St. Martin's Engineering College

UGC Autonomous
NBA & NAAC A+ Accredited
Dhulapally, Secunderabad-500 100
www.smec.ac.in

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

I YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	MA101BS	Linear Algebra and Calculus	3	1	0	4	30	70	100
2	AP102BS	Applied Physics	3	1	0	4	30	70	100
3	CS105ES	Programming for Problem Solving	3	1	0	4	30	70	100
4	ME106ES	Engineering Graphics	1	0	4	3	30	70	100
5	AP103BS	Applied Physics Lab	0	0	3	1.5	30	70	100
6	CS107ES	Programming for Problem Solving Lab	0	0	3	1.5	30	70	100
		Total	**10**	**3**	**10**	**18**	**180**	**420**	**600**
Mandatory Course (Non-Credit)									
7	*ES104BS	Environmental Science	3	0	0	-	100	-	100
8	*TS109	Technical Seminar	0	0	2	-	100	-	100
		Induction Programme							

I YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	MA201BS	Advanced Calculus	3	1	0	4	30	70	100
2	CH202BS	Engineering Chemistry	3	1	0	4	30	70	100
3	EE206ES	Basic Electrical Engineering	3	0	0	3	30	70	100
4	ME207ES	Engineering Workshop	1	0	3	2.5	30	70	100
5	EN203HS	Professional English	2	0	0	2	30	70	100
6	CH204BS	Engineering Chemistry Lab	0	0	3	1.5	30	70	100
7	EN205HS	English Language and Communication Skills Lab	0	0	2	1	30	70	100
8	EE208ES	Basic Electrical Engineering Lab	0	0	2	1	30	70	100
		Total	**12**	**2**	**10**	**19**	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*MP209	Micro Project	0	0	2	-	100	-	100

***MC – Satisfactory/ Unsatisfactory**

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

II YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	AID301PC	Discrete Mathematics	3	0	0	3	30	70	100
2	AID302PC	Data Structures	3	1	0	4	30	70	100
3	MA301BS	Mathematical and Statistical Foundations	3	0	0	3	30	70	100
4	AID304PC	Computer Organization and Architecture	3	0	0	3	30	70	100
5	AID305PC	Python Programming	2	0	0	2	30	70	100
6	BE304MS	Business Economics and Financial Analysis	3	0	0	3	30	70	100
7	AID307PC	Data Structures Lab	0	0	3	1.5	30	70	100
8	AID308PC	Python Programming Lab	0	0	3	1.5	30	70	100
Total			**17**	**1**	**6**	**21**	**270**	**630**	**900**
Mandatory Course (Non-Credit)									
9	*GS309MC	Gender Sensitization Lab	0	0	2	-	100	-	100

II YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	AID401PC	Formal Languages and Automata Theory	3	0	0	3	30	70	100
2	AID402PC	Introduction to Artificial Intelligence	3	0	0	3	30	70	100
3	AID403PC	Operating Systems	3	0	0	3	30	70	100
4	AID404PC	Database Management Systems	3	1	0	4	30	70	100
5	AID405PC	Object Oriented Programming using Java	3	1	0	4	30	70	100
6	AID406PC	Artificial Intelligence Lab	0	0	3	1.5	30	70	100
7	AID407PC	Database Management Systems Lab	0	0	3	1.5	30	70	100
8	AID408PC	Java Programming Lab	0	0	2	1	30	70	100
Total			**15**	**2**	**8**	**21**	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*CI407MC	Constitution of India	3	0	0	-	100	-	100

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

III YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours Per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	AID501PC	Machine Learning	3	0	0	3	30	70	100
2	AID502PC	Design and Analysis of Algorithms	3	0	0	3	30	70	100
3	AID503PC	Big Data Technologies	3	0	0	3	30	70	100
4	AID504PC	Software Engineering	3	0	0	3	30	70	100
5		Professional Elective - I	3	0	0	3	30	70	100
6		Professional Elective - II	3	0	0	3	30	70	100
7	AID505PC	Machine Learning Lab	0	0	3	1.5	30	70	100
8	AID506PC	Big Data Technologies Lab	0	0	3	1.5	30	70	100
9	EN506HS	Advanced Communication Skills Lab	0	0	2	1	30	70	100
Total			**18**	**0**	**8**	**22**	**270**	**630**	**900**
Mandatory Course (Non-Credit)									
10	*IP507MC	Intellectual Property Rights	3	0	0	0	100	-	100

III YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	AID601PC	Knowledge Representation and Reasoning	3	1	0	4	30	70	100
2	AID602PC	Data Analytics	3	1	0	4	30	70	100
3	AID603PC	Computer Networks	3	1	0	4	30	70	100
4		Professional Elective – III	3	0	0	3	30	70	100
5		Open Elective - I	3	0	0	3	30	70	100
6	AID604PC	Data Analytics Lab	0	0	3	1.5	30	70	100
7	AID605PC	Computer Networks Lab	0	0	3	1.5	30	70	100
8		Professional Elective - III Lab	0	0	2	1	30	70	100
Total			**15**	**3**	**8**	**22**	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*ES608BS	Environmental Science	3	0	0	0	100	-	100

***MC – Satisfactory/ Unsatisfactory**

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IV YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	AID701PC	Deep Learning	3	0	0	3	30	70	100
2	AID702PC	Data Wrangling and Visualization	2	0	0	2	30	70	100
3	AID703PC	Professional Elective - IV	3	0	0	3	30	70	100
4		Professional Elective - V	3	0	0	3	30	70	100
5		Open Elective - II	3	0	0	3	30	70	100
6	AID704PC	Deep Learning Lab	0	0	2	1	30	70	100
7	AID705PC	Industrial Oriented Mini Project/ Summer Internship	0	0	0	2	--	100	100
8	AID706PC	Seminar	0	0	2	1	100	--	100
9		Project Stage - I	0	0	6	3	100	--	100
		Total	**14**	**0**	**10**	**21**	**380**	**520**	**900**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	SM801MS	Organizational Behaviour	3	0	0	3	30	70	100
2		Professional Elective– VI	3	0	0	3	30	70	100
3		Open Elective - III	3	0	0	3	30	70	100
4	AID802PC	Project Stage– II	0	0	14	7	30	70	100
		Total	**9**	**0**	**14**	**16**	**120**	**280**	**400**

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

Professional Elective-I		Professional Elective - II	
AID511PE	Graph Theory	AID521PE	Software Testing Methodologies
AID512PE	Introduction to Data Science	AID522PE	Information Retrieval Systems
AID513PE	Scripting Languages	AID523PE	Pattern Recognition
AID514PE	Image Processing	AID524PE	Computer Vision and Robotics
AID515PE	Computer Graphics	AID525PE	Data Warehousing and Business Intelligence
Professional Elective - III		**Professional Elective -IV**	
AID611PE	Natural Language Processing	AID711PE	Quantum Computing
AID612PE	Data Mining	AID712PE	Expert Systems
AID613PE	Internet of Things	AID713PE	Cloud Computing
AID614PE	Mobile Application Development	AID714PE	Cryptography and Network Security
AID615PE	Web Technologies	AID715PE	Mobile Computing
Professional Elective - V		**Professional Elective – VI**	
AID721PE	Social Network Analysis	AID811PE	Speech and Video Processing
AID722PE	Federated Machine Learning	AID812PE	Robotic Process Automation
AID723PE	Augmented Reality & Virtual Reality	AID813PE	Randomized Algorithms
AID724PE	Web Security	AID814PE	Cognitive Computing
AID725PE	Ad-hoc & Sensor Networks	AID815PE	Semantic Web

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

Open Elective I	Open Elective II	Open Elective III
Fundamentals of AI	Introduction to Natural Language Processing	Chatbots
Machine Learning Basics	AI applications	Genetic Algorithms & Fuzzy logic

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

LINEAR ALGEBRA AND CALCULUS

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
MA101BS	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. Types of matrices and their properties.
2. Concept of a rank of the matrix which is used to know the consistency of system of linear equations.
3. Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
4. Determine the maxima and minima of functions of several variables by using partial differential coefficients.
5. Evaluation of improper integrals using Beta and Gamma functions.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations.
2. Find the Eigen values and Eigen vectors , reduce the quadratic form to canonical form using orthogonal transformations.
3. Apply the Mean value theorems for the single variable functions.
4. Apply maxima and minima for functions of several variables and Lagrange's method of multipliers.
5. Evaluate the improper integrals using Beta and Gamma functions.

UNIT-I	MATRICES	Classes: 12

Matrices: Types of Matrices, Symmetric, Hermitian, Skew-symmetric, Skew-Hermitian, orthogonal matrices, Unitary Matrices, rank of a matrix by Echelon form and Normal form, Inverse of Non-singular Matrices by Gauss-Jordan method, System of linear equations, solving system of Homogeneous and Non- Homogeneous equations. Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II	EIGEN VALUES AND EIGEN VECTORS	Classes:12

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

UNIT-III	MEAN VALUE THEOREMS	Classes:12

Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Applications: Finding areas, volumes of revolutions of curves (Only in Cartesian coordinates)

UNIT-IV	FUNCTIONS OF SEVERAL VARIABLES	Classes: 12

Definitions of Limit and continuity. Partial Differentiation; Euler's Theorem; Total derivative, Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers. Application: Errors and approximations.

UNIT-V	FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS AND SPECIAL FUNCTIONS	Classes: 12

First Order linear and nonlinear Partial Differential Equations, Method of separation of variables.

Beta and Gamma functions, properties, relation between Beta and Gamma functions, evaluation of integrals using Beta and Gamma functions.

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition.
2. Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2017.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

REFERENCE BOOKS

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2010.
2. B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint,2002.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS

1. https://www.e-
2. booksdirectory.com/listing.php?category=4https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

APPLIED PHYSICS

I B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AP102BS	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. The fundamental postulates of quantum mechanics.
2. The concepts related to semiconductors.
3. The concepts related to PN Junction diode and its applications.
4. The basic concepts of laser and optical fiber and its applications.
5. The fundamentals of dielectrics and magnetic materials.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to

1. Demonstrate the fundamental concepts on Quantum behavior of matter in its microstate.
2. Understand the knowledge of fundamentals of Semiconductor physics.
3. Design and explain the characteristics of Optoelectronic devices.
4. Analyze the properties of Laser and Optical Fibers and its application in engineering fields.
5. Design, characterize and prepare new materials for various engineering applications by using dielectric and magnetic materials.

UNIT-I	QUANTUM MECHANICS	Classes: 12

Introduction to quantum physics, Black body radiation, Planck's Law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

UNIT-II	SEMICONDUCTOR PHYSICS	Classes: 14

Intrinsic and Extrinsic semiconductors, Carrier Concentration in Intrinsic and Extrinsic semiconductors Dependence of Fermi level on Temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics.

UNIT-III	OPTOELECTRONICS	Classes: 10

Radiative and non-radiative recombination mechanisms in semiconductors and LED: Device structure, Materials, Characteristics and figures of merit, Semiconductor photo detectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

UNIT-IV	LASERS AND FIBRE OPTICS	Classes: 12

Lasers: Introduction to interaction of radiation with matter, Characteristics, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, He-Ne laser and Semiconductor laser, Applications of laser. Fibre Optics: Introduction, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres in Communication System and Sensors.

UNIT-V	Dielectric and Magnetic Properties of Materials	Classes: 12

Introduction to Dielectrics, Polarization, Permittivity and Dielectric constant, Types of Polarization (Qualitative), Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezo electrics. Magnetization, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and Domain theory of ferromagnetism – Hysteresis curve based on domain theory, Applications of magnetic materials.

TEXT BOOKS

1. Engineering Physics, B.K. Pandey, S. Chaturvedi – CengageLearning.
2. Halliday and Resnick,Physics-Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar-S.Chand.
4. Introduction to Solid State Physics by Charles Kittel (Publishers: JohnWiley&Sons)

REFERENCE BOOKS

1. Richard Robinett ,QuantumMechanics.
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hillinc.(1995).
3. Online Course: “Optoelectronics Materials and Devices” by Monica Katiyar andDeepak GuptaNPTEL.

WEB REFERENCES

1. Introductory QuantumMechanics:https://nptel.ac.in/courses/115104096/
2. Fundamental concepts of semiconductors:https://nptel.ac.in/courses/115102025/
3. SemiconductorOptoelectronics:https://nptel.ac.in/courses/115102103/
4. FibreOptics:https://nptel.ac.in/courses/115107095/

E -TEXT BOOKS

1. library genesis: https://libgen.is/

MOOCS COURSE

1. Swayam:https://swayam.gov.in/nd1_noc19_ph13/preview
2. Alison:https://alison.com/courses?&category=physics

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

PROGRAMMING FOR PROBLEM SOLVING

I B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS105ES	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. To learn the usage of structured programming approach in solving problems.

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C Programs.
3. To code and test, a given logic in C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs
6. Searching and sorting problems

UNIT-I	INTRODUCTION TO C PROGRAMMING LANGUAGE	Classes: 16

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming.
Introduction to C Programming Language: I/O: Simple input and output with scanf and printf, variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, type conversion

UNIT-II	CONDITIONAL BRANCHING, LOOPS, ARRAY AND STRINGS	Classes: 14

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops.
Arrays: one- and two-dimensional arrays, creating, accessing and manipulating elements of arrays.
Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings.

UNIT-III	STRUCTURE AND POINTER	Classes:10

Structures: Defining structures, initializing structures, unions, Array of structures.
Pointers: Idea of pointers, defining pointers, Pointers to Arrays and Structures, Use of Pointers in self- referential structures, usage of self-referential structures in linked list (no implementation), Enumeration data type.
Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different datatypes

UNIT-IV	FUNCTION AND STORAGE CLASSES	Classes: 12

Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries
Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions
Storage classes (auto, extern, static and register)

UNIT-V	FILES AND PRE-PROCESSOR	Classes: 12

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

TEXT BOOKS

1. The C Programming Language by Dennis M Ritchie, Brian W. Kernigham, 1988,PHI
2. Computer System & Programming in C by S Kumar & S Jain, Nano Edge Public publications, Meerut.
3. Fundamentals of Computing and C Programming, R. B. Patel, Khanna Publications, 2010, NewDelhi.

REFERENCE BOOKS

1. Computer Fundamentals and Programming in C, Reema Theraja, Oxford
2. Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998,TMH
3. Theory and problem of programming with C, Byron CGottfried,TMH

WEB REFERENCES

1. https://www.tutorialspoint.com/cprogramming/
2. https://www.tutorialspoint.com/cplusplus/
3. https://www.cprogramming.com/tutorial/c-tutorial.html

E -TEXT BOOKS

1. https://fresh2refresh.com/c-programming/
2. https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/
3. https://www.sanfoundry.com/simple-c-programs/

MOOCS Course

1. nptel.ac.in/courses/106105085/4
2. https://www.quora.com/Are-IIT-NPTEL-videos-good-to-learn-basic-C-programming

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

ENGINEERING GRAPHICS

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME106ES	B.Tech	1	0	4	3	30	70	100

COURSE OBJECTIVES

To learn
The course aims at empowering the students with drafting skills and enhancing their visualization capacity in order to draw different views of the given object.
To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
To expose them to existing national standards related to technical drawings.
To impart knowledge about standard principles of orthographic projection of objects.
It will help students to use the techniques, skills, and modern engineering tools and communicate effectively.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to Familiarize with the fundamentals and standards of Engineering graphics Project orthographic projections of lines and plane surfaces.
Convert orthographic views to isometric views and vice-versa and know the basics of AutoCAD.
Preparing working drawings to communicate the ideas and information.
Know and use common drafting tools with the knowledge of drafting standards.

UNIT-I	INTRODUCTION TO ENGINEERING DRAWING	Classes: 15

Introduction to Engineering Graphics: Principles of Engineering Graphics and their significance, Usage of Drawing instruments, lettering, Conic sections including Rectangular Hyperbola (General method only); Cycloid, Epicycloids and Involutes.

Scales: Plain & Diagonal Scales.

UNIT-II	ORTHOGRAPHIC PROJECTIONS	Classes:15

Projections of points: Principles of orthographic projections – conventions – first and third angle projections. Projection of points in all quadrants.

Projection Of Lines – lines inclined to single plane, lines inclined to both the planes.

Projection of Planes: Projection of regular planes – planes inclined to one plane, planes inclined to both planes.

UNIT-III	PROJECTION OF SOLIDS & SECTION OF SOLIDS	Classes:12

Projection of Solids: Projections of regular solids like cube, prism, pyramid, cylinder and cone. Axis inclined to both the reference planes.

Section of Solids: Sectioning of above solids in simple vertical position with the cutting planeisinclinedtotheoneplaneandperpendiculartotheother–trueshapeofsection.

UNIT-IV	DEVELOPMENT OF SURFACES & ISOMETRIC PROJECTIONS	Classes: 15

Development of Surfaces: Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions –Plane Figures, Simple and Compound Solids.

UNIT-V	TRANSFORMATION OF PROJECTIONS & INTRODUCTION AUTO CAD	Classes: 15

Transformation of Projections: Conversion of Isometric Views to Orthographic Views. Conversion of orthographic views to isometric views – simple objects.

Introduction to Auto CAD: Introduction, Salient features of AutoCAD software, Basic Commands, construction, editing and dimensioning, two dimensional drawings.

TEXT BOOKS

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 50th edition, 2013-Charotar Publishing House, Gujarat.
2. BasantAgarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. K.L.Narayana, P. Kannaiah, “Engineering Drawing”, SciTech Publishers. 2nd Edition, 2013
4. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

REFERENCE BOOKS

1. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited,2011.
2. K. V. Natarajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai,2015.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore,2007.
4. Trymbaka Murthy, “Computer Aided Engineering Drawing", I.K. international Publishing House, 3rd Edition, 2011.

WEB REFERENCES

1. http://freevideolectures.com/Course/3420/Engineering-Drawing
2. https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
3. https://www.wiziq.com/tutorials/engineering-drawing
4. http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics

E -TEXT BOOKS

1. http://rgpv-ed.blogspot.com/2009/09/development-of-surfaces.html
2. http://www.techdrawingtools.com/12/l1201.htm

MOOCS Course

1. https://nptel.ac.in/course.php
2. https://swayam.gov.in/explorer

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

APPLIED PHYSICS LAB

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AP103BS	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. To study semiconductor devices.
2. To verify the Biot –Savartlaw.
3. To experience resonance phenomena.
4. To compare the experimental results with the class room learning.
5. The basic experimental skills which are very essential for an engineering student.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Learn the working principles of PN Junction diode.
2. Examine the electrical and magnetic properties of materials.
3. Determine the characteristics of Opto-Electronic devices.
4. Understand the basic principles of Optical Fibers.
5. Analyze the basic electronic circuits.

LIST OF EXPERIMENTS

1. **Energy gap of P-N junction diode**: To determine the energy gap of a semiconductor diode.
2. **Solar Cell**: To study the V-I Characteristics of solar cell.
3. **Light emitting diode**: Plot V-I and P-I characteristics of light emitting diode.
4. **Stewart – Gee's experiment**: Determination of magnetic field along axis of the current carrying coil.
5. **Hall Effect**: To determine Hall co-efficient of given semiconductor.
6. **Photoelectric effect**: To determine work function of a given material.
7. **LASER**: To study the characteristics of LASER sources.
8. **Optical Fibre**: To determine the Numerical aperture and bending losses of optical fibres.
9. **LCR Circuit**: To determine the Quality factor of LCR circuit.
10. **RC Circuit**: To determine the Time constant of RC circuit.

NOTE: Any 8 experiments are to be performed

TEXT BOOKS
1. Engineering Physics, B.K. Pandey, S. Chaturvedi –CengageLearning. 2. Halliday and Resnick,Physics-Wiley. 3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar-S.Chand.
REFERENCE BOOKS
1. Main, I. G., Vibrations and Waves in Physics. 2nd. edition. CambridgeUniversity Press,1984. 2. Eugene Hecht, "Optics" , 5thEdition,AdelphiUnioversity,2016
WEB REFERENCES
1. Fundamental concepts of semi conductors:https://nptel.ac.in/courses/115102025/ 2. Semi conductorOptoelectronics:https://nptel.ac.in/courses/115102103/
E -TEXT BOOKS
1. http://www.lehman.edu/faculty/kabat/F2019-166168.pdf 2. https://www.scribd.com/doc/143091652/ENGINEERING-PHYSICS-LAB-MANUAL
MOOCS COURSE
1. Swayam:https://swayam.gov.in/nd1_noc19_ph13/preview 2. Alison:https://alison.com/courses?&category=physics

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

PROGRAMMING FOR PROBLEM SOLVING LAB

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS107ES	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. To learn the usage of structured programming approach in solving problems

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C programs.
3. To code and test a given logic in C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs.
6. Searching and sorting problems

LIST OF EXPERIMENTS

1. Write a simple program that prints the results of all the operators available in C
2. Write a simple program to convert the temperature from Fahrenheit to Celsius
3. Write a program for find the max and min from the three numbers using if else statement
4. Write a C program to find the roots of a Quadratic equation.
5. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators+,-,*, /, % and use Switch Statement)
6. Write a program that finds if a given number is a prime number
7. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
8. Write a C program to generate the Fibonacci sequence of numbers.
9. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
10. Write a C program to find the minimum, maximum and average in an array of integers
11. Write a C program that uses functions to perform the following:1) Addition of Two Matrices 2) Multiplication of Two Matrices
12. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
13. Toinsertasub- string into a given main string from a given position. e.ii. Todeleten Characters from a given position in a given string

14. WriteaCprogramthatdisplaysthepositionofacharacterchinthestringSor–1ifSdoesn‘tcontainch
15. Write a C program to count the lines, words and characters in a given text.
16. Define a structure student to store the details like Roll Number, Name, and Marks in three subjects of a student and display the same.
17. Write a C program to perform specified operation on complex numbers.
18. Write a C program to store the information about three students.
19. Write a C Program to illustrate the use of nested structures.
20. Write a C Program to perform arithmetic operations using pointers.
21. Write a C Program to display the array elements in reverse order using pointer.
22. Write a C Program to find factorial of a number using functions.
23. Write a C Program to find factorial of a number using recursive functions.
24. Write a C Program to implement call by value and call by reference.
25. Write a C Program to copy the data from one file to another
26. Write a C Program to append data to the file
27. Write a C Program to merge the two files
28. Write a C Program to display the file content on reverse order.
29. Write a C Program to count number of vowels, consonants, digits, words in a given file

TEXT BOOKS

1. TheCProgrammingLanguagebyDennisMRitchie,BrianW.Kernigham,1988,PHI Publications, 2010,NewDelhi.
2. Computer System & Programming in C by SKumar&SJain, NanoEdgePublic publications, Meerut.
3. 3 Fundamentals of Computing and C Programming, R. B. Patel,Khanna

REFERENCE BOOKS

1. Computer Fundamentals and Programming in C, ReemaTheraja,Oxford
2. Informationtechnology,DennisP.Curtin,KimFoley,KunalSen,Cat hleen Morin,1998,TMH
3. Theory and problem of programming with C, Byron CGottfried,TMH.

TEXT BOOKS

1. https://www.tutorialspoint.com/cprogramming/
2. https://www.w3schools.in/c-tutorial/
3. https://www.cprogramming.com/tutorial/c-tutorial.html
4. www.studytonight.com/c/

REFERENCE BOOKS

1. http:///programming-with-c
2. https://developerinsider.co/best-c-programming-book-for-beginners/

REFERENCE BOOKS

1. https://nptel.ac.in/courses/106105085/4
2. https://www.coursera.org/courses?query=c%20programming

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

ENVIRONMENTAL SCIENCE

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ES104BS	B. Tech	3	0	0	-	100	-	100

COURSE OBJECTIVES

To learn

1. Analyze the inter relationship between living organism and environment
2. Describe various types of natural resources available on the earth surface
3. Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity
4. Explain the causes, effects and control measures of various types of environmental pollutions
5. Understand the importance of environment by assessing its impact on the human world

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Differentiate between various biotic and abiotic components of ecosystem
2. Describe the various types of natural resources
3. Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India
4. Illustrate causes, effects, and control measures of various types of environmental pollutions
5. Understand technologies on the basis of ecological principles environmental regulations which in turn helps in sustainable development

UNIT-I	ECOSYSTEMS	Classes: 8

Definition, Scope, and Importance of ecosystem. Classification, structure and function of an ecosystem, food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification.

UNIT-II	NATURAL RESOURCES	Classes: 8

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

UNIT-III	BIODIVERSITY AND BIOTIC RESOURCES	Classes: 7
Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic, optional values and hotspots of biodiversity. Endangered and endemic species of India, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.		
UNIT-IV	**ENVIRONMENTAL POLLUTION**	**Classes: 9**
Types of pollution, Causes, effects and prevention and control measures of air, water, soil, noise and thermal pollution. Solid waste and e-waste management.		
UNIT-V	**ENVIRONMENTAL POLICY AND SUSTAINABLE DEVELOPEMENT**	**Classes: 10**
Concept of sustainable development: Sustainable development goals. Threats to sustainability: Population explosion- crazy consumerism. Green building concept. Water conservation, Rainwater harvesting, watershed management. Environmental Policies and Legislations: Environment Protection Act, Air (Prevention and Control of Pollution) Act, Forest (conservation) Act, 1980. Wildlife Protection Act.		

TEXT BOOKS

1. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Textbook of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications
4. Dr. P. D Sharma, “Ecology and Environment”, Rastogi Publications, New Delhi,12 Edition, 2015

REFERENCE BOOKS

1. Environmental Studies by AnubhaKaushik, 4 Edition, New age international publishers
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Pvt. Ltd, NewDelhi
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHL Learning Pvt. Ltd, NewDelhi
4. Environmental Science by Daniel B. Botkin& Edward A. Keller, Wiley INDIAedition

WEB REFERENCES

1. https://www.britannica.com/science/ecosystem
2. https://ocw.mit.edu/resources/#EnvironmentandSustainability

E -TEXT BOOKS

1. P N Palanisamy Environmental Science ISBN:9788131773253, eISBN:97899332509771 Edition: Secondedition
2. Environmental Studies. Author, Dr. J. P. Sharma. Publisher, Laxmi Publications, 2009 ISBN, 8131806413,9788131806418.

MOOCS COURSE

1. https://nptel.ac.in/courses/122103039/38
2. https://nptel.ac.in/courses/106105151/12

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

ADVANCED CALCULUS

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
MA201BS	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. Methods of solving the differential equations of first and higherorder
2. Evaluation of multiple integrals and their applications
3. The physical quantities involved in engineering field related to vector valued functions
4. The basic properties of vector valued functions and their applications
5. Vector point functions and scalar point functions

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Identify whether the given differential equation of first order is exact or not.
2. Solve higher order differential equation and apply the concept of differential equation to real problems.
3. Evaluate the multiple integrals and apply the concept to find areas and volumes.
4. Is able to find gradient, directional derivative, divergence and curl.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

UNIT-I	FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS	Classes: 10

Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, Applications: Newton's law of cooling, Law of natural growth and decay, Simple Harmonic Motion

UNIT-II	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER	Classes: 12

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sinax, cosax, polynomial in x^m, $e^{ax}V(x)$ and xV(x),method of variation of parameters, Applications: LCR Circuit.

UNIT-III	MULTIPLE INTEGRATION	Classes:12

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals)

UNIT-IV	VECTOR DIFFERENTIATION	Classes: 12
Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors		
UNIT-V	**VECTOR INTEGRATION**	**Classes: 12**
Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications		

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

REFERENCE BOOKS

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?category=4
2. https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

ENGINEERING CHEMISTRY

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CH202BS	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To provide basic knowledge on atomic, molecular orbitals and the bonding interaction between atoms
2. To analyze the impact of water hardness and its various methods for removal of hardness of water, numerical problems to calculate the hardness of water in a given sample
3. To discover the importance of electrical energy which originates from chemical reactions essential for industrial needs
4. Tounderstandthebasicconceptsofspectroscopyanddrugmoleculestoextrapolatetheir chemical knowledge in day to day life
5. To enable the students to understand the use of engineering materials such as polymers, lubricants and study the industrial applications in the field of engineering and technology

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Achieve the basic concepts of atomic, molecular and electronic changes related to molecular bonding and magnetism
2. Familiarize with fundamentals of treatment technologies and considerations for its design and implementation in water treatment plants
3. To extrapolate the knowledge of cell, electrode, electrolysis, electromotive force. To analyze and develop a technical solution to corrosion problems related to engineering materials
4. Acquire the significant knowledge about basic concepts of spectroscopy and synthesis of drug molecules would be known to the students
5. Comprehended and explore engineering applications of polymers and lubricants

UNIT-I	MOLECULAR STRUCTURE AND THEORIES OF BONDING	Classes: 10

Introduction to VBT, Postulates and draw backs of VBT- Atomic and Molecular orbitals, Linear Combination of Atomic Orbitals (LCAO), Introduction to Crystal Field Theory (CFT): Salient featuresofCFT-CrystalFieldSplittingoftransitionmetaliond-orbitals in tetrahedral, octahedral and square planar geometries. Applications of CFT- color and magnetic properties.

Postulates of MOT, molecular orbitals of diatomic molecules-molecular orbital energy level diagrams of N_2, O_2 and CO molecules.

UNIT-II	WATER AND ITS TREATMENT	Classes: 12

Introduction-hardness of water-causes of hardness. Types of harness: Temporary and Permanent. Expression and units of hardness. Estimation of hardness of water by complex metric method (EDTA method), Numerical problems. Boiler troubles- scales, sludges, carryover and caustic embrittlement. Internal treatment- Calgonconditioning, phosphate conditioning and colloidal conditioning. External treatment of water- Ion exchange process. Desalination of brackish water- Reverse osmosis. Potable water and its specifications. Steps involved in the treatment of water by chlorination andozonization.

UNIT-III	ELECTROCHEMISTRY AND CORROSION	Classes: 14

Electrochemical cells- electrode potential, standard electrode potential, Galvanic cell, Nernst equation-Applications. EMF of a cell. Types of electrodes-standard hydrogen electrode, calomel and glass electrode- construction and working. Numerical problems.

Batteries - Primary (Lithium cell) and secondary batteries (Lithium ion, Lead acid storage cell)-Applications.

Corrosion: Introduction, Causes and effects of corrosion- theories of chemical and electrochemical corrosion- mechanism of electrochemical corrosion. Corrosion control methods- Cathodic protection-sacrificial anode and impressed currentcathodic methods. Metallic coatings- Methods of preparation of surface- Hot dipping- Galvanization and tinning. Electro plating and electro less plating.

UNIT-IV	SPECTROSCOPY AND SYNTHESIS OF DRUG MOLECULES	Classes: 08

Spectroscopy- Introduction, electromagnetic spectrum, principles of UV-visible, IR spectroscopy-selection rules and applications. Basic concepts of Nuclear magnetic resonance spectroscopy, chemical shift, spin-spin splitting. Magnetic resonance imaging.

Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

UNIT-V	MATERIAL CHEMISTRY	Classes: 12

Polymers: Introduction, Classification of polymers with examples. Types of polymerization: Addition and Condensation polymerization with examples.
Plastics: Introduction, Characteristics. Thermoplastic and thermosetting plastics. Compounding and fabrication of plastics (compression and injection molding). Preparation, properties and engineering applications of PVC, Teflon and Bakelite.
Lubricants: Introduction, Characteristics, mechanism-thick film, thin film, extreme pressure lubrication, properties- flash point, fire point, cloud point, pour point, mechanical stability and their significance-applications of lubricants.

TEXT BOOKS

1. P. C. Jain and M. Jain, "Engineering Chemistry", DhanpatRai Publishing Company Ltd., New Delhi,18thedition(2018)
2. PrasantaRath, B. Rama Devi, Ch. Venkataramana Reddy, S. Chakrovarthy, "A Text book of Engineering Chemistry", Cengage publications(2019)
3. ShashiChawla, "Engineering Chemistry", DhanpatRai& Co. Publishers., New Delhi,15thedition(2015)
4. C.N. Banwell, "Fundamentals of MolecularSpectroscopy"

REFERENCE BOOKS

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013)
2. B.R.Puri,L.R.SharmaandM.S.Pathania,"PrinciplesofPhysicalChemistry",S.Nagin Chand & Company Ltd., 46th edition(2013)
3. J.D. Lee, "Concise Inorganic Chemistry", Willey Publications, 5th edition(2008)
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition(2006)
5. G. L. David Krupadanam, D. Vijaya Prasad, K. VaraprasadRao, K.L.N. Reddy and C. Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad(2007)

WEB REFERENCES

1. Chemistry: foundations and applications. J. J. Lagowski, editor in chief. New York, Macmillan Reference USA, c2004. 4v
2. Polymer data handbook. Edited by James E. Mark. 2nd ed. Oxford, New York, Oxford University Press, 2009
3. https://www.wyzant.com/resources/lessons/science/chemistry
4. http://www.chem1.com/acad/webtext/virtualtextbook.html

E -TEXT BOOKS

1. Krishnamurthy, N., Vallinayagam, P., Madhavan, D., Engineering Chemistry, ISBN: 9789389347005, eBook ISBN: 9789389347012, Edition: FourthEdition
2. Vijayasarathy, P. R., Engineering Chemistry, Print Book ISBN : 9789387472778, eBook ISBN : 9789387472785, Edition : Third Edition

MOOCS COURSE

1. https://onlinecourses-archive.nptel.ac.in
2. https://www.mooc-list.com/tags/chemistry

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

BASIC ELECTRICALENGINEERING

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE206ES	B. Tech	3	0	0	3	30	70	100

COURSEOBJECTIVES

To learn

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.

COURSEOUTCOMES

Upon successful completion of the course, the student is able to

1. To analyze and solve electrical circuits using network laws.
2. To analyze and solve electrical circuits using theorems.
3. To understand and analyze basic Electric and Magnetic circuits.
4. To study the working principles of Electrical Machines.
5. To introduce components of Low Voltage Electrical Installations.

UNIT-I	D.C.CIRCUITS	Classes:15

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, The venin's and NortonsTheorems.

Time-domain analysis of first-order RL and RC circuits.

UNIT-II	A.C.CIRCUITS	Classes:10

Representationofsinusoidalwaveforms,peakandrmsvalues,phasorrepresentation,realpower, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L,C,RL,RC,RLCcombinations(seriesandparallel),resonanceinseriesRL-Ccircuit.

UNIT-III	TRANSFORMERS	Classes:15

Ideal and practical transformer, EMF equation, operation on no load and on load, OC and SC tests, phasor diagrams equivalent circuit, losses in transformers, regulation, Efficiency and condition for maximum efficiency, Auto-transformer.

UNIT-IV	ELECTRICALMACHINES	Classes:15

Generation of rotating magnetic fields, Construction and working of a three-phase induction Motor, Significance of torque-slip characteristics. Loss components and efficiency. Construction, working, Torque-speed characteristics of separately excited, shunt, series, compound dc motors.

UNIT-V	ELECTRICALINSTALLATIONS	Classes:10

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.

TEXTBOOKS

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010,Tata, McGraw Hill.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGrawHill,2009.
3. L.S.Bobrow,FundamentalsofElectricalEngineering",OxfordUniversityPress,2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition,Pearson,2010

REFERENCEBOOKS

1. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition,PrenticeHallIndia, 1989.
2. P. V. Prasad, S. Sivanagaraju, R. Prasad, "Basic ElectricalandElectronics Engineering" Cengage Learning, 1stEdition,2013.
3. V. D. Toro, – Electrical Engineering Fundamentals Prentice HallIndia,1989.

WEBREFERENCES

1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits-
4. resistance/a/ee-voltage-and-current
5. https://circuitglobe.com/

E -TEXTBOOKS

1. https://easyengineering.net/basic-electrical-engineering-by-wadhwa/
2. https://easyengineering.net/objective-electrical-technology-by-mehta/

MOOCSCOURSE

1. https://nptel.ac.in/courses/108108076/1
2. https://nptel.ac.in/courses/108102146/
3. https://nptel.ac.in/courses/108108076/35

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

ENGINEERING WORKSHOP

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME207ES	B.Tech	1	0	3	2.5	30	70	100

COURSE OBJECTIVES

To learn

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at workplace.
5. It explains the construction, function, use and application of different working tools, equipment and machines.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including Fitting, Carpentry, Foundry, Tin-smithy, House Wiring and Welding.
3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
4. Apply basic electrical engineering knowledge for house wiring practice.

LIST OF EXPERIMENTS

TRADES FOR EXERCISES (Any two exercises from each trade)

1. Tin-Smithy – (Square Tin, Cone and Cylinder)
2. Carpentry – (T-Lap Joint, Planning Sawing & Dovetail Joint)
3. Welding Practice – (Arc Welding-Butt Joint, Lap Joint&T-Joint)
4. Black Smithy – (Round to Square, S-Hook&U-Clamp)
5. Foundry – (Mould using Single Piece and SplitPattern)
6. Fitting – (V-Fit, Square Filing & Semi-circular fit)
7. House-wiring – (Two-way Switch and one-way switch inseries)

TRADES FOR DEMONSTRATION

8. Plumbing, Machine Shop, Power tools in construction, Wood turning lathe and Casting Process.

Note: At least perform 10 Exercises out of 14 Exercises.

TEXT BOOKS

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ ScitechPublishers.
2. Workshop Manual / Venkat Reddy/ BS Publications/SixthEdition
3. Workshop Technology byChapman
4. A Textbook Of Workshop Technology : Manufacturing Processes/J. KGUPTA

REFERENCE BOOKS

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/BSP
3. Workshop Technology byHazra-Chowdhary
4. Production Engineering byR.K.Jain

WEB REFERENCES

1. https://nptel.ac.in/courses/112105126/
2. https://nptel.ac.in/downloads/112105127/
3. https://nptel.ac.in/courses/112107145/
4. https://nptel.ac.in/courses/122104015/

E -TEXT BOOKS

1. http://103.135.169.82:81/fdScript/RootOfEBooks/MED/Introduction Workshop%20Technology
2. https://www.quora.com/Download-free-mechanical-engineering-ebooks-sites

MOOCS COURSE

1. http://www.nits.ac.in/workshops/Workshop_on_MOOCS_26082017.pdf
2. https://www.nitttrc.ac.in/swayam/index.html

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

PROFESSIONAL ENGLISH

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN203HS	B. Tech	2	0	0	2	30	70	100

COURSE OBJECTIVES:

To enable students

1. To enhance their vocabulary and basic grammar rules for communicative competence.
2. To hone their comprehensive skills through various reading techniques.
3. To develop the professional writing with the practice of formal letters, e-mails, reports, resumes, etc.
4. To use various sentence structures effectively in formal and informal on texts.
5. To improve scientific and technical communication skills through technical vocabulary and appropriate prose texts.

COURSE OUTCOMES:

Upon successful completion of the course, the students are able to

1. Use vocabulary effectively and syntactically.
2. Translate the reading techniques and apply them in literary texts.
3. Demonstrate enhanced competence in standard Written English.
4. Develop the competence in writing professional documents.
5. Exhibit appropriate communicative approaches to suit various contexts.

UNIT-I	THE RAMAN EFFECT	Classes:7

Vocabulary: Word Formation, Use of affixes, Grammar: Articles, Prepositions
Writing: Paragraph Writing, Organizing principles of Paragraphs in documents

UNIT-II	THE LOST CHILD	Classes:9

Vocabulary: Synonyms and AntonymsGrammar: Noun – Pronoun Agreement and Concord
Significance & Techniques of reading; Skimming – Reading for the gist of a text; Scanning– Reading for specific information; Intensive; Extensive reading; SQ3R Technique; Reading Comprehension;Reading Poetry -The Road Not Taken Writing: Narrative Writing

UNIT-III	SATYA NADELLA'S EMAIL TO HIS EMPLOYEES	Classes:10

Vocabulary: Homonyms-Homophones-Homographs Grammar: TensesWriting : Significance & Effectiveness of Writing; Writing Descriptions; Letter writing; E-mail writing

UNIT-IV	WHAT SHOULD YOU BE EATING?	Classes:10
Technical vocabulary; Words from Foreign Languages; abbreviations and acronymsGrammar: Misplaced Modifiers; Redundancies and ClichesWriting: Information Transfer, Note Making, Writing an Abstract and Report Writing		
UNIT-V	**HOW A CHINESE BILLIONAIRE BUILT HER FORTUNE**	**Classes:9**
Vocabulary: Words often Confused; Idioms and Phrasal verbs, One- word Substitutes; Grammar: Conditional Sentences; Degrees of Comparison; Simple-Complex-Compound Sentences and Common errors Writing: Essay writing		

TEXTBOOKS:

1. Sudarshana, N.P. and Savitha, C. (2018). English forEngineers. Cambridge UniversityPress.
2. Education for Life and Work – English Workbook prepared by English Faculty of St. Martin's EngineeringCollege.

REFERENCE BOOKS:

1. Swan, M. (2016). Practical English Usage. Oxford UniversityPress.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford UniversityPress.
3. Zinsser, William. (2001). On Writing Well. Harper ResourceBook.

WEB REFERENCES:

1. www.edufind.com
2. www.myenglishpages.com
3. http://grammar.ccc.comment.edu
4. http://owl.english.prudue.edu

E –TEXTBOOKS:

1. http://bookboon.com/en/communication-ebooks-zip
2. http://learningenglishvocabularygrammar.com/files/idiomsandphraseswithmeaningsandexamlespdf.pdf

MOOCS COURSE:

1. https://mooec.com/courses/grammar-guru-1
2. https://mooec.com/courses/learning-styles

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

ENGINEERING CHEMISTRY LABORATORY

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CH204BS	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. Estimationofhardnessandchloridecontentinwatertocheckitssuitabilityfordrinking purpose
2. To find the concentration of ions present in an unknown solution
3. To know the handling procedure of colorimetric and conductometric instruments
4. The fundamentals of drug synthesis
5. The measurement of physical properties like surface tension, viscosity and acid value

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the total dissolved salts present in a sample of water
2. Determine the concentration of ions existing in a solution
3. Find the strength of an acid by conductometric methods
4. Acquire basic knowledge on the chemical reaction used to synthesize drug molecules like aspirin and Paracetamol
5. Select lubricants for various purposes such as to reduce the friction between two movable surfaces and to determine the surface tension of a given liquid

LIST OF EXPERIMENTS

Volumetric Analysis

1. Determination of total hardness of water by complex metric method using EDTA.
2. Determination of chloride content of water by Argentometry.
3. Determination of acid value of coconut oil.

Potentiometry

4. Determination of Fe^{2+} ions present in the given sample by Potentiometric titration.

Conductometry

5. Estimation of HClby conductometric titration.
6. Estimation of acetic acid by conductometric titration.

Colorimetry

7. Estimation of Copper by colorimetric method.

Synthesis of Drugs

8. Synthesis of aspirin and Paracetamol.

Physicalconstants

9. Determination of viscosity of the given sample by using Ostwald's Viscometer.
10. Determination of surface tension of a given liquid using stalagmometer.

TEXT BOOKS

1. Senior practical physical chemistry, B. D. Khosla, A. Gulati and V. Garg (R. Chand and Co.,Delhi)
2. PrasantaRath, B. Rama Devi, Ch. Venkataramana Reddy, S. Chakrovarthy, "A Text book of Engineering Chemistry", Cengage publications(2019)
3. An introduction to practical; chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, NewDelhi)
4. Vogel's text book of practical organic chemistry, 5edition
5. S. S. Dhara, Text book on experiments and calculations in engineering chemistry, B.S Publications

REFERENCE BOOKS

1. G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, "Vogel's Text Book of Quantitative ChemicalAnalysis"
2. O. P. Vermani&Narula, "Theory and Practice in Applied Chemistry", New Age InternationalPublishers
3. Gary D. Christian, "Analytical chemistry", 6th Edition, WileyIndia

WEB REFERENCES

1. Phillip E. Savage, Industrial & Engineering Chemistry: At the Forefront ofChemical Engineering Research since 1909, *Ind. Eng.Chem.Res.*20195811
2. Elias, AI. SundarManoharan S. and Raj, H. "Laboratory Experiments for General Chemistry", I.I.T. Kanpur,1997

E -TEXT BOOKS

1. Payal B Joshi, Experiments In Engineering Chemistry, Edition: First, ISBN:978-93- 85909-13-9, Publisher: I.K. International Publishing House Pvt.Ltd
2. Mohapatra, Ranjan Kumar, Engineering Chemistry With Laboratory Experiments, ISBN: 978- 81-203-5158-5, PHI Learning PrivateLimited

MOOCS COURSE

1. https://sce.ethz.ch/en/programmes-and-courses/suche-angebote.html?polycourseId=1299
2. https://www.classcentral.com/course/open2study-chemistry-building-blocks-of-the-world-1297

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

I B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN205HS	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES:

To train students

1. Touseaccurateandappropriatepronunciationthroughthepracticeofphonetic sounds, symbols, word accent and intonation.
2. ToimprovetheirfluencyinspokenEnglishandneutralizetheirmothertongue influence through JAM Sessions, Role-play, etc.
3. To comprehend the speech of people of various regions through Listening practice exercises.
4. To enable students to transfer information verbally with the right usage of Body language through individual and group activities.
5. TounderstandnuancesofEnglishlanguagebypracticingvariousexercisesat Multi-media lab.

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to

1. Differentiate the speech sounds in English and demonstrate accurate pronunciation.
2. Communicate with others in clear and confident manner.
3. Improve their effective and empathetic listening ability.
4. Show the zeal to participate in Public Speaking Sessions.
5. Neutralize the Mother tongue influence in day to communication.

LIST OF EXPERIMENTS:

EXERCISE: I

CALL LAB:

Introduction to Phonetics – Speech sounds - vowels and consonants

ICS LAB:

Ice-breaking Activity – Non-verbal Communication

EXERCISE: II

CALL LAB:

Minimal Pairs – Consonant Clusters – Past Tense Marker and Plural Marker Rules

ICS LAB:

Role Play – Expressions in various Situations – Making Requests and Seeking Permissions

EXERCISE: III

CALL LAB:

Structure of Syllables – Word Accent –Stress shift–Intonation

ICS LAB:
Telephone Communication –Etiquette

EXERCISE: IV

CALL LAB:
Listening Comprehension Tests

ICS LAB:
Presentations Skills & JAM Session

EXERCISE: V

CALL LAB:
Mother Tongue Interference – Differences in British and American Pronunciation

ICS LAB:
Interview Skills – Mock Interviews

TEXTBOOKS:

1. ELCS Lab Manual prepared by English faculty of St. Martin's EngineeringCollege.
2. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. OxfordUniversity Press.

REFERENCE BOOKS:

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students,Macmillan,2008
2. J Sethi et al. A Practical Course in English Pronunciation, Prentice Hall India,2005.
3. PriyadarshiPatnaik. Group Discussions and Interviews, Cambridge University Press PvtLtd2011.
4. ArunKoneru, Professional Speaking Skills, Oxford UniversityPress,2016.

WEB REFERENCES:

1. https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589935321&section=References
2. Argyle,MichaelF.,Alkema,Florisse,&Gilmour,Robin."Thecommunicationof friendly and hostile attitudes: Verbal and nonverbal signals." European Journalof Social Psychology, 1, 385-402:1971
3. Blumer, Herbert. Symbolic interaction: Perspective and method. Engle wood Cliffs; NJ: PrenticeHall.1969

E –TEXTBOOKS:

1. Mccorry Laurie Kelly Mc Corry Jeff Mason, Communication Skills forthe Healthcare Professional, 1st edition,ISBN:1582558140, ISBN-13:9781582558141
2. RobertEOwens,Jr,LanguageDevelopment, 9th edition, ISBN:0133810364,9780133810363

MOOCS Course:

1. https://www.coursera.org/specializations/improve-english
2. https://www.edx.org/professional-certificate/upvalenciax-upper-intermediate-english

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

BASIC ELECTRICAL ENGINEERINGLABORATORY

I B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE208ES	B. Tech	0	0	2	1	30	70	100

COURSEOBJECTIVES:

To learn

1. To analyze a given network by applying various electrical laws
2. To analyze a given network by applying various network theorems
3. To know the response of electrical circuits for different excitations
4. To calculate, measure and know the relation between basic electrical parameters.
5. To analyze the performance characteristics of DC and AC electrical machines

COURSEOUTCOMES:

Upon successful completion of the course, the student is able to

1. Get an exposure to basic electrical laws.
2. Understand the response of different types of electrical circuits
3. Understand the response of different types of electrical Theorems
4. Understand different types of Excitations.
5. Understand the basic characteristics of transformers and electrical machines.

LIST OFEXPERIMENTS

PART-A

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit.
6. Verification of Super position theorem.
7. Verification of Thevenin's Theorem.
8. Verification of Norton's Theorem.

PART-B

9. O.C. & S.C. Tests on Single Phase Transformer.
10. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation).
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor.
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor.
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor

*Note: Any five experiments from Part-A and Part-B.

TEXTBOOKS

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rdedition2010,Tata
2. McGraw Hill.
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGrawHill,2009.
4. L.S.Bobrow,FundamentalsofElectricalEngineering”,OxfordUniversityPress, 2011
5. Electrical and Electronics Technology, E. Hughes, 10th Edition,Pearson,2010

REFERENCEBOOKS

1. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition,Prentice Hall India,1989.
2. P.V.Prasad, S.sivanagaraju, R.Prasad, “BasicElectricalandElectronics Engineering” Cengage Learning, 1stEdition,2013.
3. V. D. Toro, – Electrical Engineering Fundamentals Prentice HallIndia,1989.

WEBREFERENCES

1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits-resistance/a/ee-voltage-and-current
4. https://circuitglobe.com/

E -TEXTBOOKS

1. https://easyengineering.net/basic-electrical-engineering-by-wadhwa/
2. https://easyengineering.net/objective-electrical-technology-by-mehta/

MOOCSCourse

1. https://nptel.ac.in/courses/108108076/1
2. https://nptel.ac.in/courses/108102146/
3. https://nptel.ac.in/courses/108108076/35

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

DISCRETE MATHEMATICS

II B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID301PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. The elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand and construct precise mathematical proofs
2. Use logic and set theory to formulate precise statements
3. Analyze and solve counting problems on finite and discrete structures
4. Describe and manipulate sequences
5. Apply graph theory in solving computing problems

UNIT-I	FOUNDATIONS	Classes: 11

The Foundations: Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT-II	SETS AND RELATIONS	Classes: 11

Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

UNIT-III	INDUCTION AND RECURSION	Classes: 12

Algorithms, Induction and Recursion: Algorithms, The Growth of Functions, Complexity of Algorithms

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness

UNIT-IV	DISCRETE PROBABILITY AND ADVANCED COUNTING TECHNIQUES	Classes: 11

Discrete Probability and Advanced Counting Techniques: An Introduction to Discrete Probability, Probability Theory, Bayes' Theorem, Expected Value and Variance

Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion

UNIT-V	GRAPHS AND TREES	Classes: 11

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees

TEXT BOOKS

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7th Edition, TMH.

REFERENCE BOOKS

1. Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R.Manohar, TMH,
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Teodore P. Baker, 2nd ed, Pearson Education.
3. Discrete Mathematics- Richard Johnsonbaugh, 7Th Edn., Pearson Education.
4. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.
5. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5th edition, Pearson Education.

WEB REFERENCES

1. https://math.dartmouth.edu/archive/m19f03/public_html/
2. https://nptel.ac.in/courses/106/106/106106094/

E -TEXT BOOKS

1. Discrete Mathematics, An Open Introduction, Oscar Levin.

MOOCS COURSES

1. https://www.edx.org/learn/discrete-mathematics
2. https://www.udemy.com/course/discrete-math/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

DATA STRUCTURES

II B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID302PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. Exploring basic data structures such as stacks and queues.
2. A variety of data structures such as hash tables, search trees, tries, heaps, graphs
3. Sorting and pattern matching algorithms

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Select the data structures that efficiently model the information in a Problem.
2. Assess efficiency trade-offs among different data structure Implementations or combinations.
3. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
4. Implement and know the application of algorithms for sorting and pattern matching
5. Implement and know the application of algorithms in Graph Traversal methods.

UNIT-I	INTRODUCTION TO DATA STRUCTURES	Classes: 12

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

UNIT-II	DICTIONARIES AND HASH TABLE	Classes: 12

Dictionaries: Linear list representation, skip list representation, operations – insertion, deletion and searching.

Hash Table Representation: Hash functions, collision resolution-separate chaining, open addressing linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT-III	SEARCH TREES	Classes: 10

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

UNIT-IV	GRAPHS AND SORTING	Classes: 12
Graphs: Graph Implementation Methods. Graph Traversal Methods. **Sorting**: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Heap Sort, External Sorting-Model for external sorting, Merge Sort.		
UNIT-V	**PATTERN MATCHING AND TRIES**	**Classes: 12**
Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.		

TEXT BOOKS

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

REFERENCE BOOKS

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.
2. Classic Data Structures, D. Samanta, 2nd edition, PHI.

WEB REFERENCES

1. Alfred Aho, John Hopcroft, and Jeffrey Ullman, Data Structures and Algorithms, Addison-Wesley, 1983, ISBN 0-201-00023-7.
2. https://www.studytonight.com/data-structures/introduction-to-data-structures
3. https://nptel.ac.in/courses/106/102/106102064/

E –TEXT BOOKS

1. Peter Brass, Advanced Data Structures, Cambridge University Press, 2008, ISBN 978-0521880374
2. G. H. Gonnet and R. Baeza-Yates, Handbook of Algorithms and Data Structures – in Pascal and C, second edition, Addison-Wesley, 1991, ISBN 0-201-41607-7.

MOOCS COURSES

1. https://www.udemy.com/data-structures-and-algorithms
2. https://onlinecourses.swayam2.ac.in/cec21_cs02/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

MATHEMATICAL AND STATISTICAL FOUNDATIONS

II B. TECH-I SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
MA301BS	**B. Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. The Number Theory basic concepts useful for cryptography etc
2. The theory of Probability and probability distributions of single and multiple random variables
3. The sampling theory and Estimating Parameters
4. Testing of hypothesis and making inferences
5. Stochastic process and Markov chains.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Apply the number theory concepts to cryptography domain.
2. Apply the concepts of probability and distributions to some case studies.
3. Correlate the material of one unit to the material in other units.
4. Estimating a Proportion of single mean and difference of means
5. Resolve the potential misconceptions and hazards in each topic of study.

UNIT-I	**GREATEST COMMON DIVISORS AND PRIME FACTORIZATION**	**Classes: 8**

Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers, Congruences: Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences.

UNIT-II	**SIMPLE LINEAR REGRESSION AND CORRELATION AND RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS**	**Classes: 8**

Simple Linear Regression and Correlation: Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Simple Linear Regression Case Study.

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence.
Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

UNIT-III	CONTINUOUS PROBABILITY DISTRIBUTIONS AND FUNDAMENTAL SAMPLING DISTRIBUTIONS	Classes:8

Continuous Probability Distributions: Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial
Fundamental Sampling Distributions: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S2, t–Distribution, F- Distribution.

UNIT-IV	ESTIMATION & TESTS OF HYPOTHESES	Classes: 8

Estimation & Tests of Hypotheses: Introduction, Statistical Inference, Classical Methods of Estimation. Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating a Proportion for single mean , Difference between Two Means, between Two Proportions for Two Samples and Maximum Likelihood Estimation.

UNIT-V	STOCHASTIC PROCESSES AND MARKOV CHAINS	Classes: 8

Stochastic Processes and Markov Chains: Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, nstep transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXT BOOKS

1. Kenneth H. Rosen, Elementary number theory & its applications, sixth edition, Addison- Wesley, ISBN 978 0-321-50031-1.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
3. S. D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi

REFERENCE BOOKS

1. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.
2. T.T. Soong, Fundamentals of Probability And Statistics For Engineers, John Wiley & Sons Ltd, 2004.
3. Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://ocw.mit.edu/resources/#Mathematics

3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?category=4
2. https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

COMPUTER ARCHITECTURE AND ORGANIZATION

II B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID304PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn
1. The principles of computer organization and the basic architectural concepts.
2. The basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Understand the basics of instructions sets and their impact on processor design.
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
4. Design a pipeline for consistent execution of instructions with minimum hazards.
5. Recognize and manipulate representations of numbers stored in digital computers

UNIT-I	BASIC OPERATIONS	Classes: 14

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

UNIT-II	CPU & MICRO PROGRAMMED CONTROL	Classes: 13

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

UNIT-III	DATA REPRESENTATION AND COMPUTER ARTIHMETIC	Classes: 12

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

UNIT-IV	INPUT-OUTPUT AND MEMORY ORGANIZATION	Classes: 11

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

UNIT-V	PIPELINE PROCESSING AND MULTI PROCESSORS	Classes: 11

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.
Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.
Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

TEXT BOOKS

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

REFERENCE BOOKS

1. Computer Organization – Car Hamacher, Zvonks Vranesic, Safea Zaky, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4thEdition, PHI/Pearson.

WEB REFERENCES

1. "Computer Organization and Design: The Hardware/Software Interface" by David A Patterson and John L Hennessy
2. "Computer Organization" by Zvonco Vranesic and SafwatZaky"
3. Computer Architecture and Organization" by John P Hayes.

E -TEXT BOOKS

1. Fundamentals of Computer organization and Design by Shivarama Dandamudi
2. Computer Architecture: Complexity and Correctness by Mueller and Paul

MOOCS COURSES

1. https://www.mooc-list.com › tags ›computer-architecture
2. https://www.edx.org › course ›computation-structures-3-computer-mitx-6

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

PYTHON PROGRAMMING

II B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID305PC	B. Tech	2	0	0	2	30	70	100

COURSE OBJECTIVES

To learn

1. Learn Syntax and Semantics and create Functions in Python.
2. Understand Lists, Dictionaries and Regular expressions in Python.
3. Handle Strings and Files in Python.
4. Implement Object Oriented Programming and graphics concepts in Python.
5. Build Web Services and introduction to Network and Database Programming in Python.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Interpret the concepts of Object-Oriented Programming and graphics as used in Python.
5. Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

UNIT-I	INTRODUCTION TO PYTHON	Classes: 13

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types

UNIT-II	FILES, EXCEPTIONS AND MODULES	Classes: 12

FILES: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Why Exceptions?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules

Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

UNIT-III	FUNCTIONS AND OBJECT-ORIENTED PROGRAMMING	Classes: 12

Functions: What are functions? Calling Functions, Creating Functions, Passing Functions, Formal Arguments, Variable-Length Arguments, Functional Programming, Recursion.

Object Oriented Programming: Introduction, Classes, Instances, Binding and Method Invocation, Inheritance, Built-in Functions, Customizing Classes, Privacy, Delegation and Wrapping.

UNIT-IV	REGULAR EXPRESSIONS AND MULTITHREADING	Classes: 12

Regular Expressions: Introduction, Special Symbols and Characters, re Module.

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT-V	GUI AND WEB PROGRAMMING	Classes: 12

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

WEB Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application Advanced CGI, Web (HTTP) Servers

TEXT BOOKS

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCE BOOKS

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
4. Learning Python, Mark Lutz, O'Reilly.

WEB REFERENCES

1. https://www.tutorialspoint.com/python3/
2. https://www.geeksforgeeks.org/cgi-programming-python/
3. https://realpython.com/python-beginner-tips/

E -TEXT BOOKS

1. https://www.tutorialspoint.com/python3/
2. https://books.goalkicker.com/PythonBook/

MOOCS COURSES

1. https://www.coursera.org/learn/python-programming
2. https://www.edx.org/professional-certificate/python-data-science
3. https://swayam.gov.in/nd1_noc19_cs41/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

II B. TECH- I SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	T	P	C	CIE	SEE	Total
BE304MS	**B. Tech**	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To learn the basic Business types, impact of the Economy on Business. and firms specifically. To analyze the Business from the Financial Perspective.
2. To Plan production and cost concepts for maximizing profit.
3. To Construct financial statement in accordance with generally accepted accounting principles
4. To Analyze the Financial performance of business through Ratios
5. To Estimate investment proposals through Capital Budgeting Methods

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand Business with the use of economic theories and business structure
2. Learn Production and cost concepts for maximizing profit
3. Construct financial statement in accordance with generally accepted accounting principles.
4. Analyze the Financial performance of business through Ratios.
5. Estimate investment proposals through Capital Budgeting Methods

UNIT-I	INTRODUCTION TO BUSINESS AND ECONOMICS	Classes: 10

Business: Characteristic features of Business, Features and evaluation of Private Enterprises and Public Enterprises.
Economics: Significance of Economics, types, Concepts and Importance of National Income, Inflation, Nature and Scope of Business Economics.
Demand Analysis: Demand Definition, Types of Demand, Demand Function, Law of Demand, Elasticity of Demand, Types of Elasticity of Demand, Demand Forecasting Methods.

UNIT-II	THEORY OF PRODUCTION AND COST ANALYSIS	Classes:8

Theory of Production: Factors of Production, Production Function, Production Function with one variable input, Production function with two variable inputs (ISO Quants and ISO Costs), Scale of Production with Law of Returns , Cobb-Douglas Production Function.
Cost Analysis: Types of Costs, Short run and Long run Cost Functions, Break Even Analysis.

UNIT-III	MARKET STRUCTURES, PRICING & FINANCIAL ACCOUNTING	Classes: 10

Market Structures, Pricing: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition, Types of Pricing.

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.		
UNIT-IV	**FINANCIAL ANALYSIS THROUGH RATIOS**	**Classes: 8**
Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Capital Structure Ratios and Profitability Ratios, (simple problems), Cash Flow Statement (simple problems) and Funds Flow Statement (simple problems)		
UNIT-V	**CAPITAL BUDGETING**	**Classes: 8**
Capital, significance, Types of Capital, Methods and sources of raising finance. Nature of Capital Budgeting, features of Capital Budgeting proposals, Methods of Capital Budgeting: Pay Back Period Method (PBP), Accounting Rate of Return (ARR), Net Present Value Method (NPV) Simple problems.		

TEXT BOOKS

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

REFERENCE BOOKS

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

WEB REFERENCES

1. https://nptel.ac.in/courses/110106050/17
2. https://nptel.ac.in/courses/110106050/39
3. https://nptel.ac.in/courses/110106050/38

E -TEXT BOOKS

1. https://www.sciencedirect.com/book/9780750644549/business-economics
2. http://www.freebookcentre.net/Business/Economics-Books.html

MOOCS COURSE

1. https://nptel.ac.in/courses/110106050/ https://nptel.ac.in/courses/110106050/11

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

DATA STRUCTURES LAB

II B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID307PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. It introduces searching and sorting algorithms
2. It provides an understanding of data structures such as stacks and queues.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Able to identify the appropriate data structures and algorithms for solving real World problems.
2. Able to implement various kinds of searching and sorting techniques.
3. Able to implement data structures such as stacks, queues, Search trees, and hash tables to solve various computing problems.

LIST OF EXPERIMENTS

1. Write a program that uses functions to perform the following operations on singly linked list.
   a) Creation.
   b) Insertion
   c) Deletion.
   d) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.
   a) Creation.
   b) Insertion
   c) Deletion.
   d) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.
   a) Creation.
   b) Insertion
   c) Deletion.
   d) Traversal
4. Write a program that implement Stack operations using Arrays and Pointers.
5. Write a program that implement Queue operations using Arrays and Pointers.
6. Write a program that implements the following sorting methods to sort a given list of integers

in ascending order

i) Bubble sort ii) Selection sort iii) Insertion sort iv) Quick sort v) Merge sort

7. Write a program that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers:

   i) Linear search ii) Binary search

8. Write a program to implement the tree traversal methods.
9. Write a program to implement the graph traversal methods.

TEXT BOOKS

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

REFERENCE BOOKS

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

WEB REFERENCES

1. "Python Data Structures and Algorithms" by Benjamin Baka.

E -TEXT BOOKS

1. Data Structures in C Nair, Achuthsankar S. Mahalakshmi,T.

MOOCS COURSES

1. https://nptel.ac.in/courses/106/106/106106127/
2. https://nptel.ac.in/courses/106/106/106106145/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

PYTHON PROGRAMMING LAB

II B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID308PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. core programming basics and program design with functions using Python programming language.
2. A range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
3. The high-performance programs designed to strengthen the practical expertise.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Write, test, and debug simple Python programs.
2. Implement Python pattern programs with conditionals and loops.
3. Develop Python programs step-wise by defining functions and calling them, Read and write data from/to files in Python.
4. Use Python lists, tuples, dictionaries for representing compound data.
5. Design a gaming.

LIST OF EXPERIMENTS

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
4. Write a python script to print the current date in the following format “Sun May 29 02:26:23IST 2017”
5. Write a program to create, append, and remove lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write a python program to find largest of three numbers.
9. Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula : c/5 = f-32/9]

10. Write a Python program to construct the following pattern, using a nested for loop

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

11. Write a Python script that prints prime numbers less than 20.
12. Write a python program to find factorial of a number using Recursion.
13. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides).
14. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
15. Write a python program to define a module and import a specific function in that module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow(x, n)
20. Write a Python class to reverse a string word by word.

TEXT BOOKS

1. A Practical Introduction to Python Programming, Brian Heinold.
2. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
3. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning. Think Python First Edition, by Allen B. Downey, Orielly publishing.

REFERENCE BOOKS

1. Learn Python in 1 Day: Complete Python Guide with Examples Kindle Edition
2. Python Crash Course Paperback – 8 Dec 2015 by Eric Matthes
3. Python Cookbook: Recipes for Mastering Python 33rd Edition, Kindle Edition

WEB REFERENCES

1. Python Programming (Edit): An Introduction to Computer Science Paperback– 7 May 2010
2. Programming Python 4e Paperback – 14 Jan 2011 by Mark Lutz
3. Introduction to Machine Learning with Python Paperback – 7 Oct 2016 by Andreas C. Mueller (Author), Sarah Guido

E -TEXT BOOKS

1. http://www.oreilly.com/programming/free/a-whirlwind-tour-of-python.csp
2. http://www.oreilly.com/programming/free/20-python-libraries-you-arent-using-but- should.csp
3. http://www.oreilly.com/programming/free/hadoop-with-python.csp

4. http://www.oreilly.com/programming/free/how-to-make-mistakes-in-python.csp

MOOCS COURSES

1. https://www.mooc-list.com › tags › python-programming
2. https://www.mooc-list.com › tags › python
3. https://www.edx.org › learn › python
4. https://www.udacity.com › course › introduction-to-python--ud1110

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

GENDER SENSITIZATION LAB

II B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours /Week			Credits	MaximumMarks		
		L	T	P	C	CIE	SEE	Total
*GS309MC	B.Tech	-	-	2	-	100	-	100

COURSEOBJECTIVES:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.

COURSEOUTCOMES:

Upon successful completion of the course

1. Students will have developed a better understanding of vital issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from various knowledge sources.
3. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
5. Men and women students and professionals will be better equipped with impartiality to work and live together as equals and develop a sense of appreciations of women

UNIT-I	UNDERSTANDING GENDER	Classes:8

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men-Preparing for Womanhood. Growing up Male.

UNIT-II	GENDER ROLE AND RELATIONS	Classes:8

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

UNIT-III	GENDER AND LABOUR	Classes:8
Division and Valuation of Labor-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming		
UNIT-IV	**GENDER BASED VIOLENCE**	**Classes:8**
The Concept of Violence-Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing-Coping with Everyday Harassment- Further Reading: "*Chupulu".* Domestic Violence: Speaking Out: Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."		
UNIT-V	**GENDER AND CULTURE**	**Classes:8**
Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues -Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals-Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks- The Brave Heart)		

TEXT BOOKS:

1. A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu, The Textbook, "Towards a World of Equals: A Bilingual Textbook on Gender" writtenby published by Telugu Akademi, Telangana Government (2015).
2. Raj Pal Singh, Anupama Sihag, "Gender Sensitization: A World of Equals", Raj Publications (Dist.), ISBN: 9789386695123, 938669512X (2019)

REFERENCE BOOKS:

1. S.Benhabib. Situating the Self: Gender, Community, Gender and Post modernism in Contemporary Ethics, London; Routledge, 1992.

WEB REFERENCES:

1. https://www.researchgate.net/publication/329541569_empowering_women_through_gender_sensitization
2. https://eige.europa.eu/gender-mainstreaming/toolkits/gender-sensitive-arliaments/references-and-resources

E –TEXTBOOKS:

1. https://harpercollins.co.in/BookDetail.asp?BookCode=3732
2. https://unesdoc.unesco.org/ark:/48223/pf0000158897_eng

MOOCS COURSE:

1. https://www.mooc-list.com/course/sustainable-development-gender-equality
2. https://www.coursera.org/learn/gender-sexuality

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

FORMAL LANGUAGES AND AUTOMATA THEORY

II B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID401PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. Central ideas of theoretical computer science from the perspective of formal languages.
2. The fundamental concepts of formal languages, grammars and automata theory.
3. Classify machines by their power to recognize languages.
4. Employ finite state machines to solve problems in computing.
5. The differences between decidability and undecidability

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the concept of abstract machines and their power to recognize the languages.
2. Employ finite state machines for modeling and solving computing problems.
3. Design context free grammars for formal languages.
4. Distinguish between decidability and undecidability.
5. Gain proficiency with mathematical tools and formal methods.

UNIT-I	FINITE AUTOMATA	Classes: 15

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA, Moore and Melay machines.

Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

UNIT-II	REGULAR EXPRESSIONS AND REGULAR LANGUAGES	Classes: 11

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages, Statement of the pumping lemma, Applications of the Pumping Lemma.
Closure Properties of Regular Languages: Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

UNIT-III	CONTEXT FREE GRAMMAR AND AUTOMATA	Classes: 10

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

UNIT-IV	PROPERTIES OF CFG AND TURING MACHINES	Classes: 11

Normal Forms for Context- Free Grammars: Eliminating useless symbols, Eliminating €-Productions. Chomsky Normal form Griebech Normal form.
Pumping Lemma for Context-Free Languages: Statement of pumping lemma, Applications **Closure Properties of Context-Free Languages**: Closure properties of CFL's, Decision Properties of CFL's

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine, Turing machines and halting problems.

UNIT-V	UNDECIDABILITY	Classes: 11

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems,

TEXT BOOKS

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.

REFERENCE BOOKS

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

WEB REERENCES
1. https://www.ics.uci.edu/~goodrich/teach/cs162/notes/ 2. http://www.cse.iitd.ac.in/~sak/courses/toc/2011-12.index.html 3. https://web.cs.hacettepe.edu.tr/~ilyas/Courses/BBM401/
E -TEXT BOOKS
1. https://www.cis.upenn.edu/~cis262/notes/tcbook-u.pdf 2. http://people.math.sc.edu/mlevet/Lecture_Notes.pdf 3. https://www.cs.utexas.edu/~ear/cs341/automatabook/AutomataTheoryBook.pdf
MOOCS COURSES
1. https://www.udemy.com/course/formal-languages-and-automata-theory/ 2. https://nptel.ac.in/courses/106/106/106106049/ 3. https://www.udemy.com/course/theory-of-automata/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

II B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID402PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. The distinction between optimal reasoning Vs. human like reasoning
2. The concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. Different knowledge representation techniques.
4. The applications of AI, namely game playing, theorem proving, and machine learning.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Formulate an efficient problem space for a problem expressed in natural language.
2. Select a search algorithm for a problem and estimate its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique for a given problem.
4. Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

UNIT-I	BASICS OF ARTIFICIAL INTELLIGENCE	Classes: 11

Introduction: Foundations of AI, History of AI, Intelligent Agents, Agents and Environments, The Nature of Environments, The structure of Agents, Problem-Solving Agents.

Basic Search Strategies: Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions.

UNIT-II	SEARCH STRATEGIES	Classes: 11

Basic Search Strategies: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment.

Advanced Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

UNIT-III	CONSTRAINT SATISFACTION PROBLEMS AND PROPOSITIONAL LOGIC	Classes: 12

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT-IV	LOGIC CONCEPTS	Classes: 12

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.
Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT-V	KNOWLEDGE REPRESENTATION	Classes: 12

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

TEXT BOOKS

1. Stuart Russell and Peter Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Third Edition. 2010

REFERENCE BOOKS

1. Artificial Intelligence, 3rd Edition, E. Rich and K.Knight (TMH)
2. Artificial Intelligence, 3rd Edition., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

WEB REFERENCES

1. https://eecs.wsu.edu/~cook/ai/lectures/p.html
2. http://www.cs.toronto.edu/~fbacchus/csc384/Lectures/lectures.html
3. http://web.cs.iastate.edu/~cs572/studyguide.html
4. https://faculty.ist.psu.edu/vhonavar/Courses/ai/studyguide.html

E -TEXT BOOKS

1. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

MOOCS COURSES

1. https://www.udacity.com/course/intro-to-artificial-intelligence--cs271
2. https://www.classcentral.com/course/edx-artificial-intelligence-ai-7230
3. https://www.my-mooc.com/en/mooc/intro-to-artificial-intelligence/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

OPERATING SYSTEMS

II B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID403PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. Operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
2. The issues to be considered in the design and development of operating system
3. Basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Control access to a computer and the files that may be shared
2. Demonstrate the knowledge of the components of computer and their respective roles in computing.
3. Recognize and resolve user problems with standard operating environments.
4. Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

UNIT-I	OPERATING SYSTEM INTRODUCTION	Classes: 12

Introduction: Operating system objectives, User view, System view, Operating system Definition, Computer System Organization, Computer System Architecture, OS Structure, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments. Operating Systems services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure.

UNIT-II	PROCESS AND CPU SCHEDULING	Classes: 14

Process and CPU Scheduling - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling.
System call interface for process management-fork, exit, wait, waitpid, exec

UNIT-III	DEADLOCKS AND PROCESS SYNCHRONIZATION	Classes: 11

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock
Process Management and Synchronization - The Critical Section Problem, Synchronization
Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors
Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT-IV	MEMORY MANAGEMENT AND VIRTUAL MEMORY	Classes: 12

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

UNIT-V	FILE SYSTEM INTERFACE AND OPERATIONS	Classes: 13

File System Interface and Operations :Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, seek system calls.

TEXT BOOKS

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

REFERENCE BOOKS

1. Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, PHI.
Operating Systems: A concept-based Approach, 2nd Edition, D.M.Dhamdhere, TMH.
2. Operating System A Design Approach- Crowley, TMH.
3. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
4. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

WEB REFERENCES

1. http://www.dreamcss.com/2009/07/-operating-system-applications.html
2. http://www.cornelios.org/
3. http://www.yousaytoo.com/best--operating-systems/247122
4. http://www.masternewmedia.org/operating_systems/web-operating-systems-vi...
5. http://desizntech.info/2009/08/top-5-web-operating-systems/

E -TEXT BOOKS

1. An Introduction To Operating Systems : Concepts And Practice (Gnu/Linux and Windows) Bhatt, Pramod ChandraP.
2. Operating Systems : Principles And Design Choudhury, Pabitra Pal
3. Operating Systems Mohan, I.Chandra
4. Understanding Unix Srirengan,K.

MOOCS COURSES

1. https://www.udacity.com › course ›introduction-to-operating-systems--ud.
2. https://www.classcentral.com › tag ›operating-systems
3. https://www.my-mooc.com›mooc›introduction-to-operating-systems-ucs140.stanford.edu

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

DATABASE MANAGEMENT SYSTEMS

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID404PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn
1. The basic concepts and the applications of database systems.
2. The basics of SQL and construct queries using SQL.
3. Data models, design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Familiar with database storage structures and access techniques

UNIT-I	DATABASE SYSTEM APPLICATIONS AND INTRODUCTION	Classes: 13

Database System Applications: A Historical Perspective, File Systems versus a DBMS**,** the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT-II	RELATIONAL MODEL	Classes: 12

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views.

Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III	SQL AND NORMAL FORMS	Classes: 12

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.
Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT-IV	TRANSACTION PROCESSING	Classes: 12

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

UNIT-V	STORAGE STRUCTURE	Classes: 13

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

TEXT BOOKS

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V Edition.

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.edx.org/learn/databases
2. https://www.youtube.com/playlist?list=PLyvBGMFYV3auVdxQ1-88ivNFpmUEy-U3M
3. https://www.youtube.com/watch?v=bGyHqvQW6JY&list=PLRFPL_aa_SLVjQn93cUGZaKZVGr_80vYv&index=1

E -TEXT BOOKS

1. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

MOOCS COURSES

1. https://onlinecourses.nptel.ac.in/noc21_cs04/preview
2. https://www.coursera.org/learn/database-management
3. https://www.udemy.com/course/database-management-system-from-scratch-part-1/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

OBJECT ORIENTED PROGRAMMING USING JAVA

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID405PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. The object-oriented programming concepts.
2. Object-oriented programming concepts, and apply them in solving problems.
3. The principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
4. The implementation of packages and interfaces
5. The concepts of exception handling and multithreading.
6. To introduce the design of Graphical User Interface using applets and swing controls.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Solve real world problems using OOP techniques.
2. Understand the use of abstract classes.
3. Solve problems using java collection framework and I/o classes.
4. Develop multithreaded applications with synchronization.
5. Develop applets for web applications and GUI based applications.

UNIT-I	OBJECT-ORIENTED THINKING AND INHERITANCE	Classes: 13

Object-Oriented Thinking- A way of viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies- Inheritance, Method binding, Overriding and Exceptions, Summary of Object-Oriented concepts. Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes, Methods and Classes, String handling.

Inheritance– Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism-ad hoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms of inheritance-specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance

UNIT-II	PACKAGES AND STREAM BASED I/O	Classes: 12

Packages - Defining a Package, CLASSPATH, Access protection, importing packages. Interfaces - defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces.

Stream based I/O(java.io)–The Stream classes -Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations, The Console class, Serialization, Enumerations, autoboxing, generics.

UNIT-III	EXCEPTION HANDLING AND MULTITHREADING	Classes: 12

Exception handling - Fundamentals of exception handling, Exception types, Termination or resumptive models, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.
Multithreading - Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads; inter thread communication

UNIT-IV	COLLECTIONS FRAMEWORK AND INTERFACES	Classes: 12

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes-Array List, Linked List ,Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hashtable, Properties, Stack, Vector

More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.

UNIT-V	GUI PROGRAMMING WITH SWING	Classes: 13

GUI Programming with Swing – Introduction, limitations of AWT, MVC architecture, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.
Event Handling-The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes.

A Simple Swing Application, Applets – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons-JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs.

TEXT BOOKS

1. Java The complete reference, 11th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd,2018.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.
4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.
5. Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning.

WEB REFERENCES

1. http://www.developer.com/icom_includes/feeds/developer/dev-25.xml
2. http://www.ibm.com/developerworks/views/java/rss/libraryview.jsp
3. http://www.javaworld.com/rss/index.html
4. http://feeds.feedburner.com/DevxLatestJavaArticles

E -TEXT BOOKS

1. HTTP Programming Recipes for Java Bots by Jeff Heaton - Heaton Research, Inc.
2. Java Distributed Computing by Jim Farley - O'Reilly Media
3. Java Precisely by Peter Sestoft - IT University of Copenhagen
4. Java for Absolute Beginners: Learn to Program the Fundamentals the Java9+ Way
5. Fundamentals of the Java Programming Language, Java SE6
6. JAVA: Easy Java Programming for Beginners, Your Step-By-Step Guideto

MOOCS COURSES

1. https://www.mooc-list.com › tags ›java-programming
2. https://www.mooc-list.com › tags ›java
3. https://www.edx.org › learn ›java
4. https://www.udacity.com › course ›java-programming-basics--ud282
5. https://www.futurelearn.com › courses ›begin-programming.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

ARTIFICIAL INTELLIGENCE LAB

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID406PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. Basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
2. Advanced topics of AI such as planning, Bayes networks and Natural Language Processing

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Identify problems that are amenable to solution by AI method.
2. Understand and analyze working of an AI technique.
3. Formalize a given problem in the language/framework of different AI methods.
4. Apply AI techniques to real-world problems to develop intelligent systems.

LIST OF EXPERIMENTS

1. Write a program to implement A* algorithm .
2. Write a program to implement Hill Climbing algorithm.
3. Write a program to implement depth first search.
4. Write a program to implement breadth first search.
5. Write a program to implement Water Jug Problem.
6. Write a program to implement Tic-Tac-Toe game.
7. Write a program to implement Simulated Annealing Algorithm
8. Write a program to find the solution for wampus world problem
9. Write a program to solve 8-Queens problem.
10. Write a program to implement search problems of 3 x 3 puzzle.
11. Write a program to find solution for travelling salesman problem.

TEXT BOOKS

1. Stuart Russell and Peter Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Third Edition. 2010

REFERENCE BOOKS

1. Artificial Intelligence, 3rd Edition, E. Rich and K.Knight (TMH)
2. Artificial Intelligence, 3rd Edition., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

WEB REFERENCES

1. https://eecs.wsu.edu/~cook/ai/lectures/p.html
2. http://www.cs.toronto.edu/~fbacchus/csc384/Lectures/lectures.html
3. http://web.cs.iastate.edu/~cs572/studyguide.html
4. https://faculty.ist.psu.edu/vhonavar/Courses/ai/studyguide.html

E -TEXT BOOKS

1. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

MOOCS COURSES

1. https://onlinecourses.swayam2.ac.in/cec21_cs08/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs42/preview
3. https://www.coursera.org/learn/introduction-to-ai

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

DATABASE MANGEMENT SYSTEMS LAB

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID407PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. ER data model, database design and normalization
2. SQL basics for data definition and data manipulation

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Design database schema for a given application and apply normalization
2. Acquire skills in using SQL commands for data definition and data manipulation.
3. Develop solutions for database applications using procedures, cursors and triggers

LIST OF EXPERIMENTS

1. Concept design with E-R Model (Library Management System and Employee Management System)
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. Practicing DCL commands
7. Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.)
8. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
9. Queries using Joins (NATURAL, INNER, OUTER, LEFT, RIGHT)
10. Triggers (Creation of insert trigger, delete trigger, update trigger)
11. Procedures
12. Usage of Cursors

TEXT BOOKS

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

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.edx.org/learn/databases
2. https://www.youtube.com/playlist?list=PLyvBGMFYV3auVdxQ1-88ivNFpmUEy-U3M
3. https://www.youtube.com/watch?v=bGyHqvQW6JY&list=PLRFPL_aa_SLVjQn93cUGZaKZVGr_80vYv&index=1

E -TEXT BOOKS

1. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

MOOCS COURSES

1. https://onlinecourses.nptel.ac.in/noc21_cs04/preview
2. https://www.coursera.org/learn/database-management
3. https://www.udemy.com/course/database-management-system-from-scratch-part-1/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

JAVA PROGRAMMING LAB

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID408PC	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

To learn

1. To build software development skills using java programming for real-world applications.
2. To understand and apply the concepts of classes, packages, interfaces, array list, exception handling and file processing.
3. To write programs using abstract classes.
4. To write programs for solving real world problems using java collection frame work and multithreaded programs.
5. To write GUI programs using swing controls in Java.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Able to write programs for solving real world problems using java collection frame work.
2. Able to write programs using abstract classes.
3. Able to write multithreaded programs.
4. Able to write GUI programs using swing controls in Java.

LIST OF EXPERIMENTS

1. Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. a) Develop an applet in Java that displays a simple message.
   b) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.
4. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1

and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

5. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
6. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color. Initially, there is no message shown.
7. Write a Java program for the following:
    - Create a doubly linked list of elements.
    - Delete a given element from the above list
    - Display the contents of the list after deletion.
8. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
11. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
12. Write a Java program that correctly implements the producer – consumer problem using the concept of interthread communication.
13. Write a Java program to list all the files in a directory including the files present in all its subdirectories.
14. Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order.
15. Write a Java program that implements Bubble sort algorithm for sorting in descending order and also shows the number of interchanges occurred for the given set of integers.
16. Write a Java program to design a registration form for creating a new email account.

TEXT BOOKS

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.

REFERENCE BOOKS

1. "The Java Programming Language" by Arnold
2. "Java: The Complete Reference" by Herbert Schildt
3. "Core Java: An Integrated Approach, New: Includes All Versions upto Java 8" by R Nageswara Rao and DT Editorial Services
4. "Java Programming Interviews Exposed (WROX)" by Noel Markham
5. "Advanced Java Programming" by Uttam Roy
6. "Cracking the C, C++ and Java Interview" by S G Ganesh and K U Subhash

WEB REFERENCES

1. Head First Java: A Brain-Friendly Guide 2nd Edition, Kindle Edition by Kathy Sierra.
2. Effective Java: A Programming Language Guide (Java Series) 2nd Edition, Kindle Edition by Joshua Bloch.
3. AI Algorithms, Data Structures, and Idioms in Prolog, Lisp, and Java Paperback – Import, 25 Aug 2008 by George F. Luger (Author), William A Stubblefield (Author).

E -TEXT BOOKS

1. Introduction to Java Programming and Data Structures, Comprehensive Version (11th Edition) 11th Edition by Y. Daniel Liang.
2. Java How to Program, Early Objects (11th Edition) (Deitel: How to

MOOCS COURSES

1. https://www.mooc-list.com › tags › java-programming
2. https://www.mooc-list.com › tags › java
3. https://www.edx.org › learn › java
4. https://onlinecourses.nptel.ac.in/noc21_cs03/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

CONSTITUTION OF INDIA

II B. TECH II SEMESTER (R20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CI407MC	**B.Tech**	3	0	0	0			

COURSE OBJECTIVES

To learn

Objective of the constitution of India is very well written in its preamble and that is to create a state which will be

This Course deals with Fundamentals and Structures of Indian Government; it is specifically designed to give a complete overview and in-depth knowledge regarding the concerns and challenges faced by the modern constitutional governments and elaborately discusses the structure, procedures, powers and duties of governmental institutions. The Course analyses in detail the basic functions of a written constitution. Also, the theories and concepts relating to constitutionalism, federalism, judicial review, constitutional interpretation, etc. are reviewed. All the discussions in the Course are updated according to the latest position and the modifications made by judicial intervention

1.Sovereign -independent to conduct internal as well as external affairs
2.Socialist - preventing concentration of wealth into few hands
3.Secular - respecting all religions equally
4.Democratic- government by the people, of the people, for the people
5.Republic - Head of the state will be elected not hereditary

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. To understand the basic concepts of democracy, republicanism, constitutionalism and to know about the constitutional theories, virtues and constitutional interpretation
2. To study and analyse the quasi-federal nature of Indian Constitution and the basic function of a written constitution regarding the allocation of State power, the functions, powers and limits of the organs of state
3. To analyse elaborately regarding the emergency and amendment procedures; the need for granting of special status or special provisions to some states
4. To know about Panchayats, Municipalities, Scheduled and Tribal areas
5. To utilize Judiciary System of India

UNIT-I	**INTRODUCTION TO INDIAN CONSTITUTION**	**Classes: 6**

Meaning and importance of Constitution, Making of Indian Constitution, Salient features and the Preamble, Fundamental rights, Fundamental duties, Directive Principles.

UNIT-II	THE AMENDMENT OF THE CONSTITUTION	Classes: 6
Need for Amendment, Types of Amendment, Judicial Review of Constituent Power, Doctrine of Basic Structure, Major Amendments and their Constitutional Values.		
UNIT-III	**UNION & STATE EXECUTIVE AND LEGISLATURE**	**Classes:8**
Lok Sabha & Rajya Sabha (Composition, Powers & Functions), President & Prime Minister (Powers, Functions, position), Supreme Court-Composition, Powers & Functions, The President: Powers, Functions and Procedure for Impeachment, Judicial Review of Presidents Actions, Governor: Powers, Functions ,Legislative Power of the Executive – Ordinance, Parliament and State Legislature ,Privileges of Legislature ,Council of Ministers - Prime Minister.		
UNIT-IV	**MAJOR FUNCTIONARIES & EMERGENCY POWERS**	**Classes: 6**
Union Public Service Commission , Election Commission, Planning Commission (NITI) , Significance of Emergency Powers , National Emergency – Grounds – Suspension of Fundamental Rights ,State Emergency – Grounds – Judicial Review , Financial Emergency.		
UNIT-V	**INDIAN JUDICIARY**	**Classes: 6**
Supreme Court of India – Appointment of Judges – Composition , Jurisdiction: Original, Appellate and Writ Jurisdiction , Prospective Overruling and Judge - Made Laws in India (Art. 141), Review of Supreme Court Decision , High Courts – Judges - Constitution , Jurisdiction: Original, Appellate, Writ Jurisdiction and Supervisory Jurisdiction		

TEXT BOOKS

1. H.M. Seervai: Constitutional Law of India
2. M.P. Jain: Indian Constitutional Law
3. Mahendra P. Singh: V. N. Shukla's Constitution of India
4. Granville Austin: The Indian Constitution: Cornerstone of a Nation

REFERENCE BOOKS

1. An Introduction to the Constitution of India by Dr.Durga Das Basu
2. An Introduction to the Constitution of India by M.V.Pylee
3. Indian Constitutional Law by M.P. Jain

WEB REFERENCES

1. https://www.wdl.org/en/item/2672/
2. https://nptel.ac.in/courses/109103135/24

E -TEXT BOOKS

1. https://iasexamportal.com/ebook/the-constitution-of-india
2. https://www.india.gov.in/my-government/documents/e-books

MOOCS COURSES

1. http://nludelhi.ac.in/images/moocs/moocs-courses.pdf
2. https://www.classcentral.com/tag/constitutional-law

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID501PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problemsin different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT-I	INTRODUCTION	Classes: 13

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering — introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT-II	ARTIFICIAL NEURAL NETWORKS	Classes: 12

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT-III	BAYESIAN LEARNING	Classes: 12

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, *k*-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT-IV	GENETIC ALGORITHMS	Classes: 12

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning – Introduction, the learning task, *Q*–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT-V	ANALYTICAL LEARNING	Classes: 13

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning,using prior knowledge to initialize the hypothesis.

TEXT BOOKS

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.w3schools.com/ai/ai_whatis.asp
2. https://www.digitalocean.com/community/tutorials/an-introduction-to-machine-learning
3. https://www.geeksforgeeks.org/machine-learning/

E -TEXT BOOKS

1. Introduction to Machine Learning with Python, Andreas C. Müller, Sarah Guido, First Edition

MOOCS COURSES

1. https://www.udemy.com/course/introduction-to-machine-learning-in-python/
2. https://www.coursera.org/learn/machine-learning
3. https://github.com/microsoft/ML-For-Beginners

DESIGN AND ANALYSIS OF ALGORITHMS

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID502PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- Introduces the notations for analysis of the performance of algorithms.
- Introduces the data structure disjoint sets.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which eachtechnique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-, average-, and bestcase analysis.
- Explains the difference between tractable and intractable problems, and introduces theproblems that are P, NP and NP complete.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specifiedapplication
- Ability to understand how the choice of data structures and the algorithm design methods
- Impact the performance of programs

UNIT-I	INTRODUCTION	Classes: 13

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

UNIT-II	DISJOINT SETS	Classes: 12

Disjoint Sets: Disjoint set operations, union and find algorithms

Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph coloring

UNIT-III	EXCEPTION HANDLING AND MULTITHREADING	Classes: 12

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

UNIT-IV	COLLECTIONS FRAMEWORK AND INTERFACES	Classes: 12

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT-V	GUI PROGRAMMING WITH SWING	Classes: 13

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

TEXT BOOKS

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

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.geeksforgeeks.org/design-and-analysis-of-algorithms/
2. https://www.w3schools.in/data-structures/big-o-notation-and-algorithm-analysis

E -TEXT BOOKS

1. https://edutechlearners.com/download/books/Algorithms%20Design%20and%20Analysis%20by%20Udit%20Agarwal%20PDF.pdf
2. Design and analysis of algorithms, Parag H. Dave, Himanshu B. Dave, Pearson Education.

MOOCS COURSES

1. https://www.udemy.com/course/design-and-analysis-of-algorithm-/
2. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
3. https://in.coursera.org/courses?query=algorithm%20design

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

BIG DATA TECHNOLOGIES

II B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID503PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- The purpose of this course is to provide the students with the knowledge of Big dataAnalytics principles and techniques.
- This course is also designed to give an exposure of the frontiers of Big data Analytics

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Ability to explain the foundations, definitions, and challenges of Big Data and variousAnalytical tools.
- Ability to program using HADOOP and Map reduce, NOSQL
- Ability to understand the importance of Big Data in Social Media and Mining.

UNIT-I	GETTING AN OVERVIEW OF BIG DATA	Classes: 13

Getting an Overview of Big Data: What is Big Data? History of Data Management – Evolution of Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics, Careers in Big Data, Future of Big Data

Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, In- Memory Computing Technology for Big Data.

UNIT-II	UNDERSTANDING HADOOP ECOSYSTEM	Classes: 12

Understanding Hadoop Ecosystem: Hadoop Ecosystem, Hadoop Distributed File System, MapReduce, Hadoop YARN, Hbase, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie

Understanding MapReduce Fundamentals and HBase: The MapReduce Framework, Techniques to Optimize MapReduce Jobs, Uses of MapReduce, Role of HBase in Big Data Processing

UNIT-III	UNDERSTANDING ANALYTICS AND BIG DATA	Classes: 12

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics, Points to Consider during Analysis, Developing an Analytic Team, Understanding Text

Analytics Analytical Approaches and Tools to Analyze Data: Analytical Approaches, History of Analytical Tools. Introduction to Popular Analytical Tools, Comparing Various Analytical Tools, Installing R.

UNIT-IV	DATA VISUALIZATION	Classes: 12

Data Visualization- I: Introducing Data Visualization, Techniques Used for Visual Data Representation, Types of Data Visualization, Applications of Data Visualization, Visualizing Big Data, Tools Used in Data Visualization, Tableau Products

Data Visualization with Tableau (Data Visualization- II): Introduction to Tableau Software, Tableau Desktop Workspace, Data Analytics in Tableau Public, Using Visual Controls in Tableau Public

UNIT-V	SOCIAL MEDIA ANALYTICS AND TEXT MINING	Classes: 13

Social Media Analytics and Text Mining: Introducing social media, Introducing Key Elements of social media, Introducing Text Mining, Understanding Text Mining Process, Sentiment Analysis, Performing Social Media Analytics and Opinion

Mining on Tweets

Mobile Analytics: Introducing Mobile Analytics, Introducing Mobile Analytics Tools, Performing Mobile Analytics, Challenges of Mobile Analytics

TEXT BOOKS

1. Big data, blackbook, Dreamtech press, 2015
2. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
3. Simon Walkowiak, Big Data Analytics with R, Packt Publishing, ISBN: 9781786466457

REFERENCE BOOKS

1. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series,2013.
2. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O" Reilly Media, 2012.
3. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

WEB REFERENCES

1. https://www.javatpoint.com/big-data-technologies
2. https://www.edureka.co/blog/top-big-data-technologies/
3. https://www.interviewbit.com/blog/big-data-technologies/

E -TEXT BOOKS

1. Big Data by James Warren, Nathan Marz, ISBN: 9781617290343
2. Big Data Analytics By Raj Kamal, Preeti Saxena, 1st Edition

MOOCS COURSES

1. https://in.coursera.org/specializations/big-data
2. https://intellipaat.com/course-cat/big-data-analytics-courses/
3. https://www.udemy.com/course/taming-big-data-with-apache-spark-hands-on/

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID504PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

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

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

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

UNIT-I	INTRODUCTION TO SOFTWARE ENGINEERING	Classes: 13

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.

A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.

Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.

UNIT-II	SOFTWARE REQUIREMENTS	Classes: 12

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

System models: Context models, behavioral models, data models, object models, structured methods.

UNIT-III	DESIGN ENGINEERING	Classes: 12

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

UNIT-IV	TESTING STRATEGIES	Classes: 12

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

UNIT-V	METRICS FOR PROCESS AND PRODUCTS	Classes: 13

Metrics for Process and Products: Software measurement, metrics for software quality.

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw HillInternational Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson,Pearson Education.

REFERENCE BOOKS

1. Software Engineering, Spectrum Publications.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

WEB REFERENCES

1. https://en.wikipedia.org/wiki/Software_engineering

E -TEXT BOOKS

1. https://books.google.co.in/books?id=bL7QZHtWvaUC&printsec=frontcover&dq=software+engineering+by+roger+pressman+vth+edition+free+download&hl=en&sa=X&ved=0ahUKEwiLkOz-pL_TAhWIuI8KHZSxD2cQ6AEIMDAC#v=onepage&q&f=false

MOOCS COURSES

1. https://www.coursera.org/specializations/software-development-lifecycle
2. https://www.mooc-list.com/tags/software-engineering

GRAPH THEORY (Professional Elective - I)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID511PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

An understanding of Mathematics in general is sufficient.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Know some important classes of graph theoretic problems;
- Be able to formulate and prove central theorems about trees, matching, connectivity, colouring and planar graphs;
- Be able to describe and apply some basic algorithms for graphs;
- Be able to use graph theory as a modelling tool.

UNIT-I	INTRODUCTION	Classes: 13

Introduction-Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

UNIT-II	CONNECTED GRAPHS AND SHORTEST PATHS	Classes: 12

Connected graphs and shortest paths - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra‟s shortest path algorithm, Floyd-Warshall shortest path algorithm.

UNIT-III	TREES	Classes: 12

Trees- Definitions and characterizations, Number of trees, Cayley‟s formula, Kirchoↄ-matrix-tree theorem, Minimum spanning trees, Kruskal‟s algorithm, Prim‟s algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury‟s algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

UNIT-IV	INDEPENDENT SETS COVERINGS AND MATCHINGS	Classes: 12

Independent sets coverings and matchings – Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall‟s Theorem, K¨onig‟s Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

UNIT-V	VERTEX COLORINGS	Classes: 13

Basic definitions, Cliques and chromatic number, Mycielski‟s theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

TEXT BOOKS

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics.Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications

REFERENCE BOOKS

1. Lecture Videos**:** http://nptel.ac.in/courses/111106050/13.
2. Introduction to Graph Theory, Douglas B. West, Pearson.
3. Schaum's Outlines Graph Theory, Balakrishnan, TMH.
4. Introduction to Graph Theory, Wilson Robin j, PHI.
5. Graph Theory with Applications to Engineering and Computer Science, Narsing Deo, PHI.
6. Graphs - An Introductory Approach, Wilson and Watkins.

WEB REFERENCES

1. https://byjus.com/maths/graph-theory/#:~:text=Graph%20theory%20is%20the%20study%20of%20relationship%20between%20the%20vertices,and%20set%20of%20edges%20E.
2. https://www.geeksforgeeks.org/mathematics-graph-theory-basics-set-1/

E -TEXT BOOKS

1. https://meskc.ac.in/wp-content/uploads/2018/12/A-Textbook-of-Graph-Theory-R.-Balakrishnan-K.-Ranganathan.pdf
2. https://www.shahucollegelatur.org.in/Department/Studymaterial/sci/it/BCS/FY/book.pdf

MOOCS COURSES

1. https://onlinecourses.nptel.ac.in/noc20_ma05/preview
2. https://www.udemy.com/course/graph-theory/
3. https://in.coursera.org/learn/graphs

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

INTRODUCTION TO DATA SCIENCE (Professional Elective - I)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID512PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Understand basic terms what Statistical Inference means.
- Identify probability distributions commonly used as foundations for statistical modeling. Fit amodel to data
- describe the data using various statistical measures
- utilize R elements for data handling
- perform data reduction and apply visualization techniques.

UNIT-I	INTRODUCTION	Classes: 13

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

UNIT-II	DATA TYPES & STATISTICAL DESCRIPTION TYPES OF DATA	Classes: 12

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

UNIT-III	VECTORS, MATRICES, FACTORS AND DATA FRAMES	Classes: 12

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

UNIT-IV	**CONDITIONALS AND CONTROL FLOW, ITERATIVE PROGRAMMING IN R & FUNCTIONS IN R**	**Classes: 12**

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT-V	**DATA REDUCTION & DATA VISUALIZATION**	**Classes: 13**

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation.

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly,2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed.The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, PearsonEducation.
2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
4. Paul Teetor, "R Cookbook", O'Reilly, 2011.

WEB REFERENCES

1. https://nathancarter.github.io/MA346-course-notes/_build/html/chapter-1-intro-to-data-science.html
2. https://www.geeksforgeeks.org/introduction-to-data-science/
3. https://www.guru99.com/data-science-tutorial.html

E -TEXT BOOKS

1. An Introduction to Data Science, Jeffrey Stanton, 2013

MOOCS COURSES

1. https://www.udemy.com/course/an-introduction-to-data-science/
2. https://nptel.ac.in/courses/106106179
3. https://www.coursera.org/specializations/introduction-data-science

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

SCRIPTING LANGUAGES (Professional Elective - I)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID513PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- This course introduces the script programming paradigm
- Introduces scripting languages such as Perl, Ruby and TCL.
- Learning TCL

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Comprehend the differences between typical scripting languages and typical system andapplication programming languages.
- Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select anappropriate language for solving a given problem.
- Acquire programming skills in scripting language

UNIT-I	INTRODUCTION	Classes: 13

Introduction: Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Web Servers, SOAP and web services.
RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling.

UNIT-II	EXTENDING RUBY	Classes: 12

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter.

UNIT-III	INTRODUCTION TO PERL AND SCRIPTING	Classes: 12

Introduction to PERL and Scripting: Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT-IV	ADVANCED PERL	Classes: 12

Advanced Perl: Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT-V	GUI PROGRAMMING WITH SWING	Classes: 13

TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

Tk: Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS

1. TheWorld of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Programmers guide by Dabve Thomas Second edition

REFERENCE BOOKS

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, LarryWall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

WEB REFERENCES

1. https://nptel.ac.in/courses/117/106/117106113/
2. https://www.freetechbooks.com/perl-f5.html
3. https://www.freetechbooks.com/ruby-f49.html
4. https://www.freetechbooks.com/tcltk-f47.html

E -TEXT BOOKS

1. http://www.freebookcentre.net/Language/Free-Tcl-Books-Download.html
2. http://www.freebookcentre.net/Language/Free-Perl-Books-Download.html
3. http://www.freebookcentre.net/Language/Free-Ruby-Books-Download.html

MOOCS COURSES

1. https://onlinecourses-archive.nptel.ac.in
2. https://swayam.gov.in/
3. https://swayam.gov.in/NPTEL

IMAGE PROCESSING (Professional Elective - I)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID514PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
- The topics include image acquisition; sampling and quantization; pre-processing; enhancement; restoration; segmentation; and compression.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition,sampling, and quantization.
2. Demonstrate the knowledge of filtering techniques.
3. Demonstrate the knowledge of 2D transformation techniques.
4. Demonstrate the knowledge of image enhancement, segmentation, restoration andcompression techniques.

UNIT-I	DIGITAL IMAGE FUNDAMENTALS	Classes: 13

Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

UNIT-II	IMAGE ENHANCEMENT	Classes: 12

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

UNIT-III	IMAGE RESTORATION	Classes: 12

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-IV	IMAGE SEGMENTATION	Classes: 12

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

UNIT-V	IMAGE COMPRESSION	Classes: 13

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

TEXT BOOKS

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Ed, 2004.

REFERENCE BOOKS

1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wilely, 3rd Edition, 2004.

WEB REFERENCES

1. https://www.ijert.org/image-processing-using-web-2-0-2
2. https://iopscience.iop.org/article/10.1088/1742-6596/1087/5/052024/pdf
3. https://en.wikipedia.org/wiki/Digital_image_processing

E -TEXT BOOKS

1. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf
2. https://sisu.ut.ee/imageprocessing/book/1

MOOCS COURSES

1. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf
2. https://sisu.ut.ee/imageprocessing/book/1

COMPUTER GRAPHICS (Professional Elective - I)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID515PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- The aim of this course is to provide an introduction of fundamental concepts and theory ofcomputer graphics.
- Topics covered include graphics systems and input devices; geometric representations and2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection;

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Acquire familiarity with the relevant mathematics of computer graphics.
- Be able to design basic graphics application programs, including animation.
- Be able to design applications that display graphic images to given specifications.

UNIT-I	INTRODUCTION	Classes: 13

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

Output primitives: Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), midpoint circle and ellipse algorithms

Polygon Filling: Scan-line algorithm, boundary-fill and flood-fill algorithms

UNIT-II	2-D GEOMETRICAL TRANSFORMS	Classes: 12

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT-III	3-D OBJECT REPRESENTATION	Classes: 12

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.

UNIT-IV	3-D GEOMETRIC TRANSFORMATIONS:	Classes: 12

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.\

viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT-V	COMPUTER ANIMATION	Classes: 13

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

Visible surface detection methods: Classification, back-face detection, depth-buffer, BSP-tree methods and area sub-division methods

TEXT BOOKS

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
3. Computer Graphics, Steven Harrington, TMH

REFERENCE BOOKS

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer

WEB REFERENCES

1. https://web.stanford.edu/class/ee478/references.html
2. https://www.tutorialsduniya.com/notes/introduction-to-computer graphics-notes/
3. https://nptel.ac.in/courses/108/108/108108168/
4. http://web.mit.edu/6.933/www/Fall2001/Shannon2.pdf

E -TEXT BOOKS

1. https://books.google.co.in/books?id=tZYdEAAAQBAJ
2. https://books.askvenkat.org/computer graphics -books/
3. https://www.kopykitab.com/ computer graphics -Notes-eBook
4. https://www.cl.cam.ac.uk/teaching/0813/computer graphics .pdf

MOOCS COURSES

1. https://web.iitd.ac.in/~rbose/initiative/MOOCS.pdf
2. http://etsc.iitd.ac.in/pdf_files/MOOCs%20IIT%20ETSC.pdf

SOFTWARE TESTING METHODOLOGIES (Professional Elective – II)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID521PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- To provide knowledge of the concepts in software testing such as testing process, criteria,strategies, and methodologies.
- To develop skills in software test automation and management using latest tools.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Design and develop the best test strategies in accordance to the development model.

UNIT-I	INTRODUCTION	Classes: 13

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs. Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT-II	TRANSACTION FLOW TESTING	Classes: 12

Transaction Flow Testing: transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing. Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT-III	PATHS, PATH PRODUCTS AND REGULAR EXPRESSIONS	Classes: 12

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT-IV	STATE, STATE GRAPHS AND TRANSITION TESTING	Classes: 12

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT-V	GRAPH MATRICES AND APPLICATION	Classes: 13

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

TEXT BOOKS

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

REFERENCE BOOKS

1. Software Testing Mythologies, Spectrum publications.
2. The craft of software testing - Brian Marick, Pearson Education.
3. Software Testing Techniques – SPD(Oreille)
4. Software Testing in the Real World – Edward Kit, Pearson.
5. Effective methods of Software Testing, Perry, John Wiley.
6. Art of Software Testing – Meyers, John Wiley

WEB REFERENCES

1. https://www.geeksforgeeks.org/software-testing-basics/
2. https://www.w3schools.in/software-testing/types

E -TEXT BOOKS

1. Software Testing, Dorothy Graham,2006.

MOOCS COURSES

1. https://www.udemy.com/courses/development/software-testing/
2. https://in.coursera.org/courses?query=software%20testing
3. https://www.edureka.co/software-testing-certification-courses

INFORMATION RETRIEVAL SYSTEMS

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID522PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn
- To learn the important concepts and algorithms in IRS
- To understand the data/file structures that are necessary to design, and implement informationretrieval (IR) systems.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks.
- Design an Information Retrieval System for web search tasks.

UNIT-I	INTRODUCTION TO INFORMATION RETRIEVAL SYSTEMS	Classes: 13

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.
Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT-II	CATALOGING AND INDEXING	Classes: 12

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction.
Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT-III	AUTOMATIC INDEXING	Classes: 12

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.
Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

UNIT-IV	USER SEARCH TECHNIQUES	Classes: 12

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.

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies.

UNIT-V	TEXT SEARCH ALGORITHMS	Classes: 13

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems.

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

TEXT BOOKS

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

EFERENCE BOOKS

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education

WEB REFERENCES

1. https://books.google.co.in/books?id=tZYdEDDDDQBAJ
2. https://books.askvenkat.org/irs-books/
3. https://www.kopykitab.com/irs-Notes-eBook
4. https://www.cl.cam.ac.uk/teaching/0809/irs/irs.pdf

E -TEXT BOOKS

1. https://www.datapine.com/blog/best-Information Retrieval Systems /-books/
2. https://files.eric.ed.gov/fulltext/ED536788.pdf

MOOCS COURSES

1. https://www.mooc-list.com/tags/ Information Retrieval Systems
2. https://www.mooc-course.com/subject/ Information Retrieval Systems /

PATTERN RECOGNITION (Professional Elective – II)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID523PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- This course introduces fundamental concepts, theories, and algorithms for pattern recognition and machine learning.
- Topics include: Pattern Representation, Nearest Neighbor Based Classifier, Bayes Classifier, Hidden Markov Models, Decision Trees, Support Vector Machines, Clustering,and an application of hand-written digit recognition.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Understand the theory, benefits, inadequacies and possible applications of various machine learning and pattern recognition algorithms
- Identify and employ suitable machine learning techniques in classification, patternrecognition, clustering and decision problems.

UNIT-I	INTRODUCTION	Classes: 13

Introduction: What is Pattern Recognition, Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

UNIT-II	NEAREST NEIGHBOR BASED CLASSIFIER	Classes: 12

Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

UNIT-III	HIDDEN MARKOV MODELS	Classes: 12

Hidden Markov Models: Markov Models for Classification, Hidden Morkov Models, Classification using HMMs. Decision Trees: Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

UNIT-IV	SUPPORT VECTOR MACHINES	Classes: 12

Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

UNIT-V	CLUSTERING	Classes: 13

Clustering: Why is Clustering Important, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-Hand Written Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

TEXT BOOKS

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Spinger Pub, 1st Ed.

EFERENCE BOOKS

1. Machine Learning - Mc Graw Hill, Tom M. Mitchell.
2. Fundamentals Of Speech Recognition: Lawrence Rabiner and Biing- Hwang Juang. Prentice-Hall Pub.

WEB REFERENCES

1. https://www.geeksforgeeks.org/pattern-recognition-introduction/
2. https://viso.ai/deep-learning/pattern-recognition/
3. https://www.edureka.co/blog/pattern-recognition/

E -TEXT BOOKS

1. https://darmanto.akakom.ac.id/pengenalanpola/Pattern%20Recognition%204th%20Ed.%20(2009).pdf
2. https://cds.cern.ch/record/998831/files/9780387310732_TOC.pdf

MOOCS COURSES

1.https://www.edureka.co/blog/pattern-recognition/
2.https://nptel.ac.in/courses/117105101

COMPUTER VISION AND ROBOTICS (Professional Elective – II)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID524PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To understand the Fundamental Concepts Related To sources, shadows and shading.
2. To understand the The Geometry of Multiple Views.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Implement fundamental image processing techniques required for computer vision.
2. Implement boundary tracking techniques.
3. Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipsedetections.
4. Apply 3D vision techniques and Implement motion related techniques.
5. Develop applications using computer vision techniques.

UNIT-I	INTRODUCTION	Classes: 13

CAMERAS: Pinhole Cameras.
Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases.
Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models.
Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

UNIT-II	LINEAR FILTERS & EDGE DETECTION	Classes: 12

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates.
Edge Detection: Noise, Estimating Derivatives, Detecting Edges.
Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

UNIT-III	GEOMETRY OF MULTIPLE VIEWS & STEREOPSIS	Classes: 12

The Geometry of Multiple Views: Two Views
Stereopsis: Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras Segmentation by Clustering: What Is Segmentation? Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

UNIT-IV	SEGMENTATION BY FITTING A MODEL	Classes: 12

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness

Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice.

Tracking With Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples

UNIT-V	GEOMETRIC CAMERA MODELS	Classes: 13

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations.

Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization.

Model-Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

TEXT BOOKS

1. David A. Forsyth and Jean Ponce: Computer Vision — A Modern Approach, PHI Learning(Indian Edition), 2009.

EFERENCE BOOKS

1. E. R. Davies: Computer and Machine Vision — Theory, Algorithms and Practicalities, Elsevier(Academic Press), 4th edition, 2013.
2. R. C. Gonzalez and R. E. Woods "Digital Image Processing" Addison Wesley 2008.
3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag LondonLimited 2011.

WEB REFERENCES

1. https://www.geeksforgeeks.org/computer-vision-introduction/
2. https://www.byjusfutureschool.com/blog/what-is-robotics-what-are-benefits-uses-types-of-robotics-in-real-world/

E -TEXT BOOKS

1. https://www.amazon.in/Computer-Vision-Robotics-Industrial-Applications ebook/dp/B00MI916RC

MOOCS COURSES

1. https://www.coursera.org/learn/robotics-perception
2. https://www.udemy.com/topic/computer-vision/

DATA WAREHOUSING AND BUSINESS INTELLIGENCE (Professional Elective – II)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID525PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. This course is concerned with extracting data from the information systems that deal with the day-to-day operations and transforming it into data that can be used by businesses to drive high-level decision making
2. Students will learn how to design and create a data warehouse, and how to utilize the processof extracting, transforming, and loading (ETL) data into data warehouses.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand architecture of data warehouse and OLAP operations.
2. Understand Fundamental concepts of BI and Analytics
3. Application of BI Key Performance indicators
4. Design of Dashboards, Implementation of Web Analytics
5. Understand Utilization of Advanced BI Tools and their Implementation.
6. Implementation of BI Techniques and BI Ethics.

UNIT-I	DATA WAREHOUSE	Classes: 13

DATA WAREHOUSE: Data Warehouse-Data Warehouse Architecture- Multidimensional Data Model-Data cube and OLAP Technology-Data Warehouse Implementation -DBMS schemas for Decision support - Efficient methods for Data cube computation.

UNIT-II	BUSINESS INTELLIGENCE	Classes: 12

Business Intelligence: Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

UNIT-III	BI IMPLEMENTATION	Classes: 12

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business intelligence -Value driven and Information use.

UNIT-IV	ADVANCED BI	Classes: 12

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

UNIT-V	BUSINESS INTELLIGENCE IMPLEMENTATION	Classes: 13

Business intelligence implementation-Business Intelligence and integration implementation-connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI.

TEXT BOOKS

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier.Rajiv Sabherwal "Business Intelligence" Wiley Publications, 2012.

EFERENCE BOOKS

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and BusinessIntelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence Solutions with SQLServer, 2008 R2 & Office 2010, TMH, 2011.
4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis][Publication: (Wiley)]
5. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007
6. Building the Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd.
7. Data Mining Introductory and Advanced topics –MARGARET H DUNHAM, PEA

WEB REFERENCES

1. https://www.geeksforgeeks.org/data-warehousing/

E -TEXT BOOKS

1. Data Warehousing, Business Intelligence

MOOCS COURSES

1. https://www.coursera.org/specializations/data-warehousing
2. https://www.udemy.com/topic/data-warehouse/

MACHINE LEARNING LAB

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID505PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

- The objective of this lab is to get an overview of the various machine learningtechniques and can able to demonstrate them using python.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- understand complexity of Machine Learning algorithms and their limitations;
- understand modern notions in data analysis-oriented computing;
- be capable of confidently applying common Machine Learning algorithms in practice andimplementing their own;
- Be capable of performing experiments in Machine Learning using real-world data.

LIST OF EXPERIMENTS

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is theprobability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
2. Extract the data from database using python
3. Implement k-nearest neighbours classification using python
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k- means clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

5. The following training examples map descriptions of individuals onto high, medium and lowcredit-worthiness.

medium skiing design single twenties no -> highRisk
high golf trading married forties yes -> lowRisk
low speedway transport married thirties yes -> medRisk
medium football banking single thirties yes -> lowRisk

high flying media married fifties yes -> highRisk
low football security single twenties no -> medRisk
medium golf media single thirties
yes -> medRisk medium golf transport
married forties yes -> lowRisk high skiing banking
single thirties yes -> highRisk low golf
unemployed married forties yes -> highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

6. Implement linear regression using python.
7. Implement Naïve Bayes theorem to classify the English text
8. Implement an algorithm to demonstrate the significance of genetic algorithm
9. Implement the finite words classification system using Back-propagation algorithm

TEXT BOOKS

1. Machine Learning – Tom M. Mitchell, - MGH.

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.geeksforgeeks.org/machine-learning/
2. https://www.techtarget.com/searchenterpriseai/definition/machine-learning-ML
3. https://www.javatpoint.com/machine-learning

E -TEXT BOOKS

1. https://www.researchgate.net/publication/344717762_Machine_Learning_Algorithms_-A_Review
2. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCSA1601.pdf
3. https://www.interactions.com/wp-content/uploads/2017/06/machine_learning_wp-5.pdf

MOOCS COURSES

1. https://www.coursera.org/learn/machine-learning
2. https://nptel.ac.in/courses/106106139

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

BIG DATA TECHNOLOGIES LAB

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID506PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

- The purpose of this course is to provide the students with the knowledge of Big dataAnalytics principles and techniques.
- This course is also designed to give an exposure of the frontiers of Big data Analytics

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- understand complexity of Machine Learning algorithms and their limitations;
- understand modern notions in data analysis-oriented computing;
- be capable of confidently applying common Machine Learning algorithms in practice andimplementing their own;
- Be capable of performing experiments in Machine Learning using real-world data.

LIST OF EXPERIMENTS

1. Implement a simple map-reduce job that builds an inverted index on the set ofinput documents (Hadoop)
2. Process big data in HBase
3. Store and retrieve data in Pig
4. Perform Social media analysis using cassandra
5. Buyer event analytics using Cassandra on suitable product sales data.
6. Using Power Pivot (Excel) Perform the following on any dataset
   a. Big Data Analytics
   b. Big Data Charting
7. Use R-Project to carry out statistical analysis of big data
8. Use R-Project for data visualization of social media data

TEXT BOOKS

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series,2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

REFERENCE BOOKS

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media(2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

WEB REFERENCES

1. https://www.javatpoint.com/big-data-technologies
2. https://www.edureka.co/blog/top-big-data-technologies/
3. https://www.interviewbit.com/blog/big-data-technologies/

E -TEXT BOOKS

1. Big Databy James Warren, Nathan Marz, ISBN: 9781617290343
   Big Data Analytics By Raj Kamal, Preeti Saxena, 1st Edition

MOOCS COURSES

1. https://in.coursera.org/specializations/big-data
2. https://intellipaat.com/course-cat/big-data-analytics-courses/
3. https://www.udemy.com/course/taming-big-data-with-apache-spark-hands-on

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

ADVANCED COMMUNICATION SKILLS LAB

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN506HS	B. Tech	0	0	2	1	30	70	100

1. INTRODUCTION:

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

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

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

COURSE OBJECTIVES

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

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakersand respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

LIST OF EXPERIMENTS

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

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language

   – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin,

business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** — Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** — Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and MockInterviews.

4. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructuralfacilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd.2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

EFERENCE BOOKS

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar andHemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.

9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata McGraw-Hill 2009.

WEB REFERENCES

1. https://www.skillsyouneed.com/docs/advanced-communication-skills-PV.pdf
2. https://zoetalentsolutions.com/course/advanced-communication-skills-training-course/

E -TEXT BOOKS

1. https://ebooks.lpude.in/management/mba/term_1/DENG401_ADVANCED_COMMUNICATION_SKILLS.pdf
2. https://www.researchgate.net/publication/301351158_Advanced_Skills_for_Communication_in_English_Book_I
3. https://www.kopykitab.com/Advanced-Communication-Skills-Ebooks-by-PUBLIC-DOMAIN

MOOCS COURSES

1. https://in.coursera.org/courses?query=communication%20skills
2. https://www.mtdtraining.com/advanced-communication-skills-training

INTELLECTUAL PROPERTY RIGHTS

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
IP507MC	B. Tech	3	0	0	0	30	70	100

COURSE OBJECTIVES

To learn

- The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
- To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.
- Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems and analyse the social impact of intellectual property law and policy
- Work in teams, solve problems and manage time
- Analyse ethical and professional issues which arise in the intellectual property law context
- Write reports on project work and critical reflect on your own learning.

UNIT-I	INTRODUCTION TO INTELLECTUAL PROPERTY	Classes: 13

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

UNIT-II	TRADE MARKS:	Classes: 12

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

UNIT-III	LAW OF COPY RIGHTS	Classes: 12

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT-IV	TRADE SECRETS:	Classes: 12

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT-V	NEW DEVELOPMENT OF INTELLECTUAL PROPERTY:	Classes: 13

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

EFERENCE BOOKS

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

WEB REFERENCES

1. https://www.geeksforgeeks.org/intellectual-property-rights/
2. https://www.javatpoint.com/ipr-full-form

E -TEXT BOOKS

1. https://core.ac.uk/download/pdf/144521077.pdf
2. https://www.icsi.edu/media/webmodules/publications/9.4%20Intellectual%20Property%20Rights.pdf

MOOCS COURSES

1. https://www.udemy.com/course/certificate-course-ipr/
2. https://www.wipo.int/academy/en/courses/distance_learning/
3. https://in.coursera.org/courses?query=intellectual%20property

KNOWLEDGE REPRESENTATION AND REASONING

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID601PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

- To investigate the key concepts of knowledge representation (KR) techniques anddifferent notations.
- To integrate the KR view as a knowledge engineering approach to model organizationalknowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques.
- To understand process, knowledge acquisition and sharing of ontology.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Analyze and design knowledge based systems intended for computer implementation.
- Acquire theoretical knowledge about principles for logic-based representation and reasoning.
- Ability to understand knowledge-engineering process
- Ability to implement production systems, frames, inheritance systems and approaches to
- handle uncertain or incomplete knowledge.

UNIT-I	THE KEY CONCEPTS	Classes: 13

The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic
Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

UNIT-II	ONTOLOGY:	Classes: 12

Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time

UNIT-III	KNOWLEDGE REPRESENTATIONS	Classes: 12

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation.

UNIT-IV	PROCESSES	Classes: 12

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction,

Change Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

UNIT-V	KNOWLEDGE SOUP	Classes: 13

Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic,

Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition

TEXT BOOKS

1. Knowledge Representation logical, Philosophical, and Computational Foundations by John F.Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier.

REFERENCE BOOKS

1. https://www.cin.ufpe.br/~mtcfa/files/in1122/Knowledge%20Representation%20and%20Reasoning.pdf
2. https://www.sciencedirect.com/book/9781558609327/knowledge-representation-and-reasoning

WEB REFERENCES

1. https://www.edureka.co/blog/knowledge-representation-in
2. https://en.wikipedia.org/wiki/Knowledge_representation_and_reasoning

E -TEXT BOOKS

1. https://www.oreilly.com/library/view/knowledge-representation-and/9781558609327/
2. https://direct.mit.edu/books/oa-edited-volume/5331/chapter/3809850/Knowledge-Representation-and-Reasoning

MOOCS COURSES

1. https://onlinecourses.nptel.ac.in/noc21_cs26/preview
2. https://www.coursera.org/lecture/chronic-pain/2-knowledge-representation-and-framing-hzrKA3
3. https://vitalflux.com/12-weeks-free-course-on-ai-knowledge-representation-reasoning-iit-madras/

DATA ANALYTICS

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID602PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To explore the fundamental concepts of data analytics.
2. To learn the principles and methods of statistical analysis
3. Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
4. To understand the various search methods and visualization techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the impact of data analytics for business decisions and strategy
2. Carry out data analysis/statistical analysis
3. To carry out standard data visualization and formal inference procedures
4. Design Data Architecture; Understand various Data Sources

UNIT-I	DATA MANAGEMENT	Classes: 13

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT-II	DATA ANALYTICS	Classes: 12

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and Variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT-III	REGRESSION	Classes: 12

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.
Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT-IV	OBJECT SEGMENTATION:	Classes: 12

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

UNIT-V	DATA VISUALIZATION	Classes: 13

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCE BOOKS

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway LabsJeffrey D Ullman Stanford Univ.

WEB REFERENCES

1. https://www.techtarget.com/searchdatamanagement/definition/data-analytics#:~:text=Data%20analytics%20(DA)%20is%20the,of%20specialized%20systems%20and%20software.
2. https://www.simplilearn.com/tutorials/data-analytics-tutorial/what-is-data-analytics

E -TEXT BOOKS

1. https://www.academia.edu/41919973/Data_Analytics_text_book
2. https://download.e-bookshelf.de/download/0011/3074/11/L-G-0011307411-0030696132.pdf

MOOCS COURSES

1. https://in.coursera.org/browse/data-science/data-analysis
2. https://www.udemy.com/topic/data-analysis/
3. https://intellipaat.com/data-analytics-master-training-course/

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID603PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. The objective of the course is to equip the students with a general overview of the conceptsand fundamentals of computer networks.
2. Familiarize the students with the standard models for the layered approach to communicationbetween machines in a network and the protocols of the various layers.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

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

UNIT-I	INTRODUCTION	Classes: 13

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.
Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

UNIT-II	DATA LINK LAYER	Classes: 12

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

UNIT-III	NETWORK LAYER	Classes: 12

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

UNIT-IV	TRANSPORT LAYER:	Classes: 12

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

UNIT-V	APPLICATION LAYER	Classes: 13

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

TEXT BOOKS

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

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.geeksforgeeks.org/basics-computer-networking/
2. https://www.javatpoint.com/computer-network-tutorial
3. https://www.spiceworks.com/tech/networking/articles/what-is-a-computer-network/

E -TEXT BOOKS

1. https://open.umn.edu/opentextbooks/textbooks/771
2. https://faculty.ksu.edu.sa/sites/default/files/computer_networks_-_a_tanenbaum_-_5th_edition.pdf

MOOCS COURSES

1. https://in.coursera.org/courses?query=computer%20network
2. https://www.udemy.com/topic/computer-network/
3. https://onlinecourses.nptel.ac.in/noc22_cs19/preview

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID611PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- Introduce to some of the problems and solutions of NLP and their relation to linguistics andstatistics.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluatingempirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, andestimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms
- Able to design different language modeling Techniques.

UNIT-I	FINDING THE STRUCTURE OF WORDS:	Classes: 13

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT-II	SYNTAX ANALYSIS:	Classes: 12

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT-III	SEMANTIC PARSING:	Classes: 12

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT-IV	PREDICATE-	Classes: 12

Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT-V	DISCOURSE PROCESSING:	Classes: 13

Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

TEXT BOOKS

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

EFERENCE BOOKS

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

WEB REFERENCES

1. https://www.ibm.com/in-en/topics/natural-language-processing
2. https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP
3. tutorialspoint.com/artificial_intelligence/artificial_intelligence_natural_language_processing.htm

E -TEXT BOOKS

1. https://cseweb.ucsd.edu/~nnakashole/teaching/eisenstein-nov18.pdf
2. https://www.london.ac.uk/sites/default/files/study-guides/introduction-to-natural-language-processing.pdf

MOOCS COURSES

1. https://in.coursera.org/specializations/natural-language-processing
2. https://www.udemy.com/topic/natural-language-processing/

DATA MINING (Professional Elective – III)

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID612PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- It presents methods for mining frequent patterns, associations, and correlations.
- It then describes methods for data classification and prediction, and data–clustering approaches.
- It covers mining various types of data stores such as spatial, textual, multimedia, streams.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Ability to understand the types of the data to be mined and present a general classification oftasks and primitives to integrate a data mining system.
- Apply preprocessing methods for any given raw data.
- Extract interesting patterns from large amounts of data.
- Discover the role played by data mining in various fields.
- Choose and employ suitable data mining algorithms to build analytical applications
- Evaluate the accuracy of supervised and unsupervised models and algorithms.

UNIT-I	DATA MINING:	Classes: 13

Data Mining: Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns– Classification of Data Mining systems– Data mining Task primitives –Integration of Data mining system with a Data warehouse–Major issues in Data Mining–Data Preprocessing.

UNIT-II	ASSOCIATION RULE MINING:	Classes: 12

Association Rule Mining: Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining. Graph Pattern Mining, SPM.

UNIT-III	CLASSIFICATION:	Classes: 12

Classification: Classification and Prediction – Basic concepts–Decision tree induction–Bayesian classification, Rule–based classification, Lazy learner.

UNIT-IV	CLUSTERING AND APPLICATIONS	Classes: 12

Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis.

UNIT-V	ADVANCED CONCEPTS:	Classes: 13

Advanced Concepts: Basic concepts in Mining data streams–Mining Time–series data—Mining sequence patterns in Transactional databases– Mining Object– Spatial– Multimedia–Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.

TEXT BOOKS

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
2. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

REFERENCE BOOKS

1. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.

WEB REFERENCES

1. https://www.techtarget.com/searchbusinessanalytics/definition/data-mining#:~:text=Data%20mining%20is%20the%20process,make%20more%2Dinformed%20business%20decisions.
2. https://www.javatpoint.com/data-mining

E -TEXT BOOKS

1. https://link.springer.com/book/10.1007/978-3-319-14142-8
2. https://doc.lagout.org/Others/Data%20Mining/Data%20Mining_%20The%20Textbook%20%5BAggarwal%202015-04-14%5D.pdf

MOOCS COURSES

1. https://in.coursera.org/specializations/data-mining
2. https://onlinecourses.nptel.ac.in/noc21_cs06/preview

INTERNET OF THINGS (Professional Elective - III)

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID613PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

- To introduce the terminology, technology and its applications.
- To introduce the concept of M2M (machine to machine) with necessary protocols.
- To introduce the Python Scripting Language which is used in many IoT devices.
- To introduce the Raspberry PI platform, that is widely used in IoT applications.
- To introduce the implementation of web-based services on IoT devices.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect themto network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

UNIT-I	INTRODUCTION TO INTERNET OF THINGS	Classes: 13

Introduction to Internet of Things –Definition and 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, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

UNIT-II	IOT AND M2M	Classes: 12

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT-III	INTRODUCTION TO PYTHON	Classes: 12

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT-IV	IOT PHYSICAL DEVICES AND ENDPOINTS	Classes: 12

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT-V	IOT PHYSICAL SERVERS AND CLOUD OFFERINGS	Classes: 13

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOKS

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, UniversitiesPress, 2015, ISBN: 9788173719547.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014,ISBN: 9789350239759.

REFERENCE BOOKS

- https://www.oreilly.com/library/view/internet-of-things/9780128093474/

WEB REFERENCES

1. https://www.oracle.com/in/internet-of-things/what-is-iot/#:~:text=The%20Internet%20of%20Things%20(IoT)%20describes%20the%20network%20of%20physical,and%20systems%20over%20the%20internet.
2. https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT
3. https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/

E -TEXT BOOKS

1. https://insights.btoes.com/top-10-internet-of-things-iot-books
2. https://www.springer.com/series/11636

MOOCS COURSES

1. https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/
2. https://onlinecourses.nptel.ac.in/noc22_cs53/preview

MOBILE APPLICATION DEVELOPMENT (Professional Elective - III)

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID614PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

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

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications.

UNIT-I	INTRODUCTION TO ANDROID OPERATING SYSTEM	Classes: 13

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT-II	ANDROID USER INTERFACE: MEASUREMENTS	Classes: 12

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT-III	INTENTS AND BROADCASTS:	Classes: 12

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT-IV	PERSISTENT STORAGE	Classes: 12
Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference		
UNIT-V	**DATABASE**	**Classes: 13**
Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)		

TEXT BOOKS

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

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.ibm.com/topics/mobile-application-development
2. https://www.techtarget.com/searchapparchitecture/definition/mobile-application-development
3. https://www.openxcell.com/mobile-app-development/

E -TEXT BOOKS

1. https://www.cs.cmu.edu/~bam/uicourse/830spring09/BFeiginMobileApplicationDevelopment.pdf
2. https://mrcet.com/pdf/Lab%20Manuals/IT/R15A0563%20MAD.pdf
3. https://baou.edu.in/assets/pdf/PGDCA203_slm.pdf

MOOCS COURSES

1. https://www.fita.in/mobile-app-development-course/
2. https://alison.com/tag/app-development

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

WEB TECHNOLOGIES (Professional Elective - III)

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID615PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To introduce PHP language for server-side scripting
2. To introduce XML and processing of XML Data with Java
3. To introduce Server-side programming with Java Servlets and JSP
4. To introduce Client-side scripting with Javascript and AJAX.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Gain knowledge of client-side scripting, validation of forms and AJAX programming
2. Understand server-side scripting with PHP language
3. Understand what is XML and how to parse and use XML Data with Java
4. To introduce Server-side programming with Java Servlets and JSP

UNIT-I	OBJECT-ORIENTED THINKING AND INHERITANCE	Classes: 13

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies
File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT-II	PACKAGES AND STREAM BASED I/O	Classes: 12

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;
XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

UNIT-III	EXCEPTION HANDLING AND MULTITHREADING	Classes: 12

Introduction to Servlets: Common Gateway Interface (CGt), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

UNIT-IV	COLLECTIONS FRAMEWORK AND INTERFACES	Classes: 12

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

UNIT-V	GUI PROGRAMMING WITH SWING	Classes: 13

Client-side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

TEXT BOOKS

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

REFERENCE BOOKS

1. Web Technologies, Spectrum Publications.
2. Web Programming, building internet applications, Chris Bates 2nd″ edition, Wiley Dreamtech
3. Java Server Pages —Hans Bergsten, SPD O'Reilly,
4. Java Script, D. Flanagan
5. Beginning Web Programming-Jon Duckett WROX.
6. Programming world wide web, R.W. Sebesta, Fourth Edition, Pearson.
7. Internet and World Wide Web — How to program. Dietel and Nieto, Pearson.

WEB REFERENCES

1. https://tms-outsource.com/blog/posts/web-technologies/
2. https://www.geeksforgeeks.org/web-technology/

E -TEXT BOOKS

1. https://archive.uneca.org/sites/default/files/uploaded-documents/SROs/SA/GIS-SP2018/introduction_to_web_technology.pdf
2. https://www.oreilly.com/library/view/web-technology-theory/9789332508194/
3. http://seu1.org/files/level6/IT230/Book/(web.tech%201st%20book)%20Web%20Technologies%20-%20A%20Computer%20Science%20Perspective.pdf

MOOCS COURSES

1. https://in.coursera.org/courses?query=web%20technologies
2. https://www.udemy.com/course/web-technology-for-entrepreneurs/

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
	B. Tech	0	0	0	3	30	70	100

COURSE OBJECTIVES

- To learn the difference between optimal reasoning Vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

COURSE OUTCOMES

- Possess the ability to formulate an efficient problem space for a problem expressed in English
- Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique
- Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems and Machine Learning.

UNIT-I	FOUNDATIONS OF AI	Classes: 13

Foundations of AI: What is AI, History of AI, Strong and weak AI, The State of the Art.
Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT-II	SOLVING PROBLEMS BY SEARCHING	Classes: 12

Solving Problems by Searching: Problem – Solving Agents, Example Problems, Searching for Solutions, uniformed search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

UNIT-III	KNOWLEDGE REPRESENTATION	Classes: 12

Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

UNIT-IV	LEARNING FROM EXAMPLES	Classes: 12

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Learner Models, Nonparametric Models, Support Vector Machines, Ensemble Learning, PracticalMachine Learning.

UNIT-V	LEARNING PROBABILISTIC MODELS	Classes: 13

Learning Probabilistic Models: Statistical Learning, Learning with Complete data, Learning with Hidden variables: The EM Algorithm.

TEXT BOOKS

1. "Artificial Intelligence A Modern Approach", Stuart J. Russell & Peter Norvig – Pearson.
2. "Artificial Intelligence", Elaine Rich, Kevin Knight & Shivashankar B Nair — McGraw HillEducation.

REFERENCE BOOKS

1. Advanced Artificial Intelligence, Spectrum Publications
2. Artificial Intelligence, 3rd Edn, E. Rich and K.Knight (TMH)
3. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
4. Artificial Intelligence, Shivani Goel, Pearson Education.
5. Artificial Intelligence and Expert systems – Patterson, Pearson Education

WEB REFERENCES

1. https://www.ibm.com/in-en/topics/artificial-intelligenc
2. https://www.techtarget.com/searchenterpriseai/definition/AI-Artificial-Intelligence

E -TEXT BOOKS

1. https://people.engr.tamu.edu/guni/csce421/files/AI_Russell_Norvig.pdf=
2. https://link.springer.com/book/10.1007/978-3-030-72357-6

MOOCS COURSES

1. https://in.coursera.org/courses?query=artificial%20intelligence
2. https://www.udemy.com/topic/artificial-intelligence/

MACHINE LEARNING BASICS (Open Elective - I)

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
	B. Tech	0	0	0	0	30	70	100

COURSE OBJECTIVES

- To understand pattern classification algorithms to classify multivariate data
- To understand the Implementation of genetic algorithms
- To gain knowledge about Q-Learning
- To create new machine learning techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

- Develop and apply pattern classification algorithms to classify multivariate data.
- Develop and apply regression algorithms for finding relationships between data variables.
- Develop and apply reinforcement learning algorithms for learning to control complex systems.
- Write scientific reports on computational machine learning methods, results and conclusions.

UNIT-I	BASICS LEARNING PROBLEMS	Classes: 13

BASICS Learning Problems Perspectives and Issues Concept Learning Version Spaces and Candidate eEliminations – Inductive bias – Decision Tree learning – Representation – Algorithm –Heuristic Space Search

UNIT-II	NEURAL NETWORKS AND GENETIC ALGORITHMS	Classes: 12

Neural Networks and Genetic Algorithms: Neural Network Representation Problems Perceptions Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms Hypothesis Space Search– Genetic Programming – Models of Evolutions and Learning.

UNIT-III	BAYESIAN AND COMPUTATIONAL LEARNING	Classes: 12

Bayesian and Computational Learning: Bayes Theorem Concept Learning Maximum Likelihood Minimum Description Length Principle Bayes Optimal Classifier Gibbs Algorithm Naïve Bayes Classifier Bayesian Belief Network EM Algorithm Probability Learning Sample Complexity Finite and Infinite Hypothesis Spaces — Mistake Bound Model.

UNIT-IV	INSTANT BASED LEARNING	Classes: 12

Instant Based Learning: K- Nearest Neighbour Learning Locally weighted Regression Radial BasesFunctions — Case Based Learning.

UNIT-V	ADVANCED LEARNING	Classes: 13

Advanced Learning: Learning Sets of Rules Sequential Covering Algorithm Learning Rule Set First Order Rules Sets of First Order Rules Induction on Inverted Deduction Inverting Resolution Analytical Learning Perfect Domain Theories Explanation Base Learning — FOCL Algorithm - Reinforcement Learning Task Learning Temporal Difference Learning

TEXT BOOKS

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill, 2010.
2. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: OxfordUniversity Press, 1995.

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.w3schools.com/ai/ai_whatis.asp
2. https://www.digitalocean.com/community/tutorials/an-introduction-to-machine-learning
3. https://www.geeksforgeeks.org/machine-learning/

E -TEXT BOOKS

1. Introduction to Machine Learning with Python, Andreas C. Müller, Sarah Guido, First Edition

MOOCS COURSES

1. https://www.udemy.com/course/introduction-to-machine-learning-in-python/
2. https://www.coursera.org/learn/machine-learning
3. https://github.com/microsoft/ML-For-Beginners

DATA ANALYTICS LAB

III B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID604PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate theaccuracy of the algorithms.
- To understand the various search methods and visualization techniques.

COURSE OUTCOMES

- Understand linear regression and logistic regression.
- Understand the functionality of different classifiers.
- Implement visualization techniques using different graphs.
- Apply descriptive and predictive analytics for different types of data.

LIST OF EXPERIMENTS

1. Data Preprocessing
    a. Handling missing values
    b. Noise detection removal
    c. Identifying data redundancy and elimination
2. Implement any one imputation model
3. Implement Linear Regression
4. Implement Logistic Regression
5. Implement Decision Tree Induction for classification
6. Implement Random Forest Classifier
7. Implement ARIMA on Time Series data
8. Object segmentation using hierarchical based methods
9. Perform Visualization techniques (types of maps - Bar, Colum, Line, Scatter, 3D Cubes etc)
10. Perform Descriptive analytics on Healthcare data
11. Perform Predictive analytics on Product Sales data
12. Apply Predictive analytics for Weather forecasting.

TEXT BOOKS

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCE BOOKS

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

WEB REFERENCES

1. https://www.geeksforgeeks.org/design-and-analysis-of-algorithms/
2. https://www.w3schools.in/data-structures/big-o-notation-and-algorithm-analysis

E -TEXT BOOKS

1. https://edutechlearners.com/download/books/Algorithms%20Design%20and%20Analysis%20by%20Udit%20Agarwal%20PDF.pdf
2. Design and analysis of algorithms, Parag H. Dave, Himanshu B. Dave, Pearson Education.

MOOCS COURSE

1. https://www.udemy.com/course/design-and-analysis-of-algorithm-/
2. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
3. https://in.coursera.org/courses?query=algorithm%20design

COMPUTER NETWORKS LAB

III B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID605PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. To understand the working principle of various communication protocols.
2. To understand the network simulator environment and visualize a network topology andobserve its performance
3. To analyze the traffic flow and the contents of protocol frames

COURSE OUTCOMES

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

LIST OF EXPERIMENTS

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

TEXT BOOKS

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

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.geeksforgeeks.org/basics-computer-networking/
2. https://www.javatpoint.com/computer-network-tutorial
3. https://www.spiceworks.com/tech/networking/articles/what-is-a-computer-network/

E -TEXT BOOKS

1. https://open.umn.edu/opentextbooks/textbooks/771
2. https://faculty.ksu.edu.sa/sites/default/files/computer_networks_-_a_tanenbaum_-_5th_edition.pdf

MOOCS COURSE

1. https://in.coursera.org/courses?query=computer%20network
2. https://www.udemy.com/topic/computer-network/
3. https://onlinecourses.nptel.ac.in/noc22_cs19/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

NATURAL LANGUAGE PROCESSING LAB (Professional Elective - III Lab)

III B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID606PE	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

- To Develop and explore the problems and solutions of NLP.

COURSE OUTCOMES

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms

LIST OF EXPERIMENTS

Implement the following using Python

1. Tokenization
2. Stemming
3. Stop word removal (a, the, are)
4. Word Analysis
5. Word Generation
6. Pos tagging
7. Morphology
8. chunking
9. N-Grams
10. N-Grams Smoothing

TEXT BOOKS

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and Imed Zitouni, Pearson Publication.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

REFERENCE BOOKS

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.

WEB REFERENCES

1. https://www.ibm.com/in-en/topics/natural-language-processing
2. https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP
3. tutorialspoint.com/artificial_intelligence/artificial_intelligence_natural_language_processing.htm

E -TEXT BOOKS

1. https://cseweb.ucsd.edu/~nnakashole/teaching/eisenstein-nov18.pdf
2. https://www.london.ac.uk/sites/default/files/study-guides/introduction-to-natural-language-processing.pdf

MOOCS COURSE
1. https://in.coursera.org/specializations/natural-language-processing https://www.udemy.com/topic/natural-language-processing/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

DATA MINING LAB (Professional Elective - III Lab)

III B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID607PE	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

- The course is intended to obtain hands-on experience using data mining software.
- Intended to provide practical exposure of the concepts in data mining algorithms

COURSE OUTCOMES

- Apply pre-processing statistical methods for any given raw data.
- Gain practical experience of constructing a data warehouse.
- Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.
- Apply OLAP operations on data cube construction

LIST OF EXPERIMENTS

Experiments using Weka & Pentaho Tools

1. Data Processing Techniques:
   (i)Data cleaning (ii) Data transformation - Normalization (iii) Data integration
2. Partitioning - Horizontal, Vertical, Round Robin, Hash based
3. Data Warehouse schemas – star, snowflake, fact constellation
4. Data cube construction – OLAP operations
5. Data Extraction, Transformations & Loading operations
6. Implementation of Attribute oriented induction algorithm
7. Implementation of apriori algorithm
8. Implementation of FP – Growth algorithm
9. Implementation of Decision Tree Induction
10. Calculating Information gain measures
11. Classification of data using Bayesian approach
12. Classification of data using K – nearest neighbor approach
13. Implementation of K – means algorithm
14. Implementation of BIRCH algorithm
15. Implementation of PAM algorithm
16. Implementation of DBSCAN algorithm

TEXT BOOKS

1. Data Mining – Concepts and Techniques - JIAWEI HAN &MICHELINE KAMBER, Elsevier.
2. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007

REFERENCE BOOKS

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Anuj Karpatne, Introduction to Data Mining,Pearson Education

WEB REFERENCES

1. https://www.techtarget.com/searchbusinessanalytics/definition/data-mining#:~:text=Data%20mining%20is%20the%20process,make%20more%2Dinformed%20business%20decisions.
2. https://www.javatpoint.com/data-mining

E -TEXT BOOKS

1. https://link.springer.com/book/10.1007/978-3-319-14142-8
2. https://doc.lagout.org/Others/Data%20Mining/Data%20Mining_%20The%20Textbook%20%5BAggarwal%202015-04-14%5D.pdf

MOOCS COURSE

1. https://in.coursera.org/specializations/data-mining
2. https://onlinecourses.nptel.ac.in/noc21_cs06/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

INTERNET OF THINGS LAB (Professional Elective - III Lab)

III B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID608PE	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

- To introduce the raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of distance sensor on IoT devices

COURSE OUTCOMES

- Ability to introduce the concept of M2M (machine to machine) with necessary protocols andget awareness in implementation of distance sensor
- Get the skill to program using python scripting language which is used in many IoT devices

LIST OF EXPERIMENTS

1. Using raspberry pi
   a. Calculate the distance using a distance sensor.
   b. Basic LED functionality.
2. Using Arduino
   a. Calculate the distance using a distance sensor.
   b. Basic LED functionality.
   c. Calculate temperature using a temperature sensor.
3. Using Node MCU
   a. Calculate the distance using a distance sensor.
   b. Basic LED functionality.
   c. Calculate temperature using a temperature sensor.

TEXT BOOKS

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, UniversitiesPress, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014,ISBN: 9789350239759

REFERENCE BOOKS

1. **1**Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016
2. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

WEB REFERENCES

1. https://www.oracle.com/in/internet-of-things/what-is-iot/#:~:text=The%20Internet%20of%20Things%20(IoT)%20describes%20the%20network%20of%20physical,and%20systems%20over%20the%20internet.
2. https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT
   https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/

E -TEXT BOOKS
1. https://insights.btoes.com/top-10-internet-of-things-iot-books 2. https://www.springer.com/series/11636
MOOCS COURSE
1. https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/ 2. https://onlinecourses.nptel.ac.in/noc22_cs53/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

MOBILE APPLICATION DEVELOPMENT LAB (Professional Elective - III Lab)

III B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID609PE	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

- To learn how to develop Applications in an android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.

COURSE OUTCOMES

1. Students understand the working of Android OS Practically.
2. Students will be able to develop user interfaces.
3. Students will be able to develop, deploy and maintain the Android Applications.

LIST OF EXPERIMENTS

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

12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarmtime.
13. Create an application that shows the given URL (from a text field) in a browser

TEXT BOOKS

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

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.ibm.com/topics/mobile-application-development
2. https://www.techtarget.com/searchapparchitecture/definition/mobile-application-development
3. https://www.openxcell.com/mobile-app-development/

E -TEXT BOOKS

1. https://www.cs.cmu.edu/~bam/uicourse/830spring09/BFeiginMobileApplicationDevelopment.pdf
2. https://mrcet.com/pdf/Lab%20Manuals/IT/R15A0563%20MAD.pdf
   https://baou.edu.in/assets/pdf/PGDCA203_slm.pdf

MOOCS COURSE

1. https://www.fita.in/mobile-app-development-course/
2. https://alison.com/tag/app-development

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

WEB TECHNOLOGIES LAB (Professional Elective - III Lab)

III B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID610PE	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

1. To introduce PHP language for server-side scripting
2. To introduce XML and processing of XML Data with Java
3. To introduce Server-side programming with Java Servlets and JSP
4. To introduce Client-side scripting with Javascript and AJAX.

COURSE OUTCOMES

1. Gain knowledge of client-side scripting, validation of forms and AJAX programming
2. Understand server-side scripting with PHP language
3. Understand what is XML and how to parse and use XML Data with Java
4. To introduce Server-side programming with Java Servlets and JSP

LIST OF EXPERIMENTS

1. Write a PHP script to print prime numbers between 1-50.
2. PHP script to
   a. Find the length of a string.
   b. Count the number of words in a string.
   c. Reverse a string.
   d. Search for a specific string.
3. Write a PHP script to merge two arrays and sort them as numbers, in descending order.
4. Write a PHP script that reads data from one file and writes into another file.
5. Develop static pages (using Only HTML) of an online book store. The pages should resemble:www.amazon.com. The website should consist of the following pages.
   a) Home page
   b) Registration and user Login
   c) User Profile Page
   d) Books catalog
   e) Shopping Cart
   f) Payment By credit card
   g) Order Confirmation
6. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
7. Create and save an XML document on the server, which contains 10 users' information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
8. Install TOMCAT web server. Convert the static web pages of assignment 2 into dynamic web pages using servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
9. Redo the previous task using JSP by converting the static web pages of assignment 2 into dynamic web pages. Create a database with user information and books information. The books catalog should be dynamically loaded from the database. Follow the MVC architecture while doing the website.

TEXT BOOKS

1. WEB TECHNOLOGIES: A Computer Science Perspective, Jeffrey C. Jackson, PearsonEducation.

REFERENCE BOOKS

1. Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International, 2012, 4th Edition.
2. J2EE: The complete Reference By James Keogh, McGraw-Hill.
3. Bai and Ekedhi, The Web Warrior Guide to Web Programming, Thomson.
4. Paul Dietel and Harvey Deitel," Java How to Program", Prentice Hall of India, 8th Edition.
5. Web technologies, Black Book, Dreamtech press.
6. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India.

WEB REFERENCES

1. https://tms-outsource.com/blog/posts/web-technologies/
2. https://www.geeksforgeeks.org/web-technology/

E -TEXT BOOKS

1. https://archive.uneca.org/sites/default/files/uploaded-documents/SROs/SA/GIS-SP2018/introduction_to_web_technology.pdf
2. https://www.oreilly.com/library/view/web-technology-theory/9789332508194/
3. http://seu1.org/files/level6/IT230/Book/(web.tech%201st%20book)%20Web%20Technologies%20-%20A%20Computer%20Science%20Perspective.pdf

MOOCS COURSE

1. https://in.coursera.org/courses?query=web%20technologies
2. https://www.udemy.com/course/web-technology-for-entrepreneurs/

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ES608BS	B. Tech	3	0	0	0	30	70	100

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

UNIT-I	ECOSYSTEMS	Classes: 13

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

UNIT-II	NATURAL RESOURCES	Classes: 12

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

UNIT-III	BIODIVERSITY AND BIOTIC RESOURCES	Classes: 12

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

UNIT-IV	ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES	Classes: 12

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control

technologies: Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation. Global Environmental Problems and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT-V	ENVIRONMENTAL POLICY, LEGISLATION & EIA	Classes: 13

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS

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

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.britannica.com/science/environmental-science
2. https://www.environmentalscience.org/

E -TEXT BOOKS

1. https://open.umn.edu/opentextbooks/textbooks/562
2. https://www.hzu.edu.in/bed/E%20V%20S.pdf

MOOCS COURSES

1. https://in.coursera.org/browse/physical-science-and-engineering/environmental-science-and-sustainability
2. https://www.udemy.com/topic/environmental-science/
3. https://alison.com/tag/environmental-science

DEEP LEARNING

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID701PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To understand complexity of Deep Learning algorithms and their limitations
- To be capable of performing experiments in Deep Learning using real-world data.

COURSE OUTCOMES

- Implement deep learning algorithms, understand neural networks and traverse the layers ofdata
- Learn topics such as convolutional neural networks, recurrent neural networks, training deepnetworks and high-level interfaces
- Understand applications of Deep Learning to Computer Vision
- Understand and analyze Applications of Deep Learning to NLP

UNIT-I	INTRODUCTION	Classes: 13

Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout

UNIT-II	CONVOLUTIONAL NEURAL NETWORKS	Classes: 12

Convolutional Neural Networks: Architectures, convolution/pooling layers, Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Auto encoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models

UNIT-III	APPLICATIONS OF DEEP LEARNING TO COMPUTER VISION	Classes: 12

Applications of Deep Learning to Computer Vision: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models, Attention Models for computer vision tasks

UNIT-IV	APPLICATIONS OF DEEP LEARNING TO NLP	Classes: 12

Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Glove, Evaluations and Applications in word similarity

UNIT-V	ANALOGY REASONING	Classes: 13

Analogy reasoning: Named Entity Recognition, Opinion Mining using Recurrent Neural Networks: Parsing and Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs

TEXT BOOKS

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning. Hastie, R. Tibshirani and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller and N. Friedman, MIT Press.

REFERENCE BOOKS

1. Bishop, C. M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G. H., and Van Loan, C.F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

WEB REFERENCES

1. https://www.geeksforgeeks.org/introduction-deep-learning/
2. https://www.techtarget.com/searchenterpriseai/definition/deep-learning-deep-neural-network

E -TEXT BOOKS

1. https://www.deeplearningbook.org/
2. https://www.simplilearn.com/best-deep-learning-books-to-read-article

MOOCS COURSES

1. https://in.coursera.org/specializations/deep-learning
2. https://www.udemy.com/topic/deep-learning/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

DATA WRANGLING AND DATA VISUALIZATION

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID702PC	B. Tech	2	0	0	2	30	70	100

COURSE OBJECTIVES

- To learn data wrangling techniques.
- To introduce visual perception and core skills for visual analysis.

COURSE OUTCOMES

Upon completion of the course, the students will be able to

- Perform data wrangling
- Explain principles of visual perception
- Apply core skills for visual analysis
- Apply visualization techniques for various data analysis tasks
- Evaluate visualization techniques

UNIT-I	DATA WRANGLING	Classes: 13

Data Wrangling: Need of data cleanup, data clean up basics — formatting, outliers, duplicates, Normalizing and standardizing data.

UNIT-II	INTRODUCTION OF VISUAL PERCEPTION	Classes: 12

Introduction of visual perception, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT-III	CLASSIFICATION OF VISUALIZATION SYSTEMS	Classes: 12

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT-IV	VISUALIZATION OF GROUPS	Classes: 12

Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

UNIT-V	VISUALIZATION OF VOLUMETRIC DATA	Classes: 13

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations

TEXT BOOKS

1. Jacqueline Kazil and Katharine Jarmul, Data Wrangling with Python: Tips and Tools to MakeYour Life Easier, O'Reilly.
2. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, andApplications. Natick A K Peters, Ltd.

REFERENCE BOOKS

1. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

WEB REFERENCES

1. https://www.simplilearn.com/data-wrangling-article
2. https://en.wikipedia.org/wiki/Data_wrangling
3. https://www.cpp.edu/cpge/professional-development/business/data-wrangling-visualization.shtml

E -TEXT BOOKS

1. https://www.oreilly.com/library/view/next-generation-big-data/9781484231470/html/456459_1_En_9_Chapter.xhtml
2. https://solutionsreview.com/data-integration/the-best-data-wrangling-books/

MOOCS COURSES

1. https://www.udemy.com/course/data-visualization-wrangling-python/?utm_source=adwords&utm_medium=udemyads&utm_campaign=DataScience_v.PROF_la.EN_cc.INDIA_ti.5336_Exp&utm_content=deal4584&utm_term=_._ag_81684907582_._ad_533157667354_._kw__._de_c_._dm__._pl__._ti_dsa-774930036449_._li_9062122_._pd__._&matchtype=&gclid=CjwKCAjw_YShBhAiEiwAMomsEFERlt1sa1SuP_YGwpoElbmmXi7SLTYtiT_zwwag7bkeLyDZpTiIWxoCOfQQAvD_BwE
2. https://in.coursera.org/courses?query=data%20wrangling

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

QUANTUM COMPUTING (Professional Elective - IV)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID711PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To introduce the fundamentals of quantum computing
- The problem-solving approach using finite dimensional mathematics

COURSE OUTCOMES

- Understand basics of quantum computing
- Understand physical implementation of Qubit
- Understand Quantum algorithms and their implementation
- Understand the Impact of Quantum Computing on Cryptography

UNIT-I	INTRODUCTION TO ESSENTIAL LINEAR ALGEBRA	Classes: 13

Introduction to Essential Linear Algebra: Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory

Complex Numbers: Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically, Vector Representations of Complex Numbers, Pauli Matrice, Transcendental Numbers

UNIT-II	BASIC PHYSICS FOR QUANTUM COMPUTING	Classes: 12

Basic Physics for Quantum Computing: The Journey to Quantum, Quantum Physics Essentials, Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement

Basic Quantum Theory: Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromodynamics, Feynman Diagram Quantum Entanglement and QKD, Quantum Entanglement, Interpretation, QKE

UNIT-III	QUANTUM ARCHITECTURE	Classes: 12

Quantum Architecture: Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, TheD-Wave Quantum Architecture

Quantum Hardware: Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials

UNIT-IV	QUANTUM ALGORITHMS	Classes: 12

Quantum Algorithms: What Is an Algorithm? Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon's Algorithm, Shor's Algorithm, Grover's Algorithm

UNIT-V	Current Asymmetric Algorithms	Classes: 13

Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve
The Impact of Quantum Computing on Cryptography: Asymmetric Cryptography, Specific Algorithms, Specific Applications

TEXT BOOKS

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press
2. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson

REFERENCE BOOKS

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci.
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.Basic Concepts, Vol.
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to QuantumComputing Algorithms.

WEB REFERENCES

1. https://www.ibm.com/topics/quantum-computing
2. https://builtin.com/hardware/quantum-computing

E -TEXT BOOKS

1. https://www.qpiai-explorer.tech/quantum-certification/?utm_source=google&utm_medium=search&utm_campaign=lead_mar&gclid=CjwKCAjw_YShBhAiEiwAMomsEJk6FxjoDSF0SNE3aDoOroNtRBHc9jVbaRXcH3giIFiDcwhqTxtE_hoCxHEQAvD_BwE

MOOCS COURSES

1. https://www.udemy.com/course/quantum-computing-with-ibm-qiskit-ultimate-masterclass/?utm_source=adwords&utm_medium=udemyads&utm_campaign=DSA_Catchall_la.EN_cc.INDIA&utm_content=deal4584&utm_term=_._ag_82569850245_._ad_533220805577_._kw__._de_c_._dm__._pl__._ti_dsa-406594358574_._li_9062122_._pd__._&matchtype=&gclid=CjwKCAjw_YShBhAiEiwAMomsEANc9Z4GZ3rNpOoh
2. https://onlinecourses.nptel.ac.in/noc19_cy31/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

EXPERT SYSTEMS (Professional Elective - IV)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID712PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- Understand the basic techniques of artificial intelligence.
- Understand the Non-monotonic reasoning and statistical reasoning.

COURSE OUTCOMES

- Apply the basic techniques of artificial intelligence.
- Discuss the architecture of an expert system and its tools.
- Understand the importance of building an expert system
- Understand various problems with an expert system

UNIT-I	INTRODUCTION TO AI PROGRAMMING LANGUAGES	Classes: 13

Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic search techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min- max algorithms, game playing – Alpha-beta pruning.

UNIT-II	KNOWLEDGE REPRESENTATION ISSUES PREDICATE LOGIC	Classes: 12

Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.

UNIT-III	INTRODUCTION TO EXPERT SYSTEMS,	Classes: 12

Introduction to Expert Systems, Architecture of expert systems, Representation and organization of knowledge, Basics characteristics, and types of problems handled by expert systems.

UNIT-IV	EXPERT SYSTEM TOOLS	Classes: 12

Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.

UNIT-V	BUILDING AN EXPERT SYSTEM	Classes: 13

Building an Expert System: Expert system development, Selection of the tool, Acquiring Knowledge, Building process.

Problems with Expert Systems: Difficulties, common pitfalls in planning, dealing with domain experts, difficulties during development.

TEXT BOOKS

1. Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, New Delhi,
2. Waterman D.A., "A Guide to Expert Systems", Addison Wesley Longman,

REFERENCE BOOKS

1. Stuart Russel and other Peter Norvig, "Artificial Intelligence – A Modern Approach", Prentice-Hall,
2. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley,
3. Patterson, Artificial Intelligence & Expert System, Prentice Hall India,1999.
4. Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley,
5. Weiss S.M. and Kulikowski C.A., "A Practical Guide to Designing Expert Systems", Rowman &Allanheld, New Jersey.

WEB REFERENCES

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2. https://www.techtarget.com/searchcloudcomputing/definition/cloud-computing

E -TEXT BOOKS

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2. https://www.knowledgehut.com/blog/cloud-computing/best-cloud-computing-books

MOOCS COURSES

1. intellipaat.com/cloud-computing-certification-program-iit-roorkee/?utm_source=google&utm_medium=search&utm_term=cloud%20computing%20online%20courses&utm_campaign=s_cloud_computing_in&utm_source=google&utm_medium=cpc&campaignid=9702800786&adgroupid=99156055333
2. https://in.coursera.org/browse/information-technology/cloud-computing

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

CLOUD COMPUTING (Professional Elective - IV)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID713PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- This course provides an insight into cloud computing.
- Topics covered include- distributed system models, different cloud service models, service-oriented architectures, cloud programming and software environments, resource management.

COURSE OUTCOMES

- Ability to understand various service delivery models of a cloud computing architecture.
- Ability to understand the ways in which the cloud can be programmed and deployed.
- Understanding cloud service providers.

UNIT-I	COMPUTING PARADIGMS	Classes: 13

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT-II	CLOUD COMPUTING FUNDAMENTALS	Classes: 12

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

UNIT-III	CLOUD COMPUTING ARCHITECTURE AND MANAGEMENT	Classes: 12

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT-IV	CLOUD SERVICE MODELS	Classes: 12

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT-V	CLOUD SERVICE PROVIDERS:	Classes: 13

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjrasoft, Aneka Platform

TEXT BOOKS

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCE BOOKS

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier,2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather,Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

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1. https://www.scaler.com/topics/computer-network/cryptography-and-network-security/
2. https://www.geeksforgeeks.org/cryptography-and-network-security-principles/

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1. https://gacbe.ac.in/images/E%20books/Cryptography%20and%20Network%20Security%20-%20Prins%20and%20Pract.%205th%20ed%20-%20W.%20Stallings%20(Pearson,%202011)%20BBSbb.pdf
2. http://uru.ac.in/uruonlinelibrary/Cyber_Security/Cryptography_and_Network_Security.pdf

MOOCS COURSES

1. https://www.coursera.org/lecture/managing-network-cybersecurity/cryptography-and-network-security-w9SuJ
2. https://onlinecourses.nptel.ac.in/noc20_cs21/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

CRYPTOGRAPHY AND NETWORK SECURITY (Professional Elective - IV)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID714PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication andavailability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe a public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted email message.
- Discuss Web security and Firewalls

COURSE OUTCOMES

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

UNIT-I	SECURITY CONCEPTS: INTRODUCTION	Classes: 13

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

UNIT-II	SYMMETRIC KEY CIPHERS	Classes: 12

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipheroperation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT-III	CRYPTOGRAPHIC HASH FUNCTIONS	Classes: 12

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public — Key Infrastructure

UNIT-IV	TRANSPORT-LEVEL SECURITY	Classes: 12

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN,IEEE 802.11i Wireless LAN Security

UNIT-V	E-MAIL SECURITY: PRETTY GOOD PRIVACY	Classes: 13

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations,Internet Key Exchange

Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

TEXT BOOKS

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

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

WEB REFERENCES

1. https://www.tutorialspoint.com/mobile_computing/mobile_computing_overview.htm
2. https://www.javatpoint.com/mobile-computing

E -TEXT BOOKS

1. https://people.cs.rutgers.edu/~imielins/book.html

MOOCS COURSES

1. https://alison.com/course/introduction-to-mobile-and-cloud-computing-revised
2. https://www.udemy.com/topic/cloud-computing/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

MOBILE COMPUTING (Professional Elective - IV)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID715PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations, the typical mobile networking infrastructure through a popular GSM protocol, the issues and solutions of various layers of mobile networks.

COURSE OUTCOMES

- Understand the concept of mobile computing paradigm, its novel applications and limitations.
- Analyze and develop new mobile applications
- Understand the protocols and platforms related to mobile environment
- Classify data delivery mechanisms

UNIT-I	INTRODUCTION: MOBILE COMMUNICATIONS	Classes: 13

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and HandheldDevices.

GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.

UNIT-II	MEDIUM ACCESS CONTROL (MAC)	Classes: 12

Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11) Mobile Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT-III	MOBILE TRANSPORT LAYER	Classes: 12

Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP,Other Transport Layer Protocols for Mobile Networks.

Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation,Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT-IV	DATA DISSEMINATION AND SYNCHRONIZATION	Classes: 12

Data Dissemination and Synchronization: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols

UNIT-V	MOBILE AD HOC NETWORKS (MANETS)	Classes: 13

Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing,Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, Mobile Agents, Service Discovery.
Protocols and Platforms for Mobile Computing: WAP, Bluetooth, XML, J2ME, JavaCard, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

TEXT BOOKS

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2009.
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772.

REFERENCE BOOKS

1. Asoke K Talukder, Hasan Ahmed, Roopa Yavagal Mobile Computing: Technology, Applications and Service Creation, McGraw Hill Education.

WEB REFERENCES

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2. https://www.techopedia.com/definition/3205/social-network-analysis-sna

E -TEXT BOOKS

1. https://www.sciencedirect.com/topics/social-sciences/social-network-analysis
2. https://www.goodreads.com/shelf/show/social-network-analysis

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1. https://www.udemy.com/course/socialnetwork/?--=&utm_source=adwords&utm_medium=udemyads&utm_campaign=LongTail_la.EN_cc.INDIA&utm_content=deal4584&utm_term=_._ag_118445032537_._ad_618853564450_._kw__._de_c_._dm__._pl__._ti_dsa-1212271230479_._li_9062122_._pd__._&matchtype=&gclid=CjwKCAjw_YShBhAiEiwAMomsEMkhI1UKswfuk_oFg7tQ1XhIiHqkF5qa33u63g9xmMoxwGgC10nvWRoCKfUQAvD_BwE
2. https://in.coursera.org/learn/social-network-analysis?utm_source=gg&utm_medium=sem&utm_campaign=B2C_INDIA__branded_FTCOF_courseraplus_arte_PMax&utm_content=Degree&campaignid=19607944793&adgroupid=&device=c&keyword=&matchtype=&network=x&devicemodel=&adpostion=&creativeid=&hide_mobile_promo&gclid=CjwKCAjw_YShBhAiEiwAMomsEP1hqQfzLh616tup33W5KwJJvHkjsvHY3QBj9h-PEfQozuxXotjN7RoCN8EQAvD_BwE

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

SOCIAL NETWORK ANALYSIS (Professional Elective - V)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID721PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- It introduces the concepts of social media
- It provides the mechanisms for social network analysis
- Includes the concepts that allow for better visualization and analysis of widely used servicessuch as email, Wikis, Twitter, flickr, YouTube, etc.

COURSE OUTCOMES

- Ability to construct social network maps easily.
- Gain skills in tracking the content flow through the social media.
- Use NodeXL to perform social network analysis.

UNIT-I	INTRODUCTION	Classes: 13

Introduction: Social Media and Social Networks.
Social Media: New Technologies of Collaboration.
Social Network Analysis: Measuring, Mapping, and Modelling collections of Connections.

UNIT-II	NODEXL, LAYOUT	Classes: 12

NodeXL, Layout, Visual Design, and Labeling, Calculating and Visualising Network Metrics, PreparingData and Filtering, Clustering and Grouping.

UNIT-III	CASE STUDIES - I	Classes: 12

Case Studies - I:
Email: The lifeblood of Modern Communication.
Thread Networks: Mapping Message Boards and Email Lists.
Twitter: Conversation, Entertainment and Information.

UNIT-IV	CASE STUDIES-II	Classes: 12

Case Studies-II: Visualizing and Interpreting Facebook Networks, WWW Hyperlink Networks

UNIT-V	CASE STUDIES - III	Classes: 13

Case Studies - III:
You Tube: Contrasting Patterns of Content Interaction, and Prominence.
Wiki Networks: Connections of Creativity and Collaboration

TEXT BOOKS

1. Hansen, Derek, Ben Sheiderman, Marc Smith, Analyzing Social Media Networks with NodeXL:Insights from a Connected World, Morgan Kaufmann, 2011.
2. Avinash Kaushik, Web Analytics 2.0: The Art of Online Accountability, Sybex, 2009.

REFERENCE BOOKS

1. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting and Using Metrics, 1st Edition, MGH, 2011

WEB REFERENCES

1. Python Programming (Edit): An Introduction to Computer Science Paperback– 7May 2010
2. Programming Python 4e Paperback – 14 Jan 2011 by Mark Lutz
3. Introduction to Machine Learning with Python Paperback – 7 Oct 2016 by Andreas Mueller (Author), Sarah Guido

E -TEXT BOOKS

1. https://link.springer.com/book/10.1007/978-3-030-96896-0
2. https://www.oreilly.com/library/view/what-is-federated/9781098107253/

MOOCS COURSES

1. https://aws.amazon.com/certification/certified-machine-learning-specialty/?trk=5faa865f-0158-4dc0-8133-e63280765ce5&sc_channel=ps&ef_id=CjwKCAjw_YShBhAiEiwAMomsEHRhPMoy7_FGNZ2CXY8FjcjstlMjKwD930MmYhOfIhfIyrIZ-VLxpRoCUrEQAvD_BwE:G:s&s_kwcid=AL!4422!3!467351733262!p!!g!!machine%20learning%20certifications!11138243480!106933383342
2. https://www.coursera.org/lecture/advanced-deployment-scenarios-tensorflow/how-it-works-Rs6HP

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

FEDERATED MACHINE LEARNING (Professional Elective - V)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID722PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- Understand the key concepts and issues behind Federated Learning
- Get familiar with key theoretical results of Federated Learning

COURSE OUTCOMES

- Knowledge of the basic concepts, architecture, and applications of FL.
- Understanding of new research and application trends in FL.
- Analyze horizontal federated learning
- Understand the significance of Federated Learning for Vision, Language, andRecommendation

UNIT-I	INTRODUCTION	Classes: 13

Introduction: Motivation, Federated Learning as a Solution, The Definition of Federated Learning, Categories of Federated Learning, Current Development in Federated Learning, Research Issues in Federated Learning, Open-Source Projects, Standardization Efforts, The Federated AI Ecosystem.
Background: Privacy-Preserving Machine Learning, PPML and Secure ML, Threat and Security Models, Privacy Threat Models, Adversary and Security Models, Privacy Preservation Techniques, Secure Multi-Party Computation, Homomorphic Encryption, Differential Privacy.

UNIT-II	DISTRIBUTED MACHINE LEARNING	Classes: 12

Distributed Machine Learning: Introduction to DML, The Definition of DML, DML Platforms, Scalability-Motivated DML, Large-Scale Machine Learning, Scalability-Oriented DML Schemes, Privacy-Motivated DML, Privacy-Preserving Decision Trees, Privacy-Preserving Techniques, Privacy- Preserving DML Schemes, Privacy-Preserving Gradient Descent, Vanilla Federated Learning, Privacy-Preserving Methods.

UNIT-III	HORIZONTAL FEDERATED LEARNING	Classes: 12

Horizontal Federated Learning: The Definition of HFL, Architecture of HFL, The Client- Server Architecture, The Peer-to-Peer Architecture, Global Model Evaluation, The Federated Averaging Algorithm, Federated Optimization, The FedAvg Algorithm, The Secured FedAvg Algorithm, Improvement of the FedAvg Algorithm, Communication Efficiency, Client Selection.
Vertical Federated Learning: The Definition of VFL, Architecture of VFL, Algorithms of VFL, Secure Federated Linear Regression, Secure Federated Tree-Boosting.

UNIT-IV	FEDERATED TRANSFER LEARNING	Classes: 12

Federated Transfer Learning: Heterogeneous Federated Learning, Federated Transfer Learning, The FTL Framework, Additively Homomorphic Encryption, The FTL Training Process, The FTL Prediction Process, Security Analysis, Secret Sharing-Based FTL Incentive Mechanism.
Design for Federated Learning: Paying for Contributions, Profit- Sharing Games, Reverse Auctions, A Fairness-Aware Profit-Sharing Framework, Modeling Contribution, Modeling Cost, Modeling Regret, Modeling Temporal Regret, The Policy Orchestrator, Computing Payoff Weightage.

UNIT-V	FEDERATED LEARNING FOR VISION, LANGUAGE, AND RECOMMENDATION	Classes: 13

Federated Learning for Vision, Language, and Recommendation: Federated Learning for Computer Vision, Federated CV, Federated Learning for NLP, Federated NLP, Federated Learning forRecommendation Systems, Recommendation Model, Federated Recommendation System.
Federated Reinforcement Learning: Introduction to Reinforcement Learning, Policy, Reward, Value Function, Model of the Environment, RL Background Example, Reinforcement Learning Algorithms, Distributed Reinforcement Learning, Asynchronous Distributed Reinforcement Learning, Synchronous Distributed Reinforcement Learning, Federated Reinforcement Learning, Background and Categorization.

TEXT BOOKS

1. Federated Learning (Synthesis Lectures on Artificial Intelligence and Machine Learning),Qiang Yang, Yang Liu, Yong Cheng, Yan Kang, Tianjian Chen, and Han Yu 2019.

REFERENCE BOOKS

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, WilliamR Sherman and Jeffrey D Will, Morgan Kaufmann, 2009
4. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381
5. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija — Utgivare Publisher. 2012. ISBN 978-951-38-7449-0
6. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005

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1. https://www.splunk.com/en_us/data-insider/what-are-augmented-reality-and-virtual-reality.html
2. https://edu.gcfglobal.org/en/thenow/understanding-virtual-reality-and-augmented-reality/1/

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1. https://link.springer.com/book/10.1007/978-3-030-680862
2. https://www.oreilly.com/library/view/creating-augmented-and/9781492044185/

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1. https://www.udemy.com/course/develop-augmented-reality-book-ar-business-card-with-unity/?gclid=CjwKCAjw_YShBhAiEiwAMomsEDdBqqQfh_xahU8x_y2iG6WNhKQPp9icJVqR1hDuHtVTJJXPWlZ_7hoCoSYQAvD_BwE&matchtype=e&utm_campaign=LongTail_la.EN_cc.INDIA&utm_content=deal4584&utm_medium=udemyads&utm_source=adwords&utm_term=_._ag_84769212688_._ad_533196121837_._kw_augmented+reality+course_._de_c_._dm__._pl__._ti_kwd-824151200384_._li_9062122_._pd__._
2. https://www.coursera.org/courses?query=augmented%20reality

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

AUGMENTED REALITY & VIRTUAL REALITY (Professional Elective - V)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID723PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- The objective of this course is to provide a foundation to the fast-growing field of AR and makethe students aware of the various AR devices.
- To give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

COURSE OUTCOMES

- Describe how AR systems work and list the applications of AR.
- Understand and analyze the hardware requirement of AR.
- Describe how VR systems work and list the applications of VR.
- Understand the design and implementation of the hardware that enables VR systems tobe built.

UNIT-I	INTRODUCTION TO AUGMENTED REALITY	Classes: 13

Introduction to Augmented Reality: What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts- How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.

UNIT-II	AR DEVICES & COMPONENTS	Classes: 12

AR Devices & Components: AR Components – Scene Generator, Tracking system, monitoring system, display, Game scene AR Devices – Optical See- Through HMD, Virtual retinal systems, Monitorbases systems, Projection displays, Video see-through systems.

UNIT-III	INTRODUCTION TO VIRTUAL REALITY	Classes: 12

Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the VirtualWorld-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

UNIT-IV	REPRESENTING THE VIRTUAL WORLD	Classes: 12

Representing the Virtual World: Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR
Case Study: GHOST (General Haptics Open Software Toolkit) software development toolkit.

UNIT-V	VISUAL PERCEPTION & RENDERING	Classes: 13

Visual Perception & Rendering: Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information

Visual Rendering - Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates.

TEXT BOOKS

1. 1Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978- 1484236178
2. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India;First edition (12 October 2016),ISBN-10: 9332578494

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7. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
8. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
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10. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381
11. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija — Utgivare Publisher. 2012. ISBN 978-951-38-7449-0
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1. https://www.splunk.com/en_us/data-insider/what-are-augmented-reality-and-virtual-reality.html
2. https://edu.gcfglobal.org/en/thenow/understanding-virtual-reality-and-augmented-reality/1/

E -TEXT BOOKS

1. https://link.springer.com/book/10.1007/978-3-030-680862
2. https://www.oreilly.com/library/view/creating-augmented-and/9781492044185/

MOOCS COURSES

1. https://www.udemy.com/course/develop-augmented-reality-book-ar-business-card-with-unity/?gclid=CjwKCAjw_YShBhAiEiwAMomsEDdBqqQfh_xahU8x_y2iG6WNhKQPp9icJVqR1hDuHtVTJJXPWlZ_7hoCoSYQAvD_BwE&matchtype=e&utm_campaign=LongTail_la.EN_cc.INDIA&utm_content=deal4584&utm_medium=udemyads&utm_source=adwords&utm_term=_._ag_84769212688_._ad_533196121837_._kw_augmented+reality+course_._de_c_._dm__._pl__._ti_kwd-824151200384_._li_9062122_._pd__._
2. https://www.coursera.org/courses?query=augmented%20reality

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

WEB SECURITY (Professional Elective - V)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID724PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- Give an Overview of information security.
- Give an overview of Access control of relational databases.

COURSE OUTCOMES

Students should be able to

- Understand the Web architecture and applications.
- Understand client side and server-side programming.
- Understand how common mistakes can be bypassed and exploit the application.
- Identify common application vulnerabilities.

UNIT-I	THE WEB SECURITY	Classes: 13

The Web Security, The Web Security Problem, Risk Analysis and Best Practices.
Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification.

UNIT-II	PRIVACY-PROTECTING TECHNIQUES	Classes: 12

The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Anti-Theft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications.

UNIT-III	DATABASE SECURITY	Classes: 12

Database Security: Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems.

UNIT-IV	SECURITY RE-ENGINEERING FOR DATABASES	Classes: 12

Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities

UNIT-V	FUTURE TRENDS PRIVACY IN DATABASE PUBLISHING	Classes: 13

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced Location Based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment.

TEXT BOOKS

1. Web Security, Privacy and Commerce Simson G Arfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends Michael Gertz, Sushil Jajodia.

REFERENCE BOOKS

- http://gvgvc.ac.in/naac/Common-link/Book/Cyber-Security-Book.pdf
- https://gacbe.ac.in/images/E%20books/Cryptography%20and%20Network%20Security%20-%20Prins%20and%20Pract.%205th%20ed%20-%20W.%20Stallings%20(Pearson,%202011)%20BBSbb.pdf

WEB REFERENCES

1. https://www.mimecast.com/content/web-security/#:~:text=In%20general%2C%20web%20security%20refers,users%20and%20companies%20from%20risk.
2. https://www.fortinet.com/resources/cyberglossary/what-is-web-security

E -TEXT BOOKS

1. https://www.pdfdrive.com/cyber-security-books.html
2. https://mrcet.com/pdf/Lab%20Manuals/IT/CYBER%20SECURITY%20(R18A0521).pdf

MOOCS COURSES

1. https://www.udemy.com/course/web-security-common-vulnerabilities-and-their-mitigation/?utm_source=adwords&utm_medium=udemyads&utm_campaign=WebDevelopment_v.PROF_la.EN_cc.INDIA_ti.8322_Exp&utm_content=deal4584&utm_term=_._ag_82381207618_._ad_533094292053_._kw__._de_c_._dm__._pl__._ti_dsa-774930032289_._li_9152458_._pd__._&matchtype=&gclid=CjwKCAjw_YShBhAiEiwAMomsENIrD2BpkNblsJ7Q_zCjqTCGBO6NC0jo_xg6VFTdzPhjDb1Q3izQ1BoC6mkQAvD_BwE
2. https://www.simplilearn.com/cyber-security-expert-master-program-training-course?https:/www.simplilearn.com/cyber-security/ceh-certification=&utm_source=google&utm_medium=cpc&utm_term=&utm_content=18997691749-143770561637-636540733675&utm_device=c&utm_campaign=Search-TechCluster-Cyber-CyberSecurityNew-DSA-IN-Main-AllDevice-adgroup-DSA-Cyber-Masters&gclid=CjwKCAjw_YShBhAiEiwAMomsEE2SFwG0zHqPRoVDFRHSQ2pXVcYlz5PDgyXZNi1q59ccU7cVHY0k1RoC3TUQAvD_BwE

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

AD-HOC & SENSOR NETWORKS (Professional Elective - V)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID725PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- To understand the applications of ad-hoc and sensor networks

COURSE OUTCOMES Students should be able to

- Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and
- Wireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN.
- Ability to conduct further research in the domain of ASN

UNIT-I	INTRODUCTION TO AD HOC NETWORKS	Classes: 13

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

UNIT-II	DATA TRANSMISSION	Classes: 12

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

UNIT-III	GEOCASTING: DATA-TRANSMISSION	Classes: 12

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

UNIT-IV	BASICS OF WIRELESS	Classes: 12

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

UNIT-V	UPPER LAYER ISSUES OF WSN	Classes: 13

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

TEXT BOOKS

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

REFERENCE BOOKS

1.https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/Ad-
2.hoc%20Sensor%20Networks.pdf

WEB REFERENCES

1. https://www.geeksforgeeks.org/differences-between-wireless-adhoc-network-and-wireless-sensor-network/
2. https://www.brunel.ac.uk/electronic-and-electrical-engineering/research-and-phd-programmes/Research-areas/Ad-hoc-Sensor-Networks

E -TEXT BOOKS

1. https://www.academia.edu/35168081/CS_6003_AD_HOC_AND_SENSOR_NETWORKS
2. https://referenceglobe.com/CollegeLibrary/library_books/20180301073312adhoc2-ilovepdf-compressed.pdf

MOOCS COURSES

1. https://www.udemy.com/course/wireless-sensor-networks-electronics-telecommunication-f/?utm_source=adwords&utm_medium=udemyads&utm_campaign=DSA_Catchall_la.EN_cc.INDIA&utm_content=deal4584&utm_term=_._ag_82569850245_._ad_533220805577_._kw__._de_c_._dm__._pl__._ti_dsa-52949608673_._li_9152458_._pd__._&matchtype=&gclid=CjwKCAjw_YShBhAiEiwAMomsEJ0wTG3rE3cSRdaOLeZfAs30TDx69dvaKyRwC5tYeabOrd1eL9PIhxoCxyQQAvD_BwE
2. https://onlinecourses-archive.nptel.ac.in/noc18_cs09/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

INTRODUCTION TO NATURAL LANGUAGE PROCESSING (Open Elective - II)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
	B. Tech	0	0	0	3	30	70	100

COURSE OBJECTIVES

- Introduction to some of the problems and solutions of NLP and their relation to linguistics andstatistics.

COURSE OUTCOMES

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, andestimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms Able to design different languagemodeling Techniques.
- Able to design different language modeling Techniques.

UNIT-I	FINDING THE STRUCTURE OF WORDS	Classes: 13

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models.

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches.

UNIT-II	SYNTAX ANALYSIS:	Classes: 12

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms.

UNIT-III	SEMANTIC PARSING:	Classes: 12

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems.

UNIT-IV	PREDICATE-ARGUMENT STRUCTURE	Classes: 12

Predicate-Argument Structure, Meaning Representation Systems

UNIT-V	LANGUAGE MODELING	Classes: 13

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, bayesian parameterestimation, Language Model Adaptation, Language Models- class based, variable length, bayesian topic based, Multilingual and Cross Lingual Language Modeling.

TEXT BOOKS

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and Imed Zitouni, Pearson Publication

REFERENCE BOOKS

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, PearsonPublications
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

WEB REFERENCES

1. https://www.ibm.com/in-en/topics/natural-language-processing
2. https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP
3. tutorialspoint.com/artificial_intelligence/artificial_intelligence_natural_language_processing.htm

E -TEXT BOOKS

1. https://cseweb.ucsd.edu/~nnakashole/teaching/eisenstein-nov18.pdf
2. https://www.london.ac.uk/sites/default/files/study-guides/introduction-to-natural-language-processing.pdf

MOOCS COURSES

1. https://in.coursera.org/specializations/natural-language-processing
2. https://www.udemy.com/topic/natural-language-processing/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

AI APPLICATIONS (Open Elective - II)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
	B. Tech	0	0	0	3	30	70	100

COURSE OBJECTIVES

- To give deep knowledge of AI and how AI can be applied in various fields to makelife easy.

COURSE OUTCOMES

After completion of course, students would be able to:

- To correlate AI and solutions to modern problems.
- To decide when to use which type of AI technique.
- Understand Robotic Processes Automation
- Analyze AI-Optimized Hardware

UNIT-I	LINGUISTIC ASPECTS OF NATURAL LANGUAGE PROCESSING	Classes: 13

Linguistic aspects of natural language processing, A.I. And Quantum Computing, Applications ofArtificial Intelligence (AI) in business.

UNIT-II	EMOTION RECOGNITION USING HUMAN FACE AND BODY LANGUAGE	Classes: 12

Emotion Recognition using human face and body language, AI based system to predict diseases early,Smart Investment analysis, AI in Sales and Customer Support.

UNIT-III	ROBOTIC PROCESSES AUTOMATION	Classes: 12

Robotic Processes Automation for supply chain management.

UNIT-IV	AI-OPTIMIZED HARDWARE	Classes: 12

AI-Optimized Hardware, Digital Twin i.e. AI Modeling, Information Technology & Security using AI.

UNIT-V	RECENT TOPICS IN AI/ML	Classes: 13

Recent Topics in AI/ML: AI/ML in Smart solutions, AI/ML in Social Problems handling, Block chain andAI.

TEXT BOOKS

1. Sameer Dhanrajani, AI and Analytics, Accelerating Business Decisions, John Wiley & Sons.
2. Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems, Bernard Marr, Matt Ward, Wiley.

REFERENCE BOOKS

1. Life 3.0: Being Human in the Age of Artificial Intelligence by Max Tegmark, 2018.
2. Homo Deus: A Brief History of Tomorrow by Yuval Noah Harari, 2017.

WEB REFERENCES

1. https://dlabs.ai/blog/free-ebooks-on-artificial-intelligence-to-read/
2. https://link.springer.com/book/10.1007/978-3-030-60032-7

E -TEXT BOOKS

1. https://eplibrary.libguides.com/EPOL/SR/Applications_of_AI/e-books
2. https://www.amazon.in/Data-Analytics-AI-Applications-ebook/dp/B08D2R7K84

MOOCS COURSES

1. https://www.google.com/aclk?sa=l&ai=DChcSEwiu49WMkvz9AhWBmWYCHX7rDCEYABAEGgJzbQ&sig=AOD64_0XpW6ln4r4O4NGrEpytT7CaXP1hg&q&adurl&ved=2ahUKEwiJ282Mkvz9AhXZT2wGHZQ0DLIQ0Qx6BAgJEAE
2. https://www.google.com/aclk?sa=l&ai=DChcSEwiu49WMkvz9AhWBmWYCHX7rDCEYABAAGgJzbQ&sig=AOD64_2NUGAYIbemWK7cXlz2OamLwKGMfw&q&adurl&ved=2ahUKEwiJ282Mkvz9AhXZT2wGHZQ0DLIQ0Qx6BAgIEAE

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

DEEP LEARNING LAB

IV B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID604PC	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

- To Build the Foundation of Deep Learning.
- To Understand How to Build the Neural Network.
- To enable students to develop successful machine learning concepts.

COURSE OUTCOMES

Upon the Successful Completion of the Course, the Students would be able to:

- Learn The Fundamental Principles of Deep Learning.
- Identify The Deep Learning Algorithms for Various Types of Learning Tasks in various domains.
- Implement Deep Learning Algorithms and Solve Real-world problems.

LIST OF EXPERIMENTS

1. Setting up the Spyder IDE Environment and Executing a Python Program
2. Installing Keras, Tensorflow and Pytorch libraries and making use of them
3. Applying the Convolution Neural Network on computer vision problems
4. Image classification on MNIST dataset (CNN model with Fully connected layer)
5. Applying the Deep Learning Models in the field of Natural Language Processing
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes
7. Applying the Autoencoder algorithms for encoding the real-world data
8. Applying Generative Adversarial Networks for image generation and unsupervised tasks.

TEXT BOOKS

1. Deep Learning by Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, N. Friedman, MIT Press.

REFERENCE BOOKS

1. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G., H., and Van Loan, C., F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

WEB REFERENCES

1. https://www.geeksforgeeks.org/introduction-deep-learning/
2. https://www.techtarget.com/searchenterpriseai/definition/deep-learning-deep-neural-network

E -TEXT BOOKS

1. https://www.deeplearningbook.org/
2. https://www.simplilearn.com/best-deep-learning-books-to-read-article

MOOCS COURSE

1. https://in.coursera.org/specializations/deep-learning
2. https://www.udemy.com/topic/deep-learning/

ORGANIZATIONAL BEHAVIOUR

IV B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
SM801MS	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- The objective of the course is to provide the students with the conceptual framework and the theories underlying Organizational Behaviour.

COURSE OUTCOMES

- To discuss the development of the field of organizational behaviour and explain the micro and macro approaches
- To analyze and compare different models used to explain individual behaviour related to motivation and rewards
- To identify the processes used in developing communication and resolving conflicts
- To explain group dynamics and demonstrate skills required for working in groups (team building)
- To identify the various leadership styles and the role of leaders in a decision making process.

UNIT-I	INTRODUCTION TO OB	Classes: 13

Introduction to OB - Definition, Nature and Scope – Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organizational Behavior. Cognitive Processes-I: Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization – Social perception – Attribution Theories – Locus of control –Attribution Errors –Impression Management.

UNIT-II	COGNITIVE PROCESSES-II	Classes: 12

Cognitive Processes-II: Personality and Attitudes – Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes – Job satisfaction and organizational commitment-Motivational needs and processes- Work-Motivation Approaches Theories of Motivation- Motivation across cultures - Positive organizational behavior: Optimism – Emotional intelligence – Self-Efficacy.

UNIT-III	DYNAMICS OF OB-I	Classes: 12

Dynamics of OB-I: Communication – types – interactive communication in organizations – barriers to communication and strategies to improve the follow of communication - Decision Making: Participative decision-making techniques – creativity and group decision making. Dynamics of OB –II Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intraindividualconflict - strategies to cope with stress and conflict.

UNIT-IV	DYNAMICS OF OB –III POWER AND POLITICS	Classes: 12

Dynamics of OB –III Power and Politics: Meaning and types of power – empowerment - Groups Vs. Teams – Nature of groups – dynamics of informal groups – dysfunctions of groups and teams – teamsin the modern workplace.

UNIT-V	**LEADING HIGH PERFORMANCE**	**Classes: 13**

Leading High performance: Job design and Goal setting for High performance- Quality of Work Life Socio technical Design and High-performance work practices - Behavioural performance management: reinforcement and punishment as principles of Learning –Process of Behavioural modification - Leadership theories - Styles, Activities and skills of Great leaders.

TEXT BOOKS

1. Luthans, Fred: Organizational Behavior 10/e, McGraw-Hill, 2009
2. McShane: Organizational Behavior, 3e, TMH, 2008
3. Nelson: Organizational Behavior, 3/e, Thomson, 2008.
4. Newstrom W. John & Davis Keith, Organizational Behavior-- Human Behaviour at Work, 12/e,TMH, New Delhi, 2009.

REFERENCE BOOKS

1. Pierce and Gardner: Management and Organizational Behavior: An Integrated perspective,Thomson, 2009.
2. Robbins, P. Stephen, Timothy A. Judge: Organizational Behavior, 12/e, PHI/Pearson, NewDelhi, 2009.
3. Pareek Udai: Behavioural Process at Work: Oxford & IBH, New Delhi, 2009.
4. Schermerhorn: Organizational Behaviour 9/e, Wiley, 2008.
5. Hitt: Organizational Behaviour, Wiley, 2008.

WEB REFERENCES

1. https://economictimes.indiatimes.com/definition/organizational-behavior
2. https://www.iedunote.com/organizational-behavior

E -TEXT BOOKS

1. https://www.academia.edu/36739565/Organizational_Behaviour_book
2. https://www.pdfdrive.com/organisational-behaviour-books.html

MOOCS COURSES

1. https://in.coursera.org/courses?query=organizational%20behavior
2. https://www.udemy.com/course/organizational-behavior-organizational-design/?utm_source=adwords&utm_medium=udemyads&utm_campaign=DSA_Catchall_la.EN_cc.INDIA&utm_content=deal4584&utm_term=_._ag_82569850245_._ad_533220805577_._kw__._de_c_._dm__._pl__._ti_dsa-44794821923_._li_9152458_._pd__._&matchtype=&gclid=CjwKCAjw_YShBhAiEiwAMomsEF9UXomf7e04X2NQRA6HtdOnIAiFrvz7BYEpRwrKOF613uIE_DOxphoCSZ4QAvD_BwE

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

SPEECH AND VIDEO PROCESSING (Professional Elective - VI)

IV B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID811PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- Knowledge on speech and video processing techniques

COURSE OUTCOMES

- Describe the mechanisms of human speech production systems and methods for speech feature extraction.
- Understand basic algorithms of speech analysis and speech recognition.
- Explain basic techniques in digital video processing, including imaging characteristics andsensors.
- Apply motion estimation and object tracking algorithms on video sequence.

UNIT-I	SPEECH PROCESSING CONCEPTS	Classes: 13

Speech processing concepts: The speech production mechanism, Discrete time speech signals, Pole-Zero modeling of speech, relevant properties of the fast Fourier transform for speech recognition,convolution, linear and nonlinear filter banks, spectral estimation of speech using DFT. Linear Prediction analysis of speech.

UNIT-II	SPEECH RECOGNITION	Classes: 12

Speech recognition: Real and Complex Cepstrum, application of cepstral analysis to speech signal, feature extraction for speech, static and dynamic feature for speech recognition, robustness issues, discrimination in the feature space, feature selection, MFCC, LPCC, Distance measures, vector quantization models.
Gaussian Mixture model, HMM.

UNIT-III	BASICS OF VIDEO PROCESSING	Classes: 12

Basics of Video Processing: Video formation, perception and representation: Principle of color video,video cameras, video display, pinhole model, CAHV model, Camera motion, Shape model, motion model, Scene model, two-dimensional motion models.
Three-Dimensional Rigid Motion, Approximation of projective mapping.

UNIT-IV	MOTION ESTIMATION TECHNIQUES	Classes: 12

Motion estimation Techniques: Optical flow, motion representation, motion estimation criteria, optimization methods, pixel based motion estimation, Block matching algorithm, gradient Based, Intensity matching, feature matching, frequency domain motion estimation, Depth from motion.
Motion analysis applications: Video Summarization, video surveillance.

UNIT-V	OBJECT TRACKING AND SEGMENTATION	Classes: 13

Object Tracking and Segmentation: 2D and 3D video tracking, blob tracking, kernel based counter tracking, feature matching, filtering Mosaicing, video segmentation, mean shift based, active shape model, video short boundary detection. Interframe compression, Motion compensation

TEXT BOOKS

1. Fundamentals of Speech recognition – L. Rabiner and B. Juang, Prentice Hall signal processingseries.
2. Digital Video processing, A Murat Tekalp, Prentice Hall.
3. Discrete-time speech signal processing: principles and practice, Thomas F. Quatieri, Coth.
4. Video Processing and Communications, Yao Wang, J. Ostermann and Qin Zhang, Pearson.

REFERENCE BOOKS

1. "Speech and Audio Signal Processing", B.Gold and N. Morgan, Wiley.
2. "Digital image sequence processing, Compression, and analysis", Todd R. Reed, CRC Press.
3. "Handbook of Image and Video processing", Al Bovik, Academic press, second Edition.

WEB REFERENCES

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2. https://speech.zone/courses/speech-processing/

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   https://www.researchgate.net/profile/A
3. Tekalp/publication/200132428_Digital_Video_Processing/links/0c96051c469546bb98000000/Digital-Video-Processing.pdf
4. https://research.iaun.ac.ir/pd/mahmoodian/pdfs/UploadFile_2643.pdf

MOOCS COURSES

1. https://in.coursera.org/courses?query=speech%20recognition
2. https://onlinecourses.nptel.ac.in/noc22_ee117/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

ROBOTIC PROCESS AUTOMATION (Professional Elective - VI)

IV B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID812PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To make learners familiar with the concepts of Robotic Process Automation.

COURSE OUTCOMES

- Describe RPA, where it can be applied and how it's implemented.
- Identify and understand Web Control Room and Client Introduction
- Understand how to handle various devices and the workload
- Understand Bot creators, Web recorders and task editors

UNIT-I	INTRODUCTION TO ROBOTIC PROCESS AUTOMATION	Classes: 13

Introduction to Robotic Process Automation & Bot Creation Introduction to RPA and Use cases – Automation Anywhere Enterprise Platform – Advanced features and capabilities – Ways to create Bots

UNIT-II	WEB CONTROL ROOM AND CLIENT INTRODUCTION	Classes: 12

Web Control Room and Client Introduction - Features Panel - Dashboard (Home, Bots, Devices, Audit, Workload, Insights) - Features Panel — Activity (View Tasks in Progress and Scheduled Tasks) - Bots (View Bots Uploaded and Credentials)

UNIT-III	DEVICES	Classes: 12

Devices (View Development and Runtime Clients and Device Pools) - Workload (Queues and SLA Calculator) - Audit Log (View Activities Logged which are associated with Web CR) - Administration (Configure Settings, Users, Roles, License and Migration) - Demo of Exposed API's – Conclusion –Client introduction and Conclusion.

UNIT-IV	BOT CREATOR INTRODUCTION	Classes: 12

Bot Creator Introduction – Recorders – Smart Recorders – Web Recorders – Screen Recorders - Task Editor – Variables - Command Library – Loop Command – Excel Command – Database Command - String Operation Command - XML Command

UNIT-V	TERMINAL EMULATOR COMMAND	Classes: 13

Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - Object Cloning Command - Error Handling Command - Manage Windows Control Command - Workflow Designer - Report Designer

TEXT BOOKS

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPA tool — UiPath Kindle Edition

REFERENCE BOOKS

1. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition

WEB REFERENCES

1. https://www.uipath.com/rpa/robotic-process-automation
2. https://www.automationanywhere.com/rpa/robotic-process-automation
3. https://www.ibm.com/topics/rpa

E -TEXT BOOKS

1. https://www.redhat.com/en/engage/executives-guide-automation-s-202101280545?sc_cid=7013a0000034oAPAAY&gclid=CjwKCAjw_YShBhAiEiwAMomsEEFbUOBRKo41wpJ7sEjwFn9alVL0ZDXfjnRYdnggkFwOL1eKuv1MyhoCYRUQAvD_BwE
2. https://www.icsanalytics.com/wp-content/uploads/2019/02/robotic_process_automation_for_dummies.pdf

MOOCS COURSES

1. https://www.udemy.com/course/robotic-process-automation/?gclid=CjwKCAjw_YShBhAiEiwAMomsELwYlBG7K_ErXpmjc4q5GNLL5D3PP1ZssiZuErY2-IuUZS33lMC1IRoC_LkQAvD_BwE&matchtype=e&utm_campaign=LongTail_la.EN_cc.INDIA&utm_content=deal4584&utm_medium=udemyads&utm_source=adwords&utm_term=_._ag_78279317959_._ad_533196033496_._kw_robotic+process+automation+training_._de_c_._dm__._pl__._ti_kwd-376326087542_._li_9152458_._pd__.
2. https://in.coursera.org/specializations/roboticprocessautomation

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

RANDOMIZED ALGORITHMS (Professional Elective - VI)

IV B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID813PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To introduce the power of randomization in the design and analysis of algorithms.

COURSE OUTCOMES

- Appreciate the fundamentals of randomized algorithm design.
- Understand the fundamentals of Markov chains and the Monte Carlo method.
- Apply high probability analysis to selected randomized algorithms.
- Understand the Comparison of Fingerprinting Techniques and Pattern Matching

UNIT-I	INTRODUCTION	Classes: 13

Introduction, A Min — Cut algorithm, Las Vegas and Monte Carlo, Binary Planar Partitions, A Probabilistic Recurrence

Game – Theoretic Techniques: Game Tree Evaluation, The Minimax Principle

UNIT-II	MOMENTS AND DEVIATIONS	Classes: 12

Moments and Deviations: Occupancy Problems, The Markov and Chebyshev Inequalities, Randomized Selection

Markov Chains and Random Walks: A 2-SAT example, Markov Chains, Random Walks on Graphs, Graph Connectivity

UNIT-III	ALGEBRAIC TECHNIQUES	Classes: 12

Algebraic Techniques: Fingerprinting and Freivald's Technique, Verifying Polynomial Identities, Perfect Matching in Graphs, Verifying Equality of Strings, A Comparison of Fingerprinting Techniques, Pattern Matching

UNIT-IV	DATA STRUCTURES	Classes: 12

Data Structures: The Fundamental Data-structuring Problem, Random Treaps, Skip Lists, Hashtables,Hashing with O(1) Search Time

Graph Algorithms: All Pairs Shortest Paths, The Min- Cut Problem, Minimum Spanning Trees

UNIT-V	GEOMETRIC ALGORITHMS	Classes: 13

Geometric Algorithms: Randomized Incremental Construction, Convex Hulls in the Plane, Duality, Half-Space Intersections, Dalaunay Triangulations, Trapezoidal Decompositions

Parallel and Distributed Algorithms: The PRAM Model, Sorting on a PRAM, Maximal Independent Sets,Perfect Matchings

TEXT BOOKS

1. Randomized Algorithms: Rajeev Motwani, Prabhakar Raghavan
2. Probability and Computing: Randomization and Probabilistic Techniques in Algorithms andData Analysis by Eli Upfal and Michael Mitzenmacher.

REFERENCE BOOKS

1. Rajeev Motwani, Prabhakar Raghavan, Randomized Algorithms, cambridge University Press

WEB REFERENCES

1. https://www.geeksforgeeks.org/randomized-algorithms/
2. https://www.educative.io/answers/what-are-randomized-algorithms

E -TEXT BOOKS

1. https://rajsain.files.wordpress.com/2013/11/randomized-algorithms-motwani-and-raghavan.pdf
2. http://theory.stanford.edu/people/pragh/amstalk.pdf

MOOCS COURSES

1. https://ocw.mit.edu/courses/6-856j-randomized-algorithms-fall-2002/
2. https://in.coursera.org/learn/algorithms-divide-conquer

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

COGNITIVE COMPUTING (Professional Elective - VI)

IV B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID814PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To provide an understanding of the central challenges in realizing aspects of human cognition.
- To provide a basic exposition to the goals and methods of human cognition.
- To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions.
- To support human reasoning by evaluating data in context and presenting relevant findings along with the evidence that justifies the answers.

COURSE OUTCOMES

- Understand what cognitive computing is, and how it differs from traditional approaches.
- Plan and use the primary tools associated with cognitive computing.
- Plan and execute a project that leverages cognitive computing.
- Understand and develop the business implications of cognitive computing

UNIT-I	INTRODUCTION TO COGNITIVE SCIENCE	Classes: 13

Introduction to Cognitive Science: Understanding Cognition, IBM's Watson, Design for Human Cognition, Augmented Intelligence, Cognition Modeling Paradigms: Declarative/ logic-based computational cognitive modeling, connectionist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition.

UNIT-II	COGNITIVE MODELS OF MEMORY AND LANGUAGE	Classes: 12

Cognitive Models of memory and language, computational models of episodic and semantic memory, modeling psycholinguistics.

UNIT-III	COGNITIVE MODELING	Classes: 12

Cognitive Modeling: modeling the interaction of language, memory and learning, Modeling select aspects of cognition classical models of rationality, symbolic reasoning and decision making

UNIT-IV	FORMAL MODELS OF INDUCTIVE GENERALIZATION	Classes: 12

Formal models of inductive generalization, causality, categorization and similarity, the role of analogy in problem solving, Cognitive Development Child concept acquisition. Cognition and Artificial cognitive architectures such as ACT-R, SOAR, OpenCog, CopyCat, Memory Networks

UNIT-V	DEEPQA ARCHITECTURE	Classes: 13

DeepQA Architecture, Unstructured Information Management Architecture (UIMA), Structured Knowledge, Business Implications, Building Cognitive Applications, Application of Cognitive Computing and Systems

TEXT BOOKS

1. The Cambridge Handbook of Computational Psychology by Ron Sun (ed.), Cambridge University Press.
2. Formal Approaches in Categorization by Emmanuel M. Pothos, Andy J. Wills, Cambridge University Press.

REFERENCE BOOKS

1. Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles Cognitive Computing and Big Data Analytics, Wiley
2. Vijay V Raghavan, Venkat N. Gudivada, Venu Govindaraju, Cognitive Computing: Theoryand Applications: Volume 35 (Handbook of Statistics), North Holland

WEB REFERENCES

1. https://www.techtarget.com/searchenterpriseai/definition/cognitive-computing#:~:text=Cognitive%20computing%20is%20an%20attempt,neural%20networks
2. https://towardsdatascience.com/what-is-cognitive-computing-how-are-enterprises-benefitting-from-cognitive-technology-6441d0c9067b

E -TEXT BOOKS

1. https://www.springer.com/journal/12559?gclid=CjwKCAjw_YShBhAiEiwAMomsEDLba9M3r_MN6d5IBzpIXtcvRdDaZIPAP_x57gDTREea2lJRK-P_CBoChD4QAvD_BwE
2. https://www.oreilly.com/library/view/cognitive-computing-and/9781118896624/

MOOCS COURSES

1. https://www.coursera.org/lecture/introduction-to-ai/cognitive-computing-perception-learning-reasoning-UBtrp
2. https://www.koenig-solutions.com/cognitive-computing-training-courses

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

SEMANTIC WEB (Professional Elective - VI)

IV B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AID815PE	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To learn Web Intelligence
- To learn Knowledge Representation for the Semantic Web
- To learn Ontology Engineering
- To learn Semantic Web Applications, Services and Technology

COURSE OUTCOMES

- Understand the characteristics of Semantic Web
- Apply SOAP and UDDI to web services
- Handle multiple web services using Orchestration
- Create documents using XML
- Construct and use Ontologies

UNIT-I	INTRODUCTION	Classes: 13

Introduction: Introduction to Semantic Web, the Business Case for the Semantic Web, XML and Its Impact on the Enterprise.

UNIT-II	WEB SERVICES	Classes: 12

Web Services: Uses, Basics of Web Services, SOAP, UDDI, Orchestrating Web Services, Securing Web Services, Grid Enabled and Semantic Web of Web Services.

UNIT-III	RESOURCE DESCRIPTION FRAMEWORK	Classes: 12

Resource Description Framework: Features, Capturing Knowledge with RDF.
XML Technologies: XPath, The Style Sheet Family: XSL, XSLT, and XSL FO, XQuery, XLink, XPointer, XInclude, XMLBase, XHTML, XForms, SVG.

UNIT-IV	TAXONOMIES AND ONTOLOGIES	Classes: 12

Taxonomies and Ontologies: Overview of Taxonomies, Defining the Ontology Spectrum, Topic Maps, Overview of Ontologies, Syntax, Structure, Semantics, and Pragmatics, Expressing Ontologies Logically, Knowledge Representation.

UNIT-V	SEMANTIC WEB APPLICATION	Classes: 13

Semantic Web Application: Semantic Web Services, e-Learning, Semantic Bioinformatics, Enterprise Application Integration, Knowledge Base.
Semantic Search Technology: Search Engines, Semantic Search, Semantic Search Technology, Web Search Agents, Semantic Methods, Latent Semantic Index Search, TAP, Swoogle.

TEXT BOOKS

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley Interscience.

REFERENCE BOOKS

1. The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Managementby Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, Wiley Publishing, Inc.
2. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R.Studer, P. Warren, John Wiley & Sons.
3. Semantic Web and Semantic Web Services - Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
4. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen,Springer Publications.
5. Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O' Reilly, SPD.

WEB REFERENCES

1. https://www.ontotext.com/knowledgehub/fundamentals/what-is-the-semantic-web/
2. https://www.techtarget.com/searchcio/definition/Semantic-Web

E -TEXT BOOKS

1. https://www.w3.org/2001/sw/wiki/Books
2. https://link.springer.com/book/10.1007/978-1-84628-710-7

MOOCS COURSES

1. https://www.udemy.com/course/semantic-web/
2. https://in.coursera.org/learn/web-data

CHATBOTS (Open Elective - III)

IV B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. Knowledge on concepts of chatbots and understanding the developer environment bot framework.

COURSE OUTCOMES

- Understand basic concepts of chatbots
- Analyze different entities in building bots
- Understand the concepts of advanced bot building
- Discuss different types of chatbot use cases

UNIT-I	INTRODUCTION TO CHATBOTS	Classes: 13

Introduction to Chatbots: Definition of chatbots, Journey of Chatbots, Rise of Chatbots, Messaging Platforms.

UNIT-II	SETTING UP THE DEVELOPER ENVIRONMENT BOTFRAMEWORK	Classes: 12

Setting Up the Developer Environment Botframework: Local Installation, Installing NodeJS, Following the Development Pipeline, Storing Messages in Database

UNIT-III	BASICS OF BOT BUILDING	Classes: 12

Basics of Bot Building- Intents, Entities

UNIT-IV	ADVANCED BOT BUILDING	Classes: 12

Advanced Bot Building: Design Principles, Showing Product Results, Saving Messages, Building Your Own Intent Classifier.

UNIT-V	BUSINESS AND MONETIZATION	Classes: 13

Business and Monetization: Analytics, Chatbot Use Cases- Modes of Communication- Business-to- Business (B2B), ChapBusiness-to-Consumer (B2C) Consumer-to-Consumer (C2C) Business-to- Employee (B2E), Employee-to-Employee (E2E), Chatbots by Industry Vertical.

TEXT BOOKS

1. Rashid Khan, Anik Das, Build Better Chatbots: A Complete Guide to Getting Started with Chatbots, Apress.

REFERENCE BOOKS

1. https://cdn2.hubspot.net/hubfs/202339/Chatbot%20Ebook.pdf

WEB REFERENCES
1. https://www.ibm.com/in-en/topics/chatbots 2. https://www.wordstream.com/blog/ws/chatbots#:~:text=Chatbots%20%E2%80%93%20also%20known%20as%20%E2%80%9Cconversational,based%20applications%20or%20standalone%20apps.
E -TEXT BOOKS
1. https://www.researchgate.net/publication/322855718_Chatbots_-_An_Interactive_Technology_for_Personalized_Communication_Transactions_and_Services
MOOCS COURSES
1. https://in.coursera.org/courses?query=chatbot 2. https://www.udemy.com/topic/chatbots/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (AI & DS)

GENETIC ALGORITHMS & FUZZY LOGIC (Open Elective - III)

IV B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

- Knowledge on concepts of fundamentals of genetic algorithms, genetic technology and fuzzy logic

COURSE OUTCOMES

- Understand the Fundamentals of genetic algorithm.
- Discuss Knowledge based techniques in Genetic Algorithm and techniques in genetic search
- Understand genetics-based machine learning.
- Analyze and Understand Classical Relations and Fuzzy Relations.

UNIT-I	FUNDAMENTALS OF GENETIC ALGORITHM	Classes: 13

Fundamentals of genetic algorithm: A brief history of evolutionary computation, biological terminology, search space encoding, reproduction elements of genetic algorithm genetic modeling, comparison of GA and traditional search methods. The Fundamental Theorem, Schema Processing atwork, Two-armed and k-armed Bandit problem, The Building block hypothesis.

UNIT-II	GENETIC TECHNOLOGY: STEADY STATE ALGORITHM	Classes: 12

Genetic Technology: steady state algorithm, fitness scaling, inversion. Genetic Programming: Genetic Algorithm in problem solving, Implementing a Genetic Algorithm: computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search: Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation.

UNIT-III	INTRODUCTION TO GENETICS	Classes: 12

Introduction to genetics - based machine learning: Classifier system, Rule and Message system, Apportionment of credit, Knowledge based Techniques, Genetic Algorithms and parallel. processors.

UNIT-IV	STATISTICS AND RANDOM PROCESSES	Classes: 12

Introduction: Background, Uncertainty and imprecision, Statistics and random processes, Uncertainty in information, Fuzzy sets and membership, Chance versus ambiguity, Classical sets - operations on classical sets to functions, Fuzzy sets-fuzzy set operations, Properties of fuzzy sets, sets as points in hypercube.

UNIT-V	CLASSICAL RELATIONS AND FUZZY RELATIONS	Classes: 13

Classical Relations And Fuzzy Relations: Cartesian product, Crisp relations-cardinality of crisp relations, Operations on crisp relations, Properties of crisp relations, Compositions, Fuzzy relations cardinality of fuzzy relations, Operations on fuzzy relations, Properties of fuzzy relations, Fuzzy Cartesian product and composition, Non interactive fuzzy sets, Tolerance and equivalence relations- crisp equivalence relation, Crisp tolerance relation, Fuzzy tolerance, Max-min Method, other similaritymethods.

TEXT BOOKS

1. David E. Goldberg, "Genetic Algorithms in search, Optimization & Machine Learning".
2. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications

REFERENCE BOOKS

1. William B. Langdon, Riccardo Poli, "Foundations of Genetic Programming".
2. P. J. Fleming, A. M. S. Zalzala "Genetic Algorithms in Engineering Systems ".
3. David A. Coley, "An Introduction to Genetic Algorithms for Scientists and Engineers".
4. Melanie Mitchell- 'An introduction to Genetic Algorithm'- Prentice-Hall of India.
5. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharanand Rai — PHI Publication.
6. Fuzzy Sets, Fuzzy Logic, and Fuzzy Systems by Lotfi A. Zadeh Fuzzy logic with engineeringapplication by Timothy J. Ross-wiley.

WEB REFERENCES

1.https://www.worldscientific.com/worldscibooks/10.1142/2896#t=aboutBook
2.https://www.hindawi.com/journals/mpe/2014/708275/?utm_source=google&utm_medium=cpc&utm_campaign=HDW_MRKT_GBL_SUB_ADWO_PAI_DYNA_JOUR_X_X0000_WileyFlipsBatch2&gclid=CjwKCAjw_YShBhAiEiwAMomsECzHop6sROXeKzQBDfKsPR_thyqxBB8aV0vY0UV7ytBLJUMh1s2k5BoCzmUQAvD_BwE

E -TEXT BOOKS

1. https://www.researchgate.net/publication/305302846_Introduction_to_Neural_NetworksFuzzy_LogicGenetic_Algorithms_Theory_Applications
2. https://link.springer.com/book/10.1007/3-540-60607-6

MOOCS COURSES

1. https://www.udemy.com/topic/fuzzy-logic/
2. https://onlinecourses.nptel.ac.in/noc21_ge07/preview