure concept behind it.
- To provide knowledge on the structure and operations of retrieval process on multimedia information.

Course Outcomes (COs)

1. Infer the various information retrieval systems, its objectives and capabilities
2. Interpret the data structure behind the retrieval systems and indexing techniques
3. Analyze the document clustering and different searching techniques
4. Demonstrate search algorithms and data visualization techniques.
5. Interpret the techniques in multimedia retrieval process and the measures and metrics used in evaluation process

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		2		2									2
2	2		2		2									2
3	2		3		3									2
4	2		3		3									2
5	2		3		3									2

UNIT I **9 Hours**

INFORMATION RETRIEVAL SYSTEMS

Introduction to Information Retrieval Systems: Definition of Information Retrieval Systems - Objectives of Information Retrieval Systems - Functional Overview - Relationship to Database Management Systems - Digital Libraries and Warehouses. Information Retrieval Systems Capabilities: Search Capabilities - Browse Capabilities - Miscellaneous Capabilities - WAIS Standards. Cataloging and Indexing: Objectives of Indexing - Indexing Process - Automatic Indexing.

UNIT II **9 Hours**

DATA STRUCTURE AND AUTOMATIC INDEXING

Introduction to Data Structure - Stemming Algorithm - Inverted File Structure - N-Gram data structure - PAT Data Structure - Signature File Structure - Hypertext and XML Data Structures - Hidden Makov Models. Automatic Indexing: Classes of Automatic Indexing - Statistical Indexing - Natural Language - Concept Indexing - Hypertext Linkages.

UNIT III **9 Hours**

CLUSTERING AND SEARCHING TECHNIQUES

Document and Term Clustering: Introduction to Clustering - Thesaurus Generation - Item Clustering - Hierarchy of clusters. User Search Techniques: Search statements and Binding - Similarity measures and ranking - Relevance Feedback - Selective dissemination of Information search - Weighted Searches of Boolean systems - Searching the INTERNET and Hypertext.

UNIT IV **9 Hours**

SEARCH ALGORITHMS AND VISUALIZATION

Information Visualization: Introduction to Information Visualization - Cognition and Perception - Background - Aspects of Visualization process - Information Visualization Technologies. Text Search Algorithms: Introduction to Text Search Techniques - Software text search Algorithms - Hardware text search Algorithms

UNIT V **9 Hours**

MULTIMEDIA INFROMATION RETRIEVAL

Spoken Language Audio Retrieval - Non-speech Audio Retrieval - Graph Retrieval - Imagery Retrieval - Video Retrieval. Information System Evaluation: Introduction to Information System Evaluation - Measures used in System Evaluations - Measurement Example - TREC Results.

Total: 45 Hours

Reference(s)

1. Gerald J. Kowalski, Mark T. Maybury, "Information Storage and Retrieval Systems", Second edition, Kluwer Academic Publishers, 2002
2. Robert R. Korfhage, "Information Storage and Retrieval Systems", Wiley India, 2006
3. Robert M. Hayes, "Information Storage and Retrieval: Tools, Elements, Theories", Society for Industrial and Applied Mathematics, 2006
4. Pollitt AS, "Information storage & Retrieval Systems : Origin Development & Applications, John Wiley & Sons, 1989
5. Philip K. C. Tse, "Multimedia Information Storage and Retrieval: Techniques and Technologies", IGI Global United States, 2008

19IS406 SOFTWARE ENGINEERING 3 0 0 3

Course Objectives

- Understand detailed concepts related to software engineering life cycle
- Gain knowledge about the concepts of software designing and testing
- Acquire knowledge about an quality management processes and methods.

Course Outcomes (COs)

1. Analyze and identify a suitable software development life cycle model for an application
2. Develop software requirements specification and cost estimation for an application
3. Analyze the software design concepts and principles to develop a high quality software
4. Apply the testing methods to identify errors during software development
5. Identify the activities that improve the quality of the software.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												2
2	2	2	2											2
3		2	3											2
4	1	2	2											2
5		3	2											2

UNIT I **7 Hours**

SOFTWARE PROCESS MODELS

The Nature of Software-Software Process Models-Waterfall Model-Incremental Process Models-Evolutionary Process Models- Prototyping-Spiral Model-Concurrent Model-Introduction to Agile Process.

UNIT II **11 Hours**

REQUIREMENT ENGINEERING AND ESTIMATION

Requirements Engineering - Establishing the Groundwork - Eliciting Requirements - Building the Requirements Model - Requirements Analysis - Metrics in the Process and Project Domains – Software Measurements - Metrics for Software Quality - Software Project Estimation - Decomposition Techniques - Empirical Estimation Models - The Make/Buy Decision

UNIT III **8 Hours**

DESIGN CONCEPTS AND PRINCIPLES

The Design Concepts - The Design Model - Architectural Design - User Interface Design: Interface Analysis - Interface Design Steps - Risk Management - Software Engineering Practice - Core Principles - Coding Principles and Concepts.

UNIT IV **10 Hours**

TESTING TACTICS

Software Testing Fundamentals - Internal and External Views of Testing - White-Box Testing - Basis Path Testing - Control Structure Testing - Black Box Testing - Unit Testing - Integration Testing - Validation Testing - System Testing - The Art of Debugging.

UNIT V **9 Hours**

QUALITY MANAGEMENT

Software Quality Assurance - Software Reviews - Formal Technical Reviews - Informal Reviews - Software Reliability - Software Configuration Management - The SCM Process - The Cleanroom Strategy - Software Reengineering Process Model - Reverse Engineering - Forward Engineering.

Total: 45 Hours

Reference(s)

1. Roger S.Pressman, Software Engineering: A Practitioners Approach, McGraw Hill International edition, Seventh edition, 2010
2. Ian Sommerville, Software Engineering, 8th Edition, Pearson Education,2008
3. Stephan Schach, Software Engineering, Tata McGraw Hill, 2007
4. Pfleeger and Lawrence Software Engineering: Theory and Practice, Pearson Education, second edition, 2001.

19IS407 OPERATING SYSTEMS LABORATORY 0 0 4 2

Course Objectives

- To make the students to learn different types of operating systems along with the components and services provided
- To understand the concept of process management and implementation of process scheduling in a multi-programming environment using scheduling algorithms
- To provide knowledge on the structure and operations of memory management and storage management

Course Outcomes (COs)

1. Describe the evolution of operating systems over time from primitive batch systems to sophisticated multi-user systems and implement the usage of different system calls to manage the resources
2. Analyze the process scheduling algorithms used in a multi-programming environment and explore interprocess communication using shared memory and message passing
3. Analyze the activities of process synchronization and deadlock towards increasing the throughput of the system
4. Select the memory-management method for a specific system depends on the hardware design and explore the various memory management techniques of allocating memory to processes.
5. Suggest an appropriate file system and disk organizations methods for a computing and storage scenario

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	2	2			1									
3	2	2			2									
4	2	2			3									
5	2	2			1									

6 Hours

EXPERIMENT 1
Basic UNIX commands

8 Hours

EXPERIMENT 2
Fork, wait, exec, stat, readdir, open, read, write system calls

6 Hours

EXPERIMENT 3
ls, grep, cp, rm commands

8 Hours

EXPERIMENT 4
Shell programming

4 Hours

EXPERIMENT 5
FCFS Scheduling

8 Hours

EXPERIMENT 6
SJF and Priority Scheduling

4 Hours

EXPERIMENT 7
Roundrobin scheduling

4 Hours

EXPERIMENT 8
Semaphore Implementation.

12 Hours

EXPERIMENT 9
Inter-process Communication, Producer-Consumer problem, Banker's Algorithms

Total: 60 Hours

Reference(s)

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, 9th Edition, John Wiley & Sons Pvt. Ltd, 2015
2. Andrew S. Tanenbaum, Modern Operating Systems, Fourth Edition, Prentice Hall of India Pvt. td, 2014
3. William Stallings, Operating System, Seventh Edition Prentice Hall of India, 2012
4. Harvey M. DeitelM ,Operating Systems, Pearson Education Pvt. Ltd, 2007

19IS408 JAVA PROGRAMMING LABORATORY 0 0 4 2

Course Objectives

- Understand the basic features of OOP in Java
- Summarize the types of Inheritance supported by Java
- Recognize the multithreading process supported by Java

Course Outcomes (COs)

1. Interpret the basic structure of Java program
2. Implement various types of inheritance and packages under different accessibility
3. Describe the concept of interfaces, exceptions and multithreading nature of Java
4. Develop applications in Java with files and Strings handling
5. Design desktop based java applications using Java Applet, AWT and its components

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	2	2	1											2
3	2	2	2											2
4	1	2	1											2
5	2	2	2											2

6 Hours

EXPERIMENT 1
Program on Classes and Method

4 Hours

EXPERIMENT 2
Implementation of Inheritance

6 Hours

EXPERIMENT 3
Implementation of Interfaces and Packages

6 Hours

EXPERIMENT 4
Implementation of Multithreaded Programming

4 Hours

EXPERIMENT 5
Develop a program to implement String Handling Methods

4 Hours

EXPERIMENT 6
Implementation of Exception handling mechanisms

6 Hours

EXPERIMENT 7
Implementation of Collections Interfaces and Classes

4 Hours

EXPERIMENT 8
Implementation of I/O Streams

4 Hours

EXPERIMENT 9
Implementation of Applet Programs

6 Hours

EXPERIMENT 10
Implementation of AWT controls

4 Hours

EXPERIMENT 11
Write a program to implement Event classes

6 Hours

EXPERIMENT 12
Implementation of JDBC concepts

Total: 60 Hours

Reference(s)

1. Herbert Schildt, Java 2-Complete Reference, Tata Mc Graw Hill, 2015
2. Deitel & Deitel, Java How to Program, Prentice Hall of India, 2010
3. Gary Cornell and Cay S.Horstmann, Core Java Vol.1 and Vol.2, Sun Microsystems Press, 2008
4. Jeff Linwood and Dave Minter, Beginning Hibernate Second Edition, Apress 2010
5. Rod Johnson, Juergen Hoeller, Alef Arendsen, Thomas Risberg, Colin Sampaleanu, Java Development with the Spring Framework, Wiley-India, 2012

18HS001 ENVIRONMENTAL SCIENCE 2 0 0 0

Course Objectives

- Understand the interdisciplinary and holistic nature of the environment
- Identify the significance of natural resources and environment on the quality of life and stimulate the quest for sustainable development
- Assess the socio-economic, political and ethical issues in environmental science

Course Outcomes (COs)

1. Examine the importance of interdisciplinary nature of environment studies, uses and exploitation of natural resources
2. Analyze the different types of ecosystems and biodiversity, its values and also role of professionals in protecting the environment from degradation
3. Impact the existing environmental challenges related to pollution and its management
4. Select suitable strategies for sustainable management of components of environmental science
5. Correlate the impacts of population and human activities on environment

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	1	1												
3	2	2					1							
4	1													
5	2													

UNIT I **6 Hours**

NATURAL RESOURCES

Forest resources: Use - over exploitation - deforestation - case studies. Water resources: Use - over utilization of surface and ground water - conflicts over water. Mineral resources: Use - exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: Effects of modern agriculture - fertilizer-pesticide problems (eutrophication, blue baby syndrome, biomagnification). Energy resources: renewable (solar, wind, and hydro).

UNIT II **6 Hours**

ECOSYSTEMS AND BIODIVERSITY

Concept of an ecosystem: Structure and function of an ecosystem - producers - consumers - decomposers - food chains - food webs and ecological pyramids - Types of ecosystem: Introduction - characteristic features: desert ecosystem. Biodiversity - value of biodiversity - threats to biodiversity - endangered and endemic species - Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT III **6 Hours**

ENVIRONMENTAL POLLUTION

Pollution: Definition - causes - effects - control measures of air pollution - water pollution: (Sewage water treatment by activated sludge and trickling filter process) - noise pollution- thermal pollution. Disaster management: causes - effects - control measures of floods Ã¢?? Earthquake

UNIT IV **7 Hours**

SOCIAL ISSUES AND ENVIRONMENT

Sustainable development: Definition - Unsustainable to sustainable development - solid waste management - causes - effects - 5R Principles (landfills, incineration, composting). Water conservation - rain water harvesting - watershed management. Climate change - global warming - acid rain - ozone layer depletion. E-waste.

UNIT V **5 Hours**

HUMAN POPULATION AND ENVIRONMENT

Human population: Population growth - characteristics - variation among nations - population explosion - value education - HIV / AIDS. Role of information technology in environment and human health - occupational safety and health administration (OSHA)

FOR FURTHER READING

Human rights:Biomedical waste -Identification of adulterants in food materials

Total: 30 Hours

Reference(s)

1. Anubha Kaushik, C.P. Kaushik, Environmental Science and Engineering , 4th Multi Colour Edtion, New Age International Publishers, New Delhi, 2014
2. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons
3. T. G. Jr. Miller, S. Spoolman, New Environmental Science, 14th Edition, Wadsworth Publishing Co, New Delhi, 2014
4. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press
5. A. K. De, Environmental Chemistry, 7th Edition , New age international publishers, New Delhi, 2014

18GE401 SOFT SKILLS-REASONING 0 0 2 -

Course Objectives

- To acquire command of both the receptive skills (Listening, Reading) and the productive skills (Writing and Speaking) of English language
- To understand and make effective use of English language in business contexts

Course Outcomes (COs)

1. Listen, Read, Speak, and Write Business English at the level of independent users
2. Appear for the Business English Certificate (BEC) Vantage level examination conducted by the Cambridge Assessment English

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1									1					
2										2				

UNIT I **15 Hours**

LISTENING AND READING

Listening for writing short answers - filling gaps in sentences - identifying topic, context and function - identify different functions of language in business situations - identify prompts -identify paraphrases of required information
Scanning - reading for gist - understanding sentence structure - error identification - identify paraphrases - cohesive words and phrases - understand the importance of analysing the distractors - identify grammatical and semantic relationships

UNIT II **15 Hours**

WRITING AND SPEAKING

Business emails - notes - memos to colleagues or friends - giving instructions - explaining a development - asking for comments - requesting information - agreeing to requests - explaining - apologising - reassuring - complaining - describing - summarising - recommending - persuading turn - taking - sustaining interaction - initiating - responding - giving personal information - talking about present circumstances, past experiences and future plans - expressing opinion - speculating - organising a larger unit of discourse - giving information - expressing and justifying opinions - speculating - comparing and contrasting - agreeing and disagreeing

Total: 30 Hours

Reference(s)

1. Whitehead, Russell and Michael Black. Pass Cambridge BEC Vantage Self - study Practice Tests with Key, Heinle - a part of Cengage Learning, Delhi, 2003.

21IS501 COMPILER DESIGN 3 1 0 4

Course Objectives

- Acquire knowledge in different phases of a Compiler and its applications
- Understand the categorization of tokens using lexical analyzer and pattern recognition using parsers
- Familiar with the code generation schemes and optimization methods

Course Outcomes (COs)

1. Analyze the output generated in each phase of the compiler
2. Construct Finite automata for Regular Expression and apply minimization techniques
3. Construct Top down and Bottom up parser for context free grammars
4. Generate intermediate code for programming constructs
5. Apply optimization techniques in code generation and analyze the issues in code generation

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1	1											
2		2	3		1									
3		3	3		1									
4		2	2											
5		2	1											

UNIT I **8 Hours**

INTRODUCTION TO COMPILER

Language processors - Structure of a compiler - Grouping of phases into passes- Compiler construction tools - Applications of compiler technology: Implementation of high-level programming languages - Optimizations for computer architectures-Design of new computer architecture - Program Translations-Software productivity tools

UNIT II **9 Hours**

LEXICAL ANALYSIS

Lexical Analysis: Role of Lexical Analyzer - Input Buffering - Lexical Errors - Specification of tokens - Recognition of Tokens - Finite automata - Regular expression to finite automation-Optimization of DFA based Pattern Matchers-LEX-Design of Lexical Analyzer for a sample Language

UNIT III **11 Hours**

SYNTAX ANALYSIS

Introduction-Role of the parser - Context-Free Grammars -Writing a Grammar-Top Down parsing - Recursive Descent Parsing - Nonrecursive Predictive Parsing - Bottom-up parsing - Shift Reduce Parsing- LR Parsers: Simple LR Parser - Canonical LR Parser - LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language

UNIT IV **8 Hours**

SEMANTIC ANALYSIS

Syntax Directed Translation - Construction of Syntax Tree - Variants of Syntax Trees -Three-Address Code - Types and Declarations - Translation of Expressions - Control Flow - Backpatching - Switch-Statements - Intermediate Code for Procedures

UNIT V **9 Hours**

CODE OPTIMIZATION

Principal Sources of Optimization-DAG- Optimization of Basic Blocks- Global Data Flow Analysis - Issues in Design of a Code Generator - A Simple Code Generator Algorithm

Total: 45+15=60 Hours

Reference(s)

1. Alfred V. Aho, Ravi Sethi and Jeffrey D. Ullman Compilers: Principles, Techniques and Tools , 2nd Edition, Pearson, 2012
2. D. Grune, H.E. Bal, C.J.H. Jacobs, K.G. Langendoen, Modern Compiler Design, Wiley, 2008
3. Kennath C. Louden, Compiler Construction Principles and Practice. New Delhi: Vikas publishing House, 2003
4. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2003

21IS502 MICROPROCESSORS AND MICROCONTROLLER

3 0 2 4

Course Objectives

- Understand the architecture and software aspects of 8085, 8086 microprocessors and 8051 microcontroller
- Implement assembly language programs for various applications using the instructions of 8085,8086 microprocessors and 8051 microcontroller
- Impart knowledge on the methods of interfacing 8085 and 8086 microprocessors with various peripheral devices

Course Outcomes (COs)

1. Analyze the architectural features and develop an ALP using instruction set of 8085
2. Characterize the architecture and timing diagram for minimum and maximum mode in 8086 and classify its addressing modes
3. Develop assembly language programs using 8086 microprocessor instructions
4. Analyze the modes of operations of I/O interface devices
5. Develop programs using the register set and instruction set of 8051 microcontroller

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1			2									
2		1			2									
3		2			3									
4		2			3									
5		1			3									

UNIT I **8 Hours**

THE 8085 MICROPROCESSOR

Microprocessor Architecture and its Operations - The 8085 MPU - 8085 Instruction Set - Programming
Techniques with Additional Instructions of 8085 microprocessor - The 8085 Interrupt Process - 8085 Vectored Interrupts

UNIT II **11 Hours**

THE 8086 MICROPROCESSOR

Register Organisation of 8086 - Architecture - Signal Descriptions of 8086 - Physical memory organization - General bus Operation - I/O Addressing Capability - Special Processor Activities - Minimum Mode 8086 Architecture - Read/Write Cycle Timing Diagram for Minimum mode - Maximum Mode 8086 Architecture - Read/Write Cycle Timing Diagram for Maximum Mode - Addressing Modes of 8086 - Instruction set of 8086

UNIT III **7 Hours**

8086 SYSTEM DESIGN AND RECENT ADVANCES IN MICROPROCESSOR ARCHITECTURES

The Art of Assembly Language Programming with 8086: A few Machine Level Programs - Programming
with an Assembler - Special Architecture Features and Related Programming: Introduction to stack - Stack Structure of 8086 - Interrupt and Interrupt Service Routines - Non-Maskable Interrupt - Maskable interrupt - Interrupt programming - Macros. Intel Pentium 80586 architecture-Branch prediction-Instruction set of Pentium-MMX-Architecture-Data types and Instruction set.

UNIT IV **10 Hours**

PERIPHERAL DEVICES AND I/O INTERFACING

Programmable Interrupt Controller 8259A: Architecture and Signal Descriptions of 8259A - Command
Words of 8259A - Operating modes of 8259A - The Keyboard/Display Controller 8279: Architecture and Signal Descriptions of 8279 - Modes of Operation of 8279 - DMA Controller 8257: Internal Architecture and Signal Descriptions of 8257 - DMA Transfers and Operations.

UNIT V **9 Hours**

8051 MICROCONTROLLER

Architecture of 8051 - Signal Descriptions of 8051 - Register Set of 8051 - Memory Addressing - External I/O Interfacing - Addressing modes of 8051 - Instruction Set of 8051

3 Hours

EXPERIMENT 1

8085-Arithmetic operations

3 Hours

EXPERIMENT 2

8085-Code conversions

3 Hours

EXPERIMENT 3

8085-Matrix Multiplication

3 Hours

EXPERIMENT 4

8086-Arithmetic operations

3 Hours

EXPERIMENT 5

8086-String Manipulation

3 Hours

EXPERIMENT 6

Stepper motor interfacing with 8086

3 Hours

EXPERIMENT 7
Counters and time delay using 8086

3 Hours

EXPERIMENT 8
Interfcaing 8085 with 8255

3 Hours

EXPERIMENT 9
Interfcaing 8085 with 8279

3 Hours

EXPERIMENT 10
8051-Arithmetic operations

Total: 45+30=75 Hours

Reference(s)

1. Ramesh S.Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International publishing private limited, 2013
2. A.K.Ray and K.M.Bhurchandi, Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing, Tata McGraw Hill Education Private Limited, 2013
3. Douglas V.Hall, Microprocessors and Interfacing: Programming and Hardware, TMH, 2010
4. Yu-cheng Liu and Glenn A. Gibson, Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design, PHI, 2011
5. Mohamed Ali Mazidi, Janice Gillispie Mazidi, The 8051 microcontroller and embedded systems, Pearson education, 2009

21IS503 DATA MINING **3 0 0 3**

Course Objectives

- Understand the basic concepts of data mining
- Apply the data mining functionalities
- Assess the strengths and weaknesses of various data mining techniques

Course Outcomes (COs)

1. Implement the data warehouse architecture
2. Explain the functionalities of data mining
3. Explore the different data preprocessing techniques
4. Identify the association rules using frequent itemset mining algorithms
5. Describe the classification and clustering techniques

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	2													
3	1													
4	2													
5	2													

UNIT I **7 Hours**

DATA WAREHOUSING

Data Warehouse: Basic Concepts, Differences between Operational Database Systems and Data Warehouses- A Multitiered Architecture - Data Warehouse Models : Extraction, Transformation and Loading - Metadata Repository -Data Cube and OLAP -Data Warehouse Design and Usage - Data warehouse implementation

UNIT II **9 Hours**

INTRODUCTION TO DATA MINING

Introduction - The evolution of database system technology - Steps in knowledge discovery from database
process - Architecture of a data mining systems - Data mining on different kinds of data - Different kinds of pattern - Technologies used - Applications - Major issues in data mining - Classification of data mining systems - Data mining task primitives - Integration of a data mining system with a database or datawarehouse system

UNIT III **10 Hours**

DATA PREPROCESSING

Data Objects and attribute types - Basic statistical description of data - Data visualization - Measuring data similarity and dissimilarity - Data cleaning - Integration - Data reduction - Data transformation and data discretization

UNIT IV **9 Hours**

ASSOCIATION RULE MINING

Basic concepts - Frequent itemset mining methods - Apriori algorithm, APattern growth approach for mining frequent itemsets,Mining frequent itemsets using vertical data format, Mining closed and max patterns - Pattern mining in multilevel and multidimensional space - ConstraintbasedFrequentpatternmining - Mining High-Dimensional Data and Colossal Patterns

UNIT V **10 Hours**

CLASSIFICATION AND CLUSTERING

Classification : Basic concepts - Decision tree induction - Bayes classification methods-Rule Based Classification- Model Evaluation and Selection - Techniques to Improve Classification Accuracy - Bayesian Belief Networks - Classification by Backpropagation - Cluster Analysis - Partitioning methods
- Hierarchical methods

Total: 45 Hours

Reference(s)

1. Jiawei Han, Micheline Kamber and Jian Pai, Data Mining: Concepts and Techniques, Morgan Kauffman, 2013
2. Alex Berson and Stephen J Smith, Data Warehousing, Data Mining, and OLAP, Mcgraw-Hill,2008
3. David Hand, Heikki Manila, PadhraicSymth, Principles of Data Mining, MIT Press, 2004
4. Margaret H.Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education 2008

21IS504 COMPUTER NETWORKS 3 0 0 3

Course Objectives

- Understand the state-of-the-art in network protocols, architectures and applications
- Gain knowledge about the functions of different network layers
- Familiarize in the various aspects of computer networks

Course Outcomes (COs)

1. Illustrate the basic concept in modern data communication and computer networking
2. Apply the functions of different layers and in depth knowledge of data link layer
3. Analyze the different protocols and network layer components
4. Outline the basic functions of transport layer and congestion in networks
5. Analyze the working of application layer along with the protocols used

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2					1		2							
3					2		2							
4					2		2							
5					1		2							

UNIT I **10 Hours**

INTRODUCTION

Data Communications - Data Flow - Networks - The Internet - Protocols and Standards - Network Models: Layered Tasks - The OSI Model - TCP/IP Protocol Suite - Addressing - Transmission Media - Connecting LANs, Backbone Networks, and Virtual LANs: Connecting Devices-Circuit Switching and Packet Switching

UNIT II **10 Hours**

DATA LINK LAYER

Introduction - Block Coding - Cyclic codes - Checksum -Data Link Control: Framing - Flow and Error Control - Noiseless Channels - Noisy Channels - HDLC -Multiple Access: Random Access - Channelization -Wired LANs: IEEE Standards- Standard Ethernet - Encoding (NRZ, NRZI, Manchester, 4B/5B- WiMax

UNIT III **9 Hours**

NETWORK LAYER

IPv4 Addresses- IPv6 Addresses - Internetworking - IPv4 - IPv6 - Transition from IPv4 to IPv6 – Network Layer: Delivery, Forwarding, and Routing: Address Mapping - Internet Control Message Protocol(ICMP) - Internet Group Management Protocol (IGMP) - Network Layer: Delivery, Forwarding, and Routing

UNIT IV **9 Hours**

TRANSPORT LAYER

Process-to-Process Delivery - User Datagram Protocol (UDP) - Transmission Control Protocol (TCP) -Stream Control Transmission Protocol (SCTP) - Congestion Control and Quality of Service: Data Traffic - Congestion Control - Quality of Services (QoS)-POP3- IMAP

UNIT V **7 Hours**

APPLICATION LAYER

Domain Name System (DNS): Domain Name Space - Distribution of Name Space - DNS in the Internet World Wide Web and HTTP - Simple Mail Transfer Protocol - File Transfer Protocol -Secure Shell (SSH)- TELNET - PGP - Firewalls

Total: 45 Hours

Reference(s)

1. Behrouz A.Forouzan, Data Communication and Networking, 5th Edition, Tata McGraw-Hill, 2014
2. James F.Kurose and Keith W.Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Pearson Education, 2005
3. Larry L.Peterson and Bruce S.Davie, Computer Networks, Elsevier, 2009
4. Andrew S.Tanenbaum, Computer Networks, Pearson Education, 2008
5. William Stallings, Data and Computer Communication, Pearson Education, 2007
6. Douglas E.Comer and M.S.Narayanan, Computer Networks and Internets, Pearson Education, 2008

21IS507 DATA MINING LABORATORY 0 0 4 2

Course Objectives

- Understand the basic concepts of data mining
- Apply the data mining functionalities
- Assess the strengths and weaknesses of various data mining techniques

Course Outcomes (COs)

1. Implement the data warehouse architecture
2. Explain the functionalities of data mining
3. Explore the different data preprocessing techniques
4. Identify the association rules using frequent itemset mining algorithms
5. Describe the classification and clustering techniques

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	2													
3	1													
4	2													
5	2													

8 Hours

EXPERIMENT 1
Working with attributes and filters

8 Hours

EXPERIMENT 2
Associating - Apriori algorithm and FP-Growth
a.Learning Associations

8 Hours

EXPERIMENT 3
Classification - Bayesian, Decision tree, SVM
a.Selecting a Classifier, b.Test Options, c.Training a Classifier, d.Classifier Output, e.Result list

8 Hours

EXPERIMENT 4
Clustering - K-means clustering, Agglomerative clustering a.Selecting a Cluster
b.Cluster Modes c.Ignoring Attributes
d.Working with Filters e.Learning Clusters

8 Hours

EXPERIMENT 5
Visualizing methods in data mining

10 Hours

EXPERIMENT 6
Applications of classification for web mining

10 Hours

EXPERIMENT 7
Case Study on Text Mining or any commercial application

Total: 60 Hours

Reference(s)

1. Jiawei Han, Micheline Kamber and Jian Pai, Data Mining: Concepts and Techniques, Morgan Kauffman, 2013
2. Alex Berson and Stephen J Smith, Data Warehousing, Data Mining, and OLAP, Mcgraw-Hill,2008
3. David Hand, Heikki Manila, PadhraicSymth, Principles of Data Mining, MIT Press, 2004
4. Margaret H.Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education 2008

21IS508 COMPUTER NETWORKS LABORATORY 0 0 4 2

Course Objectives

- Understand the concepts of computer networks and to study the functions of different layers
- Familiarize with different protocols and network components
- Familiarize in the various aspects of computer networks

Course Outcomes (COs)

1. Predict the different types of cables in networks
2. Configure networking in a system
3. Implement and simulate protocols
4. Develop applications using packet tracer software

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1					2									
2					2		2							
3					2		1							
4					2		2							

4 Hours

EXPERIMENT 1

Study of Color coding Jack RJ45 and do the following Cabling works in a network a. Cable Crimping b. Standard Cabling c. Cross Cabling and
d. Establish a LAN connection using three systems using any topology

4 Hours

EXPERIMENT 2

Configure IP Address in a system in LAN (TCP/IP Configuration) and Implement the client server communication using socket connection

6 Hours

EXPERIMENT 3

Write a program for transferring a file between nodes in a network

4 Hours

EXPERIMENT 4

Perform Bit Stuffing and CRC computation

4 Hours

EXPERIMENT 5

By varying the no of frames, design the Sliding Window Protocol

6 Hours

EXPERIMENT 6
Simulation of ARP/RARP

4 Hours

EXPERIMENT 7
Display the routing table for the nodes in a network using Distance Vector Routing (DVR) algorithm

4 Hours

EXPERIMENT 8
Find the minimum cost in the node to node communication by Open Shortest Path First (OSPF) protocol

6 Hours

EXPERIMENT 9
Write a program for downloading a file from HTTP server

6 Hours

EXPERIMENT 10
Develop a client that contacts a given DNS server to resolve a given host name

6 Hours

EXPERIMENT 11
Configure a Network topology using Packet tracer software

6 Hours

EXPERIMENT 12
Study of Network simulator (NS) and Simulation of any one of routing protocol using NS2.

Total: 60 Hours

Reference(s)

1. Behrouz A.Forouzan, Data Communication and Networking, 5th Edition, Tata McGraw-Hill, 2014
2. James F.Kurose and Keith W.Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Pearson Education, 2005
3. Larry L.Peterson and Bruce S.Davie, Computer Networks, Elsevier, 2009
4. Andrew S.Tanenbaum, Computer Networks, Pearson Education, 2008
5. William Stallings, Data and Computer Communication, Pearson Education, 2007
6. Douglas E.Comer and M.S.Narayanan, Computer Networks and Internets, Pearson Education,2008

21GE501 SOFT SKILLS - APTITUDE I **0 0 2 -**

Course Objectives

- Expose the undergraduate students to such methods and practices that help, develop and nurture qualities such as character, effective communication, aptitude and holding ethical values. It will provide a lot of activities and examples for a student to learn and develop these life skills.

Course Outcomes (COs)

1. Explain various concepts of number systems and their techniques in solving the percentage, average and age problems.
2. Analyse the profit and loss of real time situations and the relation between ratio, proportion and variation.
3. Apply different techniques to find the distance, speed and time of various moving objects.
4. Understand the concepts of coding, sequences and series, data interpretation and critical reasoning to solve real time logical reasoning problems.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	2	2												
3	2	2												
4	2	2												

2 Hours

NUMBER SYSTEMS

Introduction - Definition - Classification on Numbers- Power cycles and remainders - Short cut process- Concept of Highest Common Factor-Concept of Least Common Multiple- Divisibility-Number of zeros in an expression.

2 Hours

PERCENTAGE

Introduction - Definition and Utility of Percentage - Importance of base/denominator for percentage calculations-Concept of percentage values through additions-Fraction to percentage conversion table.

3 Hours

AVERAGES AND AGES

Introduction-Average of different groups-Addition or removal of items and change in average-Replacement of some of the items.

3 Hours

RATIO, PROPORTIONS AND VARIATION

Introduction- Ratio- Properties-Dividing a given number in the given ratio-Comparison of ratios-Proportions-Useful results on proportion- Continued proportion-Relation among the quantities more than two-Variation.

2 Hours

PROFIT AND LOSS

Gain/Loss and percentage gain or percentage loss-Multiplying equivalents to find sale price-Relation among cost price, sale price, gain/loss and percentage gain or percentage loss-An article sold at two different selling price-Two different articles sold at same selling price-Percentage gain or percentage loss on selling price-Percentage gain or percentage loss on whole property.

2 Hours

TIME AND WORK

Introduction-Basic concepts-Concepts on working with different efficiencies-Pipes and Cisterns-Work Equivalence (Man Days) -Alternative approach.

2 Hours

TIME, SPEED AND DISTANCE

Definition-Basics of Time, Speed and Distance - Relative speed-Problems based on Trains-Problems based on Boats and Streams-Problems based on Races-Time taken with two difference modes of transport-Time and distance between two moving bodies.

3 Hours

CODING AND DECODING

Introduction-Description of Coding method-Coding patterns - Concepts of Coding and Decoding-Problems involving Coding and Decoding methods.

2 Hours

SEQUENCE AND SERIES

Introduction-Sequences of real numbers - Number and Alphabet series-Description of Number and Alphabet series-Analogy-Odd man out-Power series.

3 Hours

DATA SUFFICIENCY

Introduction to Data Sufficiency - Overview of the wide variety of Data Sufficiency problems - Basic introduction on how to determine what information is sufficient to solve a given problem - Common pitfalls to avoid.

3 Hours

DIRECTION

Introduction to Direction - sense test - Overview of the wide variety of Direction problems-Direction-Plotting diagrams.

3 Hours

CRITICAL REASONING

Introduction-Basic concept of critical reasoning- Weaken the argument-Strengthen the argument-Flaw in the argument-Evaluate the conclusion.

Total: 30 Hours

Reference(s)

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Mc Graw Hill Publications.
2. U. Mohan Rao, Quantitative Aptitude for Competitive Examinations, Scitech Publications Pvt Ltd, India.
3. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Third Edition, Pearson Education Pvt Ltd, India, 2016.
4. Dr. R S Aggarwal, A Modern Approach to Verbal and Non Verbal Reasoning, Revised Edition, S Chand Publications.
5. Arun Sharma, How to prepare for Logical Reasoning for CAT & other Management Exams, Fifth Edition, Mc Graw Hill Publications.
6. Jaikishan and Premkishan, How to Crack Test of Reasoning in all Competitive Examinations, Revised Edition, Arihant Publications.

21IS601 INTERNET OF THINGS 2 0 0 2

Course Objectives

- Understand the components and protocols used in IOT.
- To Understand the IoT Reference Architecture and Real World Design Constraints.
- Ability to understand the Security requirements in IoT.

Course Outcomes (COs)

1. Identify physical design, components and communication models used in IOT.
2. Understand the protocol architecture of IOT.
3. Implement sensor interfacing and collaborate them with network devices.
4. Identify protocols used for connecting devices to cloud and web servers.
5. Understand the security requirements and threats in IOT.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	2		2									
2		2	2		2									2
3		3	3		3									2
4		2	2		2								1	
5		2	2		2								1	

UNIT I **6 Hours**

INTRODUCTION TO INTERNET OF THINGS

IOT Fundamentals - Characteristics of IoT - Physical Design of IoT - IoT Protocols - IoT communication models - IOT Communication APIs -IOT enabled Technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, and Communication protocols, Embedded Systems, IOT Levels and Templates.

UNIT II **6 Hours**

IOT REFERENCE ARCHITECTURE

Introduction - State of the art - Architecture Reference Model- IOT reference Model - IOT Protocols: Zigbee, RFID, BLE, NFC, BACnet, 6LowPAN, RPL, XMPP, CoAP, and QTT.

UNIT III **6 Hours**

IOT DEVICES AND INTERFACING

IOT components - Sensors - Actuators - Hardware Platforms - Interfacing with devices: Setting up the board -Programming for IOT - Reading from Sensors, Communication: Connecting microcontroller with mobile devices - communication through Bluetooth, wifi, Ethernet.

UNIT IV **6 Hours**

IOT CLOUD, WEB SERVICES AND DATA ANALYTICS

Introduction to Cloud Storage models - Cloud services and IOT - communication APIs - Cloud for IOT - Web server: Web server for IOT - Amazon Web services for IOT- Data analytics for IOT.

UNIT V **6 Hours**

IOT SECURITY

Security Requirements in IOT - Security Concerns in IOT Applications - Security Architecture in the Internet of Things - Insufficient Authentication/Authorization - Insecure Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IOT. Vulnerabilities - Secrecy and Secret- Key Capacity - Authentication/Authorization for Smart Devices - Transport Encryption

Total: 30 Hours

Reference(s)

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle,From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2. Vijay Madisettiand ArshdeepBahga, Internet of Things (A Hands-on-Approach), 1stEdition, VPT, 2014.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things Key applications and Protocols, Wiley, 2012.
4. Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) [Kindle Edition] by CunoPfister, 2011.
5. Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren.
6. Security and Privacy in Internet of Things (IOTs): Models, Algorithms, and Implementations.

21IS602 CLOUD INFRASTRUCTURE AND SERVICES

3 0 0 3

Course Objectives

- Understand the architecture and features of different cloud models
- Be familiar with the underlying principles of virtualization, cloud applications and cloud storage
- Gain knowledge on security issues and risk management

Course Outcomes (COs)

1. Describe the different types of cloud models and services for building an efficient cloud computing environment
2. Analyze the virtualization technologies and capacity planning techniques to create shared resource pools
3. Determine the best features to move to the cloud and categorize the cloud storage types
4. Explore the cloud security concerns
5. Examine the risks involved in virtualization security management.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			1		1									
2			2		2									
3			2		2									
4			1		1									
5			2		2									

UNIT I **9 Hours**

INTRODUCTION

Defining Cloud Computing-Cloud Types: The NIST Model-The Cloud Cube Model - Deployment Models-Service Models-Essential Characteristics of Cloud Computing-Benefits of Cloud Computing-Measuring the Cloud"s Value: Measuring Cloud Computing Costs-Understanding Services and Applications by Type: Defining IaaS-Defining PaaS-Defining SaaS.

UNIT II **8 Hours**

VIRTUALIZATION AND CAPACITY PLANNING

Using Virtualization Technologies - Load Balancing and Virtualization - Advanced Load Balancing - Understanding Hypervisors: Virtual Machine Types - VMware vSphere -Capacity Planning: Defining Baseline and Metrics - Network Capacity.

UNIT III **10 Hours**

CLOUD APPLICATIONS AND CLOUD STORAGE

Moving Applications to the Cloud: Applications in the Cloud - Functionality Mapping - Application Attributes - Cloud Service Attributes - System Abstraction - Cloud Bursting - Cloud APIs - Working with Cloud - Based Storage: Cloud Storage Definition - Provisioning Cloud Storage - Cloud Backup Types - Cloud Backup Features - Cloud Data Management Interface (CDMI) - Open Cloud Computing Interface (OCCI).

UNIT IV **10 Hours**

CLOUD SECURITY FUNDAMENTALS

Cloud Information Security Objectives - Cloud Security Services - Cloud Security Design Principles - Secure Cloud Software Requirements: Secure Development Practices - Approaches to Cloud Secure Software Requirements Engineering - Cloud Computing and Business Continuity Planning/Disaster Recovery

UNIT V **8 Hours**

CLOUD RISK MANAGEMENT

Cloud Computing Risk Issues: The CIA Triad - Threats to Infrastructure, Data and Access Control - Cloud Service Provider Risks - Cloud Computing Security Challenges: Security Policy Implementation - Virtualization Security Management.

Total: 45 Hours

Reference(s)

1. Barrie Sosinsky, Cloud Computing Bible,Wiley-India,2014.
2. Ronald L.Krutz and Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2013.
3. Anthony T Velte, Cloud Computing: A practical Approach, Tata McGraw Hill, 2009.
4. Halper Fern, Kaufman Marcia, Bloor Robin, Hurwit Judith, Cloud Computing for Dummies, Wiley India, 2009.

21IS603 VISUALIZATION TECHNIQUES 3 0 0 3

Course Objectives

- Apply data transformations such as aggregation and filtering for visualization.
- Identify opportunities for application of data visualization in various domains.
- Critique existing visualizations based on data visualization theory and principles.

Course Outcomes (COs)

1. Design and create data visualizations.
2. Conduct exploratory data analysis using visualization.
3. Craft visual presentations of data for effective communication.
4. Use knowledge of perception and cognition to evaluate visualization design alternatives.
5. Design and evaluate color palettes for visualization based on principles of perception.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2		2									
2			2		2									
3			2		2									
4			2		2									
5			2		2									

UNIT I **9 Hours**

ABSTRACTION

What"s Vis, and Why Do It? - Data Abstraction: Data types - Dataset types - Tables, Networks and Trees, Fields, Geometry, Other combination, Dataset availability - Attribute types - Semantic - Task Abstraction: Action - Analyze, Produce, Search, Query - Targets - Analyzing and deriving examples.

UNIT II **9 Hours**

ANALYSIS, MARKS AND CHANNELS

Validation - Four levels of design - Angles of attack - Threats to validity - Validation approaches - Examples. Marks and Channels: Defining marks and channels - channel types and mark types - Expressiveness and Effectiveness - Channel Rankings - Channel Effectiveness - Relative versus Absolute Judgments.

UNIT III **9 Hours**

TABLES

Rules of Thumb: No Unjustified 3D, Resolution over Immersion, Overview First, Zoom and Filter, Details on Demand - Arrange Tables: Arrange by Keys and Values - Express: Quantitative Values - Separate, Order, and Align: Categorical Regions - Spatial Axis Orientation - Spatial Layout Density

UNIT IV **9 Hours**

SPATIAL DATA, NETWORKS, TREES

Arrange Spatial data: Geometry - Scalar Fields: One Value - Vector Fields: Multiple Values - Tensor Fields: Many Values - Arrange Networks and Trees: Connection: Link Marks - Matrix Views - Costs and Benefits: Connection versus Matrix - Containment: Hierarchy Marks.

UNIT V **9 Hours**

VIEWS

Manipulate View: Change View over Time - Select Elements - Navigate: Changing Viewpoint - Navigate: Reducing Attributes - Facet into Multiple views: Juxtapose and Coordinate Views - Partition into Views - Superimpose Layers - Visually Distinguishable Layers - Static Layers - Dynamic Layers - Reduced Items and Attributes: Filter - Aggregate.

Total: 45 Hours

Reference(s)

1. Tamara Munzner, "Visualization Analysis and Design", CRC Press Taylor & Francis Group, 2014.
2. Andy Kirk, "Data Visualisation: A Handbook for Data Driven Design", 2016.
3. Kieran Healy, "Data Visualization: A Practical Introduction", Princeton University Press, 2018.
4. Cole Nussbaumer Knaflic, "Storytelling with Data: A Data Visualization Guide for Business Porfessionals", John Wiley & Sons, 2015.

21IS607 CLOUD INFRASTRUCTURE AND SERVICES LABORATORY

0 0 4 2

Course Objectives

- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud based application
- To learn to implement and use parallel programming using Hadoop

Course Outcomes (COs)

1. Configure various virtualization tools such as Virtual Box, VMware workstation.
2. Design and deploy a web application in a PaaS environment.
3. Learn how to simulate a cloud environment to implement new schedulers.
4. Install and use a generic cloud environment that can be used as a private cloud.
5. Manipulate large data sets in a parallel environment.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			1											
2			2											
3			1											
4			2											
5			2											

8 Hours

EXPERIMENT 1

Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.

8 Hours

EXPERIMENT 2

Install a C compiler in the virtual machine created using virtual box and execute Simple Programs

8 Hours

EXPERIMENT 3

Install Google App Engine. Create hello world app and other simple web applications using python/java.

7 Hours

EXPERIMENT 4

Use GAE launcher to launch the web applications.

7 Hours

EXPERIMENT 5

Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.

7 Hours

EXPERIMENT 6

Find a procedure to transfer the files from one virtual machine to another virtual machine.

7 Hours

EXPERIMENT 7

Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

8 Hours

EXPERIMENT 8

Install Hadoop single node cluster and run simple applications like wordcount.

Total: 60 Hours

Reference(s)

1. Anthony T Velte, Cloud Computing: A practical Approach, Tata McGraw Hill, 2009.
2. Halper Fern, Kaufman Marcia, Bloor Robin, Hurwit Judith, Cloud Computing for Dummies, Wiley India, 2009.
3. Barrie Sosinsky, Cloud Computing Bible,Wiley-India,2014.

21IS608 VISUALIZATION TECHNIQUES LABORATORY

0 0 4 2

Course Objectives

- Apply data transformations such as aggregation and filtering for visualization.
- Identify opportunities for application of data visualization in various domains.
- Critique existing visualizations based on data visualization theory and principles.

Course Outcomes (COs)

1. Design and create data visualizations.
2. Conduct exploratory data analysis using visualization.
3. Craft visual presentations of data for effective communication.
4. Use knowledge of perception and cognition to evaluate visualization design alternatives.
5. Design and evaluate color palettes for visualization based on principles of perception.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2		2									
2			2		2									
3			2		2									
4			2		2									
5			2		2									

10 Hours

EXPERIMENT 1
2D, 3D plots

10 Hours

EXPERIMENT 2
Revealing business trends by analyzing the data

10 Hours

EXPERIMENT 3
Visualizing wealth and personal finance based on real dataset

10 Hours

EXPERIMENT 4
Visualizing maps and locations.

10 Hours

EXPERIMENT 5
Python for Data Visualization.

10 Hours

EXPERIMENT 6

Gephi visualization on real data sets.

Total: 60 Hours

Reference(s)

1. Tamara Munzner, "Visualization Analysis and Design", CRC Press Taylor & Francis Group, 2014.
2. Andy Kirk, "Data Visualisation: A Handbook for Data Driven Design", 2016.
3. Kieran Healy, "Data Visualization: A Practical Introduction", Princeton University Press, 2018.
4. Cole Nussbaumer Knaflic, "Storytelling with Data: A Data Visualization Guide for Business Porfessionals", John Wiley & Sons, 2015.

21GE601 SOFT SKILLS-APTITUDE II **0 0 2 -**

Course Objectives

- Expose the undergraduate students to such methods and practices that help, develop and nurture qualities such as character, effective communication, aptitude and holding ethical values. It will provide a lot of activities and examples for a student to learn and develop these life skills.

Course Outcomes (COs)

1. Apply the concepts of probability, Sets, Permutation and Combinations in estimating data for real time problems.
2. Understand the concept of logarithms, progressions and Simple and Compound interest to solve various practical problems.
3. Analyse objects involving cubes and cuboids in determining the number of sides colored.
4. Interpret various data from graphs and tables to determine ratio, percentage and averages.
5. Apply the logical reasoning skills for identifying age, relations, visual relations and puzzles.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	2	2												
3	2	2												
4	2	2												
5	2	2												

2 Hours

PERMUTATION AND COMBINATION

Definition-Fundamental rules-Theorems on Permutation-Theorems on Combination.

2 Hours

PROBABILITY

Concept and Importance of Probability-Underlying factors for real Life estimation of probability-Basic facts about probability-Some important consideration while defining event.

2 Hours

SYLLOGISM AND VENN DIAGRAM

Concepts on Syllogisms-Venn diagram-Interpretation-Venn diagram-solving.

4 Hours

SIMPLE INTEREST AND COMPOUND INTEREST

Introduction-Definition - Effect of change of P, R, T on simple interest-Amount-Amount becomes N times the principle-Repayment of debt in equal installments-Rate and time are numerically equal-Compound Interest-Conversion period-Basic formula-Special cases-To find the principle / Time /Rate-Difference between Compound Interest and Simple Interest-Equal annual installment to pay the borrowed amount.

2 Hours

MIXTURES AND ALLIGATION

Definition-Alligation rule-Mean value (cost price) of the mixture-Some typical situations where allegation can be used.

4 Hours

CUBE AND LOGARITHM

Introduction-Basic Concepts of Cube and Cuboid-Problems involving cubes and cuboids of various dimensions-Problems involving coloured cubes and cuboids - Basic concepts of Logarithm-Laws of Logarithms including change of base-Common logarithm (base 10) - Properties of Logarithms to solve equations involving logarithmic expressions.

2 Hours

DATA INTERPRETATION

Introduction-Ratio-Percentage-Average-Tables - Graphs and Charts.

2 Hours

PROGRESSION AND LOGICAL REASONING

Arithmetic progression-Geometric progression-Harmonic progression-Theorems related with progressions.

2 Hours

PROBLEM ON AGES

Introduction-Basic concept-Usage of Percentage and Averages -Applications.

2 Hours

ANALYTICAL REASONING

Introduction-Basic concept-Non verbal Analytical Reasoning -Arrangements.

2 Hours

BLOOD RELATION

Introduction-Basic concept-Kinds of relation-Tree diagram -Relations.

2 Hours

VISUAL REASONING

Introduction-Basic concepts-Odd man out-Next series-Mirror image and water image

2 Hours

SIMPLIFICATIONS

Introduction-Basic concepts-Arithmetic operations-Equation solving methods-Puzzles.

Total: 30 Hours

Reference(s)

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Mc Graw Hill Publications.
2. U. Mohan Rao, Quantitative Aptitude for Competitive Examinations, Scitech Publications Pvt Ltd, India.
3. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Third Edition, Pearson Education Pvt Ltd, India, 2016.

4. Dr. R S Aggarwal, A Modern Approach to Verbal and Non Verbal Reasoning, Revised Edition, S Chand Publications.
5. Arun Sharma, How to prepare for Logical Reasoning for CAT & other Management Exams, Fifth Edition, Mc Graw Hill Publications.
6. Jaikishan and Premkishan, How to Crack Test of Reasoning in all Competitive Examinations, Revised Edition, Arihant Publications.

21HS002 HUMAN VALUES AND ETHICS 2 0 0 2

Course Objectives

- Understand the concept of good values and comprehend the importance of value-based living.
- Recognize the culture of peace through education.
- Identify and apply the practices for value development and clarification.

Course Outcomes (COs)

1. Understand the importance of human values and ethics in life.
2. Execute the importance of harmonious living in a diverse society.
3. Analyze the sensitivity to the crying needs of society such as ungodliness, corruption, poverty, and suffering, and play a vital role in eradicating them.
4. Plan intellectually mature, morally upright, ethically correct, and spiritually inspired decisions.
5. Execute a correct balance between professional excellence and social commitment.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1								3	2	2				
2								3	2	2				
3								3	2	2				
4								3	2	2				
5								3	2	2				

UNIT I **6 Hours**

COURSE INTRODUCTION - NEED, BASIC GUIDELINES AND ANALYSIS

1. Importance of Human Values & Ethics in 21st Century
2. Understanding the theory of basic human values and ethics

Openness to change
Self-enhancement
Conservation
Self-transcendence

3. Schwartz Value Survey: Self-Assessment

UNIT II **6 Hours**

EMBRACING THE COMMON ETIQUETTE

Altruism – Integrity -Freedom -Justice -Honesty -Truthfulness -Responsibility -Compassion

UNIT III **6 Hours**

CONTINUOUS HAPPINESS AND PROSPERITY

An overview on basic Human Aspirations - Understanding and living in harmony at various levels of life -Embracing self-love and wellness -Understanding harmony in the family and society

UNIT IV **6 Hours**

UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS

Reflection on growing global multifold problems: poverty, pollution, hunger, disease, unemployment, caste system, child labour, gender equality, politics and violence.
Understanding the challenges in cultural, personal, social, political, and economic environment

UNIT V **6 Hours**

UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS CO-EXISTENCE

Understanding the harmony in the Nature - Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions

Total: 30 Hours

Reference(s)

1. Martin, G. (2011). The Little Book of Ethics: A Human Values Approach. Australia: G.P. Martin.
2. Gupta, N. L. (2002). Human Values For The 21St Century. India: Anmol Publications Pvt. Limited.
3. Mishra, A. (2017). Happiness Is All We Want. India: Bloomsbury Publishing.
4. Universal Human Values. (2023). (n.p.): Booksclinic Publishing.
5. A Textbook On Professional Ethics And Human Values. (2007). India: New Age International (P) Limited

21IS702 MACHINE LEARNING **3 0 0 3**

Course Objectives

- Illustrate concept learning and linear regression.
- Apply the different machine learning techniques to problem solutions.
- Analyze the datasets and apply appropriate machine learning techniques.

Course Outcomes (COs)

1. Classify the supervised and unsupervised machine learning.
2. Identify machine learning techniques suitable for a given problem.
3. Solve the problems using various machine learning techniques.
4. Apply Dimensionality reduction techniques.
5. Design application using machine learning techniques.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1										1	
2	3	3	2		1								1	
3	2	2	2		1								2	
4	2	2	2	2									2	1
5	2	2	2	2									2	2

UNIT I **9 Hours**

INTRODUCTION

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

UNIT II **9 Hours**

UNSUPERVISED LEARNING

Clustering–Applications- Metrics - Partitional Clustering - K means Algorithms – K- mediods - Hierarchical clustering – Density based clustering: DBSCAN –Mean shift clustering – Vector quantization – Self Organising Feature Map

UNIT III **9 Hours**

CLASSIFICATION METHODS

Classification metrics –Confusion matrix - Neural Network model - Multi-layer Perceptron - Decision tree - Support Vector Machines- K-Nearest Neighbor – Boosting and Bagging – Convolutional Neural Network.

UNIT IV **9 Hours**

DIMENSIONALITY REDUCTION

Dimensionality Reduction - Linear Discriminant Analysis - Principal Component Analysis (PCA) - Factor Analysis- Independent Component Analysis- Feature selection: Filter and Wrapper methods- Rank based algorithms

UNIT V **9 Hours**

REINFORCEMENT LEARNING

Reinforcement learning - Non deterministic rewards and Actions - Q Learning – Genetic Algorithm- Tools for machine learning- Case study IRIS dataset using Weka: Classification

FOR FURTHER READING

Feature selection – Feature ranking and subset selection- Machine Learning for Big data: Big Data and Map Reduce.

Total: 45 Hours

Reference(s)

1. T.M. Mitchell, “Machine Learning”, McGraw-Hill 2017.
2. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third edition 2014
3. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014

21IS707 MACHINE LEARNING LABORATORY 0 0 4 2

Course Objectives

- Make use of data sets in implementing the machine learning algorithms.
- Apply the different machine learning techniques to problem solutions.
- Implement the machine learning concepts and algorithms in any suitable language of choice.

Course Outcomes (COs)

1. Understand the implementation procedures for the machine learning algorithms.
2. Apply appropriate data sets to the machine learning algorithms
3. Design Java/Python programs for various learning algorithms.
4. Identify and apply Machine learning algorithms to solve real world problems
5. Implement clustering algorithms to solve real world problems

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	2	2	2		1									
3	2	2	2		1									
4	2	2	1		1									
5	2	2	2											

12 Hours

EXPERIMENT 1

Build a Support Vector Machine (SVM) to classify healthy vs. diseased plants based on image features.

6 Hours

EXPERIMENT 2

Develop a regression model to predict the selling price of used cars .

6 Hours

EXPERIMENT 3

Implement Find-S algorithm that analyzes customer purchase history and suggest the most specific product a customer might buy.

6 Hours

EXPERIMENT 4

Implement Candidate Elimination algorithm that analyzes customer purchase history and suggest the most specific product a customer might buy.

6 Hours

EXPERIMENT 5

Implement a Bayesian network to diagnose heart disease using the Heart Disease dataset.

6 Hours

EXPERIMENT 6

Implement and compare K-Means and EM algorithms to cluster patients based on medical records to identify personalized treatment plans.

6 Hours

EXPERIMENT 7

Implement the k-Nearest Neighbors algorithm to predict survival on the Titanic dataset based on passenger attributes.

6 Hours

EXPERIMENT 8

Apply k-means clustering, and identify malignant or benign tumors using Breast Cancer dataset.

6 Hours

EXPERIMENT 9

Develop a Grid World game using the Q-learning algorithm.

Total: 60 Hours

Reference(s)

1. T.M. Mitchell, “Machine Learning”, McGraw-Hill 2017.
2. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third edition 2014
3. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014

NOTE: Datasets for the above exercises available in Kaggle and UCI repository mentioned below

i. https://www.kaggle.com
ii. http://archive.ics.uci.edu/ml/datasets.html

21IS708 PROJECT WORK I 0 0 6 3

Course Objectives

- Work in teams to propose, formulate, and solve a challenging open-ended design problem of significant scope, depth, and breadth.
- Understand and incorporate engineering standards and multiple realistic constraints, within realistic design time, budget, and performance objectives.
- Develop a prototype of the proposed design and demonstrate the prototype in accordance with the specifications.
- Effectively communicate information relating to all aspects of the design process in written, oral, and graphical form.

Course Outcomes (COs)

1. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
4. Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
5. Prepare report and present the oral demonstrations.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2		2										
2		2		2	2						2			
3			2		3	2					2	2		
4			2		3		3	2			2	2		
5									2	3	2			

21IS801 PROJECT WORK II 0 0 18 9

Course Objectives

- Work in teams to propose, formulate, and solve a challenging open-ended design problem of significant scope, depth, and breadth.
- Understand and incorporate engineering standards and multiple realistic constraints, within realistic design time, budget, and performance objectives.
- Develop a prototype of the proposed design and demonstrate the prototype in accordance with the specifications.
- Effectively communicate information relating to all aspects of the design process in written, oral, and graphical form.

Course Outcomes (COs)

1. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
4. Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
5. Prepare report and present the oral demonstrations.

Articulation Matrix

CO No	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2		2										
2		2		2	2						2			
3			2		3	2					2	2		
4			2		3		3	2			2	2		
5									2	3	2			

18HS201 COMMUNICATIVE ENGLISH II 1 0 2 2

Course Objectives

- Read and understand ideas of complex text on both concrete and abstract topics
- Listen and understand technical discussions in his/her field of specialisation
- Produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options
- Interact with a degree of fluency and spontaneity that makes regular interaction without strain

Course Outcomes (COs)

1. Use appropriate grammar & vocabulary that is expected at the BEC Vantage exam level.
2. Understand the general meaning of non-routine letters, and of a report of predictable / unpredictable topic
3. Write simple reports of factual nature and factual non-routine letters
4. Ask for factual information and understand the answer; and take/pass on workplace messages
5. Express opinions and present arguments to a limited extent; and give simple, prepared presentations on familiar topics

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1									1					
2									2					
3									3					
4										1				
5										2				

UNIT I 9 Hours

GRAMMAR3

Tenses - Future continuous, Future perfect, Future perfect continuous, Past perfect, Past perfect continuous - Adjectives and adverbs - Mixed conditionals - Modals - can't have, needn't have - Modals of deduction and speculation - Narrative tenses - Passives - Phrasal verbs, extended - Relative clauses - Reported speech - Will and going to, for prediction - Wish - Would expressing habits, in the past.

UNIT II 9 Hours

READING

Scanning and reading for gist - Understanding text structure - Reading for gist and specific information - Vocabulary and structure - Understanding sentence structure and error identification

UNIT III **9 Hours**

WRITING

A message, memo or email, Giving instructions, explaining a development, asking for comments, requesting information, agreeing to requests - Business correspondence: explaining, apologising, reassuring, complaining, short report: describing, summarising - proposal: describing, summarising, recommending, persuading.

UNIT IV **9 Hours**

LISTENING

Listening for and noting specific information - Listening to identify topic, context, Function - Following the main points and retrieving specific information from the text.

UNIT V **9 Hours**

SPEAKING

Giving personal information: Talking about present circumstances, past experiences and future plans, expressing opinions, speculating - Organising a larger unit of discourse: Giving information and expressing and justifying opinions - Turn-taking: negotiating, collaborating, exchanging information, expressing and justifying opinions, agreeing/disagreeing, suggesting, speculating, comparing and contrasting, and decision-making.

1. A Horse and Two Goats-R K Narayan
2. My Lord the Baby - Rabindranath Tagore
3. Twist in the Tale-Jeffery Archer
4. The Third and Final Continent – Jhumpa Lahiri
5. The Gift of the Magi - O Henry

Total: 45 Hours

Reference(s)

1. Guy Brook-Hart, "BEC Vantage: Business Benchmark Upper-Intermediate- Student's Books" 1st Edition, Cambridge University Press, New Delhi, 2006.
2. Ian Wood, Paul Sanderson, Anne Williams with Marjorie Rosenberg, "Pass Cambridge BEC Vantage- Student's Book" 2nd Edition, Cengage Learning, New Delhi, 2014
3. Michael Handford, Martin Lisboa, Almut Koester, Angela Pitt, "Business Advantage - Student's Book Upper-Intermediate" Cambridge University Press, New Delhi, 2014.
4. Cambridge Examinations Publishing, “Cambridge BEC VANTAGE - Self-study Edition", Cambridge University Press, UK, 2005.

18HSH01 HINDI 1 0 2 2

Course Objectives

- To help students acquire the basics of Hindi
- To teach them how to converse in Hindi on simple day-to-day situations
- To help students acquire the ability to understand a simple technical text in Hindi

Course Outcomes (COs)

1. Construct simple sentences and use vocabulary required for day-to-day conversation.
2. Distinguish and understand the basic sounds of Hindi language.
3. Appear for Hindi examinations conducted by Dakshin Bharat Hindi Prachar Sabha.

Articulation Matrix

CO No	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
1										2				
2										2				
3										2				

UNIT I **9 Hours**

Hindi Alphabet: Introduction - Vowels - Consonants - Plosives - Fricatives - Nasal sounds - Vowel Signs - Chandra Bindu & Visarg -Table of Alphabet -Vocabulary.

UNIT II **9 Hours**

Nouns: Genders (Masculine & Feminine Nouns long vowels and short vowels - -Masculine & Feminine - Reading Exercises.

UNIT III **9 Hours**

Pronouns and Tenses: Categories of Pronouns - Personal Pronouns - Second person (you & honorific) - Definite & Indefinite pronouns - Relative pronouns - Present tense - Past tense - Future tense - Assertive & Negative Sentences - Interrogative Sentences.

UNIT IV **9 Hours**

Classified Vocabulary: Parts of body - Relatives - Spices - Eatables - Fruit & Vegetables - Clothes - Directions - Seasons - Professions.

UNIT V **9 Hours**

Speaking: Model Sentences and Rhymes - Speaking practice for various occasions.

Total: 45 Hours

Reference(s)

1. Hindi Prachar Vahini-1 by Dakshin Bharat Hindi Prachar Sabha Chennai
2. B.R. Kishore, Self Hindi Teacher for Non-Hindi Speaking People,Vee Kumar Publications(P)Ltd., New Delhi,2009
3. Videos, Stories, Rhymes and Songs

18HSG01 GERMAN **1 0 2 2**

Course Objectives

- To help students appear for the A1 level Examination
- To teach them how to converse fluently in German in day-to-day scenarios

Course Outcomes (COs)

1. Listen and identify individual sounds of German
2. Use basic sounds and words while speaking
3. Read and understand short passages on familiar topics
4. Use basic sentence structures while writing
5. Understand and use basic grammar and appropriate vocabulary in completing language tasks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										2				
2										2				
3										3				
4										2				
5										3				

UNIT I **9 Hours**

Introduction to German language: Alphabet - Numbers - Greetings - Days and Seasons- Working with Dictionary.

UNIT II **9 Hours**

Nouns - articles - Speaking about one self - Listening to CD supplied with the books, paying special attention to pronunciation

UNIT III **9 Hours**

Regular & Irregular verbs - Personal pronouns - family - Introduction to types of sentences

UNIT IV **9 Hours**

Question words-Types of Questions - Nominative case- Verb Conjugation - country - nationalities

UNIT V **9 Hours**

Verbs - to be & to have - conjugation - Hobbys - Framing basic Questions and answers

Total: 45 Hours

Reference(s)

1. Kursbuch and Arbeitsbuch, NETZWERK A1 DEUTSCH ALS FREMDSPRACHE, Goyal Publishers & Distributers Pvt. Ltd., New Delhi, 2015
2. Langenscheidt Eurodictionary - German - English / English - German, Goyal Publishers & Distributers Pvt. Ltd., New Delhi, 2009
3. Grundkurs, DEUTSCH Lehrbuch Hueber Munichen, 2007.

18HSJ01 JAPANESE **1 0 2 2**

Course Objectives

- To train students for N5 Level Examination
- To teach them use basic Japanese sentences in day-to-day conversation
- To make students familiar with the Japanese cultural facets and social etiquettes

Course Outcomes (COs)

1. Recognize and write Japanese alphabet
2. Speak using basic sounds of the Japanese language
3. Apply appropriate vocabulary needed for simple conversation in Japanese language
4. Apply appropriate grammar to write and speak in Japanese language
5. Comprehend the conversation and give correct meaning

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										2				
2										2				
3										2				
4										2				
5										2				

UNIT I **9 Hours**

Introduction to Japanese - Japanese script- Pronunciation of Japanese(Hiragana)- (Katakana) Long vowels - Pronunciation of in,tsu,ga - Letters combined with ya,yu,yo - Daily Greetings and Expressions - Numerals. N1 wa N2 desu - N1 wa N2 ja arimasen - S ka N1 mo - N1 no N2 - san - Kore - Sore - Are - Kono N - Sono N - Ano N - Sou desu - Sou ja Arimasen - S1 ka - S2 ka - N1 no N2 - Sou desu ka - Koko - Soko - Asoko - Kochira - Sochira Achira - N1 wa N2 (place) desu - Doko - Dochira - N1 no N2 - Ko - So - A - Do (Demonstrative words) - O kuni Kanji10 - Technical Japanese Vocabulary (30 Numbers)

UNIT II **9 Hours**

Introduction to time - Ji - Fun - Pun - Introduction of verbs - V Masu - V Masen - V Mashita - V Masendeshita N (Time) Ni V - N1 Kara - N2 Made - N1 to N2 - S Ne - N (Place) e Ikimasu - Kimasu - Kaerimasu - Doko (e) Mo Ikimasen - Ikimasendeshita - N (Vechile) de Ikimasu - Kimasu - Kaerimasu - N (Person / Animal) to V - Itsu - S Yo N o (transitive) - N o Shimasu - Nani o Shimasuka - Nan and Nani - N (place) de V - V Masenka - V Mashou - o - Kanji 10 - Technical Japanese Vocabulary (30 Numbers) .

UNIT III **9 Hours**

N (tool/means) de V - Word/Sentence wa Go de Nani desu ka - N (person) Ni Agemasu, etc - N (person) Ni Moraimasu etc - Mou V Mashita - Introduction to Adjectives - N wa Na adj (Na) desu - N wa II adj (II) desu - Na adj Na n - II adj (II) N - Totemo - Amari - N wa Dou desuka - N1 wa Donna N2 desuka - S1 Ga S2 - Dore N ga Arimasu - Wakarimasu - N Ga Sukidesu - Kiraidesu - Jozu desu -

Heta desu - Donna N - Yoku - Daitai - Takusan - Sukoshi - Amari - Zenzen - S1 kara S2 - Doushite - Kanji 10 - Technical Japanese Vocabulary (30 Numbers)

UNIT IV **9 Hours**

N ga Arimasu - Imasu - N1 (place) Ni N2 ga Arimasu - Imasu - N1 (thing/person/place) no N2 (position) - N1 ya N2 - Word (s) desuka - Chirisosu wa Arimasuka - Saying numbers - Quantifier (period) Ni kai V - Quantifier Dake - N dake - Past tense of Noun sentences and Na adjective sentences - Past tense of ii adjective sentences - N1 wa N2 yori adjective desu - N1 to N2 to dochira ga adjective desu ka - N1/N2 no houga adjective desu - Kanji 10 - Technical Japanese Vocabulary (30 Numbers)

UNIT V **9 Hours**

N ga hoshi desu - V masu form tai desu - N (place) e V masu form - N Ni - ikimasu - kimasu - kaerimasu N ni V - N o V - dou ko ka - nani ka - go chuu mon - Verb conjugation - Verb groups - Verb te form - V te form kudasai - V te form imasu - V masu from mashouka - S1 ga S2 - N ga V - V te form mo ii desu - V te form wa ikemasen - V te form imasu Shrimasen - Kanji 10 - Technical Japanese Vocabulary (30 Numbers)

Total: 45 Hours

Reference(s)

1. Japanese for Everyone: Elementary Main Textbook1-1, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.

18HSC01 CHINESE **1 0 2 2**

Course Objectives

- To help students appear for HSK Level 1 Exam
- To help students acquire the basics of Chinese language
- To teach the students how to converse in Chinese in various situations

Course Outcomes (COs)

1. Listen and identify individual sounds of Chinese
2. Use basic sounds and words while speaking
3. Read and understand short passages on familiar topics
4. Use basic sentence structures while writing
5. Understand and use basic grammar and appropriate vocabulary in completing language tasks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										2				
2										2				
3										3				
4										2				
5										3				

UNIT I **9 Hours**

Hello | 1.Initials and Finals of Chinese | b,p,m,f,d,,n,l,g,k,h,j,q,x | 2. Tones Four | 3.Chinese Syllables | 4.Tone S

UNIT II **9 Hours**

Thank you | Initials and Finals of Chinese | The Neutral Tone | Rules of Tone Marking and Abbreviation

UNIT III **9 Hours**

1. What's your name - In the school; -In the classroom; -In the school | The Interrogative Pronoun | 2 The Sentence | 3 Interrogative Sentences with

UNIT IV **9 Hours**

She is my Chinese teacher | In the library | The Interrogative Pronouns | The Structural Particle | The interrogative Particle

UNIT V **9 Hours**

Her daughter is 20 years old this year | 1.The Interrogative Pronoun | 2. Numbers below 100 | 3.Indicating a Change | The Interrogative Phrase

Total: 45 Hours

18HSF01 FRENCH 1 0 2 2

Course Objectives

- To prepare the students for DELF A1 Examination
- To teach them to converse fluently in French in day-to-day scenarios

Course Outcomes (COs)

1. To help students acquire familiarity in the French alphabet & basic vocabulary
2. Listen and identify individual sounds of French
3. Use basic sounds and words while speaking
4. Read and understand short passages on familiar topics
5. Understand and use basic grammar and appropriate vocabulary in completing language tasks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										2				
2										2				
3										3				
4										2				
5										3				

UNIT I **9 Hours**

ENTRER EN CONTACT

La langue francaise, alphabets, les numeros, les jours, les mois.| Grammaire Les verbes s appeler,etre, avoir, les articles definis, indefinis | Communication - Saluer, s informer sur quelquun, demander de se presenter | Lexique - Les alphabets, les nationalites, age, les pays, les couleurs, les jours de la semaine, les mois de l annee, les professions

UNIT II **9 Hours**

PARTAGER SON LIEU DE VIE

Les francais et leur habitat, des habitations insolites | Grammaire - Verbes - Conjugaison : Present (Avoir / etre / ER, IR, RE : Regulier et Irregulier) - Adjectifs les propositions de lieu | Communication - Chercher un logement, d ecrire son voisin, s informer sur un logement | Lexique - L habitat, les pieces, l equipement, la description physique.

UNIT III **9 Hours**

VIVRE AU QUOTIDIEN

Grammaire - Articles contractes, verbes vouloir, pouvoir, devoir, adjective interrogative, future proche | Communication- Exprimer ses gouts, parler de ses loisirs, justifier un choix, exprimer une envie | Lexique - le temps libre et les loisirs, les saisons, les activites quotidiennes, le temps (le matin, le soir, la nuit)

UNIT IV **9 Hours**

COMPRENDRE SON ENVIRONNEMENT - OUVRIR -Ãƒ?Ã‚Â LA CULTURE

Grammaire - Verbes - Finir, Sortir, les adjectifs demonstratifs, le passe compose, l imparfait | Communication - Propose quelqu un de faire quelque chose, raconteur une sortie au passe parler un film | Lexique - Les sorties, la famille, art, les vetements et les accessoires

UNIT V **9 Hours**

GOUTER A LA CAMPAGNE

Grammaire La forme negative, les verbes acheter, manger, payer, articles partitifs, le pronom en de quantite | Communication Accepter et refuse rune invitation, donner des instructions, commander au restaurant | Lexique Les services et les commerces, les aliments, les ustensiles, argent

Total: 45 Hours

Reference(s)

1. Saison A1, Methode de francais
2. Hachette FLE

21IS001 INFORMATION STORAGE AND MANAGEMENT

3 0 0 3

Course Objectives

- To Understand the Challenges in Information Storage and Management.
- To Describe the Core Elements in a Data Center.
- To Understand RAID and its various Levels for Data Backup.

Course Outcomes (COs)

1. Explain Physical and Logical components of a Storage Infrastructure including Storage subsystems, RAID and Intelligent Storage Systems.
2. Describe Storage Networking Technologies such as FC-SAN, IP-SAN, FCoE, NAS and Object- based and Unified Storage.
3. Illustrate and articulate business continuity solutions, Backup and replications, along with archives for managing fixed content.
4. Explain key characteristics, Services, Deployment models, and Infrastructure components for Cloud Computing.
5. Implement the concept of Security Storage Infrastructure Management.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2		3	3								3	
2			2	2	2				3				1	2
3	2								2		3		1	2
4		3		2									2	
5		2	2		2					2			3	3

UNIT I **9 Hours**

STORAGE SYSTEM

Introduction to Information Storage-Virtualization and Cloud Computing-Key Data Center elements - Compute, Application and Storage Virtualization-Disk drive & Flash drive Components and Performance-RAID-Intelligent Storage System and Storage Provisioning (including virtual provisioning)

UNIT II **9 Hours**

STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION

Fiber Channel SAN components-FC Protocol and Operations-Block Level Storage Virtualization-iSCL and FCIP as an IP-SAN solutions-Converged Networking option FcoE-Network Attached Storage (NAS) components-Protocol and Operations-File Level Storage Virtualization-Object based Storage and Unified Storage Platform.

UNIT III **9 Hours**

BACKUP, ARCHIVE AND REPLICATION

Business Continuity Terminologies-Planning and Solutions-Clustering and Multipathing to avoid Single points of failure -Backup and Recovery methods-Targets and Topologies-Data Deduplication and Backup in Virtualized environment-Fixed content and Data archive-Local replication in classic and Virtual environments-Remote replication in classic and Virtual environments-Three-site remote replication and Continuous Data protection.

UNIT IV **9 Hours**

CLOUD COMPUTING CHARACTERISTICS AND BENEFITS

Cloud Enabling Technologies-Characteristics of Cloud Computing -Benefits of Cloud Computing-Cloud Service Models Cloud Deployment models-Cloud Computing Infrastructure-Cloud Challenges, Cloud Migration considerations.

UNIT V **9 Hours**

SECURING AND MANAGING STORAGE INFRASTRUCTURE

Security threats and Countermeasures in various domains-Security solutions for FC-SAN, IP-SAN and NAS environments- Security in virtualized and Cloud environments-Monitoring and Managing various Information Infrastructure Components in classic and Virtual environments-Information Life cycle Management (ILM) and Storage tiering.

Total: 45 Hours

Reference(s)

1. Information Storage and Management: Storing, Managing and Protecting Digital Information in classic, Virtualized and Cloud Environments, 2nd Edition, EMC Educations Services, Wiley, May 2012.
2. Information Storage and Management: Storing, Managing, and Protecting Digital Information, EMC Education Services, Wiley, January 2010.
3. Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein ,Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, iSCSI, InfiniBand and FCoE, 2nd Edition, Wiley, July 2009.
4. EMC Corporation, Information Storage and Management, Wiley, India.
5. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017.

21IS002 MANAGEMENT INFORMATION SYSTEM 3 0 0 3

Course Objectives

- Gain knowledge about the major types of information systems used in a business environment.
- Impart knowledge on the ethical, social, and security issues of information systems.
- Understand the processes of developing and implementing information systems.

Course Outcomes (COs)

1. Understand basic concepts of MIS and business functions.
2. Formulate solutions to social and ethical issues related to information technology infrastructure.
3. Apply the knowledge on database management systems to store hybrid information in a business organization.
4. Recognize the use of security mechanisms to share business information over various types of networks.
5. Explore the new IT initiatives for enhancing knowledge management information system.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		2		2	2	2				1		-	
2	2		2		2	2	2	2			2	3	-	-
3	2		2		3	3	3				2		-	
4	2		2		2	2	2				3		-	
5	2		2		2	2	2				3		-	

UNIT I **9 Hours**

INTRODUCTION TO INFORMATION SYSTEMS

Information Systems in Global Business Today: Role of Information Systems in Business Today-Perspectives of Information Systems-Approaches to Information Systems-Global E-Business and Collaboration: Business Process and Information Systems-Types of Information Systems Enterprise Systems

UNIT II **9 Hours**

INFORMATION TECHNOLOGY INFRASTRUCTURE

Information Systems, Organizations and Strategy: Organizations and Information Systems-Impact of Information Systems on organizations and Business Firms-Ethical and Social Issues in Information Systems: Understanding Ethical and Social Issues Related to Systems-Ethics in an information society-IT Infrastructure and Emerging Technologies: Infrastructure Components-Hardware Platform Trends-Software Platform Trends.

UNIT III **8 Hours**

DATABASES AND INFORMATION MANAGEMENT

Organizing Data in Traditional File Environment-Database Approach to Data Management-Using Databases to improve Business Performance and Decision Making-Managing Data Resources.

UNIT IV **9 Hours**

NETWORKS AND SECURITY

Telecommunications and Networking in todays Business Needs: Networking and Communication Trends-Key Digital Networking Technologies-Securing Information Systems: System Vulnerability-Business Value of Security and Control-Establishing Management Framework for Security and Control- Technologies and Tools for Protecting Information Resources.

UNIT V **10 Hours**

NEW IT INITIATIVES

Enterprise Applications: Enterprise Systems-Supply Chain Management Systems-Customer Relationship Management Systems- Electronic Commerce: Types of Electronic Commerce-M-Commerce Services and Applications-The Knowledge Management Landscape: Important Dimensions of Knowledge-The Knowledge Management Value Chain-Types of Knowledge Management Systems.

Total: 45 Hours

Reference(s)

1. Kenneth C. Laudon, Jane P. Laudon, Management Information Systems -Managing the digital firm, Pearson Education, 2012.
2. Kenneth Laudon, Jane Laudon, Management Information Systems-Managing the digital firm, Pearson 17th edition, 2021.
3. Keri E. Pearlson, Carol S. Saunders, Dennis F. Galletta, Managing and Using Information Systems: A Strategic Approach 7th Edition, 2019.
4. Waman S Jawadekar, Management Information Systems-Texts and Cases, the McGraw-Hill Company, 2009.
5. James O" Brien, Management Information Systems-Managing Information Technology in the E- business enterprise, McGraw-Hill Higher Education, 2011.
6. Turban, McLean and Wether, Information Technology for Management-Transforming Organisations in the Digital Economy, John Wiley, 2008.

21IS003 NOSQL DATABASE 2 0 2 3

Course Objectives

- Explore the origins of NoSQL databases and the characteristics that distinguish them from traditional relational database management systems.
- Understand the architectures and common features of the main types of NoSQL databases (key-value stores, document databases, column-family stores, graph databases).
- Discuss the criteria that decision makers should consider when choosing between relational and non-relational databases and techniques for selecting the NoSQL database that best addresses specific use cases.

Course Outcomes (COs)

1. Explain and compare different types of NoSQL Databases.
2. Compare and contrast RDBMS with different NoSQL databases.
3. Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases.
4. Explain performance tune of Key-Value Pair NoSQL databases.
5. Apply Nosql development tools on different types of NoSQL Databases.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1	1	1								2	
2	3	2	1	1	1								2	
3	2	1	1	1	1								2	3
4	3	2	1	1	1								1	
5	2	2	1	1	1								2	2

UNIT I **6 Hours**

INTRODUCTION TO NOSQL CONCEPTS

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL.

UNIT II **6 Hours**

KEY VALUE DATABASE

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT III **6 Hours**

DOCUMENT ORIENTED DATABASE

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT IV **6 Hours**

COLUMNAR DATA MODEL

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT V **6 Hours**

DATA MODELING WITH GRAPH

Graph NoSQL databases using Neo4,NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

5 Hours

EXPERIMENT 1

Implementation of Document Document-Oriented Database (MongoDB) to perform CRUD operations, Indexing, Sharding query optimization and data modeling.

5 Hours

EXPERIMENT 2

Implementation of Column-Family Store (Apache Cassandra) to perform data modeling and querying.

5 Hours

EXPERIMENT 3

Create a database that stores road cars. Cars have a manufacturer ,a type. Each car has a maximum performance and a maximum torque value. Do the following: Test Cassandra's replication schema and consistency models.

5 Hours

EXPERIMENT 4

Implementation of Column-Family Store (Apache Cassandra) to set up replication across multiple nodes and observe read write operation.

5 Hours

EXPERIMENT 5

Implementation of Graph Database (Neo4j) to demonstrate graph algorithms.

5 Hours

EXPERIMENT 6

Download a zip code dataset at http://media.mongodb.org/zips.json .Use mongo import to import the zip code dataset into MongoDB. After importing the data, answer the following questions by using aggregation pipelines: (1) Find all the states that have a city called BOSTON. Find all the states and cities whose names include the string BOST. Each city has several zip codes. Find the city in each state with the most number of zip codes and rank those cities along with the states using the city populations. MongoDB can query on spatial information.

Total: 30+30=60 Hours

Reference(s)

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.
2. Dan Sullivan, NoSQL For Mere Mortals, 1st Edition, Pearson Education India, 2015. (ISBN-13: 978-9332557338).
3. Dan McCreary and Ann Kelly, Making Sense of NoSQL: A guide for Managers and the Rest of us, 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022).
4. Kristina Chodorow, Mongodb: The Definitive Guide- Powerful and Scalable Data Storage, 2nd Edition, O"Reilly Publications, 2013. (ISBN-13: 978-9351102694).

21IS004 DATA COMPRESSION 3 0 0 3

Course Objectives

- Understand the important issues in data compression.
- Develop a reasonably sophisticated data compression application.
- Learn different types of compression techniques used for audio, image and video compression.

Course Outcomes (COs)

1. Understand the basic mathematical models used in data compression.
2. Implement the Lossless compression techniques to compress different raw data.
3. Understand the conceptual basis for commonly used Lossy compression techniques.
4. Apply various audio compression techniques over real world data.
5. Analyze different types of image and video compression techniques.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	1	1								1	
2	2	2	3	2									2	
3	2	2											2	
4	2	1	3	3	2								2	3
5	1	2		2									3	

UNIT I **9 Hours**

INTRODUCTION

Mathematical Preliminaries, Lossy and Lossless compression, Application of compression-Huffman coding: Overview; The Huffman coding algorithm, Minimum variance Huffman codes; Application of Huffman coding for text compression.

UNIT II **9 Hours**

LOSSLESS COMPRESSION

Dictionary Techniques: Overview; Introduction; Static dictionary; Adaptive dictionary; Applications: UNIX compress, GIF, PNG, V.42. Lossless image compression: Overview; Introduction; Basics; CALIC; JPEG- LS; Multiresoution approaches; Facsimile encoding: Run-length coding, T.4 and T.6.

UNIT III **9 Hours**

BASICS OF LOSSY CODING

Some mathematical concepts: Introduction-Distortion Criteria-Models. Scalar quantization: Overview-The quantization problem-Uniform quantizer- Adaptive quantization.

UNIT IV **9 Hours**

AUDIO COMPRESSION

High quality digital audio, frequency and temporal masking, lossy sound compression-law and A-law, companding, and MP3 audio standard.

UNIT V **9 Hours**

IMAGE AND VIDEO COMPRESSION

PCM, DPCM JPEG, JPEG - LS , and JPEG 2000 standards- Intra frame coding, motion estimation and compensation, introduction to MPEG-2 H-264 encoder and decoder.

Total: 45 Hours

Reference(s)

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers, 4th Edition,2013
2. David Saloman,Data Compression: The complete reference, 3rd Edition,Springer publication,2007.
3. W.B.Pennebaker: JPEG still image compression standard, 1993

21IS005 DECISION SUPPORT SYSTEM 3 0 0 3

Course Objectives

- To understand the major concepts in decision support systems.
- To apply knowledge based for any real life applications.
- To analyze a knowledge-based system for a smart production system.

Course Outcomes (COs)

1. Apply to perceive the characteristics of the decision models in real time or not.
2. Ability to locate and select appropriate data to support decision models.
3. Analyze to investigate and evaluate a decision model.
4. Analyze the characteristics and type of data required to develop and support decision models.
5. Apply the Characteristics and variables in the standardization of decision models.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1		1									
2	2	2	3		3								2	
3	1	3	3		3								2	
4	2	2	2		3								3	
5	2	1	1		3								2	

UNIT I **9 Hours**

DECISION SUPPORT SYSTEMS

An Overview DSS Configurations Characteristics and Capabilities of DSS, Components of DSS, The Data Management Subsystem, The Model Management Subsystem, The User Interface (Dialog) Subsystem, The Knowledge-Based Management Subsystem, The User, DSS Hardware, DSS Classifications.

UNIT II **8 Hours**

KNOWLEDGE MANAGEMENT

Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Initiatives, Approaches to Knowledge Management, Information Technology in Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management, Ensuring Success of Knowledge Management.

UNIT III **10 Hours**

KNOWLEDGE ACQUISITION

Knowledge Acquisition, Representation, and Reasoning Concepts of Knowledge Engineering, Scope and Types of Knowledge, Methods of Knowledge Acquisition from Experts, Knowledge Acquisition from Multiple Experts, Automated Knowledge Acquisition from Data and Documents, Knowledge Verification and Validation, Representation of Knowledge, Reasoning in Rule-Based Systems, Explanation and Meta knowledge, Inference with Uncertainty, Expert Systems Development, Knowledge Acquisition and the Internet.

UNIT IV **9 Hours**

MODELLING IN DECISION SUPPORT SYSTEMS

Modeling and Support Decision-Making Introduction and Definitions, Systems, Models, Phases of the Decision-Making Process, Decision-Making: The Intelligence Phase, The Design Phase, Decision-Making: The Choice Phase, The Implementation Phase, How Decisions Are Supported, Personality Types, Gender, Human Cognition, and Decision Styles.

UNIT V **9 Hours**

FUTURE TRENDS AND TECHNIQUES

Advanced Intelligent Systems Machine-Learning Techniques; Case-Based Reasoning; Basic Concept of Neural Computing; Learning in Artificial Neural Networks; Developing Neural Network-Based Systems; Genetic Algorithms Fundamentals; Developing Genetic Algorithm Applications; Fuzzy Logic Fundamentals; Developing Integrated Advanced Systems.

Total: 45 Hours

Reference(s)

1. Gupta, J.N.D., Forgionne, G.A., and Manuel, M.T., Intelligent Decision-making Support Systems: Foundations, Applications and Challenges, Springer, 2006.
2. Iantovics, B., and Kountchev, R., Advanced Intelligent Computational Technologies and Decision Support Systems, Springer, 2014.
3. Tweedale, J.W, Neves-Silva, R., Jain, L.C., Phillips-Wren, G., Watada, J., and Howlett, R.J., Intelligent Decision Technology Support in Practice, Springer, 2016.
4. Valencia-Garcia, R, Paredes-Valverde, M.A., Salas-Zarate, M.P. and Alor-Hernandez, Giner., Exploring Intelligent Decision Support Systems, Springer, 2018.

21IS006 BUSINESS INTELLIGENCE 3 0 0 3

Course Objectives

- To enable students to understand the role of mathematical models in business intelligence and develop skills in using them to make effective and timely decisions.
- To provide students with an introduction to data mining, data warehousing, and big data analytics, and enable them to apply these techniques in real-world scenarios.
- To equip students with the knowledge and skills required to deliver business intelligence effectively, including designing and presenting reports, visualizations, and dashboards.

Course Outcomes (COs)

1. Understand the role of data, information, and knowledge in making effective and timely decisions in a business context.
2. Acquire proficiency in data warehousing and apply it to solve business problems.
3. Understand the concept of big data and its impact on business intelligence.
4. Develop an understanding of different business intelligence user types, including standard reports, interactive analysis, and ad hoc querying.
5. Understand the concept of efficiency measures and their importance in business intelligence.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		2					2					-	
2	2	2	3	2									-	
3	1		2		3								-	
4	2	2	3										-	
5	1		2	2										

UNIT I **9 Hours**

BUSINESS INTELLIGENCE

Effective and timely decisions-Data, information and knowledge-Role of mathematical models-Business intelligence architectures: Cycle of a business intelligence analysis-Enabling factors in business intelligence projects-Development of a business intelligence system-Ethics and business intelligence.

UNIT II **10 Hours**

INTRODUCTION TO DATA MINING AND DATA WAREHOUSING

Data Modeling-Data Extraction-Transformation and Loading-Data Warehousing Case Studies Pattern matching-Association rule mining-Cluster analysis, outlier analysis-Text Mining-Web Analytics-Decision modelling and optimization.

UNIT III **9 Hours**

INTRODUCTION TO BIG DATA ANALYTICS

Introduction to Big Data-Hadoop Architecture-Hadoop Distributed File System (HDFS) MapReduce Framework-Pig-Hive-Business Intelligence Analytics: Descriptive analytics-Predictive analytics-Prescriptive analytics-Business Intelligence Analytics Case Studies.

UNIT IV **9 Hours**

KNOWLEDGE DELIVERY

The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

UNIT V **8 Hours**

EFFICIENCY

Efficiency measures-The CCR model: Definition of target objectives-Peer groups-Identification of good operating practices; cross efficiency analysis-virtual inputs and outputs.

Total: 45 Hours

Reference(s)

1. Efraim Turban, Ramesh Sharda, Dursun Delen, Decision Support and Business Intelligence Systems, 9th Edition, Pearson 2013.
2. Larissa T. Moss, S. Atre, Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making, Addison Wesley, 2003.
3. Carlo Vercellis, Business Intelligence: Data Mining and Optimization for Decision Making, Wiley Publications, 2009.
4. David Loshin Morgan, Kaufman, Business Intelligence: The Savvy Managers Guide, Second Edition, 2012.
5. Data Warehousing, Data Mining, and OLAP by Alex Berson and Stephen J. Smith - 1st edition, McGraw-Hill Education.
6. Big Data: A Revolution That Will Transform How We Live, Work, and Think by Viktor Mayer-Schonberger and Kenneth Cukier - 1st edition, Mariner Books.

21IS007 VIRTUALIZATION IN CLOUD COMPUTING

3 0 0 3

Course Objectives

- Analyze the basic concepts of virtualization technology to derive the best practice model for deploying cloud based applications.
- Create an application by utilizing cloud platforms such as Amazon Web Services and Windows Azure.
- Identify major security and privacy problems in cloud computing environment.
- Apply the ability to use the architecture of cloud, service and delivery models.
- Implement the key enabling technologies that help in the development of cloud.

Course Outcomes (COs)

1. Analyze the concept of virtualization and its properties.
2. Apply different forms of virtualization.
3. Implement various architectures for implementing virtualization methods.
4. Create virtual machines and installing various operating systems.
5. Evaluate the performance of the virtual machines and deployed applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2	3										
2			1	3	2									
3			2	1	3									
4	1		2	1	3									
5	1		3		2									

UNIT I **9 Hours**

UNDERSTANDING VIRTUALIZATION

Describing Virtualization-Microsoft Windows Drives Server Growth-Explaining Moores Law-Understanding the Importance of Virtualization-Examining Todays Trends-Virtualization and Cloud Computing-Understanding Virtualization Software Operation-Virtualizing Servers-Virtualizing Desktops-Virtualizing Applications.

UNIT II **9 Hours**

HYPERVISORS

Describing a Hypervisor-Exploring the History of Hypervisors-Understanding Type 1 Hypervisors-Type 2 Hypervisors-Role of a Hypervisor-Holodecks and Traffic Cops-Resource Allocation-Comparing Todays Hypervisors-VMware ESX-Citrix Xen-Microsoft Hyper-V-Other Solutions.

UNIT III **9 Hours**

VIRTUAL MACHINES

Introduction to Virtual Machine-CPUs in a Virtual Machine-Memory in a Virtual Machine-Network Resources in a Virtual Machine-Storage in a Virtual Machine-Understanding How a Virtual Machine Works-Working with Virtual Machines-Virtual Machine Clones-Templates-Snapshots-OVF-Containers.

UNIT IV **9 Hours**

CREATION OF VIRTUAL MACHINES

Understanding Configuration Options-Installing Windows on a Virtual Machine-Installing Linux on a Virtual Machine-Installing VirtualBox Guest Additions-Managing CPUs for a Virtual Machine-Configuring VM CPU Options-Managing Storage for a Virtual Machine-Managing Networking for a Virtual Machine- Copying a Virtual Machine-Managing Additional Devices in Virtual Machines.

UNIT V **9 Hours**

AVAILABILITY

Increasing Availability-Protecting a Virtual Machine-Protecting Multiple Virtual Machines-Protecting Data Centers- Examining Virtual Infrastructure Performance Capabilities-Deploying Applications in a Virtual Environment-Understanding Virtual Appliances and vApps-Open Stack and Containers.

Total: 45 Hours

Reference(s)

1. Matthew Portney, Virtualization Essentials, John Wiley & Sons, Second Edition, 2016.
2. Kailash Jayaswal, Jagannath Kallakurchi,Donald J.Houde,Dr.devan Shah, Cloud Computing Black Book, Dreamtech press, 2015.
3. Rajkumar Buyya, Christian Vecchiola and Thamarai Selvi S,Mastering in Cloud Computing, McGraw Hill Education, (India) Private Limited, 2013.
4. Bernard Golden, Amazon Web Services for Dummies, John Wiley & Sons, First Edition, 2013.
5. http//www.microsoft.com/learning/default.mspx.
6. https://www.oreilly.com/library/view/cloud- security-and/9780596806453/ch04.html

21IS008 CLOUD SERVICES AND DATA MANAGEMENT

3 0 0 3

Course Objectives

- Analyze the basic concepts of Cloud and capabilities across the various Cloud service models.
- Analyze virtualization technology to derive the best practice model for deploying cloud based applications.
- Create an application by utilizing cloud platforms such as Google App Engine, Microsoft Azure and OpenStack.
- 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.

Course Outcomes (COs)

1. Apply Cloud Computing reference architecture for developing clouds.
2. Analyze the different forms of cloud service models.
3. Apply the characteristics and architecture of IaaS using various real world applications.
4. Evaluate PaaS concepts and architectures with real-world examples.
5. Analyze, and synthesize concepts related to the SaaS delivery model.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1	1	1								1	1
2	3	1	2	3	2								1	2
3	1	1	3	1	3								1	3
4	1	1	1	2	3								2	3
5	1	3	3	2	2								2	3

UNIT I **9 Hours**

CLOUD COMPUTING REFERENCE ARCHITECTURE (CCRA)

Introduction to Cloud Computing Reference Architecture (CCRA), Benefits of CCRA, Architecture Overview, Versions and Application of CCRA for Developing Clouds.

UNIT II **9 Hours**

INTRODUCTION OF DELIVERY MODELS IN CLOUD COMPUTING

Introduction to Cloud Delivery Models, List Various Cloud Delivery Models, Advantages of Delivery Models in Cloud, Trade-off in Cost to Install Versus Flexibility, Cloud Service Model Architecture.

UNIT III **9 Hours**

INFRASTRUCTURE AS A SERVICE (IAAS)

Introduction to Infrastructure as a Service Delivery Model, Characteristics of IaaS, Architecture, Examples of IaaS, Applicability of IaaS in the Industry.

UNIT IV **9 Hours**

PLATFORM AS A SERVICE (PAAS)

Introduction to Platform as a Service Delivery Model, Characteristics of PaaS, Patterns, Architecture and Examples of PaaS, Applicability of PaaS in the Industry.

UNIT V **9 Hours**

SOFTWARE AS A SERVICE (SAAS)

Introduction to Software as a Service Delivery Model, Characteristics of SaaS, Architecture, Examples of SaaS, Applicability of SaaS in the Industry.

Total: 45 Hours

Reference(s)

1. (IBM ICE), Cloud Computing Architecture, IBM Global Technology Services Thought Leadership White Paper, April 2011.
2. Bernard Golden, Amazon Web Services for Dummies, John Wiley & Sons, First Edition, 2013.
3. Cloud Computing: A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill, 2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, Oreilly, SPD, 2011.

21IS009 CLOUD STORAGE TECHNOLOGIES 3 0 0 3

Course Objectives

- 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.

Course Outcomes (COs)

1. Analyze the fundamentals of information storage management and various models of Cloud infrastructure services and deployment.
2. Apply the usage of advanced intelligent storage systems and RAID.
3. Evaluate various storage networking architectures - SAN, including storage subsystems and virtualization.
4. Execute the different roles in providing disaster recovery and remote replication technologies.
5. Implement the security needs and security measures to be employed in information storage management.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1	3	3								3	3
2	3	1	2	3	3								2	3
3	1	1	3	2	2								3	
4	3	2	1	2	2								3	3
5	1	3	2	1	2								3	3

UNIT I **8 Hours**

STORAGE SYSTEMS

Cloud Storage Fundamentals and Architecture-Cloud Storage Providers and Services-Access methods (RESTful APIs, SDKs) for cloud object storage-Block storage technologies in cloud environments-File Storage in the Cloud: Network File System (NFS) and Server Message Block (SMB) protocols-Hybrid Cloud Storage-Data Migration-Data Lifecycle Management in the Cloud.

UNIT II **9 Hours**

INTELLIGENT STORAGE SYSTEMS AND RAID

Storage Tiering and Caching-Automated Data Placement and Load Balancing: Intelligent Algorithms for Data Placement, Load Balancing Strategies for Distributed Storage Systems, Dynamic Resource Allocation-RAID Technologies in Cloud Storage: RAID Levels-Data Striping, Mirroring, and Parity for Fault Tolerance-RAID Configuration and Performance Optimization.

UNIT III **10 Hours**

STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION

Storage Networking in Cloud Environments-Understanding storage protocols-Network-attached storage (NAS) vs. storage area network (SAN)-Storage virtualization techniques and technologies-Network-Attached Storage (NAS)-Storage Area Network (SAN)-iSCSI and Fiber Channel over IP (FCIP) in Cloud Storage-Network Virtualization and Overlay Networks-Storage Virtualization and Abstraction-Network Performance Optimization-Network Security in Cloud Storage.

UNIT IV **9 Hours**

BACKUP, ARCHIVE AND REPLICATION

Cloud Backup: Strategies and Architecture, Data Deduplication and Compression, Security-Cloud Archive: Strategies and Architecture, Replication for Data Redundancy: Synchronous and asynchronous replication methods-Disaster Recovery in the Cloud-Hybrid Backup and Archiving in Cloud Environments- Backup and Archive Management in Cloud Environments.

UNIT V **9 Hours**

SECURING STORAGE INFRASTRUCTURE

Storage Security Fundamentals: Key Security Principles, Threats and Vulnerabilities in Storage Infrastructure, Access Control and Authentication: Role-based Access Control (RBAC) and Permissions Management, Multi-factor authentication (MFA) for Storage Systems-Storage-level Encryption and Application-level Encryption-Storage infrastructure Management Functions and Processes.

Total: 45 Hours

Reference(s)

1. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), OReilly, 2009.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers, 2012.

21IS010 CLOUD AUTOMATION TOOLS AND APPLICATIONS

3 0 0 3

Course Objectives

- To learn the options for running automation tools, and load balancers in the cloud-native applications.
- To learn the configuration management in the cloud.
- To know why cloud automation is important.
- To learn what types of cloud automation tools can be used.
- To learn load balancing and auto scaling in the cloud.

Course Outcomes (COs)

1. Implement cloud native applications on AWS and Terraform.
2. Apply VM provisioning and migration in the cloud.
3. Analyze cloud automation and configuration.
4. Apply balance load and auto scaling in the cloud.
5. Analyze the AWS cloud formation use-case.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		2	1	3								3	3
2		2			3								3	3
3			3	2	3								3	2
4			2		3								3	2
5			2		3								3	3

UNIT I **7 Hours**

UNDERSTANDING THE CLOUD AUTOMATION

Introduction to Automation & Configuration Tools. Introduction to Terraform. Understanding Terraform Vs CloudFormation. Deploying and Destroying AWS environment with Terraform. Introduction to Packer.

UNIT II **9 Hours**

ABSTRACTION AND VIRTUALIZATION

Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding hypervisors Porting Applications, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data Centre Automation.

UNIT III **9 Hours**

AUTOMATION AND CONFIGURATION MANAGEMENT IN THE CLOUD

Cloud automation at scale, Cloud Configuration Management-unmanaged and managed configuration management, Modification of the capacity of the service, horizontal and vertical scaling, and automatic versus manual scaling. Migrating the business to Cloud. Automating cloud deployments-Balancers.

UNIT IV **9 Hours**

LOAD BALANCING AND AUTO SCALING IN CLOUD

Managed instance groups, Auto scaling and health check, Overview of HTTP(S) load balancing. Example: HTTP load balancer, HTTP(S) load balancing, Configuring an HTTP Load Balancer with Auto scaling, SSL proxy load balancing, TCP proxy load balancing, Network load balancing, Internal load balancing, Configuring an Internal Load Balancer, Choosing a load balancer.

UNIT V **11 Hours**

AWS CLOUDFORMATION USE-CASE

Introduction to AWS CloudFormation, AWS CloudFormation Features and Components, Working of AWS CloudFormation, setting up AWS CloudFormation, building a Pipeline for Test and Production Stacks, AWS CloudFormation Artifacts, Parameter Override Functions with Code Pipeline, Using AWS CLI. AWS CloudFormation, Terraform, VMware vs Center Configuration Manager (VCM), and Puppet.

Total: 45 Hours

Reference(s)

1. Bernd Ruecker, Practical Process Automation: Orchestration and Integration in Micro services and Cloud Native Architectures,OReilly Media, First Edition, 2021.
2. Douglas Comer, The Cloud Computing Book: The Future of Computing Explained, Chapman and Hall/CRC, First Edition, 2021.
3. Karen Tovmasyan, Mastering AWS CloudFormation: Plan, develop, and deploy your cloud infrastructure effectively using AWS CloudFormation, Packt Publishing Limited, First Edition, 2020.
4. Mikael Krief, Mitchell Hashimoto, Terraform Cookbook: Efficiently define, launch, and manage Infrastructure as Code across various cloud platforms, Packet Publishing Limited, 2020.
5. Yogesh Raheja, Dennis McCarthy, Automation with Puppet 5.0, Wiley, First Edition, 2018.

21IS011 SOFTWARE DEFINED NETWORKS 2 0 2 3

Course Objectives

- 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.

Course Outcomes (COs)

1. Apply the motivation behind SDN.
2. Analyze the functions of the data plane and control plane.
3. Evaluate and develop network applications using SDN.
4. Execute network services using NFV.
5. Implement various use cases of SDN and NFV.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3	1	3								2	
2	2	1	2	2	3								2	
3	2	2	2	3	3								3	2
4	2	2	2	3	1								2	3
5	3	3	1	1	3								3	3

UNIT I **6 Hours**

SDN: INTRODUCTION

History of Software Defined Networking (SDN)-Modern Data Center-Traditional Switch Architecture-Why SDN-Evolution of SDN-How SDN Works-Centralized and Distributed Control and Date Planes.

UNIT II **6 Hours**

SDN DATA PLANE AND CONTROL PLANE

Data Plane functions and protocols-OpenFLow Protocol-Packet Processing and Performance Optimization-Flow Table - Control Plane Functions-Southbound Interface, Northbound Interface-SDN Controllers-Ryu, OpenDaylight, ONOS-Distributed Controllers.

UNIT III **6 Hours**

SDN APPLICATIONS

SDN Application Plane Architecture-Network Services Abstraction Layer-Traffic Engineering-Measurement and Monitoring-Security-Data Center Networking-Wide Area Networks (WAN)-Service Provider Networks-Internet Service Providers (ISPs).

UNIT IV **6 Hours**

NETWORK FUNCTION VIRTUALIZATION

Network Virtualization-NFV Architecture-Virtual LANs-OpenFlow VLAN Support-NFV Standards and Frameworks-NFV Concepts-Benefits and Requirements-Reference Architecture.

UNIT V **6 Hours**

NFV FUNCTIONALITY

NFV Infrastructure-Virtualized Network Functions-NFV Management and Orchestration-NFV Use Cases: Virtual Customer Premises Equipment, Virtual Evolved Packet Core, Virtualized Network Monitoring and Traffic Analysis, Network Slicing, Edge Computing and NFV.

6 Hours

EXPERIMENT 1

Setup your own virtual SDN lab
i) Virtualbox/Mininet Environment for SDN - http://mininet.org
ii) https://www.kathara.org
iii) GNS3

6 Hours

EXPERIMENT 2

Create a simple mininet topology with SDN controller and use Wireshark to capture and visualize the OpenFlow messages such as OpenFlow FLOW MOD, PACKET IN, PACKET OUT etc.

6 Hours

EXPERIMENT 3

Create a SDN application that uses the Northbound API to program flow table rules on the switch for various use cases like L2 learning switch, Traffic Engineering, Firewall etc.

6 Hours

EXPERIMENT 4

Create a simple end-to-end network service with two VNFs using vim-emu https://github.com/containernet/vim-emu

6 Hours

EXPERIMENT 5

Install OSM and onboard and orchestrate network service.

Total: 30+30=60 Hours

Reference(s)

1. Fei Hu, Network Innovation through OpenFlow and SDN: Principles and Design, 1st Edition, CRC Press, 2014.
2. Ken Gray, Thomas D. Nadeau, Network Function Virtualization, Morgan Kauffman, 2016.
3. Oswald Coker, Siamak Azodolmolky, Software-Defined Networking with OpenFlow, 2nd Edition, OReilly Media, 2017.
4. Paul Goransson, Chuck Black Timothy Culver, Software Defined Networks: A Comprehensive Approach, 2nd Edition, Morgan Kaufmann Press, 2016.
5. Thomas D Nadeau, Ken Gray, SDN: Software Defined Networks, OReilly Media, 2013.
6. William Stallings, Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud, Pearson Education, 1st Edition, 2015.

21IS012 SECURITY AND PRIVACY IN CLOUD 3 0 0 3

Course Objectives

- 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.

Course Outcomes (COs)

1. Understand the cloud security concepts and fundamentals.
2. Explain the security challenges in the cloud.
3. Analyze the cloud policy, identity and Access Management.
4. Delivers various risks, audit and monitoring mechanisms in the cloud.
5. Applying the various architectural and design considerations for security in the cloud.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	1	2								3	-
2	1	3	2	3	1								3	-
3	3	2	2	3	2								3	-
4	2	1	2	3	3								3	-
5	1	3	3	1	1								3	-

UNIT I **8 Hours**

FUNDAMENTALS OF CLOUD SECURITY CONCEPTS

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 II **11 Hours**

SECURITY DESIGN AND ARCHITECTURE FOR CLOUD

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 Redaction, Tokenization, Obfuscation, PKI and Key.

UNIT III **9 Hours**

ACCESS CONTROL AND IDENTITY MANAGEMENT

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.

UNIT IV **8 Hours**

CLOUD SECURITY DESIGN PATTERNS

Introduction to Design Patterns, Cloud Bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud.

UNIT V **9 Hours**

MONITORING, AUDITING AND MANAGEMENT

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 Hours

Reference(s)

1. Dave Shackleford, Virtualization Security, SYBEX a Wiley Brand, 2013.
2. Mark C. Chu-Carroll, Code in the Cloud, CRC Press, 2011.
3. Mather, Kumaraswamy and Latif, Cloud Security and Privacy, Oreilly, 2011.
4. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing Foundations and Applications Programming, 2013.
5. Raj Kumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing, Wiley 2013.

21IS013 CYBER SECURITY 3 0 0 3

Course Objectives

- 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.

Course Outcomes (COs)

1. Understand the basics of cyber security, cybercrime and cyber law.
2. Classify various types of attacks and learn the tools to launch the attacks.
3. Apply various tools to perform information gathering for data security and integrity.
4. Apply intrusion techniques to detect intrusion and to observe network traffic for malicious transactions in the network.
5. Apply intrusion prevention techniques to prevent intrusion and to protect against known and unknown threats.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1	1	1	2								-	
2	1	3	1	3	3								2	
3	2	1	1	1	2								3	
4	3	3	2	2	1								3	
5	3	2	2	2	3								3	

UNIT I **9 Hours**

INTRODUCTION

Cyber Security-History of Internet-Impact of Internet-CIA Triad; Reason for Cyber Crime-Need for Cyber Security-History of Cyber Crime; Cybercriminals-A Global Perspective on Cyber Crimes-Classification of Cybercrimes

UNIT II **9 Hours**

ATTACKS AND COUNTER MEASURES

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 III **9 Hours**

RECONNAISSANCE

Harvester-Who is-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 Fingerprinting Techniques.

UNIT IV **9 Hours**

INTRUSION DETECTION

Host-Based Intrusion Detection-Network-Based Intrusion Detection-Distributed or Hybrid Intrusion Detection-Intrusion Detection Exchange Format-Honeypots-Example System Snort-Cyber Laws-The Indian ITS Act-Cyber Crime and Punishment.

UNIT V **9 Hours**

INTRUSION PREVENTION

Firewalls 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 Hours

Reference(s)

1. David Kim, Michael G. Solomon, Fundamentals of Information Systems Security, Jones & Bartlett Learning Publishers, 2013.
2. Patrick Engebretson, The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy, Elsevier, 2011.
3. Kimberly Graves, CEH Official Certified Ethical hacker Review Guide, Wiley Publishers, 2007.
4. William Stallings, Lawrie Brown, Computer Security Principles and Practice, Third Edition, Pearson Education, 2015.
5. Georgia Weidman, Penetration Testing: A Hands-On Introduction to Hacking, No Starch Press, 2014.

21IS014 MODERN CRYPTOGRAPHY 3 0 0 3

Course Objectives

- To learn about the basics of modern cryptography.
- To focus on how cryptographic algorithms and protocols work and how to use them.
- To build a pseudorandom permutation.
- To construct the basics of cryptanalytic techniques for ensuring data integrity.
- To provide instruction on how to use the concepts of block ciphers and message authentication codes.

Course Outcomes (COs)

1. Interpret the basic principles of cryptography and general cryptanalysis.
2. Determine the concepts of symmetric encryption and authentication.
3. Identify the use of public key encryption, digital signatures, and key establishment.
4. Apply the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.
5. Demonstrate the use of Message Authentication Codes to authenticate information transmitted between the users.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	3	1							2	2	
2	1	3	2	1	2							2	2	
3	1	1	2	3	2							3	1	
4	3	1	2	1	3							2	3	
5	2	3	3	3	3							1	2	

UNIT I **9 Hours**

INTRODUCTION

Basics of Symmetric Key Cryptography, Basics of Asymmetric Key Cryptography, Hardness of Functions. Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser-Micali Encryption. Goldreich-Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations.

UNIT II **9 Hours**

FORMAL NOTIONS OF ATTACKS

Attacks under Message Indistinguishability: Chosen Plaintext Attack (IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), And And Attacks under Message Non-malleability: NM-CPA and NMCCA2, Inter-relations among the attack model

UNIT III **9 Hours**

RANDOM ORACLES

Provable Security and asymmetric cryptography, hash functions. One-way functions: Weak and Strong one-way functions. Pseudo-random Generators (PRG): Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudorandom Functions (PRF).

UNIT IV **9 Hours**

BUILDING A PSEUDORANDOM PERMUTATION

The LubyRackoff Construction: Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction.

UNIT V **9 Hours**

MESSAGE AUTHENTICATION CODES

Left or Right Security (LOR). Formal Definition of Weak and Strong MACs, Using a PRF as a MAC, Variable length MAC. Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing. Assumptions for Public Key Signature Schemes: One-way functions Imply Secure One-time Signatures. Shamir"s Secret Sharing Scheme. Formally Analyzing Cryptographic Protocols. Zero Knowledge Proofs and Protocols.

Total: 45 Hours

Reference(s)

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 7th Edition, 2017.
2. OdedGoldreich, Foundations of Cryptography, CRC Press (Low Priced Edition Available), 2009.
3. Hans Delfs and Helmut Knebl, Introduction to Cryptography: Principles and Applications, Springer Verlag, 2007.
4. Wenbo Mao, Modern Cryptography, Theory and Practice, Pearson Education (Low Priced Edition), 2004.

21IS015 CYBER FORENSICS 3 0 0 3

Course Objectives

- To understand the principles and concepts of computer forensics
- To learn to utilize forensic tools for network-based attacks.
- To identify and apply appropriate methodologies for forensics data.
- To identify and analyze the vulnerabilities in the network.
- To analyze the various hacking techniques and their impacts.

Course Outcomes (COs)

1. To understand the basics of computer forensics, legal and ethical considerations, and the importance of maintaining the integrity of digital evidence.
2. Apply different types of computer forensic tools to preserve the integrity of data in the network.
3. Analyze and validate forensics data from the communicating devices to detect intruders.
4. Apply the various firewall techniques to detect the vulnerabilities in the networks.
5. Implement real-world hacking techniques to test system security and to ensure the system"s safety from hackers.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	3	1	2			2					2	
2	2	2	3	2	3			2					2	
3	2	1	3	2	2			3					2	
4	2	1	2	3	3			3					3	
5	2	2	2	2	3			3					3	

UNIT I **9 Hours**

INTRODUCTION TO COMPUTER FORENSICS

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques- Incident and incident response methodology-Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team.-Forensics Technology and Systems-Understanding Computer Investigation-Data Acquisition.

UNIT II **9 Hours**

EVIDENCE COLLECTION AND FORENSICS TOOLS

Processing Crime and Incident Scenes-Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT III **9 Hours**

ANALYSIS AND VALIDATION

Validating Forensics Data-Data Hiding Techniques-Performing Remote Acquisition-Network Forensics-Email Investigations-Cell Phone and Mobile Devices Forensics.

UNIT IV **9 Hours**

E-MAIL SECURITY

PGP-S/MIME-Internet Firewalls for Trusted System: Roles of Firewalls-Firewall related terminology-Types of Firewalls- Firewall designs-SET for E-Commerce Transactions.

UNIT V **9 Hours**

ETHICAL HACKING IN WEB

Social Engineering-Denial of Service-Session Hijacking-Hacking Web servers-Hacking Web Applications-SQL Injection-Hacking Wireless Networks-Hacking Mobile Platforms.

Total: 45 Hours

Reference(s)

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, Computer Forensics and Investigations, Cengage Learning, India Edition, 2016.
2. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015.
3. MarjieT.Britz, Computer Forensics and Cyber Crime: An Introduction, 3rd Edition, Prentice Hall, 2013.
4. John R. Vacca, Computer Forensics: Computer Crime Scene Investigation, Cengage Learning, 2nd Edition, 2005.
5. Man Young Rhee, Internet Security: Cryptographic Principles, Algorithms and Protocols, Wiley Publications, 2003.

21IS016 ETHICAL HACKING 3 0 0 3

Course Objectives

- To learn about the importance of information security.
- To learn different scanning and enumeration methodologies and tools.
- To understand various hacking techniques and attacks.
- To be exposed to programming languages for security professionals.
- To understand the different phases in penetration testing.

Course Outcomes (COs)

1. Enumerate the numerous assaults carried out during ethical hacking and penetration testing.
2. Apply the hacking techniques and understand the tools to be used for hacking.
3. Understand the various vulnerabilities of Windows and Linux OS.
4. Apply the techniques to hack web servers and tools for it.
5. Determine the characteristics of the firewall, the intruder detection mechanisms, and the malicious software to protect the system.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1	2	2									
2	1	2	2	1	2									
3	1	2	-	2	2									
4	1	2	2	3	3									
5	1	2	1	2	2									

UNIT I **9 Hours**

INTRODUCTION

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 II **9 Hours**

SCANNING AND ENUMERATION

Introduction to Scanning-Objectives-Scanning Methodology-Tools -Introduction to Enumeration-Enumeration Techniques-Enumeration Procedure-Tools.

UNIT III **9 Hours**

SYSTEM HACKING

Introduction-Cracking Passwords-Password Cracking Websites-Password Guessing-Password Cracking Tools-Password Cracking Countermeasures-Escalating Privileges-Executing Applications-Keyloggers and Spyware.

UNIT IV **9 Hours**

PROGRAMMING FOR SECURITY PROFESSIONALS

Programming Fundamentals-C language-HTML-Perl-Windows OS Vulnerabilities-Tools for Identifying Vulnerabilities-Countermeasures-Linux OS Vulnerabilities-Tools for Identifying Vulnerabilities-Countermeasures.

UNIT V **9 Hours**

NETWORK PROTECTION SYSTEMS

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 Hours

Reference(s)

1. EC-Council, Ethical Hacking and Countermeasures: Attack Phases, Cengage Learning, 2010.
2. Jon Erickson, Hacking, 2nd Edition: The Art of Exploitation, No Starch Press Inc., 2008.
3. Michael T. Simpson, Kent Backman, James E. Corley, Hands-On Ethical Hacking and Network Defense, Cengage Learning, 2013.
4. Patrick Engebretson, The Basics of Hacking and Penetration Testing-Ethical Hacking and Penetration Testing Made Easy, Second Edition, Elsevier, 2013.
5. RafayBoloch, Ethical Hacking and Penetration Testing Guide, CRC Press, 2014.

21IS017 CRYPTOCURRENCY AND BLOCK CHAIN TECHNOLOGIES

2 0 2 3

Course Objectives

- To understand the basics of Blockchain Technology.
- To learn Different protocols and consensus algorithms in Blockchain.
- To learn the Blockchain implementation frameworks.
- To experiment the Hyperledger Fabric, Ethereum networks.
- To understand the Blockchain Applications.

Course Outcomes (COs)

1. Understand emerging abstract models for Blockchain Technology.
2. Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.
3. Develop conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
4. Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application.
5. Analyze the real life applications of Blockchain Technologies.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	2	2	1								1	
2	3	3	3	1	2								2	
3	2	2	1	1										
4		2	2		3								2	
5	1	2	3	1	2								1	

UNIT I **7 Hours**

INTRODUCTION TO BLOCKCHAIN

Blockchain- Public Ledgers, Blockchain as Public Ledgers-Block in a Blockchain, Transactions-The Chain and the Longest Chain-Permissioned Model of Blockchain, Cryptographic-Hash Function, Properties of a hash function-Hash pointer and Merkle tree.

UNIT II **6 Hours**

BITCOIN AND CRYPTOCURRENCY

A basic crypto currency, Creation of coins, Payments and double spending, FORTH-the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.

UNIT III **6 Hours**

BITCOIN CONSENSUS

Bitcoin Consensus, Proof of Work (PoW)-Hashcash PoW , Bitcoin PoW, Attacks on PoW, monopoly problem- Proof of Stake- Proof of Burn-Proof of Elapsed Time-Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT IV **5 Hours**

HYPERLEDGER FABRIC

Architecture of Hyperledger fabric v1.1-chain code-Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT V **6 Hours**

BLOCKCHAIN APPLICATIONS

Smart contracts, Truffle Design and issue-DApps-NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance-Case Study.

5 Hours

EXPERIMENT 1

Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on cloud to run.

5 Hours

EXPERIMENT 2

Create and deploy a blockchain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chain code, and perform invoke and query on your blockchain network.

5 Hours

EXPERIMENT 3

Interact with a blockchain network. Execute transactions and requests against a blockchain network by creating an app to test the network and its rules.

5 Hours

EXPERIMENT 4

Deploy an asset-transfer app using blockchain. Learn app development within a Hyperledger Fabric network.

5 Hours

EXPERIMENT 5

Use blockchain to track fitness club rewards. Build a web app that uses Hyperledger Fabric to track and trace member rewards.

5 Hours

EXPERIMENT 6

Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Blockchain Starter Plan. Use Hyperledger Fabric to invoke chain code while storing results and data in the starter plan.

Total:30+30=60 Hours

Reference(s)

1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
2. Andreas Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, OReilly, 2014.
3. Daniel Drescher, Blockchain Basics, First Edition, Apress, 2017.

4. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
5. Melanie Swan, Blockchain: Blueprint for a New Economy, OReilly, 2015.
6. Ritesh Modi, Solidity Programming Essentials: A Beginners Guide to Build Smart Contracts for Ethereum and Blockchain, Packt Publishing.

21IS018 MALWARE ANALYSIS 3 0 0 3

Course Objectives

- Understand the fundamentals of malware, types and its effects.
- Identify and analyze various malware types by static and dynamic analysis.
- To deal with detection, analysis, understanding, controlling, and eradication of malware.

Course Outcomes (COs)

1. Understand the various concepts of malware analysis and their technologies used.
2. Possess the skills necessary to carry out independent analysis of modern malware samples using both static and dynamic analysis techniques.
3. Understand the methods and techniques used by professional malware analysts.
4. To be able to safely analyze, debug, and disassemble any malicious software by malware analysis.
5. Understand the concept of Android malware analysis their architecture, and App development.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	2	2	2								2	
2	3	3	2	2	2								2	
3	3	3	3	3	3								3	
4	3	3	3	3	3								3	
5	3	3	3	3	3								3	

UNIT I **9 Hours**

INTRODUCTION AND BASIC ANALYSIS

Introduction to Malware-Malware threats-Malware types: Viruses, Worms, Rootkits, Trojans, Bots, Spyware, Adware, Logic Bombs-Goals of Malware Analysis-AV Scanning-Hashing-Finding Strings Packing and Obfuscation-PE file format-Static -Linked Libraries and Functions-Static Analysis tools Virtual Machines and their usage in Malware analysis-Sandboxing-Basic dynamic analysis-Malware execution-Process Monitoring-Viewing processes-Registry snapshots.

UNIT II **10 Hours**

ADVANCED STATIC ANALYSIS

The Stack-Conditionals-Branching-Rep Instructions-Disassembly -Global and local variables-Arithmetic operations-Loops-Function Call Conventions-C Main Method and Offsets. Portable Executable File Format-The PE File Headers and Sections-IDA Pro-Function analysis-Graphing-The Structure of a Virtual Machine-Analyzing Windows programs-Anti-static analysis techniques-obfuscation-packing-metamorphism-polymorphism.

UNIT III **10 Hours**

ADVANCED DYNAMIC ANALYSIS

Live malware analysis-dead malware analysis-analyzing traces of malware-system calls-api calls-registries-network activities. Anti-dynamic analysis techniques-VM detection techniques-Evasion techniques-Malware Sandbox-Monitoring with Process Monitor-Packet Sniffing with Wireshark-Kernel vs. User-Mode Debugging-OllyDbg-Breakpoints-Tracing - Exception Handling-Patching.

UNIT IV **8 Hours**

MALWARE FUNCTIONALITY

Downloaders and Launchers-Backdoors-Credential Stealers-Persistence Mechanisms-Handles-Mutexes-Privilege Escalation-Covert malware launching-Launchers-Process Injection-Process Replacement-Hook Injection-Detours-APC injection.

UNIT V **8 Hours**

ANDROID MALWARE ANALYSIS

Android Malware Analysis: Android architecture-App development cycle-APKTool-APKInspector-Dex2Jar-JD-GUI-Static and Dynamic Analysis-Case Study: Smartphone (Apps) Security.

Total: 45 Hours

Reference(s)

1. Michael Sikorski and Andrew Honig, Practical Malware Analysis by No Starch Press, 2012, ISBN: 9781593272906
2. Bill Blunden, The Rootkit Arsenal: Escape and Evasion in the Dark Corners of the System, Second Edition, Jones & Bartlett Publishers, 2009.
3. Jamie Butler and Greg Hoglund, Rootkits: Subverting the Windows Kernel by 2005, Addison-Wesley Professional.
4. Bruce Dang, Alexandre Gazet, Elias Bachaalany, SebastienJosse, Practical Reverse Engineering:x86,x64,ARM, Windows Kernel, Reversing Tools, and Obfuscation, 2014.
5. Victor Marak, Windows Malware Analysis Essentials Packt Publishing, OReilly, 2015.
6. Ken Dunham, Shane Hartman, Manu Quintans, Jose Andre Morales, Tim Strazzere, Android Malware and Analysis, CRC Press, Taylor and Francis Group, 2015.

21IS019 AGILE SOFTWARE DEVELOPMENT 3 0 0 3

Course Objectives

- To provide students with a theoretical as well as practical understanding of agile software development practices.
- To understand the Agile Scrum framework and development practices.
- To apply software design principles and refactoring techniques to achieve agility.
- To understand Agile requirements and perform testing activities within an agile project.
- To understand the benefits and pitfalls of working in an Agile team in terms of quality assurance.

Course Outcomes (COs)

1. Understand genesis of Agile and driving forces for choosing Agile techniques.
2. Apply the Agile Scrum framework and development practices.
3. Apply iterative software development processes by planning and executing them.
4. Analyze the impact of the success of social aspects behind the software testing.
5. Analyze techniques and tools for improving team collaboration and management.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2									2		
2	2	2	2											
3	1		2		2							2		
4	1		2		2							2	-	
5	1		2		2							2	-	

UNIT I **9 Hours**

AGILE METHODOLOGY

Theories for Agile management-agile software development-traditional model vs. agile model-classification of agile methods -agile manifesto and principles-agile project management-agile team interactions-ethics in agile teams-agility in design, testing-agile documentations-agile drivers, capabilities and values.

UNIT II **9 Hours**

AGILE PROCESSES

Extreme Programming: Method overview-lifecycle-work products, roles and practices-Lean production-SCRUM, Crystal, Feature Driven Development, Adaptive Software Development, Kanban model.

UNIT III **9 Hours**

AGILITY AND KNOWLEDGE MANAGEMENT

Agile information systems-agile decision making-Earl ACEs schools of KM-institutional knowledge evolution cycle-development, acquisition, refinement, distribution, deployment, leveraging-KM in software engineering-managing software knowledge-challenges of migrating to agile methodologies-agile knowledge sharing-role of story-cards-Story-card Maturity Model(SMM).

UNIT IV **9 Hours**

AGILITY AND REQUIREMENTS ENGINEERING

Impact of agile processes in RE-current agile practices-variance-overview of RE using agile-managing unstable requirements-requirements elicitation-agile requirements abstraction model-requirements management in agile environment, agile requirements prioritization-agile requirements modeling and generation-concurrency in agile requirements generation.

UNIT V **9 Hours**

AGILITY AND QUALITY ASSURANCE

Agile Interaction Design-Agile product development-Agile Metrics-Feature Driven Development (FDD)-Financial and Production Metrics in FDD-Agile approach to Quality Assurance-Test Driven Development-Pair programming: Issues and Challenges-Agile approach to Global Software Development.

Total: 45 Hours

Reference(s)

1. Dingsoyr, Torgeir, Dyba, Tore, Moe, Nils Brede (Eds.), Agile Software Development,Current Research and Future Directions, Springer Verlag Berlin Heidelberg, 2010.
2. David J. Anderson; Eli Schragenheim,Agile Management for Software Engineering:Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
3. Hazza and Dubinsky, Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, VIII edition, 2009.
4. Craig Larman, Agile and Iterative Development: A managers Guide, Addison-Wesley,2004.
5. Kevin C. Desouza, Agile information systems: conceptualization, construction, and management, Butterworth-Heinemann, 2007.

21IS020 UI AND UX DESIGN 3 0 0 3

Course Objectives

- Study about designing web pages and understand the difference between UI and UX Design.
- To understand the concept of UX design and how it has evolved.
- Able o to understand UX design process and methodology.
- Learning the Importance and scope of Interaction design, User centered design.

Course Outcomes (COs)

1. Understand to do user research, persona mapping, customer journey mapping.
2. Design of interactive products Methods of interaction design Tools for interaction design.
3. Design wireframes on paper and translate paper concepts into digital wireframes.
4. Apply and practice the techniques involved in designing digital wireframes using various UI elements.
5. Implement the process of conducting usability tests Learning steps for digital products.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	1	2	2		1									
3		3	3		1									
4		2	2											
5		2	2											

UNIT I **9 Hours**

USER-CENTERED DESIGN PROCESS

Scripting Languages-HTML, CSS-Fundamentals of graphics design, principles of visual design-Overview of UI and UX Design-Overview of the UX Design Process-Difference between User Interface (UI) vs User Experience (UX)-Defining problem and vision statement-Persona creation-Primary and Secondary persona-Requirement definition-Creative ideation-brainstorming and ideation techniques-Scenarios and functionality extraction-Information Architecture-Task flows-Wireframe design.

UNIT II **9 Hours**

FUNDAMENTALS OF UI, HEURISTICS, AND INTERACTION DESIGN

Design Principles for UX and UI Design-UI Elements-Patterns- Material Design (Google) and Human Interface Design (Apple) guidelines-Interaction Principles and Interaction Behaviour-Master the Brand Platforms and Style Guides-comments and current UI patterns-Understand problems and design solutions for e-commerce, social media, message, data, and dashboard design

UNIT III **9 Hours**

ELEMENTARY SKETCHING

Principles of Sketching-Core Responsive Design-Wireframing vs Wireflows-Click through Wireframing Prototyping-Wireflow Creation-Work with different tools-Figma-Low-High Fidelity Design: Inclusive Design and Designing for Accessibility-Building High-Fidelity Mockups-Designing Efficiently with Tools-Interaction Patterns-Designing animations and interactions.

UNIT IV **9 Hours**

UNDERSTAND STYLE GUIDES, ELEMENTS, PROTOTYPING

Building a Design System-Style guides, color palette, fonts, grid, iconography, UI elements,photography or imagery, and illustration-Use of grids in UI design-Design animations and interaction patterns for key UI elements.

UNIT V **9 Hours**

USABILITY EVALUATION AND PRODUCT DESIGN

Type of usability evaluation-Qualitative & Quantitative evaluation-Guerilla testing , A/B Testing, Unmoderated remote usability testing, Card sorting, Session recording, think aloud-Think aloud-Introduction and advantages- Designing evaluation protocol-Conducting usability evaluation study-Conduct Usability Test explicit-Synthesize Test Findings- practices in corporate World-Product Design : Types of products & solutions-Design Psychology for e-commerce sites , CMS-Design Thinking Life Cycle.

Total: 45 Hours

Reference(s)

1. Norman, Donald A. The Design of Everyday Things. Basic Books, 2002.
2. Wilbent. O. Galitz ,The Essential Guide To User Interface Design, John Wiley&Sons, 2001.
3. Alan Cooper,The Essential Of User Interface Design, Wiley Dream Tech Ltd.,2002.
4. Baecker, Ronald M., Jonathan Grudin, et al. Readings in Human-Computer Interaction: Toward the Year 2000.
5. Shneiderman, Ben, and Catherine Plaisant. Designing the User Interface: Strategies for Effective Human-Computer Interaction. 4th ed. Addison Wesley, 2004.

21IS021 WEB FRAMEWORKS 3 0 0 3

Course Objectives

- Understand the architecture behind an Angular application and how to use it.
- To understand the significance of using MongoDB as a database system.
- To understand the role of React in designing front-end components.
- Build a Web Server in Node and understand how it really works.
- Develop a web application and API using web frameworks.

Course Outcomes (COs)

1. Apply modules and components and Animations for creating Forms and developing web pages.
2. Create web applications by performing CRUD operations in database using web frameworks.
3. Design Progressive Web Application with dynamic HTML web pages using Angular.
4. Designing single page applications with reusable UI components using React CSS and SaaS.
5. Use Node Package Manager and Node packages for Server Side programming.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2		2				2	2				
2	1		1		3				2	2				
3	1		2		2				2	2				
4	1		1		3				2	2				
5	1		1		3				1	1				

UNIT I **9 Hours**

ANGULAR FRONT-END FRAMEWORK

Introduction-Setup-Architecture: Modules, Components, Services and DI fundamentals-Components and Templates-Configuration-Forms-Observables and RxJS-Boot Strapping-Ng Modules-Dependency Injection-Http Client-Routing and Navigation-Animations.

UNIT II **9 Hours**

FRAMEWORKS WITH DATABASES

MongoDB-MongoDB Basics-Documents-Collections-Query Language-Installation-The mongo Shell-Schema Initialization-MongoDB Node.js Driver-Reading from MongoDB-Writing to MongoDB-CRUD operations-projections-Indexing-Aggregation-Replication-Sharding-Creating backup-Deployment.

UNIT III **9 Hours**

ANGULAR TECHNIQUES

Service workers & PWA-Server side rendering-Angular Libraries- Schematics-CLI Builders-Angular Ivy-Web Workers.

UNIT IV **9 Hours**

REACT

React Introduction-React ES6-React Render HTML-React JSX-Components-React Classes-Composing Components-Passing Data-Dynamic Composition-React state-setting State-Async State

Initialization-Event Handling Communicating from Child to Parent-Stateless Components-Designing components-React Forms- React CSS-React SaaS.

UNIT V **9 Hours**

NODE JS BACK-END FRAMEWORK

Node.js basics-Local and Export Modules-Node Package Manager- Node.js web server-Node.js File system-Node Inspector-Node.js EventEmitter-Frameworks for Node.js-Express.js Web App-Serving static Resource-Node.js Data Access.

Total: 45 Hours

Reference(s)

1. Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, A Press Publisher, 2019.
2. Christoffer Noring, Pablo Deeleman,Learning Angular, Packt Publishing Limited, 2nd Revised edition edition, 2017.
3. Caleb Dayley Brad Dayley,Brendan Dayley ,Node.js, MongoDB and Angular Web Development, 2nd Edition,Pearson, 2018.
4. Shyam Seshadri, Angular: Up and Running- Learning Angular, Step by Step , OReilly; First edition, 2018.

21IS022 APP DEVELOPMENT 2 0 2 3

Course Objectives

- To facilitate students to understand android SDK.
- To help students to gain a basic understanding of Android application development.
- To inculcate working knowledge of Android Studio development tool.

Course Outcomes (COs)

1. Identify fundamental concepts of mobile programming that make it unique from programming for other platforms.
2. Analyze the essential of Android Application with their anatomy and terminologies.
3. Apply rapid prototyping techniques to design, develop and deploy the Android Applications.
4. Analyze the essentials of User Interface Design in IoS with SqLite Database.
5. Design the flutter applications on the Android marketplace for distribution.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
1	2		1		3									
2	1	2	2		3									
3	1		2		3									
4	1	1	2		3								2	
5	1	2	2		3									

UNIT I **6 Hours**

INTRODUCTION TO ANDROID

The Android Platform, Android SDK, Eclipse Installation, Android Installation, building your First Android application, Understanding the Android Manifest file.

UNIT II **6 Hours**

ANDROID APPLICATION DESIGN ESSENTIALS

Anatomy of Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Using Intent Filter, Permissions.

UNIT III **6 Hours**

COMMON ANDROID APIS

Testing Android applications, Publishing Android applications, Using Android Data and Storage APIs, managing data using Sqlite, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Applications to the World.

UNIT IV **6 Hours**

IOS USER INTERFACE DESIGN ESSENTIALS

Ios features, UI implementation, Touch frameworks, Data persistence using Core Data and SQLite,Integrating calendar and address book with social media application, Using Wifi, iPhone marketplace.

UNIT V **6 Hours**

APP DEVELOPMENT WITH FLUTTER

Flutter Introduction, Create First Flutter Application, Exploring commonly used flutter widgets: Container, Margin, Padding and Box Constraints, Custom Fonts, Column and Expanded Widgets, Image Asset, Raised Button, and Alert Dialog .

3 Hours

EXPERIMENT 1

Develop a new Android application for Android Text to Speech converter.

2 Hours

EXPERIMENT 2

Create an application to design a Visiting Card for the travel agency using a Business card template

10 Hours

EXPERIMENT 3

Develop a program for dynamic wallpaper on a PC

5 Hours

EXPERIMENT 4

Implement the program for medicine schedule tracker in SQLite Database

EXPERIMENT 5

Develop a mobile app for making phone calls using android intent.

5 Hours

EXPERIMENT 6

Design a simple webpage for an institution with the basic properties of
Flutter app bar.

Total: 30+30 = 60 Hours

Reference(s)

1. Lauren Darcey and Shane Conder, Android Wireless Application Development, Pearson Education, 2nd ed. (2011)
2. Reto Meier, Professional Android 2 Application Development, Wiley India Pvt Ltd.
3. Mark L Murphy, Beginning Android, Wiley India Pvt Ltd.
4. Android Application Development All in one for Dummies by Barry Burd.
5. Alberto Miola, Flutter Complete Reference: Create beautiful, fast and native apps for any device.
6. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, Beginning iOS Development: Exploring the iOS SDK, Apress, 2013.

21IS023 SOFTWARE TESTING AND AUTOMATION 3 0 0 3

Course Objectives

- Understand the importance of software testing in the software development process.
- Analyze different testing methodologies and techniques to create test plans, test cases, and test scripts.
- Apply automation testing tools and frameworks to design and implement automated test suites.

Course Outcomes (COs)

1. Understand the importance of testing in the software development process.
2. Compare the different test case design strategies.
3. Analyze the different levels of testing and their importance.
4. Apply test management techniques and the role of a test specialist.
5. Analyze the software test automation and its requirements.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
1	3	2	1		1									
2	2	3	2		2									
3	2	2	2		2									
4	2	3	2		3									
5	3	2	1		3									

UNIT I **9 Hours**

INTRODUCTION

Basic definitions-Software Testing Principles-The Testers Role in a Software Development Organization-Origins of Defects-Cost of Defects-Defect Classes-The Defect Repository and Test Design-Defect Examples-Developer or Tester Support of Developing a Defect Repository.

UNIT II **9 Hours**

TEST CASE DESIGN STRATEGIES

Test Scenarios-Test Cases-Test case Design Strategies-Black Box Approach to Test Case Design-Using White Box Approach to Test design-Test Adequacy Criteria-Static testing vs. Structural testing-Code functional testing-Coverage and Control Flow Graphs-Covering Code Logic-Paths-Code complexity testing-Additional White box testing approaches-Test Coverage.

UNIT III **9 Hours**

LEVELS OF TESTING

Types of testing-manual and automation-Introduction to testing methods-White-box, Black-box and Grey-box-Functional testing-Non-functional testing-Introduction to levels of testing-Unit Testing, Integration Testing, System Testing, User Acceptance Testing - Introduction to types of testing-Regression Testing, Smoke Testing, Database Testing, Usability Testing, Load Testing, Stress Testing, Performance Testing, Compatibility Testing, Security Testing, Internationalization Testing, Localization Testing.

UNIT IV **9 Hours**

TEST MANAGEMENT

People and organizational issues in testing-Organization structures for testing teams-testing services-Test Planning-Test Plan Components-Test Plan Attachments-Locating Test Items-test management-test process-Reporting Test Results-Introducing the test specialist-Skills needed by a test specialist-Building a Testing Group-The Structure of Testing Group-The Technical Training Program.

UNIT V **9 Hours**

TEST AUTOMATION

Software test automation-Design and Architecture for Automation-Automation testing-Automation Tools-Selenium Web Driver-Create Selenese Commands-TestNG-TestNG Annotations-Jmeter-Assertions in JMeter-Junit.

Total: 45 Hours

Reference(s)

1. Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing Principles and Practices, Pearson Education, 2006.
2. Ilene Burnstein, Practical Software Testing, Springer International Edition, 2003.
3. Edward Kit,Software Testing in the Real World Improving the Process, Pearson Education, 1995.
4. Boris Beizer,Software Testing Techniques 2nd Edition, Van Nostrand Reinhold, New York, 1990.
5. Aditya P. Mathur, Foundations of Software Testing Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

21IS024 DEVOPS **3 0 0 3**

Course Objectives

- 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.

Course Outcomes (COs)

1. Understand different actions performed through Version control tools like Git.
2. Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
3. Ability to Perform Automated Continuous Deployment.
4. Ability to do configuration management using Ansible.
5. Understand how to leverage Cloud-based DevOps tools using Azure DevOps.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1	2	2									
2	3	3	3	3	2									
3	2	2	2	3	2									
4	2	2	2	2	2									
5	2	2	2	2	2									

UNIT I **7 Hours**

INTRODUCTION TO DEVOPS

Devops Essentials-Introduction to AWS, GCP, Azure-Version control systems: Git and GitHub.

UNIT II **10 Hours**

COMPILE AND BUILD USING MAVEN

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 Artifacts-Dependency Management-Installation of Gradle- understanding build using Gradle.

UNIT III **12 Hours**

CONTINUOUS INTEGRATION USING JENKINS

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 IV **9 Hours**

CONFIGURATION MANAGEMENT USING ANSIBLE

Ansible Introduction-Installation-Ansible master or slave configuration-YAML basics-Ansible Modules-Ansible Inventory files- Ansible playbooks-Ansible Roles-and ad-hoc commands in Ansible.

UNIT V **7 Hours**

BUILDING DEVOPS PIPELINES USING AZURE

Create GitHub Account, Create Repository-Create Azure Organization-Create a new pipeline-Build a sample code-Modify azure-pipelines-yaml file.

Total: 45 Hours

Reference(s)

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
3. 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 by Mitesh Soni.
4. Jeff Geerling, Ansible for DevOps: Server and configuration management for humans, First Edition, 2015.
5. David Johnson, Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps, Second Edition, 2016.
6. Mariot Tsitoara, Ansible, Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer, Second Edition, 2019.

21IS025 EXPLORATORY DATA ANALYSIS 2 0 2 3

Course Objectives

- To outline an overview of exploratory data analysis.
- To implement data cleaning and preparation techniques.
- To perform descriptive statistics and data visualization techniques to present insights from the data.
- To apply univariate, bivariate, multivariate, correlation, and time series data exploration and analysis techniques
- To use dimensionality reduction techniques for simplifying complex datasets and visualize high- dimensional data.

Course Outcomes (COs)

1. Understand the fundamentals of exploratory data analysis.
2. Implement the data cleaning and preparation techniques.
3. Apply advanced data visualization techniques to explore complex relationships and patterns in the data.
4. Analyze and interpret relationships between variables using EDA analysis techniques to gain insights into complex data patterns.
5. Apply dimensionality reduction techniques, such as Principal Component Analysis (PCA), to simplify complex datasets and extract essential features.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	3	3	3								2	
2	2	2	2	3	3								3	
3	2	3	2	2	3								3	3
4	2	2	2	2	3								3	3
5	2	2	3	2	1								3	3

UNIT I **6 Hours**

EXPLORATORY DATA ANALYSIS

Overview of Exploratory Data Analysis-importance of EDA-data analysis process: data collection, data cleaning, and data exploration-Introduction to common data types and formats- Introduction to Python-data analysis libraries.

UNIT II **6 Hours**

DATA CLEANING AND PREPARATION

Introduction to data quality issues and common data cleaning techniques-Handling missing data and outliers-Data transformation techniques-Feature engineering and variable creation.

UNIT III **6 Hours**

DESCRIPTIVE STATISTICS AND DATA VISUALIZATION

Descriptive statistics: measures of central tendency, dispersion, and shape-Data visualization principles and best practices-Exploratory data visualization using Matplotlib and Seaborn

UNIT IV **6 Hours**

EXPLORATORY DATA ANALYSIS TECHNIQUES

Univariate analysis: exploring single variables-Bivariate analysis: exploring relationships between variables- Multivariate analysis: analyzing relationships among multiple variables-Exploring time series data.

UNIT V **6 Hours**

DIMENSIONALITY REDUCTION TECHNIQUES

Introduction to dimensionality reduction-Principal Component Analysis (PCA) and its applications-Distributed Stochastic Neighbor Embedding (t-SNE) for visualization

5 Hours

EXPERIMENT 1

Explore the Titanic dataset using descriptive statistics and data visualization.

1. Load the Titanic dataset.
2. Calculate the descriptive statistics for each variable.
3. Create a variety of data visualizations to explore the relationships between variables.
4. Interpret the results of the descriptive statistics and data visualizations.

5 Hours

EXPERIMENT 2

Clean and prepare the California housing dataset for analysis.

1. Identify and handle missing data.
2. Identify and remove outliers.
3. Convert categorical variables to numerical variables.
4. Explore the distribution of the data after cleaning and preparing it.

5 Hours

EXPERIMENT 3

Perform univariate analysis on the Iris dataset.

1. Calculate the descriptive statistics for each variable.
2. Create a variety of data visualizations to explore the distribution of each variable.
3. Interpret the results of the descriptive statistics and data visualizations.

5 Hours

EXPERIMENT 4

Perform bivariate analysis on the Boston housing dataset.

1. Explore the relationship between housing prices and different features of the houses, such as the number of rooms, the lot size, and the crime rate.
2. Use data visualization to explore the relationships between variables.
3. Interpret the results of the bivariate analysis.

5 Hours

EXPERIMENT 5

Perform multivariate analysis on the Wine dataset.

1. Explore the relationships between different features of the wine, such as the color, the acidity, and the
alcohol content.
2. Use data visualization to explore the relationships between variables.
3. Interpret the results of the multivariate analysis.

5 Hours

EXPERIMENT 6

Apply dimensionality reduction techniques to the MNIST dataset.

1. Use PCA to reduce the dimensionality of the dataset from 784 dimensions to 2 dimensions.
2. Visualize the reduced data using a scatter plot.
3. Interpret the results of the dimensionality reduction.

Total: 30+30=60 Hours

Reference(s)

1. Provost, Foster, and Tom Fawcett. Data Science for Business: What you need to know about data mining and data-analytic thinking , O""Reilly Media, Inc., 2013. (Unit 1)
2. McKinney, Wes. Python for Data Analysis. O""""Reilly Media, Inc., 2022. (Unit 1, 3, 5)
3. Knaflic, Cole Nussbaumer. Storytelling with data: A data visualization guide for business professionals. John Wiley & Sons, 2015. (Unit 2)
4. Kazil, Jacqueline, and Katharine Jarmul. Data wrangling with python: tips and tools to make your life easier. O""Reilly Media, Inc., 2016. (Unit 3)
5. Wickham, Hadley, and Garrett Grolemund. R for data science: import, tidy, transform, visualize,and model data. O""Reilly Media, Inc., 2016. (Unit 4, 5)
6. Matthew O. Ward, Georges Grinstein, Daniel Keim, Interactive Data Visualization: Foundations, Techniques, and Applications, 2nd Edition, CRC press, 2015.

21IS026 RECOMMENDER STSYEMS 3 0 0 3

Course Objectives

- To understand the foundations of the recommender system.
- To learn the significance of machine learning and data mining algorithms for Recommender systems
- To learn about collaborative filtering
- To make students design and implement a recommender system.
- To learn collaborative filtering.

Course Outcomes (COs)

1. Understand the basic concepts of recommender systems.
2. Implement machine-learning and data-mining algorithms in recommender systems data sets.
3. Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.
4. Implement a simple recommender system.
5. Learn about Evaluating Paradigms of recommender systems and its applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	2	1								-	
2	1	2	1	1	1								2	3
3	2	3	1	1	1								2	3
4	3	2	2	2	1								2	3
5	2	2	1	2	1								3	

UNIT I **9 Hours**

INTRODUCTION

Introduction and basic taxonomy of recommender systems- Traditional and non-personalized-Recommender Systems-Overview of data mining methods for recommender systems-similarity measures-Dimensionality reduction-Singular Value Decomposition (SVD)

UNIT II **9 Hours**

CONTENT-BASED RECOMMENDATION SYSTEMS

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

UNIT III **9 Hours**

COLLABORATIVE FILTERING

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection

UNIT IV **9 Hours**

ATTACK-RESISTANT RECOMMENDER SYSTEMS

Introduction-Types of Attacks-Detecting attacks on recommender systems-Individual attack-Group attack-Strategies for robust recommender design-Robust recommendation algorithms.

UNIT V **9 Hours**

EVALUATING RECOMMENDER SYSTEMS

Evaluating Paradigms-User Studies-Online and Offline evaluation-Goals of evaluation design-Design Issues-Accuracy metrics-Limitations of Evaluation measures

Total: 45 Hours

Reference(s)

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
3. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Systems Handbook, 1st ed,Springer (2011)
4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.

21IS027 BIG DATA ANALYTICS 3 0 0 3

Course Objectives

- Acquire a deep understanding of big data and NoSQL.
- Develop expertise in mapreduce analytics using Hadoop and related tools
- Explore the Hadoop related tools for Big Data Analytics.

Course Outcomes (COs)

1. Understand the big data and use cases from selected business domains.
2. Understand NoSQL big data management.
3. Utilize map reduce analytics and related tools.
4. Understand the basics of Hadoop.
5. Apply the usage of Hadoop related tools for Big Data Analytics.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
1	2	1	1		1								3	
2	2	2	3		3								3	
3	1	3	3		3								3	2
4	2	2	2		3								2	
5	2	2	1		3								2	3

UNIT I **9 Hours**

UNDERSTANDING BIG DATA

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 II **9 Hours**

NOSQL DATA MANAGEMENT

Introduction to NoSQL-Aggregate data models-Key-value and document data models-Relationships-Graph databases-Schema less databases-Materialized views-Distribution models-Master-slave replication-Consistency-Cassandra-Cassandra data model-Cassandra examples-Cassandra clients

UNIT III **9 Hours**

MAP REDUCE APPLICATIONS

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 IV **9 Hours**

BASICS OF HADOOP

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 V **9 Hours**

HADOOP RELATED TOOLS

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 Hours

Reference(s)

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
4. E. Capriolo, D. Wampler, and J. Rutherglen, Programming Hive, O""Reilley, 2012.
5. Lars George, HBase: The Definitive Guide, O""Reilley, 2011.
6. Eben Hewitt, Cassandra: The Definitive Guide, O""Reilley, 2010.

21IS028 NEURAL NETWORKS AND DEEP LEARNING

2 0 2 3

Course Objectives

- To understand the major concepts in deep neural networks.
- To apply Convolutional Neural Network architectures for any real-life applications
- To analyze the key computations underlying deep learning to build and train deep neural networks for various tasks.

Course Outcomes (COs)

1. Apply Convolution Neural Network for any suitable applications.
2. Analyze the various categories of associative memory and unsupervised learning networks.
3. Apply Convolutional Neural Networks and its variants for any suitable applications.
4. Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.
5. Apply autoencoders and generative models for suitable applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1		1									-
2	2	2	2		3									-
3	1	3	3		3									-
4	2	2	2		3									-
5	2	2	1		3									-

UNIT I **6 Hours**

UNDERSTANDING NEURAL NETWORKS

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction Evolution of Neural Networks-Basic Models of Artificial Neural Network-Important Terminologies of ANNs-Supervised Learning Network.

UNIT II **6 Hours**

ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS

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 III **6 Hours**

THIRD-GENERATION NEURAL NETWORKS

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 IV **6 Hours**

DEEP FEEDFORWARD NETWORKS

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 V **6 Hours**

RECURRENT NEURAL NETWORKS

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.

3 Hours

EXPERIMENT 1

Implement simple vector addition in TensorFlow.

3 Hours

EXPERIMENT 2

Implement a regression model in Keras.

3 Hours

EXPERIMENT 3

Implement a perceptron in TensorFlow/Keras Environment.

3 Hours

EXPERIMENT 4

Implement a Feed-Forward Network in TensorFlow/Keras.

3 Hours

EXPERIMENT 5

Implement an Image Classifier using CNN in TensorFlow/Keras.

3 Hours

EXPERIMENT 6

Improve the Deep learning model by fine tuning hyperparameters.

3 Hours

EXPERIMENT 7

Implement a Transfer Learning concept in Image Classification.

3 Hours

EXPERIMENT 8

Using a pre trained model on Keras for Transfer Learning

3 Hours

EXPERIMENT 9

Perform Sentiment Analysis using RNN

3 Hours

EXPERIMENT 10

Implement an LSTM based Autoencoder in TensorFlow/Keras.

Total: 30+30=60 Hours

Reference(s)

1. S Rajasekaran, G A Vijayalakshmi Pai, Neural Networks, FuzzyLogic and Genetic Algorithm,Synthesis and applications, PHI Learning, 2017
2. Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook, Springer International Publishing, 1st Edition, 2018.
3. James A Freeman, David M S Kapura,Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
5. Francois Chollet, Deep Learning with Python, Second Edition, Manning Publications, 2021.
6. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020

21IS029 NATURAL LANGUAGE PROCESSING 3 0 0 3

Course Objectives

- To understand basics of linguistics, probability and statistics
- To study statistical approaches to NLP and understand sequence labeling
- To outline different parsing techniques associated with NLP
- To explore semantics of words and semantic role labeling of sentences
- To understand discourse analysis, question answering and chatbots

Course Outcomes (COs)

1. Understand basics of linguistics, probability and statistics associated with NLP
2. Implement a Part-of-Speech Tagger
3. Design and implement a sequence labeling problem for a given domain
4. Implement semantic processing tasks and simple document indexing and searching system using the concepts of NLP
5. Implement a simple chatbot using dialogue system concepts

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1		1								2	
2	2	2	3		3								2	2
3	1	3	3		3								2	3
4	2	2	2		3								2	3
5	2	2	1		3								2	3

UNIT I **9 Hours**

INTRODUCTION

Natural Language Processing-Components-Basics of Linguistics and Probability and Statistics-Words-Tokenization-Morphology-Finite State Automata.

UNIT II **9 Hours**

STATISTICAL NLP AND SEQUENCE LABELING

N-grams and Language models-Smoothing-Text classification- Bayes classifier-Evaluation-Vector Semantics-TF-IDF-Word2Vec-Evaluating Vector Models-Sequence Labeling-Part of Speech-Part of Speech Tagging-Named Entities-Named Entity Tagging.

UNIT III **9 Hours**

CONTEXTUAL EMBEDDING

Constituency-Context Free Grammar-Lexicalized Grammars-CKY Parsing-Earley"s algorithm Evaluating Parsers-Partial Parsing- Dependency Relations-Dependency Parsing-Transition Based-Graph Based.

UNIT IV **9 Hours**

COMPUTATIONAL SEMANTICS

Word Senses and WordNet-Word Sense Disambiguation-Semantic Role Labeling-Proposition Bank-FrameNet-Selectional Restrictions-Information Extraction-Template Filling.

UNIT V **9 Hours**

DISCOURSE ANALYSIS AND SPEECH PROCESSING

Discourse Coherence-Discourse Structure Parsing-Centering and Entity Based Coherence-Question Answering-Factoid Question Answering-Classical QA Models-Chatbots and Dialogue systems-Frame based Dialogue Systems-Dialogue State Architecture.

Total: 45 Hours

Reference(s)

1. Daniel Jurafsky and James H.Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition (Prentice Hall Series in Artificial Intelligence), 2020.
2. Jacob Eisenstein. Natural Language Processing, MIT Press, 2019.
3. Samuel Burns Natural Language Processing: A Quick Introduction to NLP with Python and NLTK, 2019.
4. Christopher Manning,Foundations of Statistical Natural Language Processing, MIT Press,2009.
5. Nitin Indurkhya,Fred J. Damerau,Handbook of Natural Language Processing, Second edition, Chapman & Hall/CRC: Machine Learning & Pattern Recognition, Hardcover,2010.

21IS030 COMPUTER VISION 3 0 0 3

Course Objectives

- 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

Course Outcomes (COs)

1. Understand basic knowledge, theories and methods in image processing and computer vision.
2. Implement basic and some advanced image processing techniques in OpenCV.
3. Apply 2D a feature-based based image alignment, segmentation and motion estimations.
4. To apply 3D image reconstruction techniques.
5. To design and develop innovative image processing and computer vision applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	1	1	1				2	1	3	2	2	
2	3	3	3	2	3		1		2	1	3	2	2	3
3	3	3	2	2	3				1	1	2	2	2	2
4	2	3	3	2	3				2	1	2	3	2	2
5	2	3	3	2	2	2			2	1	2	3	2	3

UNIT I **9 Hours**

INTRODUCTION TO IMAGE FORMATION AND PROCESSING

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 II **9 Hours**

FEATURE DETECTION, MATCHING AND SEGMENTATION

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 III **9 Hours**

FEATURE-BASED ALIGNMENT

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 IV **9 Hours**

3D RECONSTRUCTION

Shape from X-Active range finding-Surface representations-Point-based representations Volumetric representations-Model-based reconstruction-Recovering texture maps and albedosos.

UNIT V **9 Hours**

IMAGE-BASED RENDERING AND RECOGNITION

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 Hours

Reference(s)

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.
3. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
4. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006.
5. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.

21IS031 MULTIMEDIA DATA COMPRESSION 3 0 0 3

Course Objectives

- Acquire knowledge of the basics of compression techniques.
- Understand the categories of compression for Data.
- Explore the modalities of image and video compression algorithms.
- Understand the basics of consistency of data availability in storage devices.

Course Outcomes (COs)

1. Describe the importance of multimedia compression and compare the various compression algorithms.
2. Illustrate the applications of various Data compressions techniques
3. Compare various compression algorithms for Image and Video compression.
4. Analyze the various audio compression techniques.
5. Design and develop multimedia application in various domains.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		1			1					1	1	2	
2	2		3			3					2	2	2	3
3	2		2			3					2	2	1	
4	2		2			3					3	3	3	
5	2		3			3					3	3		3

UNIT I **9 Hours**

INTRODUCTION TO MULTIMEDIA COMPRESSION

Multimedia-Special features of multimedia-Graphics, Image and Video representations-Fundamental concepts of video, digital audio-Need for compression-Taxonomy of compression Algorithms-Error Free Compression-Lossy Compression.

UNIT II **9 Hours**

DATA COMPRESSION

Introduction-Lossless and Lossy Compression-Basics of Huffmann coding-Arithmetic coding-Dictionary techniques-Context based compression-Applications

UNIT III **9 Hours**

IMAGE AND VIDEO COMPRESSION

Image Compression:Lossless Image compression-JPEG-CALIC-JPEG LS-Prediction using conditional averages-Progressive Image Transmission-Lossless Image compression formats-Applications-Facsimile encoding. Video Compression:Introduction-Motion Compensation-Video Signal Representation-H.261-MPEG-1-MPEG-2-H.263.

UNIT IV **9 Hours**

AUDIO COMPRESSION

Audio compression-DPCM-Adaptive PCM-adaptive predictive coding-linear Predictive coding code excited LPC-Perpetual coding. Audio compression Techniques-mÃŽÂ¼ Law and A Law

companding-Speech compression-Frequency domain and filtering-Basic sub band coding-Application to speech coding-G.722-Application to audio coding-MPEG audio.

UNIT V **9 Hours**

MULTIMEDIA COMMUNICATION

Tele Services-Implementation of Conversational Services, Messaging Services, Retrieval Services, Tele Action Services, Tele Operation Services-Media Consumption-Media Entertainment- Virtual Reality-Interactive Audio-Interactive Video-Games.

Total: 45 Hours

Reference(s)

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Series in Multimedia Information and Systems, 2018, 5th Edition.
2. Philip K.C.Tse, Multimedia Information Storage and Retrieval: Techniques and Technologies, 2008.
3. David Salomon, A concise introduction to data compression, 2008.
4. Yun-Qing Shi, Image And Video Compression For Multimedia Engineering Fundamentals Algorithms And Standards, Taylor& Francis,2019.
5. Ralf Steinmetz, Klara Nahrstedt, Multimedia computing, communications, and applications, Pearson India, 2009.
6. Ranjan Parekh, Principles of Multimedia, Second Edition, McGraw Hill Education, 2017.

21IS032 STREAMING MEDIA TOOLS AND TECHNOLOGIES

2 0 2 3

Course Objectives

- Understand the basics of Audio and Video Streaming
- Understand the basics of Streaming media
- Familiar with Streaming Technologies and tools

Course Outcomes (COs)

1. Understand the basics of Audio and Video Streaming
2. Develop Streaming media Applications
3. Implement applications using streaming technologies.
4. Demonstrate the use of streaming stages and tools
5. Analyze streaming services

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	1	1	1							1	1	
2	3	2	1	1	1							1	2	3
3	3	2	2	1	2							1	2	3
4	3	2	2	1	2							1		
5	3	3	1	2	2							1	2	

UNIT I **6 Hours**

BASICS OF AUDIO AND VIDEO STREAMING

Introduction-IP Networks-World Wide Web-Video formats-Video compression-Audio compression

UNIT II **6 Hours**

BASICS OF STREAMING MEDIA

Introduction to streaming media-Video streaming-Audio Streaming-Stream serving-Live webcasting-Media Players

UNIT III **6 Hours**

STREAMING TECHNOLOGIES AND APPLICATIONS

Associated Technologies and Applications-Rights Management-Content Distribution-Applications of Streaming Media

UNIT IV **6 Hours**

STREAMING STAGES AND TOOLS

Broadcasting Area-setting up your home studio-Preparing stage -starting your first-video broadcast-Top live streaming third party apps:vMix v.2x-OBS studio-FFSplit-VidBalsterX-Xsplit-ManyCam-Wirecast v.7 studio

UNIT V **6 Hours**

STREAMING SERVICES

Software as a Service websites-Top 7 live streaming websites: Light stream-Smiletime-BlueJeans-BeLive Tv-Vidpresso Live-Zoom w webinar addon-Crowdcast

4 Hours

EXPERIMENT 1

Use any popular open source tool like HandBrake to compress, modify format and other attributes of audio and video.

4 Hours

EXPERIMENT 2

Set up a DLNA service for streaming media from windows 10

4 Hours

EXPERIMENT 3

Implement media casting using Google Cast SDK on TV like device

4 Hours

EXPERIMENT 4

Setup streaming media servers using open sources tools like kodi, Stremio etc.,

4 Hours

EXPERIMENT 5

Use any Screen Capture software tools like OBS studio, FFsplit etc., to create live video streaming and broadcasting.

5 Hours

EXPERIMENT 6

Create simple live webcast

5 Hours

EXPERIMENT 7

Create an example tutorial content by combing the tutor with screen capture using any of the tools and make them available for streaming

Total: 30+30=60 Hours

Reference(s)

1. David Austerberry, The Technology of Audio and Video Streaming, Second Edition, Taylor and Francis 2013
2. Lenald Best, Bests Guide to Live Stream Video Broadcasting, BCB Live Teaching series,2017.
3. Helen M Heneveld Audio, Video and Streaming Media Technologies, Smart Home and office technologies, 2018.
4. Yun-Qing Shi, Image And Video Compression For Multimedia Engineering FundamentalsAlgorithms And Standards, Taylor & Francis,2019
5. Tay Vaughan, Multimedia: Making it Work, McGraw Hill Education, Ninth Edition, 2017.
6. Lenald Best, Bests Guide to Live Stream Video Broadcasting, BCB Live Teaching series,2017.

21IS033 METAVERSE 2 0 2 3

Course Objectives

- Understand the History of Metaverse.
- Explore the role of Metaverse to connect the real world and blockchain.
- Understand the advanced development of blockchain in the future.
- Study an open ecosystem of smart properties and assets.
- Explore the integration of futuristic technologies such as blockchain, crypto currency, DAO, AR/VR

Course Outcomes (COs)

1. Understand the History of Metaverse.
2. Summarize the technologies involved in metaverse.
3. Illustrate the adoption of blockchain by metaverse.
4. Implement the applications of AR,VR and MR in metaverse.
5. Analyze some use cases of metaverse.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
1	3	3	3	3	2							1		
2	3	3	3	3	2							2		
3	3	3	3	3	2							2	2	
4	3	3	3	3	2							3	2	3
5	3	3	3	3	2							3	2	

UNIT I **6 Hours**

INTRODUCTION TO METAVERSE

Introduction to metaverse and immersive experience-History of metaverse-Metaverse value chain with 7 layer.

UNIT II **6 Hours**

TECHNOLOGIES INVOLVED IN THE METAVERSE

Metaverse as a product of Extended Reality-Augmented Reality (AR)- Virtual Reality (VR)-Benefits of AR/VR-Difference between AR/ VR-Mixed Reality (MR)-Artificial Intelligence (AI)- Introduction in Metaverse-Financial and Economics of Metaverse-Benefits of Metaverse.

UNIT III **6 Hours**

BLOCKCHAIN ADOPTION IN METAVERSE

Blockchain Overview-History of Blockchain-Need of Decentralization in MV-Smart Contract Capabilities in Blockchain-Blockchain in Metaverse-Understanding Tokens-Understanding the NFT-NFT Token Standards-NFTs in MV-Cryptocurrency in MV.

UNIT IV **6 Hours**

AR, VR, AND MR IN METAVERSE

Everything about VR (Virtual Reality)-Everything about AR (Augmented Reality)-Everything about MR (Mixed Reality)-Block chain Identity Management in Metaverse-NFT (non-fungible token) for Metaverse-Introduction to NFTs-History of NFTs-Benefits of NFTs.

UNIT V **6 Hours**

USE-CASES

Gaming in Metaverse-Meetings in Metaverse-Virtual Learning in Metaverse-Social Interactions in Metaverse-Virtual Real-estate in Metaverse-e-commerce in Metaverse-Travel in Metaverse-Personalized Avatars-Digital Identity in Metaverse.

6 Hours

EXPERIMENT 1

Installations:
Hardware Required: Android phone, Cardboard Viewer, PC with Dedicated Graphics Card and atleast 32GB RAM.
Software required: Android Studio, Cardboard SDK, Android NDK, Google Carboard XR plugin for Unity, Unity, Nethereum library to (as needed)

6 Hours

EXPERIMENT 2

Using Google Cardboard SDK for Creating simple AR/VR (XR) applications in Unity

6 Hours

EXPERIMENT 3

Creating blockchain applications in metaverse, by creating virtual assets, smart Contracts for exchange of assets using utility tokens and NFTs.

6 Hours

EXPERIMENT 4

Create any Metaverse based application for an educational institution.

6 Hours

EXPERIMENT 5

Create any Metaverse based application for a healthcare application.

Total: 30+30=60 Hours

Reference(s)

1. The Metaverse: And How It Will Revolutionize Everything Kindle Edition by Matthew Ball , Publisher : Liveright ,2022
2. The Metaverse Handbook: Innovating for the Internets Next Tectonic Shift Kindle Edition by QuHarrison Terry (Author), Scott Keeney (Author), Paris Hilton (Foreword), Publisher: Wiley; 1st edition ,2022
3. Metaverse Made Easy: A Beginners Guide to the Metaverse, Dr.Liew Voon Kiong,Publisher, Liew Voon Kiong, 2022
4. Metaverse For Beginners and Advanced: A Complete Journey Into the Metaverse Virtual World (Web 3.0), Darell Freeman,Publisher Darell Freeman,2022
5. Metaverse Glossary - Your Gateway to the Future , Ravindra Dastikop, Evincepub Publishing,2022
6. The Metaverse: Prepare Now for the Next Big Thing Paperback, Terry Winters, Winters media Publication 2021

21IS034 IMAGE AND VIDEO ANALYTICS 3 0 0 3

Course Objectives

- Understand the basics of image processing techniques for computer vision.
- Learn the techniques used for image pre-processing.
- Discuss the various object detection techniques.
- Understand the various Object recognition mechanisms.
- Elaborate on the video analytics techniques.

Course Outcomes (COs)

1. Interpret the importance of multimedia compression and compare the various compression algorithms.
2. Illustrate the applications of various Data compressions techniques
3. Compare various compression algorithms for Image and Video compression.
4. Analyze the Multimedia storage on disks.
5. Examine multimedia application in various domains.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		1			1					1	1	2	
2	2		3			3					2	2	2	
3	2		2			3					2	2	2	
4	2		2			3					3	3	3	
5	2		3			3					3	3	2	

UNIT I **9 Hours**

INTRODUCTION

Basic concepts-Image functions and types-Computer Vision-Image representation and image analysis tasks-Image representations -digitization-properties-color images-Data structures for Image Analysis-Levels of image data representation-Traditional and Hierarchical image data structures.

UNIT II **9 Hours**

IMAGE PRE-PROCESSING

Pixel brightness transformations-Geometric transformations-Local pre-processing-Image smoothing-Edge detectors-Zero-crossings of the second derivative-Scale in image processing -Canny edge detection-Parametric edge models-Edges in multi-speralct imagesL-ocal pre-processing in the frequency domain- Line detection by local pre-processing operators-Image restoration.

UNIT III **9 Hours**

OBJECT DETECTION USING MACHINE LEARNING

Object localization-Object detection-Object detection methods -Deep Learning framework for Object detection-bounding box approach-Intersection over Union (IoU)-Deep Learning Architectures-R-CNN-Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures

UNIT IV **9 Hours**

FACE RECOGNITION AND GESTURE RECOGNITION

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition-Deep Face solution by Facebook-FaceNet for Face Recognition-Implementation using FaceNet-Gesture Recognition.

UNIT V **9 Hours**

VIDEO ANALYTICS

Video Processing-use cases of video analytics-Vanishing Gradient and exploding gradient problem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-Implementation using RestNet and Inception v3.

Total: 45 Hours

Reference(s)

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, Image Processing, Analysis, and Machine Vision, 4nd edition, Thomson Learning, 2013.
2. Vaibhav Verdhan,(2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras,Apress 2021
3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer Verlag London Limited,2011.
4. Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, Video Analytics for Business Intelligence, Springer, 2012.
5. D. A. Forsyth, J. Ponce, Computer Vision: A Modern Approach, Pearson Education, 2003.
6. E. R. Davies, (2012), Computer & Machine Vision, Fourth Edition, Academic Press.

21IS035 WEARABLE DEVICES APPLICATIONS 3 0 0 3

Course Objectives

- Understand the basics of Wearable Computing, Wearable Devices and Technologies.
- Explore about basics of Security Challenges.
- Understand the concepts of Applications of wearables in Health Care.
- Acquire knowledge about the advanced applications of Wearable Computing.

Course Outcomes (COs)

1. Understand the basics of Wearable Computing
2. Explain the various devices and technologies of Wearable computing
3. Analyze the challenges of Security issues in Wearable computing
4. Discuss the applications of Wearable computing in health sector
5. Discover the advanced trends in wearable computing

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
1	3		1			1					1	1		
2	2		3			3					2	2	2	
3	2		2			3					2	2	3	
4	2		2			3					3	3	1	2
5	2		3			3					3	3	2	1

UNIT I **9 Hours**

WEARABLE COMPUTING

Introduction to Wearable Computers-Design Considerations-Wearable Interactions-Design Guidelines and Evaluation-Future Trends in Wearable Computing-Benefits

UNIT II **9 Hours**

WEARABLE DEVICES AND TECHNOLOGIES

Health and Fitness Wearables-The Promise and Perils of Wearable Technologies-Confidential Data Storage system for wearable platforms-Management and Security issues in Wearable platforms.

UNIT III **9 Hours**

SECURITY CHALLENGES

Authenticity Challenges of Wearable Technologies-Wearable Computing: Security Challenges, BYOD, Privacy, and Legal Aspects-Security, Privacy, and Ownership Issues With the Use of Wearable Health Technologies-Wearable Devices: Ethical Challenges and Solutions.

UNIT IV **9 Hours**

HEALTH CARE APPLICATION

IoT for Ambient Assisted Living: Care4Me-A Healthcare Support System-Study of Real-Time Cardiac Monitoring System: A Comprehensive Survey-Co-Designing Wearable Technology Together with Visually Impaired Children

UNIT V **9 Hours**

ADVANCED APPLICATIONS

Securing the Human Cloud: Applying Biometrics to Wearable Technology-Context-Aware Mobile and Wearable Device Interfaces -An Overview of Telemedicine Technologies for Healthcare Applications-Internet of Things in E-Health: An Application of Wearables in Prevention and WellBeing-Wearable ECG Monitoring and Alerting System Associated With Smartphone

Total: 45 Hours

Reference(s)

1. Vivian Genaro Motti, Wearable Interaction, Springer Nature, 2020.
2. Marc L. Resnick (Bentley University, USA) and Alina M. Chircu, Wearable Devices: Ethical Challenges and Solutions, IGI Global Publisher 2018.
3. Edward Sazonov and Michael R. Neuman (Editors), Wearable Sensors Fundamentals, Implementation and Applications, Elsevier, 2015.
4. Wearable Applications Research, devices and Interactions, Internet of Medical Things Paradigm of Wearable Devices, 1st Edition, 2021 by CRC Press.
5. Wearable Technologies: Concepts, Methodologies, Tools, and Applications (Critical Explorations) 1st Edition,2018
6. Information Resources Management Association (Author, Editor), Wearable Technologies: Concepts, Methodologies, Tools, and Applications (Critical Explorations) 1st Edition, 2018.

21IS036 3D PRINTING AND DESIGN 3 0 0 3

Course Objectives

- Learn the basics of 3D printing.
- Explain the principles of 3D printing technique.
- Illustrate the inkjet technology and laser technology.
- Analyze the applications of 3D printing.

Course Outcomes (COs)

1. Understand the basic concepts of 3D printing technology.
2. Outline the processes and materials used in 3D printing.
3. Explain the concepts and working principles of 3D printing using inkjet technique.
4. Explain the working principles of 3D printing using laser technique.
5. Analyze the various methods for designing and modeling for industrial applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		1			1					1	1		
2	2		3			3					2	2		
3	2		2			3					2	2		
4	2		2			3					3	3		
5	2		3			3					3	3		

UNIT I **9 Hours**

INTRODUCTION

Introduction; Design considerations-Material, Size, Resolution, Process; Modelling and viewing-3D; Scanning; Model preparation-Digital; Slicing; Software; File formats

UNIT II **9 Hours**

PRINCIPLE

Processes-Extrusion, Wire, Granular, Lamination, Photo polymerisation; Materials-Paper, Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Graphene; Material Selection-Processes, applications, limitations;

UNIT III **9 Hours**

INKJET TECHNOLOGY

Printer-Working Principle, Positioning System, Print head, Print bed, Frames, Motion control; Print head Considerations-Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication-Continous jet, Mulitjet; Powder based fabrication - Colourjet-Applications to manufacturing.

UNIT IV **9 Hours**

LASER TECHNOLOGY

Light Sources-Types, Characteristics; Optics-Deflection, Modulation; Material feeding and flow-Liquid, powder; Printing machines-Types, Working Principle, Build Platform, Print bed Movement, Support structures-Applications.

UNIT V **9 Hours**

INDUSTRIAL APPLICATIONS

Securing the Human Cloud: Applying Biometrics to Wearable Technology-Context-Aware Mobile and Product Models, manufacturing-Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology, Displays; Future trends;-cloud based additive manufacturing-Research-Agile tooling.

Total: 45 Hours

Reference(s)

1. Christopher Barnatt, 3D Printing: The Next Industrial Revolution, CreateSpace Independent Publishing Platform, 2013.
2. Ian M. Hutchings, Graham D. Martin, Inkjet Technology for Digital Fabrication, John Wiley & Sons, 2013.
3. Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010
4. Joan Horvath, Mastering 3D Printing, APress, 2014

21IS037 OPEN SOURCE SOFTWARE 3 0 0 3

Course Objectives

- Introduce open source technology for development of web applications.
- Understand open source scripting language for programming in web environment i.e. PHP.
- Familiar with the open source management system and connection with database.
- Learn open source web server, software tools.

Course Outcomes (COs)

1. Analyze the need of open source technology, open source development model, application of open sources, aspects of open source movement.
2. Apply the basic syntax of PHP, common PHP scripts elements.
3. Implement open source database management system - MySQL.
4. Demonstrate the creation of the server side scripting using PHP, implement PHP database connectivity, perform operation on database and open source database management system.
5. Analyze the software tool and process like Eclipse IDE, Selenium ID and open source web servers.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
1		2					2							
2		2					3							
3		2					3						2	3
4		2					2						3	3
5		2					2							

UNIT I **9 Hours**

INTRODUCTION

The need of open Sources, advantages of Open sources application , Open Source Development Model Licences and Patents ,FOSS, BSD, Free Software Movement, commercial software vs. Open Source software, Commercial aspects of Open Source movement-Certification courses issues-global and Indian. Copyrights and copy lefts, Application of Open Sources. Problems with traditional commercial software

UNIT II **9 Hours**

OPEN SOURCE SCRIPTING LANGUAGE

Introduction: What is PHP?-Basic Syntax of PHP-programming in web environment-Common PHP Script Elements-Using Variables-Constants-Data types-Operators; Statements-Working With Arrays - Using Functions-OOP-String Manipulation and Regular Expression , File and Directory Handling , Working With Forms , Introduction to advanced PHP concepts

UNIT III **9 Hours**

OPEN SOURCE DATABASE MANAGEMENT SYSTEM

MySQL: Introduction-Setting up an account-Starting, Terminating and writing your own MySQL Programs-Record Selection Technology-Working with Strings-Date and Time- Sorting Query Results module-Generating Summary-Working with Metadata-Using Sequences-MySQL and Web.

UNIT IV **9 Hours**

PHP AND SQL DATABASE

PHP and LDAP ; PHP Connectivity ; Sending and receiving emails , PHP Database Connectivity: Retrieving data from MySQL - Manipulating data in MySQL using PHP

UNIT V **9 Hours**

WEB SERVER AND OPEN SOURCE TOOLS

Apache Web server-Working with web server-Configuring and using apache web server, WAMP server, Lighttpd, Fnord, Nginx, Savant, tornado. Open Source Software tools and Processors: Introduction-Eclipse IDE Platform-Compilers-Model driven architecture tools-Selenium ID-Features and uses Government Policy toward Open Source (E- Governance)-Wikipedia as an open Source Project Case Studies: Apache, BSD, Linux, Mozilla (Firefox), Wikipedia, Joomla, GCC, Open Office.

Total: 45 Hours

Reference(s)

1. The Linux Kernel Book Rem Card,Eric Dumas and Frank Mevel Wiley Publications sons, 2003
2. MySQL Bible Steve Suchring John Wiley sons, 2002
3. Programming PHP Rasmus Lerdorf and Levin Tatroe OReilly Publications, 2002

21IS038 OPEN STACK ESSENTIALS 3 0 0 3

Course Objectives

- Familiarize students with the practical aspects of IaaS (Infrastructure as a Service) cloud computing model.
- Familiarize students with the installation and configuration procedure of compute, storage and networking components of openstack platform for establishing enterprise private cloud.

Course Outcomes (COs)

1. Explain Openstack Architecture and list the components in it.
2. Interpret Identity Management and the role of image management using web interface.
3. Summarize network management in neutron.
4. Implement the block storage to the instance using Dashboard.
5. Exemplify the architecture of swift and its role in object storage.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	2											3
2		2	2	2										3
3		3	3	3										3
4		2	2	2										2
5		2	2	3										2

UNIT I **9 Hours**

ARCHITECTUREAND COMPONENTOVERVIEW

OpenStack Architecture-DashBoard-Keystone-Glance-Neutron - Nova - Cinder - swift - ceilometer - Heat-Summary.

UNIT II **9 Hours**

IDENTITY MANAGEMENT

RDO Installation: Installing RDO using packstack-Identity Management:Services and End Points-Hierarchy of User,tenants and roles-creating a user-creating a tenant-Granting a role-Interacting with keystone in dashboard-End Points in the dashboard-Image Management: Glance as a registry of images- using the web interface-Building an image

UNIT III **9 Hours**

NETWORK MANAGEMENT

Networking and Neutron - Open VSwitch Configuration - Creating a network - Web Interface Management - External Network Access - Web Interface External Network Setup

UNIT IV **9 Hours**

INSTANCE MANAGEMENT AND BLOCK STORAGE

Instance Management: Managing Flavors-Managing Key Pairs- Launching an Instance-Managing Floating IP address-Managing Security groups-Communicating with Instances-Launching an Instances using Web Interface-Creating and Using block storage -Attaching the block storage to an Instance-Managing Cinder Volumes in the Web Interface-Backing Storages

UNIT V **9 Hours**

OBJECT STORAGE AND TELEMETRY

Object Storage: Architecture of swift cluster-Creating and Using Object Storage-Object File Management in Web Interface- Using Object Storage on an Instance-Ring Files-Telemetry: Understanding Data Store-Ceilometer"s Configuration Terms- Graphing the data Tools : Wireshark and Packet tracer.

Total: 45 Hours

Reference(s)

1. Dan Radez, OpenStack Essentials, PackT publishing, 2015
2. Omar Khedhar, "Mastering Openstack", PackT Publishing, 2015
3. docs.openstack.org

21IS039 BIOINFORMATICS ALGORITHMS 3 0 0 3

Course Objectives

- Adapt basic knowledge on various techniques and areas of applications in bioinformatics.
- Analyze common problem in bioinformatics, alignment techniques, ethical issues, public data sources, and evolutionary modelling.
- Discover the practical use of tools for specific bioinformatic areas.

Course Outcomes (COs)

1. Apply knowledge of bioinformatics in a practical project.
2. Develop the ability for critical assessment of scientific research publications in bioinformatics.
3. Analyze processed data with the support of analytical and visualization tool.
4. Apply the different approaches used for data integration and data management, including data warehouse and wrapper approaches.
5. Compare the databases, tools, repositories and be able to use each one to extract specific information.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2	2				1					1	
2	1	3	2	2				1					2	
3	1	2	2	2	3			1					2	3
4	1	2	2	2				1					2	3
5	1	2	2	2	2			1					2	

UNIT I **9 Hours**

INTRODUCTION TO BIOINFORMATICS

Need for Bioinformatics technologies-Overview of Bioinformatics technologies Structural bioinformatics-Data format and processing-Secondary resources and applications- Role of Structural bioinformatics-Biological Data Integration System-Biological Data Acquisition: Retrieval methods for DNA sequence, protein sequence and protein structure information

UNIT II **9 Hours**

DATABASES

Introduction to Bioinformatics and Computational Biology, Introduction to Operating systems, Linux commands, File transfer protocols ftp and telnet, Biological sequences, Biological databases, Genome specific databases, Data file formats, Data life cycle, Database management system models, Kernel Recompilation, Basics of Structured Query Language (SQL).

UNIT III **9 Hours**

DATA PROCESSING

Data-Access, Retrieval and Submission: Standard search engines; Data retrieval tools-Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local versus global, Distance metrics, Similarity and homology, Scoring matrices.

UNIT IV **9 Hours**

SCORING MATRICES AND DATABASE SEARCH METHODS

Pairwise sequence alignment: Global alignment, Local alignment, Scoring functions, concepts behind General gap, affine gap penalty and amino acid substitution matrices (PAM, BLOSUM,GONNET), Statistical significance. BLAST: Algorithm, types, Blast output and applications. FASTA, Difference between BLAST & FASTA,Rings and Protection Rings.

UNIT V **9 Hours**

APPLICATIONS FOR BIOINFORMATICS

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/ unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.

Total: 45 Hours

Reference(s)

1. Bioinformatics: Sequence and Genome Analysis David W.Mount, David Mount
2. Introduction to Bioinformatics by Arthur K. Lesk , Oxford University Press
3. Fundamental concepts of Bioinformatics-D E Krane and M L Raymer, Pearson Education.
4. Bioinformatics: with fundamentals of genomics and proteomics -Shubha Gopal, et.al., Mc Graw Hill.
5. Mount, D.W, Bioinformatics Sequence and Genome Analysis, 2nd Edition, Cold Spring Harbor Laboratory Press, 2004.
6. Introduction to Bioinformatics by V. Kothekar, 1 st Edition, (2006), Dhruv Publications, Delhi.

21IS040 FAULT TOLERANT COMPUTING 3 0 0 3

Course Objectives

- To understand reliability engineering in a system perspective.
- To determine the type of redundancy either in the form of hardware or software module and the optimum number of redundant units.
- To understand the fault detection and activation technique of the necessary standby units in the repairable system in a quantitative manner

Course Outcomes (COs)

1. Interpret the fundamental concepts of fault-tolerance and discuss the appropriate hardware detection and recovery techniques for a given environment
2. Discuss the Information Redundancy and Fault Tolerant Networks in terms of Network Topologies and their Resilience and Routing.
3. Develop skills in modeling and evaluating fault-tolerant architectures in terms of reliability, availability and safety
4. Analyses the merits and limitations of fault-tolerant design
5. Describe the fault injection attacks and detect the injected faults in an attempt to foil the attacks.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2		2	2								3	
2		2		2	2								3	
3		2		2	2								2	3
4		2		2	2								1	
5		2		2	2								2	

UNIT I **10 Hours**

HARDWARE FAULT TOLERANCE

Preliminaries - Fault classification-Types of Redundancy; Basic measures of Fault Tolerance-Hardware Fault Tolerance- The rate of hardware failures-Failure rate, Reliability, and Mean Time to Failure-Canonical and Resilient Structures-Other Reliability Evaluation Techniques-Fault-Tolerance-Processor-Level techniques-Byzantine Failures.

UNIT II **9 Hours**

INFORMATION REDUNDANCY AND FAULT-TOLERANT NETWORKS

Coding-Resilient Disk Systems; Data Replication-Algorithm-Based Fault Tolerance-Measures of Resilience-Common Network Topologies and their Resilience-Fault-Tolerant Routing.

UNIT III **9 Hours**

SOFTWARE FAULT TOLERANCE

Acceptance Tests-Single-Version Fault Tolerance-N-Version Programming-Recovery Block Approach-Preconditions, Postconditions and Assertions-Exception Handling-Software Reliability Models-Fault-Tolerant Remote Procedure Calls

UNIT IV **9 Hours**

CHECKPOINTING

Checkpointing-Checkpoint Level-Optimal Checkpointing-An Analytical Model-Cache-Aided Rollback Error Recovery- Checkpointing in Distributed Systems-Checkpointing in Shared Memory Systems-Checkpointing in Real-Time Systems-Other uses of Checkpointing

UNIT V **8 Hours**

FAULT DETECTION IN CRYPTOGRAPHIC SYSTEMS

Overview of Ciphers-Security Attacks through Fault Injection-Countermeasures-Case Studies:Non-Stop Systems-Stratus Systems -Cassini Command and Data Sub-System; IBM G5-IBM Sysplex-n Itanium

Total: 45 Hours

Reference(s)

1. Israel Koren, C. Mani Krishna: Fault-Tolerant Systems, Elsevier, 2020.
2. Parag K. Lala,: Fault Tolerant and Fault Testable Hardware Design, BS Publications,2011.
3. D. K. Pradhan (Ed): fault Tolerant Computer Systems Design, Prentice Hall, 1996.
4. K. S. Trivedi: Probability, Statistics with Reliability, Queuing and Computer Science Applications, John Wiley, 2002.

21IS041 DIGITAL MARKETING 3 0 0 3

Course Objectives

- To Provide an Overview of Digital Marketing plans.
- To Provide a Foundation of a Greater market share and Increasing brand awareness.

Course Outcomes (COs)

1. Identify some of the latest digital marketing trends and skills sets needed for today"s Marketer.
2. Discover the hottest techniques to help to successfully plan, predict, and manage your digital Marketing campaigns
3. Evaluate the importance of your digital marketing assets, which ones actually matter the most to your business
4. Assess digital marketing as a term career opportunity
5. Understand experiments using A/B testing

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2		2	2									
2		2		2	2									
3		3		3	3									
4		2		2	2									
5		2		2	2									

UNIT I **9 Hours**

INTRODUCTION OF DIGITAL MARKETING

Introduction of Digital Marketing-Planning Digital Marketing Campaigns-Website designing with Word Press-Essentials of a website.

UNIT II **9 Hours**

SEARCH ENGINE OPTIMIZATION

Introduction to Search Engines-Keyword Research and Competition-On page Optimization-Off page Optimization-Local SEO-Search Engine Algorithm Updates-SEO Reporting

UNIT III **9 Hours**

GOOGLE ADWORDS

PPC Advertising (Online Advertisement)-Display Advertising- Google Shopping Ads-Introduction to Bing Ads-Mobile Marketing -Video Marketing-Google online Advertisement program- Certification

UNIT IV **9 Hours**

SOCIAL MEDIA MARKETING

Introduction to SMM -Facebook Marketing-Facebook Advertising -Twitter Marketing & Ads-YouTube Marketing-LinkedIn Marketing-InstaGram Marketing-Email Marketing-Pinterest Marketing-Online Reputation Management-Inbound Marketing- Google Analytics-Audience Reports-Traffic Reports-Behavior Reports

UNIT V **9 Hours**

EXPERIMENTAL TESTING

Conversion Tracking-Personality Development-Google AdSense- Getting Started as Freelancer-Affiliate Marketing

Total: 45 Hours

Reference(s)

1. Shivani Karwal, Digital Marketing Handbook: A Guide to Search Engine Optimization Paperback - Import, 25 Nov 2015.
2. Philip kolter and Gary Armstrong, Principles of marketing, Pearson education, 2010.
3. Michael Millerth, B2B Digital Marketing: Using the Web to Market Directly to Businesses,first edition, Que Biz-Tech series2012.
4. Dave Chaffey, Fiona Ellis Chadwick, Digital Marketing: Strategy, Implementation & Practice, Paperback - Import, 2012.

21IS042 DESIGN THINKING 3 0 0 3

Course Objectives

- To understand and compare the important of design thinking
- To identify the steps in the design thinking (DT) process

Course Outcomes (COs)

1. Interpret the importance of design thinking and steps in the DT process
2. Analyze empathize phase of design thinking
3. Compare the different perspectives on personas in the define phase
4. Analyze the ideate phase of design thinking
5. Recognize the importance of the prototype and testing phase in DT

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		2			2					2	2		
2	2		2			2					2	2		
3	2		2			2					2	2		
4	2		2			2					2	2		
5	2		2			2					2	2		

UNIT I **9 Hours**

INTRODUCTION

Introduction-Importance of Design Thinking (DT)-Design Thinking for business-Design Thinking for an Individual-Steps in the DT process-Empathize -Define-Ideate-Prototype-Test.

UNIT II **9 Hours**

EMPATHY PHASE

Empathy Phase:-Steps in the empathize phase of DT-Empathy- What, How, Why-Different types to developing Empathy towards People-Steps required to conduct an immersion activity-How to empathize. Introduction to Immersion Activity-Conducting an immersion activity-DT question template for Immersion activity.

UNIT III **9 Hours**

DEFINE PHASE

Creating personas-Steps to create personas in the define phase of DT-Creating your own Persona-Four Different Perspectives on Personas-Goal-directed Personas, Role-Based Personas, Engaging Personas, Fictional Personas-Steps to create your Engaging Personas and Scenarios-Steps to create problem statements in the define phase of DT-Problem statements-Defining problem statements-Problem statements in define phase of DT.

UNIT IV **9 Hours**

IDEATE PHASE

How to Ideate-Steps in the ideate phase of DT-Applying the steps in the ideate phase of DT-Ideation games-Six Thinking Hats and Million-dollar idea-Ideate to find solution- Characteristics Required for Successful Ideation-Doodling for expressing ideas-Importance of storytelling in presenting ideas and prototypes-Storytelling in DT.

UNIT V **9 Hours**

PROTOTYPE AND TESTING PHASE

Importance of the prototype phase in DT-Prototype your idea- Create a prototype-Types of Prototyping Low-Fidelity Prototyping and High-Fidelity Prototyping-Guidelines for Prototyping-Service value proposition-Creating a value proposition statement-Testing in Design Thinking-Test the Prototype-Role of DT in your work-DT for better coding-Agile and DT complement each other to deliver customer Satisfaction -Satori.

Total: 45 Hours

Reference(s)

1. Mauricio Vianna, Ysmar Vianna, Isabel K. Adler, Brenda Lucena and Beatriz Russo, Design Thinking: Business innovation, MJV Press, First Edition, 2014.
2. Mads Soegaard, The Basics of User Experience Design by Interaction Design Foundation, Kindle Edition.
3. Nir Eyal, Hooked: How to Build Habit-Forming Products, Penguin Publishers, Kindle Edition, 2011.
4. Rod Judkins, The Art of Creative Thinking, Hachette Book Publishing, Kindle Edition, 2015.
5. Dan Senor and Saul Singer, Start Up Nation, Twelve Publishers, Kindle Edition, 2011.
6. Simon Sinek, Start with Why, Portfolio Publishers, Kindle Edition, 2011.

21ISH01 EXPLORATORY DATA ANALYSIS 2 0 2 3

Course Objectives

- To outline an overview of exploratory data analysis.
- To implement data cleaning and preparation techniques.
- To perform descriptive statistics and data visualization techniques to present insights from the data.
- To apply univariate, bivariate, multivariate, correlation, and time series data exploration and analysis techniques
- To use dimensionality reduction techniques for simplifying complex datasets and visualize high- dimensional data.

Course Outcomes (COs)

1. Understand the fundamentals of exploratory data analysis.
2. Implement the data cleaning and preparation techniques.
3. Apply advanced data visualization techniques to explore complex relationships and patterns in the data.
4. Analyze and interpret relationships between variables using EDA analysis techniques to gain insights into complex data patterns.
5. Apply dimensionality reduction techniques, such as Principal Component Analysis (PCA), to simplify complex datasets and extract essential features.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	3	3	3								2	
2	2	2	2	3	3								3	
3	2	3	2	2	3								3	3
4	2	2	2	2	3								3	3
5	2	2	3	2	1								3	3

UNIT I **6 Hours**

EXPLORATORY DATA ANALYSIS

Overview of Exploratory Data Analysis-importance of EDA-data analysis process: data collection, data cleaning, and data exploration-Introduction to common data types and formats- Introduction to Python-data analysis libraries.

UNIT II **6 Hours**

DATA CLEANING AND PREPARATION

Introduction to data quality issues and common data cleaning techniques-Handling missing data and outliers-Data transformation techniques-Feature engineering and variable creation.

UNIT III **6 Hours**

DESCRIPTIVE STATISTICS AND DATA VISUALIZATION

Descriptive statistics: measures of central tendency, dispersion, and shape-Data visualization principles
and best practices-Exploratory data visualization using Matplotlib and Seaborn

UNIT IV **6 Hours**

EXPLORATORY DATA ANALYSIS TECHNIQUES

Univariate analysis: exploring single variables-Bivariate analysis: exploring relationships between variables- Multivariate analysis: analyzing relationships among multiple variables-Exploring time series data.

UNIT V **6 Hours**

DIMENSIONALITY REDUCTION TECHNIQUES

Introduction to dimensionality reduction-Principal Component Analysis (PCA) and its applications-Distributed Stochastic Neighbor Embedding (t-SNE) for visualization

5 Hours

EXPERIMENT 1

Explore the Titanic dataset using descriptive statistics and data visualization.

1. Load the Titanic dataset.
2. Calculate the descriptive statistics for each variable.
3. Create a variety of data visualizations to explore the relationships between variables.
4. Interpret the results of the descriptive statistics and data visualizations.

5 Hours

EXPERIMENT 2

Clean and prepare the California housing dataset for analysis.

1. Identify and handle missing data.
2. Identify and remove outliers.
3. Convert categorical variables to numerical variables.
4. Explore the distribution of the data after cleaning and preparing it.

5 Hours

EXPERIMENT 3

Perform univariate analysis on the Iris dataset.

1. Calculate the descriptive statistics for each variable.
2. Create a variety of data visualizations to explore the distribution of each variable.
3. Interpret the results of the descriptive statistics and data visualizations.

5 Hours

EXPERIMENT 4

Perform bivariate analysis on the Boston housing dataset.

1. Explore the relationship between housing prices and different features of the houses, such as the number of rooms, the lot size, and the crime rate.
2. Use data visualization to explore the relationships between variables.
3. Interpret the results of the bivariate analysis.

5 Hours

EXPERIMENT 5

Perform multivariate analysis on the Wine dataset.

1. Explore the relationships between different features of the wine, such as the color, the acidity, and the
alcohol content.
2. Use data visualization to explore the relationships between variables.
3. Interpret the results of the multivariate analysis.

5 Hours

EXPERIMENT 6

Apply dimensionality reduction techniques to the MNIST dataset.

1. Use PCA to reduce the dimensionality of the dataset from 784 dimensions to 2 dimensions.
2. Visualize the reduced data using a scatter plot.
3. Interpret the results of the dimensionality reduction.

Total: 30+30=60 Hours

Reference(s)

1. Provost, Foster, and Tom Fawcett. Data Science for Business: What you need to know about data mining and data-analytic thinking , O""Reilly Media, Inc., 2013. (Unit 1)
2. McKinney, Wes. Python for Data Analysis. O"""""Reilly Media, Inc., 2022. (Unit 1, 3, 5)
3. Knaflic, Cole Nussbaumer. Storytelling with data: A data visualization guide for business professionals. John Wiley & Sons, 2015. (Unit 2)
4. Kazil, Jacqueline, and Katharine Jarmul. Data wrangling with python: tips and tools to make your life easier. O""Reilly Media, Inc., 2016. (Unit 3)
5. Wickham, Hadley, and Garrett Grolemund. R for data science: import, tidy, transform, visualize,and model data. O""Reilly Media, Inc., 2016. (Unit 4, 5)
6. Matthew O. Ward, Georges Grinstein, Daniel Keim, Interactive Data Visualization: Foundations, Techniques, and Applications, 2nd Edition, CRC press, 2015.

21ISH02 RECOMMENDER STSYEMS 3 0 0 3

Course Objectives

- To understand the foundations of the recommender system.
- To learn the significance of machine learning and data mining algorithms for Recommender systems
- To learn about collaborative filtering
- To make students design and implement a recommender system.
- To learn collaborative filtering.

Course Outcomes (COs)

1. Understand the basic concepts of recommender systems.
2. Implement machine-learning and data-mining algorithms in recommender systems data sets.
3. Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.
4. Implement a simple recommender system.
5. Learn about Evaluating Paradigms of recommender systems and its applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	2	1								-	
2	1	2	1	1	1								2	3
3	2	3	1	1	1								2	3
4	3	2	2	2	1								2	3
5	2	2	1	2	1								3	

UNIT I **9 Hours**

INTRODUCTION

Introduction and basic taxonomy of recommender systems- Traditional and non-personalized-Recommender Systems-Overview of data mining methods for recommender systems-similarity measures-Dimensionality reduction-Singular Value Decomposition (SVD)

UNIT II **9 Hours**

CONTENT-BASED RECOMMENDATION SYSTEMS

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

UNIT III **9 Hours**

COLLABORATIVE FILTERING

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection

UNIT IV **9 Hours**

ATTACK-RESISTANT RECOMMENDER SYSTEMS

Introduction-Types of Attacks-Detecting attacks on recommender systems-Individual attack-Group attack-Strategies for robust recommender design-Robust recommendation algorithms.

UNIT V **9 Hours**

EVALUATING RECOMMENDER SYSTEMS

Evaluating Paradigms-User Studies-Online and Offline evaluation-Goals of evaluation design-Design Issues-Accuracy metrics-Limitations of Evaluation measures

Total: 45 Hours

Reference(s)

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
3. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Systems Handbook, 1st ed,Springer (2011)
4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.

21ISH03 BIG DATA ANALYTICS 3 0 0 3

Course Objectives

- Acquire a deep understanding of big data and NoSQL.
- Develop expertise in mapreduce analytics using Hadoop and related tools
- Explore the Hadoop related tools for Big Data Analytics.

Course Outcomes (COs)

1. Understand the big data and use cases from selected business domains.
2. Understand NoSQL big data management.
3. Utilize map reduce analytics and related tools.
4. Understand the basics of Hadoop.
5. Apply the usage of Hadoop related tools for Big Data Analytics.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1		1								3	
2	2	2	3		3								3	
3	1	3	3		3								3	2
4	2	2	2		3								2	
5	2	2	1		3								2	3

UNIT I **9 Hours**

UNDERSTANDING BIG DATA

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 II **9 Hours**

NOSQL DATA MANAGEMENT

Introduction to NoSQL-Aggregate data models-Key-value and document data models-Relationships-Graph databases-Schema less databases-Materialized views-Distribution models-Master-slave replication-Consistency-Cassandra-Cassandra data model-Cassandra examples-Cassandra clients

UNIT III **9 Hours**

MAP REDUCE APPLICATIONS

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 IV **9 Hours**

BASICS OF HADOOP

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 V **9 Hours**

HADOOP RELATED TOOLS

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 Hours

Reference(s)

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
4. E. Capriolo, D. Wampler, and J. Rutherglen, Programming Hive, O""Reilley, 2012.
5. Lars George, HBase: The Definitive Guide, O""Reilley, 2011.
6. Eben Hewitt, Cassandra: The Definitive Guide, O""Reilley, 2010.

21ISH04 NEURAL NETWORKS AND DEEP LEARNING

2 0 2 3

Course Objectives

- To understand the major concepts in deep neural networks.
- To apply Convolutional Neural Network architectures for any real-life applications
- To analyze the key computations underlying deep learning to build and train deep neural networks for various tasks.

Course Outcomes (COs)

1. Apply Convolution Neural Network for any suitable applications.
2. Analyze the various categories of associative memory and unsupervised learning networks.
3. Apply Convolutional Neural Networks and its variants for any suitable applications.
4. Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.
5. Apply autoencoders and generative models for suitable applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1		1									-
2	2	2	2		3									-
3	1	3	3		3									-
4	2	2	2		3									-
5	2	2	1		3									-

UNIT I **6 Hours**

UNDERSTANDING NEURAL NETWORKS

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction Evolution of Neural Networks-Basic Models of Artificial Neural Network-Important Terminologies of ANNs-Supervised Learning Network.

UNIT II **6 Hours**

ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS

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 III **6 Hours**

THIRD-GENERATION NEURAL NETWORKS

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 IV **6 Hours**

DEEP FEEDFORWARD NETWORKS

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 V **6 Hours**

RECURRENT NEURAL NETWORKS

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.

3 Hours

EXPERIMENT 1

Implement simple vector addition in TensorFlow.

3 Hours

EXPERIMENT 2

Implement a regression model in Keras.

3 Hours

EXPERIMENT 3

Implement a perceptron in TensorFlow/Keras Environment.

3 Hours

EXPERIMENT 4

Implement a Feed-Forward Network in TensorFlow/Keras.

3 Hours

EXPERIMENT 5

Implement an Image Classifier using CNN in TensorFlow/Keras.

3 Hours

EXPERIMENT 6

Improve the Deep learning model by fine tuning hyperparameters.

3 Hours

EXPERIMENT 7

Implement a Transfer Learning concept in Image Classification.

3 Hours

EXPERIMENT 8

Using a pre trained model on Keras for Transfer Learning

3 Hours

EXPERIMENT 9

Perform Sentiment Analysis using RNN

3 Hours

EXPERIMENT 10

Implement an LSTM based Autoencoder in TensorFlow/Keras.

Total:30+30= 60 Hours

Reference(s)

1. S Rajasekaran, G A Vijayalakshmi Pai, Neural Networks, FuzzyLogic and Genetic Algorithm,Synthesis and applications, PHI Learning, 2017
2. Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook, Springer International Publishing, 1st Edition, 2018.
3. James A Freeman, David M S Kapura,Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
5. Francois Chollet, Deep Learning with Python, Second Edition, Manning Publications, 2021.
6. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020

21ISH05 NATURAL LANGUAGE PROCESSING 3 0 0 3

Course Objectives

- To understand basics of linguistics, probability and statistics
- To study statistical approaches to NLP and understand sequence labeling
- To outline different parsing techniques associated with NLP
- To explore semantics of words and semantic role labeling of sentences
- To understand discourse analysis, question answering and chatbots

Course Outcomes (COs)

1. Understand basics of linguistics, probability and statistics associated with NLP
2. Implement a Part-of-Speech Tagger
3. Design and implement a sequence labeling problem for a given domain
4. Implement semantic processing tasks and simple document indexing and searching system using the concepts of NLP
5. Implement a simple chatbot using dialogue system concepts

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1		1								2	
2	2	2	3		3								2	2
3	1	3	3		3								2	3
4	2	2	2		3								2	3
5	2	2	1		3								2	3

UNIT I **9 Hours**

INTRODUCTION

Natural Language Processing-Components-Basics of Linguistics and Probability and Statistics-Words-Tokenization-Morphology-Finite State Automata.

UNIT II **9 Hours**

STATISTICAL NLP AND SEQUENCE LABELING

N-grams and Language models-Smoothing-Text classification- Bayes classifier-Evaluation-Vector Semantics-TF-IDF-Word2Vec-Evaluating Vector Models-Sequence Labeling-Part of Speech-Part of Speech Tagging-Named Entities-Named Entity Tagging.

UNIT III **9 Hours**

CONTEXTUAL EMBEDDING

Constituency-Context Free Grammar-Lexicalized Grammars-CKY Parsing-Earley"s algorithm Evaluating Parsers-Partial Parsing- Dependency Relations-Dependency Parsing-Transition Based-Graph Based.

UNIT IV **9 Hours**

COMPUTATIONAL SEMANTICS

Word Senses and WordNet-Word Sense Disambiguation-Semantic Role Labeling-Proposition Bank-FrameNet-Selectional Restrictions-Information Extraction-Template Filling.

UNIT V **9 Hours**

DISCOURSE ANALYSIS AND SPEECH PROCESSING

Discourse Coherence-Discourse Structure Parsing-Centering and Entity Based Coherence-Question Answering-Factoid Question Answering-Classical QA Models-Chatbots and Dialogue systems-Frame based Dialogue Systems-Dialogue State Architecture.

Total: 45 Hours

Reference(s)

1. Daniel Jurafsky and James H.Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition (Prentice Hall Series in Artificial Intelligence), 2020.
2. Jacob Eisenstein. Natural Language Processing, MIT Press, 2019.
3. Samuel Burns Natural Language Processing: A Quick Introduction to NLP with Python and NLTK, 2019.
4. Christopher Manning,Foundations of Statistical Natural Language Processing, MIT Press,2009.
5. Nitin Indurkhya,Fred J. Damerau,Handbook of Natural Language Processing, Second edition, Chapman & Hall/CRC: Machine Learning & Pattern Recognition, Hardcover,2010.

21ISH06 COMPUTER VISION 3 0 0 3

Course Objectives

- 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

Course Outcomes (COs)

1. Understand basic knowledge, theories and methods in image processing and computer vision.
2. Implement basic and some advanced image processing techniques in OpenCV.
3. Apply 2D a feature-based based image alignment, segmentation and motion estimations.
4. To apply 3D image reconstruction techniques.
5. To design and develop innovative image processing and computer vision applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	1	1	1				2	1	3	2	2	
2	3	3	3	2	3		1		2	1	3	2	2	3
3	3	3	2	2	3				1	1	2	2	2	2
4	2	3	3	2	3				2	1	2	3	2	2
5	2	3	3	2	2	2			2	1	2	3	2	3

UNIT I **9 Hours**

INTRODUCTION TO IMAGE FORMATION AND PROCESSING

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 II **9 Hours**

FEATURE DETECTION, MATCHING AND SEGMENTATION

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 III **9 Hours**

FEATURE-BASED ALIGNMENT

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 IV **9 Hours**

3D RECONSTRUCTION

Shape from X-Active range finding-Surface representations-Point-based representations Volumetric representations-Model-based reconstruction-Recovering texture maps and albedosos.

UNIT V **9 Hours**

IMAGE-BASED RENDERING AND RECOGNITION

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 Hours

Reference(s)

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.
3. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
4. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006.
5. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.

21ISH09 CLOUD STORAGE TECHNOLOGIES 3 0 0 3

Course Objectives

- 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.

Course Outcomes (COs)

1. Analyze the fundamentals of information storage management and various models of Cloud infrastructure services and deployment.
2. Apply the usage of advanced intelligent storage systems and RAID.
3. Evaluate various storage networking architectures - SAN, including storage subsystems and virtualization.
4. Execute the different roles in providing disaster recovery and remote replication technologies.
5. Implement the security needs and security measures to be employed in information storage management.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1	3	3								3	3
2	3	1	2	3	3								2	3
3	1	1	3	2	2								3	
4	3	2	1	2	2								3	3
5	1	3	2	1	2								3	3

UNIT I **8 Hours**

STORAGE SYSTEMS

Cloud Storage Fundamentals and Architecture-Cloud Storage Providers and Services-Access methods (RESTful APIs, SDKs) for cloud object storage-Block storage technologies in cloud environments-File Storage in the Cloud: Network File System (NFS) and Server Message Block (SMB) protocols-Hybrid Cloud Storage-Data Migration-Data Lifecycle Management in the Cloud.

UNIT II **9 Hours**

INTELLIGENT STORAGE SYSTEMS AND RAID

Storage Tiering and Caching-Automated Data Placement and Load Balancing: Intelligent Algorithms for Data Placement, Load Balancing Strategies for Distributed Storage Systems, Dynamic Resource Allocation-RAID Technologies in Cloud Storage: RAID Levels-Data Striping, Mirroring, and Parity for Fault Tolerance-RAID Configuration and Performance Optimization.

UNIT III **10 Hours**

STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION

Storage Networking in Cloud Environments-Understanding storage protocols-Network-attached storage (NAS) vs. storage area network (SAN)-Storage virtualization techniques and technologies-Network-Attached Storage (NAS)-Storage Area Network (SAN)-iSCSI and Fiber Channel over IP

(FCIP) in Cloud Storage-Network Virtualization and Overlay Networks-Storage Virtualization and Abstraction-Network Performance Optimization-Network Security in Cloud Storage.

UNIT IV **9 Hours**

BACKUP, ARCHIVE AND REPLICATION

Cloud Backup: Strategies and Architecture, Data Deduplication and Compression, Security-Cloud Archive: Strategies and Architecture, Replication for Data Redundancy: Synchronous and asynchronous replication methods-Disaster Recovery in the Cloud-Hybrid Backup and Archiving in Cloud Environments- Backup and Archive Management in Cloud Environments.

UNIT V **9 Hours**

SECURING STORAGE INFRASTRUCTURE

Storage Security Fundamentals: Key Security Principles, Threats and Vulnerabilities in Storage Infrastructure, Access Control and Authentication: Role-based Access Control (RBAC) and Permissions Management, Multi-factor authentication (MFA) for Storage Systems-Storage-level Encryption and Application-level Encryption-Storage infrastructure Management Functions and Processes.

Total: 45 Hours

Reference(s)

1. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), OReilly, 2009.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers, 2012.

21ISH21 WEB FRAMEWORKS 3 0 0 3

Course Objectives

- Understand the architecture behind an Angular application and how to use it.
- To understand the significance of using MongoDB as a database system.
- To understand the role of React in designing front-end components.
- Build a Web Server in Node and understand how it really works.
- Develop a web application and API using web frameworks.

Course Outcomes (COs)

1. Apply modules and components and Animations for creating Forms and developing web pages.
2. Create web applications by performing CRUD operations in database using web frameworks.
3. Design Progressive Web Application with dynamic HTML web pages using Angular.
4. Designing single page applications with reusable UI components using React CSS and SaaS.
5. Use Node Package Manager and Node packages for Server Side programming.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2		2				2	2				
2	1		1		3				2	2				
3	1		2		2				2	2				
4	1		1		3				2	2				
5	1		1		3				1	1				

UNIT I **9 Hours**

ANGULAR FRONT-END FRAMEWORK

Introduction-Setup-Architecture: Modules, Components, Services and DI fundamentals-Components and Templates-Configuration-Forms-Observables and RxJS-Boot Strapping-Ng Modules-Dependency Injection-Http Client-Routing and Navigation-Animations.

UNIT II **9 Hours**

FRAMEWORKS WITH DATABASES

MongoDB-MongoDB Basics-Documents-Collections-Query Language-Installation-The mongo Shell-Schema Initialization-MongoDB Node.js Driver-Reading from MongoDB-Writing to MongoDB-CRUD operations-projections-Indexing-Aggregation-Replication-Sharding-Creating backup-Deployment.

UNIT III **9 Hours**

ANGULAR TECHNIQUES

Service workers & PWA-Server side rendering-Angular Libraries- Schematics-CLI Builders-Angular Ivy-Web Workers.

UNIT IV **9 Hours**

REACT

React Introduction-React ES6-React Render HTML-React JSX-Components-React Classes-Composing Components-Passing Data-Dynamic Composition-React state-setting State-Async State Initialization-Event Handling Communicating from Child to Parent-Stateless Components-Designing components-React Forms- React CSS-React SaaS.

UNIT V **9 Hours**

NODE JS BACK-END FRAMEWORK

Node.js basics-Local and Export Modules-Node Package Manager- Node.js web server-Node.js File system-Node Inspector-Node.js EventEmitter-Frameworks for Node.js-Express.js Web App-Serving static Resource-Node.js Data Access.

Total: 45 Hours

Reference(s)

1. Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, A Press Publisher, 2019.
2. Christoffer Noring, Pablo Deeleman,Learning Angular, Packt Publishing Limited, 2nd Revised edition edition, 2017.
3. Caleb Dayley Brad Dayley,Brendan Dayley ,Node.js, MongoDB and Angular Web Development, 2nd Edition,Pearson, 2018.
4. Shyam Seshadri, Angular: Up and Running- Learning Angular, Step by Step , OReilly; First edition, 2018.

21ISM01 EXPLORATORY DATA ANALYSIS 2 0 2 3

Course Objectives

- To outline an overview of exploratory data analysis.
- To implement data cleaning and preparation techniques.
- To perform descriptive statistics and data visualization techniques to present insights from the data.
- To apply univariate, bivariate, multivariate, correlation, and time series data exploration and analysis techniques
- To use dimensionality reduction techniques for simplifying complex datasets and visualize high- dimensional data.

Course Outcomes (COs)

1. Understand the fundamentals of exploratory data analysis.
2. Implement the data cleaning and preparation techniques.
3. Apply advanced data visualization techniques to explore complex relationships and patterns in the data.
4. Analyze and interpret relationships between variables using EDA analysis techniques to gain insights into complex data patterns.
5. Apply dimensionality reduction techniques, such as Principal Component Analysis (PCA), to simplify complex datasets and extract essential features.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	3	3	3								2	
2	2	2	2	3	3								3	
3	2	3	2	2	3								3	3
4	2	2	2	2	3								3	3
5	2	2	3	2	1								3	3

UNIT I **6 Hours**

EXPLORATORY DATA ANALYSIS

Overview of Exploratory Data Analysis-importance of EDA-data analysis process: data collection, data cleaning, and data exploration-Introduction to common data types and formats- Introduction to Python-data analysis libraries.

UNIT II **6 Hours**

DATA CLEANING AND PREPARATION

Introduction to data quality issues and common data cleaning techniques-Handling missing data and outliers-Data transformation techniques-Feature engineering and variable creation.

UNIT III **6 Hours**

DESCRIPTIVE STATISTICS AND DATA VISUALIZATION

Descriptive statistics: measures of central tendency, dispersion, and shape-Data visualization principles
and best practices-Exploratory data visualization using Matplotlib and Seaborn

UNIT IV **6 Hours**

EXPLORATORY DATA ANALYSIS TECHNIQUES

Univariate analysis: exploring single variables-Bivariate analysis: exploring relationships between variables- Multivariate analysis: analyzing relationships among multiple variables-Exploring time series data.

UNIT V **6 Hours**

DIMENSIONALITY REDUCTION TECHNIQUES

Introduction to dimensionality reduction-Principal Component Analysis (PCA) and its applications-Distributed Stochastic Neighbor Embedding (t-SNE) for visualization

5 Hours

EXPERIMENT 1

Explore the Titanic dataset using descriptive statistics and data visualization.

1. Load the Titanic dataset.
2. Calculate the descriptive statistics for each variable.
3. Create a variety of data visualizations to explore the relationships between variables.
4. Interpret the results of the descriptive statistics and data visualizations.

5 Hours

EXPERIMENT 2

Clean and prepare the California housing dataset for analysis.

1. Identify and handle missing data.
2. Identify and remove outliers.
3. Convert categorical variables to numerical variables.
4. Explore the distribution of the data after cleaning and preparing it.

5 Hours

EXPERIMENT 3

Perform univariate analysis on the Iris dataset.

1. Calculate the descriptive statistics for each variable.
2. Create a variety of data visualizations to explore the distribution of each variable.
3. Interpret the results of the descriptive statistics and data visualizations.

5 Hours

EXPERIMENT 4

Perform bivariate analysis on the Boston housing dataset.

1. Explore the relationship between housing prices and different features of the houses, such as the number of rooms, the lot size, and the crime rate.
2. Use data visualization to explore the relationships between variables.
3. Interpret the results of the bivariate analysis.

5 Hours

EXPERIMENT 5

Perform multivariate analysis on the Wine dataset.

1. Explore the relationships between different features of the wine, such as the color, the acidity, and the
alcohol content.
2. Use data visualization to explore the relationships between variables.
3. Interpret the results of the multivariate analysis.

5 Hours

EXPERIMENT 6

Apply dimensionality reduction techniques to the MNIST dataset.

1. Use PCA to reduce the dimensionality of the dataset from 784 dimensions to 2 dimensions.
2. Visualize the reduced data using a scatter plot.
3. Interpret the results of the dimensionality reduction.

Total: 30+30=60 Hours

Reference(s)

1. Provost, Foster, and Tom Fawcett. Data Science for Business: What you need to know about data mining and data-analytic thinking , O""Reilly Media, Inc., 2013. (Unit 1)
2. McKinney, Wes. Python for Data Analysis. O"""""Reilly Media, Inc., 2022. (Unit 1, 3, 5)
3. Knaflic, Cole Nussbaumer. Storytelling with data: A data visualization guide for business professionals. John Wiley & Sons, 2015. (Unit 2)
4. Kazil, Jacqueline, and Katharine Jarmul. Data wrangling with python: tips and tools to make your life easier. O""Reilly Media, Inc., 2016. (Unit 3)
5. Wickham, Hadley, and Garrett Grolemund. R for data science: import, tidy, transform, visualize,and model data. O""Reilly Media, Inc., 2016. (Unit 4, 5)
6. Matthew O. Ward, Georges Grinstein, Daniel Keim, Interactive Data Visualization: Foundations, Techniques, and Applications, 2nd Edition, CRC press, 2015.

21ISM02 RECOMMENDER STSYEMS 3 0 0 3

Course Objectives

- To understand the foundations of the recommender system.
- To learn the significance of machine learning and data mining algorithms for Recommender systems
- To learn about collaborative filtering
- To make students design and implement a recommender system.
- To learn collaborative filtering.

Course Outcomes (COs)

1. Understand the basic concepts of recommender systems.
2. Implement machine-learning and data-mining algorithms in recommender systems data sets.
3. Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.
4. Implement a simple recommender system.
5. Learn about Evaluating Paradigms of recommender systems and its applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	2	1								-	
2	1	2	1	1	1								2	3
3	2	3	1	1	1								2	3
4	3	2	2	2	1								2	3
5	2	2	1	2	1								3	

UNIT I **9 Hours**

INTRODUCTION

Introduction and basic taxonomy of recommender systems- Traditional and non-personalized-Recommender Systems-Overview of data mining methods for recommender systems-similarity measures-Dimensionality reduction-Singular Value Decomposition (SVD)

UNIT II **9 Hours**

CONTENT-BASED RECOMMENDATION SYSTEMS

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

UNIT III **9 Hours**

COLLABORATIVE FILTERING

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection

UNIT IV **9 Hours**

ATTACK-RESISTANT RECOMMENDER SYSTEMS

Introduction-Types of Attacks-Detecting attacks on recommender systems-Individual attack-Group attack-Strategies for robust recommender design-Robust recommendation algorithms.

UNIT V **9 Hours**

EVALUATING RECOMMENDER SYSTEMS

Evaluating Paradigms-User Studies-Online and Offline evaluation-Goals of evaluation design-Design Issues-Accuracy metrics-Limitations of Evaluation measures

Total: 45 Hours

Reference(s)

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
3. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Systems Handbook, 1st ed,Springer (2011)
4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.

21ISM03 BIG DATA ANALYTICS 3 0 0 3

Course Objectives

- Acquire a deep understanding of big data and NoSQL.
- Develop expertise in mapreduce analytics using Hadoop and related tools
- Explore the Hadoop related tools for Big Data Analytics.

Course Outcomes (COs)

1. Understand the big data and use cases from selected business domains.
2. Understand NoSQL big data management.
3. Utilize map reduce analytics and related tools.
4. Understand the basics of Hadoop.
5. Apply the usage of Hadoop related tools for Big Data Analytics.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1		1								3	
2	2	2	3		3								3	
3	1	3	3		3								3	2
4	2	2	2		3								2	
5	2	2	1		3								2	3

UNIT I **9 Hours**

UNDERSTANDING BIG DATA

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 II **9 Hours**

NOSQL DATA MANAGEMENT

Introduction to NoSQL-Aggregate data models-Key-value and document data models-Relationships-Graph databases-Schema less databases-Materialized views-Distribution models-Master-slave replication-Consistency-Cassandra-Cassandra data model-Cassandra examples-Cassandra clients

UNIT III **9 Hours**

MAP REDUCE APPLICATIONS

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 IV **9 Hours**

BASICS OF HADOOP

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 V **9 Hours**

HADOOP RELATED TOOLS

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 Hours

Reference(s)

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
4. E. Capriolo, D. Wampler, and J. Rutherglen, Programming Hive, O""Reilley, 2012.
5. Lars George, HBase: The Definitive Guide, O""Reilley, 2011.
6. Eben Hewitt, Cassandra: The Definitive Guide, O""Reilley, 2010.

21ISM04 NEURAL NETWORKS AND DEEP LEARNING

2 0 2 3

Course Objectives

- To understand the major concepts in deep neural networks.
- To apply Convolutional Neural Network architectures for any real-life applications
- To analyze the key computations underlying deep learning to build and train deep neural networks for various tasks.

Course Outcomes (COs)

1. Apply Convolution Neural Network for any suitable applications.
2. Analyze the various categories of associative memory and unsupervised learning networks.
3. Apply Convolutional Neural Networks and its variants for any suitable applications.
4. Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.
5. Apply autoencoders and generative models for suitable applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1		1									-
2	2	2	2		3									-
3	1	3	3		3									-
4	2	2	2		3									-
5	2	2	1		3									-

UNIT I **6 Hours**

UNDERSTANDING NEURAL NETWORKS

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction Evolution of Neural Networks-Basic Models of Artificial Neural Network-Important Terminologies of ANNs-Supervised Learning Network.

UNIT II **6 Hours**

ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS

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 III **6 Hours**

THIRD-GENERATION NEURAL NETWORKS

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 IV **6 Hours**

DEEP FEEDFORWARD NETWORKS

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 V **6 Hours**

RECURRENT NEURAL NETWORKS

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.

3 Hours

EXPERIMENT 1

Implement simple vector addition in TensorFlow.

3 Hours

EXPERIMENT 2

Implement a regression model in Keras.

3 Hours

EXPERIMENT 3

Implement a perceptron in TensorFlow/Keras Environment.

3 Hours

EXPERIMENT 4

Implement a Feed-Forward Network in TensorFlow/Keras.

3 Hours

EXPERIMENT 5

Implement an Image Classifier using CNN in TensorFlow/Keras.

3 Hours

EXPERIMENT 6

Improve the Deep learning model by fine tuning hyperparameters.

3 Hours

EXPERIMENT 7

Implement a Transfer Learning concept in Image Classification.

3 Hours

EXPERIMENT 8

Using a pre trained model on Keras for Transfer Learning

3 Hours

EXPERIMENT 9

Perform Sentiment Analysis using RNN

3 Hours

EXPERIMENT 10

Implement an LSTM based Autoencoder in TensorFlow/Keras.

Total:30+30= 60 Hours

Reference(s)

1. S Rajasekaran, G A Vijayalakshmi Pai, Neural Networks, FuzzyLogic and Genetic Algorithm,Synthesis and applications, PHI Learning, 2017
2. Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook, Springer International Publishing, 1st Edition, 2018.
3. James A Freeman, David M S Kapura,Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
5. Francois Chollet, Deep Learning with Python, Second Edition, Manning Publications, 2021.
6. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020

21ISM05 NATURAL LANGUAGE PROCESSING 3 0 0 3

Course Objectives

- To understand basics of linguistics, probability and statistics
- To study statistical approaches to NLP and understand sequence labeling
- To outline different parsing techniques associated with NLP
- To explore semantics of words and semantic role labeling of sentences
- To understand discourse analysis, question answering and chatbots

Course Outcomes (COs)

1. Understand basics of linguistics, probability and statistics associated with NLP
2. Implement a Part-of-Speech Tagger
3. Design and implement a sequence labeling problem for a given domain
4. Implement semantic processing tasks and simple document indexing and searching system using the concepts of NLP
5. Implement a simple chatbot using dialogue system concepts

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	1		1								2	
2	2	2	3		3								2	2
3	1	3	3		3								2	3
4	2	2	2		3								2	3
5	2	2	1		3								2	3

UNIT I **9 Hours**

INTRODUCTION

Natural Language Processing-Components-Basics of Linguistics and Probability and Statistics-Words-Tokenization-Morphology-Finite State Automata.

UNIT II **9 Hours**

STATISTICAL NLP AND SEQUENCE LABELING

N-grams and Language models-Smoothing-Text classification- Bayes classifier-Evaluation-Vector Semantics-TF-IDF-Word2Vec-Evaluating Vector Models-Sequence Labeling-Part of Speech-Part of Speech Tagging-Named Entities-Named Entity Tagging.

UNIT III **9 Hours**

CONTEXTUAL EMBEDDING

Constituency-Context Free Grammar-Lexicalized Grammars-CKY Parsing-Earley"s algorithm Evaluating Parsers-Partial Parsing- Dependency Relations-Dependency Parsing-Transition Based-Graph Based.

UNIT IV **9 Hours**

COMPUTATIONAL SEMANTICS

Word Senses and WordNet-Word Sense Disambiguation-Semantic Role Labeling-Proposition Bank-FrameNet-Selectional Restrictions-Information Extraction-Template Filling.

UNIT V **9 Hours**

DISCOURSE ANALYSIS AND SPEECH PROCESSING

Discourse Coherence-Discourse Structure Parsing-Centering and Entity Based Coherence-Question Answering-Factoid Question Answering-Classical QA Models-Chatbots and Dialogue systems-Frame based Dialogue Systems-Dialogue State Architecture.

Total: 45 Hours

Reference(s)

1. Daniel Jurafsky and James H.Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition (Prentice Hall Series in Artificial Intelligence), 2020.
2. Jacob Eisenstein. Natural Language Processing, MIT Press, 2019.
3. Samuel Burns Natural Language Processing: A Quick Introduction to NLP with Python and NLTK, 2019.
4. Christopher Manning,Foundations of Statistical Natural Language Processing, MIT Press,2009.
5. Nitin Indurkhya,Fred J. Damerau,Handbook of Natural Language Processing, Second edition, Chapman & Hall/CRC: Machine Learning & Pattern Recognition, Hardcover,2010.

21ISM06 COMPUTER VISION 3 0 0 3

Course Objectives

- 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

Course Outcomes (COs)

1. Understand basic knowledge, theories and methods in image processing and computer vision.
2. Implement basic and some advanced image processing techniques in OpenCV.
3. Apply 2D a feature-based based image alignment, segmentation and motion estimations.
4. To apply 3D image reconstruction techniques.
5. To design and develop innovative image processing and computer vision applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	1	1	1				2	1	3	2	2	
2	3	3	3	2	3		1		2	1	3	2	2	3
3	3	3	2	2	3				1	1	2	2	2	2
4	2	3	3	2	3				2	1	2	3	2	2
5	2	3	3	2	2	2			2	1	2	3	2	3

UNIT I **9 Hours**

INTRODUCTION TO IMAGE FORMATION AND PROCESSING

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 II **9 Hours**

FEATURE DETECTION, MATCHING AND SEGMENTATION

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 III **9 Hours**

FEATURE-BASED ALIGNMENT

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 IV **9 Hours**

3D RECONSTRUCTION

Shape from X-Active range finding-Surface representations-Point-based representations Volumetric representations-Model-based reconstruction-Recovering texture maps and albedosos.

UNIT V **9 Hours**

IMAGE-BASED RENDERING AND RECOGNITION

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 Hours

Reference(s)

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.
3. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
4. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006.
5. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.

19IS0YA WEB PROGRAMMING 3 0 0 3

Course Objectives

- Understand the concepts and architecture of the World Wide Web.
- Familiar with the different server technologies.
- Understand the scripting languages XHTML, JavaScript and PHP.

Course Outcomes (COs)

1. Create a basic website using HTML and Cascading Style Sheets.
2. Design and implement dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.
3. Design rich client presentation using AJAX.
4. Design and implement simple web page in PHP, and to present data in XML format.
5. Design front end web page and connect to the back end databases

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		3		2	2								
2	2		3		3	2								
3	2		3		3	3								
4	2		3		3	3								
5	1		2		3	2								

UNIT I **9 Hours**

INTRODUCTION TO WWW

Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response – Generation of dynamic web pages.

UNIT II **9 Hours**

UI DESIGN

Markup Language (HTML5): Basics of Html -Syntax and tags of Html- Introduction to HTML5 - Semantic/Structural Elements -HTML5 style Guide and Coding Convention– Html Svg and Canvas – Html API's - Audio & Video - Drag/Drop - Local Storage - Web socket API– Debugging and validating Html.

UNIT IV **9 Hours**

UI DESIGN-CSS

Cascading Style Sheet (CSS3): The need for CSS – Basic syntax and structure Inline Styles – Embedding Style Sheets - Linking External Style Sheets - Introduction to CSS3 – Backgrounds - Manipulating text - Margins and Padding - Positioning using CSS.

UNIT IV **9 Hours**

OVERVIEW OF JAVASCRIPT

Introduction - Core features - Data types and Variables - Operators, Expressions, and Statements Functions - Objects - Array, Date and Math Related Objects - Document Object Model - Event Handling - Controlling Windows & Frames and Documents - Form validations.

UNIT V **9 Hours**

PHP

Introduction - How web works - Setting up the environment (LAMP server) - Programming basics Print/echo - Variables and constants – Strings and Arrays – Operators, Control structures and looping structures – Functions – Reading Data in Web Pages - Embedding PHP within HTML - Establishing connectivity with MySQL database.

Total : 45 Hours

Reference(s)

1. David Flanagan, “JavaScript: The Definitive Guide, Sixth Edition”, O'Reilly Media, 2011
2. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, “Internet and World Wide Web - How To Program”, Fifth Edition, Pearson Education, 2011
3. James Lee, BrentWare , “Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl, and PHP” AddisonWesley, Pearson 2009
4. Thomas A. Powell, “HTML & CSS: The Complete Reference”, Fifth Edition, 2010
5. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, Tata McGraw Hill, 2013
6. Thomas A Powell, “Ajax: The Complete Reference”, McGraw Hill, 2008.

18GE0XA ETYMOLOGY 1 0 0 1

Course Objectives

- To increase vocabulary and enhance use, knowledge, and understanding of the English language.
- To stimulate an appreciation for the English language, including how it developed, how new wordsenter the language, and how it continues to be dynamic.
- To demonstrate the importance of a broad-based vocabulary for effective oral and written communication.

Course Outcomes (COs)

1. Examine prefixes, roots, and suffixes of Latin, Greek, Germanic, and Anglo-Saxon origin.
2. Explore the historical aspects of language, including the infusion of Indo-European languages, semantic changes, and the influence of world events.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										2				
2										2				

UNIT I **7 Hours**

CONVENTIONS

Acronyms, Abbreviations, Initialises, Jargon Neologisms - Idiomatic Expressions, Euphemisms Spoonerisms Malapropisms ; Mondegreens - Words Derived from Latin - Words Derived from Greek - Words Derived from - Germanic/Anglo-Saxon - Abstract word Acronym - Affix Analogy - Antonym Apheresis - Blend word Assimilation - Colloquial language Clipped word

UNIT II **8 Hours**

WORD ANALYSIS

Concrete word Derivative - Dialect Diminutive suffix - Dissimilation Doublet - Etymology Euphemism - Figurative word Homonym - Hybrid word Inflection - Informal language Infusion - Jargon Linguistics - Loan words Metathesis ; Modify - Philology Onomatopoeia - Romance language Prefix - Semantics - Root-base word - Suffix Slang - Word component Synonym

Total: 15 Hours

Reference(s)

1. Norman, Lewis. Word Power Made Easy, Goyal Publisher. Edition 2. 2014.
2. C T Onions. The Oxford Dictionary of English Etymology, Volume 11, Issue 1.70, Wynford Drive, Don Mills, Ont, Oxford University Press.1965.
3. Nurnberg W, Maxwell and Rosenblum, Morris, How to build a better Vocabulary, Completely Revised and Updated, Popular Library. 1961.

18GE0XB GENERAL PSYCHOLOGY 1 0 0 1

Course Objectives

- To provide a basic understanding of psychology.
- Defining Psychology and the subject matter of psychology.
- To provide an awareness of various methods and branches of psychology.
- To explain social and work psychology of people and the need for mental health.

Course Outcomes (COs)

1. Understand the basics of human behavior in the workplace and society at large.
2. Understand the different fields of psychology and its uses.
3. Deal people effectively in their personal and social life.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1								2	1					
2								2	2					
3								2	3					

UNIT I **15 Hours**

GENERAL PSYCOLOGY

Psychology - Introduction - Mind body relationship - Methods and Scope of Psychology -Motivation- Types of Needs- Motivational Cycle- Intelligence: Concept of Intelligence and IQ- measurement - Social psychology: individual behavior and group behavior - Group dynamics- group formation- social influence-social cognition, stereotypes- prejudice- discrimination - Definitions, formation of attitude, factors of attitude formation-change of attitude.

Total: 15 Hours

Reference(s)

1. Atkinson & Atkinson, Introduction to Psychology, 6th Ed McGraw-Hill Publications. 1975
2. Mishra, B. K, Psychology: The study of human behavior, 2nd Ed New Delhi: Prentice Hall of India Learning Pvt. Ltd. 2016.
3. Baron, R.A., Branscombe. N.R, Social Psychology, 14th Ed. New Delhi; Pearson Education. 2016
4. Morgan, C.T., King, R.A., Weisz, J.R., & Schopler, J. Introduction to Psychology, 7th Ed. New Delhi: Tata McGraw Hill. 1993

18GE0XC NEURO BEHAVIORAL SCIENCE 1 0 0 1

Course Objectives

- To provide an introduction to the Cognitive Neuro Science of languages.
- To provide an understanding of the Cognitive processes.

Course Outcomes (COs)

1. Identify the psychological problems that will impact mental health.
2. Value ethical conduct in professional and personal life.
3. Recognize the need for rationale and evidence in decision-making.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1									1					
2									2					
3									3					

UNIT I **15 Hours**

NEURO BEHAVIOURAL SCIENCE

Introduction to physiology - Anatomy - Neuro Biology - Psycho Neuro Science Behaviour and Hormones - Behaviour Modifications - Relaxation Therapy - Psycho Education for minds.

Total: 15 Hours

Reference(s)

1. Beck, Robert. Handbook of Physiology. Vol I. Oxford University Press March 15,1996
2. Horon C Philip. Sexology and Mind. Academic Press. 1993
3. Blatteis M.Clark and Melvin J. Fregly. Handbook of Physiology Sect 4, Oxford University Press. March 15, 1996

18GE0XD VISUAL MEDIA AND FILM MAKING 1 0 0 1

Course Objectives

- To acquire fundamental knowledge on development of filmmaking as an art
- To provide students a basic understanding of the techniques and nuances of visual medium
- To inculcate an ability to plan and produce a short film

Course Outcomes (COs)

1. Understand the significance and techniques of visual medium
2. Analyse and produce visual clippings

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						2	2							
2						2	2							

UNIT I **15 Hours**

ART OF FILMMAKING

History of Cinema (Origin and Narrative) Cinema as a visual medium -Significance of Editing Styles of Editing Editing as a methodology (Hollywood s Invisible Editing) Technical Aspects of Editing (Final Cut Pro (FCP), AVID and Premire Pro) - Basics of video production (pre-production to post-production) Different types of shots and angles - Film style and Narrative (Italian Neo-realism, Avant Garde, Russain Formalism, Alternative Cinema etc.,) Regional Cinema to National Cinema Basics of Script Writing (Double and Single Column) Basics of Video Production (script to screen) Final submission of a script for five minutes short film.

Total: 15 Hours

Reference(s)

1. Monaco, James, How to Read a Film: Movies, Media, and Beyond. Auckland: OUP, 2009.
2. Belavadi, Vasuki, Video Production. India: OUP, 2013.

18GE0XE YOGA FOR HUMAN EXCELLENCE 1 0 0 1

Course Objectives

- To know about the history and schools of yoga
- To know the difference between supreme consciousness and individual consciousness
- To apply the knowledge by the way of practice and introspection

Course Outcomes (COs)

1. Understand the historical aspects and schools of yoga
2. Ensure their physical & mental wellness through yoga practice
3. Develop the power to concentrate and have stress free mind

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1								2	2					
2								2	2					
3								2	2					

UNIT I **15 Hours**

YOGA FOR HUMAN EXCELLENCE

What is Yoga , History of Yoga - Yoga in todays scenario- Schools of Yoga - Eight Limbs of Yoga - Sathvic, Rajasic, Tamasic Foods and Thoughts - Science of Yoga Loosening Exercises - Yogasanas & Benefits - Super Brain Yoga - Surya Namaskar Standing Asanas - Sitting Asanas - Prone Asanas - Supine Asanas - MudrasRelaxation - Pranayama - Meditation

Total: 15 Hours

Reference(s)

1. Vethathiri Publications, Yoga Practices-2, Erode, 2012.
2. Iyengar B.K.S. Yoga: Wisdom & Practice, B.K.S. Iyengar, 2009.
3. Ramesh Partani, The Complete Secret, Ru Education, 2013.
4. http://www.sarvyoga.com/
5. http://www.wikihow.com/Do-Superbrain-Yoga

18GE0XF VEDIC MATHEMATICS 1 0 0 1

Course Objectives

- To improve their calculation speed, analytical thinking and numerical skills

Course Outcomes (COs)

1. Solve problems creatively in mathematics and its applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3												

UNIT I **15 Hours**

VEDIC MATHEMATICS

Addition- Subtraction- System of Multiplication- Squaring numbers- Cube roots- Square roots- Solution of simultaneous equations- Solutions of Quadratic equations

Total: 15 Hours

Reference(s)

1. Dhaval Bathia, Vedic Mathematics, JAICO Publishing House, 29th Edition, Mumbai, 2014
2. Jagadguru Swami Sri Bharathi Krsna Tirthaji Maharaja, Vedic Mathematics, Motilal Banarsidass Publishers Private Limited, New Delhi, 1997

18GE0XG HEALTH AND FITNESS 1 0 0 1

Course Objectives

- To understand the fundamental concepts about physical fitness & its types, training and assessment of physical fitness

Course Outcomes (COs)

1. Acquire the knowledge and training of the individual physical, mental and social concepts
2. Understand the fundamental concepts of yogic practice and physical fitness
3. To acquire the knowledge about nutrition and health consciousness.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1							1		2					
2						2			2					
3						2			2					

UNIT I **5 Hours**

FITNESS

Meaning & Definition, Need & importance of Physical fitness, Types Physical fitness - Exercise, Training and Conditioning and it is important

UNIT II **5 Hours**

YOGA AND MEDITATION

Meaning and definition; Principles of practicing;Basic Asana and it important; Pranayama and Meditation - Relaxation Techniques

UNIT III **5 Hours**

NUTRITION AND BALANCE DIET

Nutrition and Balance Diet: Needs and Important, Significant of Nutritional Food - Tips for balance diet. Common Diseases for IT professionals: Common diseases - cause prevention-First aid for common sports injuries.

Total: 15 Hours

Reference(s)

1. Anderson, Bob., Pearl, Bill.,&Burke, Edmund R., (2001). Getting in Shape Workout Programs for Men&Women. Mumbai: Jaico Publishing House
2. Baechle, Thomas. R, & Earle, Roger. W., (2000). Essentials of Strength Training and Conditioning. Champaign: Human Kinetics
3. Iyengar, BKS., (2003). The Art of Yoga. New Delhi: Harper Collins Publishers
4. Singh, Hardayal, (1995). Science of Sports training. New Delhi: D.V.S. Publications
5. Begum, Raheena. M., (2002). A Textbook of Foods, Nutrition and Dietetics. New Delhi: Sterling Publishers Private Limited

18GE0XH CONCEPT, METHODOLOGY AND APPLICATIONS OF VERMICOMPOSTING **1 0 0 1**

Course Objectives

- To understand the importance of safe methods of treating solid wastes generated through various human activities
- To appreciate the skills / devices / practices associated with the compact proceedures of biodegradation of unwanted solid residues

Course Outcomes (COs)

1. Understand the role of recycling of garbage leading to the sustenance of our healthand environment.
2. Recognize the organic farming practices and production of healthy food products.
3. Prepare and maintain tips for small scale compost units and thereby becoming more environmentally conscious

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						2								
2						2								
3						2								

UNIT I **15 Hours**

VERMICOMPOSTING TECHNOLOGY

Ecological roles and economic importance of earthworms - need for earthworm culture, scope and importance of vermiculture , limiting factors - types of worm culturing and the relative benefits Small scale and commercial methods: process & advantages , Vermicomposting equipments, devices, Design and maintenance of vermi bed - Products from vermiculture (matter & humus cycle), vermicastings in organic farming/horticulture - Marketing the products of vermiculture quality control, market research, marketing techniques , Applied vermiculture: use of urban solids & farm/ industrial residues for vermicomposting - Constraints of vermiculture and its future perspectives Artificial Earthworm as a standalone biodegradation assembly.

Total: 15 Hours

Reference(s)

1. Sultan Ahmed Ismail, 2005. The Earthworm Book, Second Revised Edition. Other India Press, Goa, India.4
2. Vermiculture Technology; Earthworms, Organic Wastes and Environmental Management, 2011, Edited by Clive A Edwards, Norman Q Arancon & Rhonda Sherman, CRC Press
3. www.organicgrowingwithworms.com.au
4. New York Times , Scientists Hope to Cultivate and Immune System for Crops

18GE0XI BLOG WRITING 1 0 0 1

Course Objectives

- To sharpen and improve writing skills, including draft writing, voice, and format.
- To develop general and global knowledge.
- To experiment with non-written forms of online communications, including images, audio and video.
- To be able to add content to your website without the assistance of a web designer.

Course Outcomes (COs)

1. Understand the flow of language in natural manner.
2. Understand the elements of a blog and be able to use them effectively.
3. Find a niche for a long-term blog.
4. Gain insight into the strategies, methods and writing of successful bloggers.
5. Develop their creative thinking.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1										1				
2										1				
3						2								
4							2							
5							2							

UNIT I **7 Hours**

Concept: What is blog writing? Types of blog posts -personal experience, opinion, reviews, advice, news/updates. Focusing your blog - concept, audience, uniqueness, posts. Company blogs. Structure: Types of structure - inverted pyramid, feature article, list, story, other options. Creating effective openings. Planning a post.

UNIT II **8 Hours**

Voice: Defining and achieving voice. Exploring various voices. Stylistic tipsÃƒÂ¢??rhythm, verbs, interesting words, senses, emphasis. Smartness and sarcasm. Reliability - accuracy, provability, specificity. Transparency about payments. Sample Blogs and Activities

Total: 15 Hours

Reference(s)

1. The Elements of Blogging: Expanding the Conversation of Journalism, by Mark Leccese and Jerry Lanson. (Taylor & Francis, 2015) ISBN: 978-1-13-802154-9. $29.95 paperback.
2. Blogging Heroes, by Michael Banks. Choose 15 of the 30 interviews/profile segments to read, be sure to include the segments on Chris Anderson and Brian Lam.
3. Complete Guide to Blogging, Huffinghton Post

18GE0XJ INTERPERSONAL SKILLS 1 0 0 1

Course Objectives

- To communicate and work effectively, both individually and in groups
- To be able to understand and manage ones own and others emotions
- To define and solve problems by making decisions about the best course of action

Course Outcomes (COs)

1. Express themselves clearly and confidently
2. Listen to others completely and with empathy
3. Assert an opinion without diminishing others opinion
4. Be responsible and timely with a willingness to collaborate
5. Develop innate personality traits to handle certain social situations

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1							2		2					
2							2		2					
3							2		2					
4							2		2					
5							2		2					

UNIT I **7 Hours**

INTRODUCTION

Conversational Skills - Active Listening - Team working Empathy - Emotional Intelligence

UNIT II **8 Hours**

SKILLS

Conflict Resolution and Mediation skills - Decision making and Problem Solving - Negotiation and Persuasion skills

Total: 15 Hours

Reference(s)

1. Stephen P. Robbins, Phillip L. Hunsaker, Training in Interpersonal Skills, Pearson, 2015
2. Robert B. Cialdini, Influence: The Psychology of Persuasion, Harper Business; Revised Edition, 2006
3. Suzanne C De Janasz, Karen O Dowo & Beth Z Schneder, Interpersonal Skills in Organisations, McGraw-Hill Education; 5th Edition, 2014

18GE0XK NEW AGE INNOVATION AND ENTREPRENEURSHIP 1 0 0 1

Course Objectives

- To make the participants understand as to how to get along with the task of setting independent business units and on the various facets of running a business
- To get the budding young entrepreneurs to appreciate the structured knowledge of the dynamics of operationalizing a business opportunity

Course Outcomes (COs)

1. Understanding entrepreneurship as an important career option
2. Concept and methodology of idea translation to viable start-ups
3. Events to occur in the building of a technology based venture for students or working professionals or women
4. Overview of Indian trends in the start-up scene

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						2			2					
2						2			2					
3						2			2					
4						2			2					

UNIT I **15 Hours**

NEW AGE INNOVATION AND ENTREPRENEURSHIP

Introduction to Entrepreneurship - Opportunity Identification ideation -MVPPositioning as an Entrepreneur Starting own Business - Developing Effective Business Model - Industry and Competitor Analysis - Building Business PlanMentoring Session with Investors- Legal and Ethical Foundation for Startup. Types of startups and licensing systems - MSME -Evaluating the Financial Strength of a New Venture/Project - Getting Funding - Types of Sources VCs, Angel funding, PE etc. -Marketing Strategies for New Ventures - IT Systems - IPR - Strategies for New Venture Growth - Talent Acquisition and Management for New Ventures - Valuation Challenge in Entrepreneurship - Intrapreneurship Sustainability - Exit strategiesand Start-up trends in India.

Total: 15 Hours

Reference(s)

1. Kathleen R. Allen, Launching New Ventures, South-WesternCengage Learning, 6th Edition, 2012
2. Alex Osterwalder and Yves Pigneur, Business Model Generation, publishedby the authors, 2010
3. Branson. R. Business stripped bare, New York, Penguin books, 2011
4. Moris MH, Kuratko DF and Covin JG, Corporate entrepreneurship and innovation, 3 edition, Mason, Oh; CENGAGE/SOUTH WESTERN publisher, 2011

18GE0XL NATIONAL CADET CORPS 1 0 0 1

Course Objectives

- To understand the importance of NCC and its organization.
- To realize the skills in the applications of drill and weapon training.
- To analyze the factors in National unity
- To identify the utility of smart materials in engineering applications.

Course Outcomes (COs)

1. Recall the motto and aim of NCC.
2. Implement synergy in disaster management.
3. Execute an example patriotic leader to serve nation

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1							2		2					
2							1		2					
3							1		2					

UNIT I **7 Hours**

NCC STRUCTURE AND TRAINING

NCC ORGANIZATION:National Cadet Corps: Aim and Objectives - Administrative and Organizational pattern - NCC flag and NCC song - Duties, Responsibilities and Conduct by NCC Cadets - Badges of ranks in NCC and Armed forces- Types of NCC camps - Eligibility conditions for writing B and C certificate examinations. Cadet welfare society and Career opportunities for NCC cadets. DRILL AND WEAPON TRAINING Drill: Aims of drill - Types of drill - Foot drill, Arms drill and Ceremonial drill. Word of commands, Guard of honour. Weapon training - Rifles used in NCC: Parts and Characteristics of 0.22 and INSAS - Stripping, Assembling and Cleaning of weapons.NATIONAL INTEGRATION AND SOCIAL AWARENESS National Integration: Introduction - Constitution of India- Importance and Necessity - Factors affecting National integration - Role of NCC in National integration. Social service and its need - Rural development programs - NGOs role and Contribution - Social Security schemes.

UNIT II **8 Hours**

PERSONALITY DEVELOPMENT AND LEADERSHIP

PERSONALITY DEVELOPMENT AND LEADERSHIP : Personality Development: Introduction - Factor influences in personality development. Leadership: Leadership traits and Skills - Indicator of good leader - Honour code concept - Type of leaders - Case studies of effective leader.DISASTER MANAGEMENT AND FIRST AID Disaster types - Natural and Manmade disasters. Role of NCC cadets in disaster management. Civil defence: Civil defence measures - Civil defence services. First aid: First aid kits and Equipments - First aid for snake bite, Sun stroke and Drowning - Respiration -Types of respiration.

Total: 15 Hours

Reference(s)

1. Cadets Hand book Common subject, DG NCC, New Delhi.
2. Cadets Hand book Special subject, DG NCC, New Delhi
3. Misra R.C and Sanjaykumar Mishra, A HAND BOOK OF NCC(English), Kanti Prakashan, 2016
4. Gupta R. K, NCC: Handbook of NCC Cadets for A, B and C Certificate Examinations (English) RPH Editorial Board, 2018.

18GE0XM COMMUNITY SERVICE AND LEADERSHIP DEVELOPMENT 1 0 0 1

Course Objectives

- Understand the role of National Service Scheme in community
- Identify the needs and problems of the community and involve in problem solving
- Develop competence required for group living and acquire leadership qualities

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														

UNIT I **15 Hours**

COMMUNITY SERVICE AND LEADERSHIP DEVELOPMENT

Introduction and Basic Concepts of NSS: History-philosophy-aims & objectives of NSS- Emblem, flag, motto, song, badge- Organizational structure - roles and responsibilities functionaries. NSS Programmes and Activities: Concept of regular activities, special camping, Day Camps-Basis of adoption of village/slums-Methodology of conducting Survey -Financial pattern of the scheme -Coordination with different agencies-Maintenance of the Diary. Community Mobilization: Mapping of community stakeholders-Designing the message in the context of the problem and the culture of the community-Identifying methods of mobilization-Youth-adult partnership. Health, Hygiene & Sanitation: Definition, needs and scope of health education- Food and Nutrition - Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan). Entrepreneurship Development: Definition & Meaning – Qualities of good entrepreneur - Steps/ways in opening an enterprise -Role of financial and support service Institutions.

Total: 15 Hours

Reference(s)

1. A Hand book on National Service Scheme, Anna University, Chennai, 2012
2. http://nss.nic.in/intro.asp
3. Delgado-Gaitn and Concha, The Power of Community: Mobilizing for Family and SchoolingNew York: Rowman & Littlefield Publishing, Inc. 2001
4. James Bailey,Guide to Hygiene and Sanitation in Aviation, World health organization, 2nd edition. 1980
5. AnuradhaBasu, Mark Casson, Nigel wadeson and Bernard Yeung, The oxford hand book of entrepreneurship, Oxford Press. 2009.

18GE0XN DISRUPTIVE INNOVATION BASED STARTUP ACTIVITIES **1 0 0 1**

Course Objectives

- To make the participants understand as to how to get along with the task disruption led innovations.
- To get the budding young entrepreneurs to appreciate the structured knowledge of the dynamics of operationalizing creativity based disruption strategy

Course Outcomes (COs)

1. Understanding contemporary entrepreneurship as an important career option
2. Concept and methodology of creative disruption to viable start-ups
3. Events to occur in the building of a technology based venture for students or working professionals or women with disruptive technology option
4. Overview of Indian trends with reference to disruptive innovation based start-ups.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1							2	2						
2							2	2						
3							2	2						
4							2	2						

UNIT I **15 Hours**

DISRUPTIVE INNOVATION

Creativity linked innovation - Differences between Disruptive & incremental Innovations - Historical, theoretical, and practical evolution of disruptive innovation (DI). - Idea generation & communication of creativity leading to DI. Innovation management concepts in DI based entrepreneur generation - How do firms bring in new business models and get new products and services to the market? - Investor preferences in core versus new or disruptive business models - disruptors and the disrupted frameworks for assessing company''s capabilities and rethinking product, market and strategy - Right customers for DI: strategy in a world that is changing so rapidly - Application of disruptive theories to complex problems and opportunities.

Total: 15 Hours

Reference(s)

1. https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1540-5885.2005.00177.x
2. http://www.brinq.com/workshop/archives/2005/01/08/what-is-disruptive-innovation
3. https://hbr.org/2006/12/disruptive-innovation-for-social-change

18GE0XO SOCIAL PSYCHOLOGY 1 0 0 1

Course Objectives

- To provide a basic understanding of social psychology.
- Defining psychological & physical changes during puberty age.
- To provide an awareness of various psychological problems and social problems.
- To explain social and work psychology of people and the need for mental health.

Course Outcomes (COs)

1. Understand the basics of human behavior in the workplace and society at large
2. Understand the various psychological, physical, social problems and management skills.
3. Deal people effectively in their personal and social life.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						2	2		1					
2						1	2		1					
3						2	2		3					

UNIT I **7 Hours**

INTRODUCTION

Introduction - Ice breaker - Time Line - Tasks and Challenges of the age(Erik Erikson)Physical changes - Introduction to Reproductive Health - Reproductive Organs - Menstruation - Changes during Puberty - Abortions - Contraception - Difference between Sex and Gender - Introduction to the origins of Patriarchy - Gender.

UNIT II **8 Hours**

PSYCHOLOGY

Developmental changes - Attraction - Friendship - Differences and Similarities - Images of Beauty and Body Image -Introduction to Media-Feedback - Sexuality - Boundaries Relationships - Marriage - Love - Emotional Health - Sexual Abuse and Safety - Role of Media - Abortions, Contraception, Wrapping up the Course.

Total: 15 Hours

Reference(s)

1. Baron, R. A.,Branscombe.N.R.(2016).Social Psychology,14th Ed. New Delhi;Pearson Education
2. Morgan,C.T., King,R.A.,Weisz,J.R.,&Schopler,J.(1993). Introduction to Psychology,7th Ed.New Dehi:Tata McGraw Hill.

18GE0XP FM RADIO BROADCASTING TECHNOLOGY 1 0 0 1

Course Objectives

- The course focuses on community radio technology and various program productions techniques for FM Radio Broadcasting.

Course Outcomes (COs)

1. Understand the hardware required for field recording and setting up a studio and carry out studio and field recording.
2. Examine the available options for telephony interfaces for radio.
3. Demonstrate proper techniques of wiring, fixing of connectors, soldering and use of tools and equipment for studio work.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3	2											
2	2	2	2											
3	2	2	2											

UNIT I **3 Hours**

INTRODUCTION TO AM/ FM RADIO

History of Radio-Types of Radio and its Reach- Entertainment Radio- Community Radio- Internet Radio- Satellite Radio. Evolution of Community Radio (CR) in India- principles behind setting up of FM/CR-policy guidelines and their impact on technology and content of a CR station- fundamental principles behind deciding the technology for a CR station.

UNIT II **3 Hours**

STUDIO TECHNOLOGY

Use of Microphones-Console handling-OB Recordings & Live Shows-Properties and components of sound-difference between analogue and digital audio-hardware required for field recording and setting up a studio-fundamental principles for setting up an audio studio.

UNIT III **3 Hours**

AUDIO PRODUCTION

Concept of recording and storing audio-hardware related to audio recording-open source software solutions for audio production-telephony interfaces for radio- audio Post Production. Voice Culture Exercise- Radio Production Techniques & Tools.

UNIT IV **3 Hours**

STUDIO OPERATIONS

Wiring, fixing of connectors, soldering and use of tools and equipment- preventive and corrective maintenance of studio and equipment.

UNIT V **3 Hours**

RADIO TRANSMISSION TECHNOLOGY

Components of the FM transmission chain- FM transmitter-different types of FM antenna - coaxial cable-propagation and coverage of RF signals-FM transmitter setup- Radio audience -measurements systems.

Total: 15 Hours

Reference(s)

1. UNESCO (2001). Community Radio Handbook.
2. Vinod Pavarala, Kanchan K Malik, Other Voices: The Struggle for Community Radio in India, SAGE Publications India, 2007.
3. Steve Buckley, Mark Raboy, Toby Mendel, Kreszentia Duer, Monroe E. Price, Sean O Siochru, Broadcasting, Voice, and Accountability: A Public Interest Approach to Policy, Law, and Regulation, University of Michigan Press, 2008.
4. www.floridasound.com
5. www.mediacollege.com

19IS0XA FULL STACK DEVELOPMENT **1 0 0 1**

Course Objectives

- Give learning opportunity on front and back end development.

Course Outcomes (COs)

1. Understand website development using HTML and CSS.
2. Analyze the scripting concepts in Java script.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2		2									
2			2		2									

UNIT I **15 Hours**

FULL STACK DEVELOPMENT

Introduction to Web Development – Getting started with HTML – Introduction to CSS – Intermediate CSS – Advanced CSS: Building and Styling website – Learning to code with Javascript – Introduction to Bootstrap 4 – Creating a login portal – Skate or Die website – Flexbox – CSS Grids – Sass – Hosting for Web apps – Node - Mongo – REST APIs – React.

Total: 15 Hours

Reference

1. https://www.udemy.com/course/ultimate-web/

19IS0XB GRAPHICAL PROCESSING UNIT PROGRAMMING 1 0 0 1

Course Objectives

- Understand the basic of GPU Programming.
- Gain knowledge about the advanced GPU programming model and techniques.

Course Outcomes (COs)

1. Elucidate the architecture of GPU programming.
2. Explore the openCL programming model.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2		2									
2			2		2									

UNIT I **15 Hours**

GRAPHICAL PROCESSING UNIT PROGRAMMING

Introduction to GPU – Difference between GPU and CPU – Advantages of GPU – CUDA – Example of Vector Addition – Device code – Compilation and Execution – Vector Addition with Blocks - Vector Addition with Blocks and Threads – Advanced concepts in Thread – CUDA in two-dimension – Ray tracing and constant memory.

Total: 15 Hours

Reference(s)

1. http://selkie.macalester.edu/csinparallel/modules/GPUProgramming/build/html/index.html

19IS0XC PROJECT MANAGEMENT TOOLS AND TECHNIQUES

1 0 0 1

Course Objectives

- Understand the methods and tools of project management.
- Understand the realistic application of project management methods.

Course Outcomes (COs)

1. Identify the tools of project management.
2. Implement the concept of PERT and CPM.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1					3									
2					3									

UNIT I **15 Hours**

PROJECT MANAGEMENT TOOLS AND TECHNIQUES

PMTT applications - PMTT as critical success factors – Life cycle – Project size – Project Types – Four important types of projects - Contingency Model of the Use of PMTT - Gantt chart - Logic Network - PERT chart - Product Breakdown Structure - Work Breakdown Structure - SWOT – RACI – Stakeholder matrix – Cause and Effect Diagram – Risk map – Summary Risk profile

Total: 15 Hours

Reference(s)

1. https://www.finance-ni.gov.uk/articles/programme-and-project-management-tools-and-techniques
2. https://www.projectsmart.co.uk/project-management-tools.php
3. https://www.projectcentral.com/blog/project-management-techniques/
4. https://www.pmi.org/learning/library/project-management-tools-techniques-impact-success-8349

19IS0XD GAME PROGRAMMING 1 0 0 1

Course Objectives

- Demonstrate the basic and fundamental concepts in Unity 3D.
- Understand the 3D concepts for game play, modeling, and programming.
- Learn the basics of Modeling like object creation, collision with Unity.

Course Outcomes (COs)

1. Explain the basic concepts of Unity development environment.
2. Apply the scripting programming concepts in real world problems.
3. Implement the modeling and programming concepts for 2D and 3D objects.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1					3									
2					3									

UNIT I **15 Hours**

INTRODUCTION TO UNITY DEVELOPMENT ENVIRONMENT

Game Engines: Engine Concepts - Development Tools - Introducing Unity, Unity Development Environment: IDE Basics - Unity Concepts – Sprites, Setup And Unity Features - Introduction to Game Design and Production - Unity Production Basics: Lighting, Materials, Effects, etc. - Setting up Game and Adding Script - Adding Script -Unity Camera- Unity Identifying Collision.

Total: 15 Hours

Reference(s)

1. Joe Hocking, Unity in Action. Multiplatform game development in C# with Unity 5.1, 1st Edition, 2015.
2. Ben Tristem and Mike Geig, Unity Game Development in 24 Hours, 2nd Edition, Sams, 2013.
3. Andy Beane, 3D Animation Essentials, John Wiley & Sons, 2012

19IS0XE SALESFORCE APP BUILDER FUNDAMENTALS 1 0 0 1

Course Objectives

- Understand the basics and tools of Salesforce App
- Understand the realistic applications of Salesforce App.

Course Outcomes (COs)

1. Determine the solution for a given set of business requirements.
2. Apply features and capabilities available to restrict and extend object, record, and field access

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1					3									
2					3									

UNIT I **15 Hours**

SALESFORCE FUNDAMENTALS

Boundaries of declarative customization and the use cases for programmatic customization-Common scenarios for extending an org using the AppExchange-Apply features and capabilities available to restrict and extend object, record, and field access-Determine the appropriate sharing solution for a given set of business requirements -Identify the features and capabilities available when creating reports, report types, and dashboards-determine the appropriate global, object-specific actions and layouts to optimize the Salesforce mobile user experience-Customizations and use cases for Chatter.

Total: 15 Hours

Reference(s)

1. https://focusonforce.com/salesforce-certifications/platform-app-builder/
2. https://developer.salesforce.com/resources2/certification-site/files/SGCertifiedPlatformAppBuilder.pdf

19IS0XF LARAVEL: A PHP WEB FRAMEWORK 1 0 0 1

Course Objectives

- Able to develop dynamic web applications using Laravel's MVC architecture, handle routing and URLs and integrate databases.
- Implement authentication and authorization, employ middleware for request handling.
- Conduct testing and debugging, adhere to security best practices and explore deployment options.
- Integrate with front-end tools and apply industry-standard coding practices.

Course Outcomes (s)

1. Students will be able to confidently develop dynamic web applications using Laravel's MVC architecture.
2. Students will gain the ability to implement authentication and authorization in Laravel applications, ensuring secure access and protecting sensitive data.
3. Students will be proficient in conducting testing and debugging of Laravel applications, enabling them to identify and fix issues efficiently.
4. Students will be proficient in integrating Laravel with front-end tools and technologies, enabling them to build modern and responsive web applications.

Articulation Matrix

CO No	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
1		2	2		3									
2			2	2	3									
3			2	2	3									
4	2	2	2	2	3									

UNIT I **15 Hours**

Introduction - Laravel Version Upgrade - Local Environment Setup - Laravel Installation - Laravel Directory Structure and Artisan CLI - Route - Templating and Views - Controller - Form Validation and Handling - Database : Migration and Seeding - Query Builder - Relationship - File Storage - Request and Response - CRUD Operations. Sending EMail - HTTP Session - Payment Gateway Integration.

Total: 15 Hours

Reference(s)

1. Matt Stauffer, Laravel: Up & Running, 2e: A Framework for Building Modern PHP Apps, O'Reilly Media, Inc., 2019.
2. Taylor Otwell, Laravel: From Apprentice To Artisan, Leanpub, 2013.

19IS0XG - BUILDING UI USING FLASK 1 0 0 1

Course Objectives

- Learn the fundamental concepts used to develop a simple web application
- Learn the basics of the Flask framework, its architecture, and its role in building web applications.
- Learn how to interact with databases using Flask, including connecting to a database.

Course Outcomes (s)

1. Build a simple web application from scratch using flask with database connectivity.
2. Create file uploading capabilities for Flask applications.
3. Create end to end web-based applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	2		3									
2			2	2	3									
3			2	2	3									

UNIT I **15 Hours**

Flask Framework Overview - Environment - Flask Framework Hello World - Routing - Variable rules - URL Building - HTTP Method Flask Framework – Templates - Static Files – Request Object – Cookies – Session Object – Redirects & Errors – Message Flashing – File Uploading – WTF Extension – SQLite – SQLAlchemy - Flask Framework Deployment - creating end to end web-based applications.

Total: 15 Hours

Reference(s)

1. Flask Web Development, 2nd Edition, by Miguel Grinberg, Released March 2018, Publisher(s): O'Reilly Media, Inc.
2. https://flask.palletsprojects.com/en/2.3.x/ - Web Resource
3. Mastering Flask Web Development - Second Edition, By Daniel Gaspar, Jack Stouffer.

19IS0XH IOT APPLICATION DESIGN USING EMBEDDED SYSTEM 1 0 0 1

Course Objectives

- To introduce the fundamental architecture of Microcontrollers
- To Learn the interface of peripheral devices (Sensors/Actuators)
- To explore the integration between Microcontroller with LoRa-IoT platform
- Understand the concept of Wireless Communication Protocols for LoRa- IoT
- Applications (Wi-Fi, Bluetooth, BLE)
- Understand the concept of MQTT, HTTP Protocols.

Course Outcomes (s)

1. Students will understand the Python programming and its application in hardware programming on the Raspberry Pi platform
2. Students will gain hands-on experience in connecting and reading sensor data using Python programming.
3. Students will knowledge of different protocols and their implementation using Raspberry Pi.
4. Students will explore the usage of mobile applications for device control using MQTT.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	2		3									
2			2	2	3									
3			2	2	3									
4	2	2	2	2	3									

UNIT I **15 Hours**

Introduction to Raspberry Pi - OS installation and configuration - Introduction to Python - Hardware programming using python 3 in Raspberry Pi. Sensors Interfacing with Raspberry Pi - Tilt Sensor - Flame Sensor - DHT11 - Ultrasonic Sensor. Protocols and Device Control - Relay Control using raspberry pi - Protocol Implementation using Raspberry Pi – Bluetooth – Applications - Device control and data accessing using Bluetooth - Introduction to BLE.

Cloud Applications - Introduction to Thingspeak Cloud Accessing in Raspberry Pi - Data Accessing and Monitoring in the Cloud - Device control using Cloud application – MQTT - Device control using Mobile Application (MQTT).

Total: 15 Hours

Reference(s)

1. Upton, E., & Halfacree, G. (2021). Raspberry Pi User Guide (5th ed.). Wiley.
2. Briggs, J. R. (2013). Python for Kids: A Playful Introduction to Programming. No Starch Press.
3. Molloy, D. (2019). Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux (3rd ed.). Wiley.
4. Monk, S. (2016). Raspberry Pi Cookbook: Software and Hardware Problems and Solutions (3rd ed.). O'Reilly Media.