



**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**  
(Autonomous Institution – UGC, Govt. of India)

---

**BACHELOR OF TECHNOLOGY (B.Tech)**  
**ARTIFICIAL INTELLIGENCE &**  
**DATA SCIENCE (AI & DS)**  
**COURSE STRUCTURE & SYLLABUS (R20)**  
(Batches admitted from the academic year 2020 - 2021)



**Department of**  
**COMPUTATIONAL INTELLIGENCE**

---

**M R C E T CAMPUS**

(Autonomous Institution – UGC, Govt. of India)

(Affiliated to JNTU, Hyderabad, Approved by AICTE - Accredited by NBA & NAAC – ‘A’ Grade - ISO 9001:2015 Certified)

Maisammaguda, Dhulapally (Post Via. Kompally), Secunderabad – 500100, Telangana State, India.

Contact Number: 040-23792146/64634237, E-Mail ID: [mrcet2004@gmail.com](mailto:mrcet2004@gmail.com), website:

[www.mrcet.ac.in](http://www.mrcet.ac.in)

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**

**COURSE STRUCTURE BTECH- AI-DS**

**B. Tech (AI-DS) – I Semester (I Year I Semester)**

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	R20A0001	English	2	0	0	2	30	70
2	R20A0021	Mathematics – I	3	1	0	4	30	70
3	R20A0201	Basic Electrical Engineering	3	0	0	3	30	70
4	R20A0301	Computer Aided Engineering Graphics	2	0	2	3	30	70
5	R20A0501	Programming for Problem Solving	3	0	0	3	30	70
6	R20A0081	English Language Communication Skills Lab	-	0	4	2	30	70
7	R20A0281	Basic Electrical Engineering Lab	-	0	3	1.5	30	70
8	R20A0581	Programming for Problem Solving Lab	-	0	3	1.5	30	70
9	R20A0003*	Human Values and Professional Ethics	2	0	0	0	100	-
		<b>TOTAL</b>	<b>15</b>	<b>1</b>	<b>12</b>	<b>20</b>	<b>340</b>	<b>560</b>

\*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree

**B. Tech (AI-DS) – II Semester (I Year II Semester)**

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX MARKS	
							INT	EXT
1	R20A0002	Professional English	2	0	0	2	30	70
2	R20A0022	Mathematics – II	3	1	0	4	30	70
3	R20A0011	Applied Physics	3	0	0	3	30	70
4	R20A0401	Analog and Digital Electronics	3	0	0	3	30	70
5	R20A0502	Python Programming	3	0	0	3	30	70
6	R20A0082	Applied Physics Lab	-	0	3	1.5	30	70
7	R20A0582	Python Programming Lab	-	0	3	1.5	30	70
8	R20A0083	Engineering and IT Workshop	-	0	4	2	30	70
9	R20A0064	Financial Institutions, Markets and Services	2	-	-	0	100	-
		<b>TOTAL</b>	<b>16</b>	<b>1</b>	<b>10</b>	<b>20</b>	<b>340</b>	<b>560</b>

\*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree

**B. Tech (AI-DS) – III Semester (II Year I Semester)**

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	R20A0503	Data Structures using python	3	0	0	3	30	70
2	R20A0563	Computer Organization and Operating Systems	3	0	0	3	30	70
3	R20A0505	Design and Analysis of Algorithms	3	0	0	3	30	70
4	R20A6701	Introduction to Data Science	3	0	0	3	30	70
5	R20A0024	Probability & Statistics	3	0	0	3	30	70
6	R20A0061	Managerial Economics and Financial Analysis	3	0	0	3	30	70
7	R20A0583	Data Structures using Python Lab	-	0	3	1.5	30	70
8	R20A0594	Computer Organization and Operating Systems Lab	-	0	3	1.5	30	70
9	R20A0004*	Foreign Language: French	2	-	-	0	100	-
		<b>TOTAL</b>	<b>20</b>	<b>0</b>	<b>6</b>	<b>21</b>	<b>340</b>	<b>560</b>

\*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree

**B. Tech (AI-DS) – IV Semester (II Year II Semester)**

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX.MARKS	
							INT	EXT
1	R20A0511	Software Engineering	3	0	0	3	30	70
2	R20A0508	Object Oriented Programming through Java	3	0	0	3	30	70
3	R20A0509	Database Management System	3	0	0	3	30	70
4	R20A0513	Artificial Intelligence	2	0	2	3	30	70
5	R20A0026	Discrete Mathematics	3	0	0	3	30	70
6	OE-I	Open Elective-I	3	0	0	3	30	70
7	R20A0585	Object Oriented Programming through Java Lab	-	0	3	1.5	30	70
8	R20A0586	Database Management System Lab	-	0	3	1.5	30	70
9	R20A0008*	Global Education & Professional Career	2	-	-	0	100	-
		<b>TOTAL</b>	<b>20</b>	<b>0</b>	<b>6</b>	<b>21</b>	<b>340</b>	<b>560</b>

\*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree

**B. Tech (AI-DS)— V Semester (III Year I Semester)**

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	R20A0525	Machine Learning	3	0	0	3	30	70
2	R20A0510	Computer Networks	3	0	0	3	30	70
3	R20A0516	Full Stack Development	3	0	0	3	30	70
4	R20A1204 R20A1262 R20A7204 R20A0515	Professional Elective-I 1. Image Processing 2. Information Retrieval systems 3. R Programming 4. Scripting Languages	3	0	0	3	30	70
5	R20A7305 R20A1202 R20A6604 R20A7202	Professional Elective-II 1. Computer Vision 2. Automata and Compiler Design 3. Soft Computing 4. AI in Speech Processing	3	0	0	3	30	70
6	OE-II	Open Elective-II	3	0	0	3	30	70
7	R20A0589	Full Stack Development Lab	0	0	3	1.5	30	70
8	R20A6681	Artificial Intelligence & Machine Learning Lab	0	0	3	1.5	30	70
9	R20A7291	Application Development-1	-	-	4	2	30	70
10	R20A0006	Technical Communication & Soft Skills	2	-	-	0	100	-
		<b>TOTAL</b>	<b>20</b>	<b>0</b>	<b>10</b>	<b>23</b>	<b>370</b>	<b>630</b>

**B.Tech (AI-DS)— VI Semester (III Year II Semester)**

S.NO	Subject Code	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	R20A1206	Data Warehousing and Data Mining	3	0	0	3	30	70
3	R20A0519	Big Data Analytics	3	0	0	3	30	70
4	R20A0521 R20A7201 R20A6611 R20A7303	Professional Elective-III 1. Blockchain Technology 2. Text Analytics 3. Design Patterns using Python 4. Health care Analytics	3	-	-	3	30	70
5	R20A0520 R20A7203 R20A6202 R20A6608	Professional Elective-IV 1. Cloud Computing 2. Business Intelligence 3. Cyber Security 4. Reinforcement Learning	3	0	0	3	30	70

6	OE-III	Open Elective-III	3	0	0	3	30	70
7	R20A1283	Data Warehousing and Data Mining Lab	0	0	3	1.5	30	70
8	R20A0592	Big Data Analytics Lab	0	0	3	1.5	30	70
9	R20A7292	Application Development-II	-	-	4	2	30	70
10	R20A0007	Constitution of India	2	-	-	0	100	-
		<b>TOTAL</b>	<b>17</b>	<b>0</b>	<b>10</b>	<b>20</b>	<b>340</b>	<b>560</b>

**B.Tech (AI-DS)— VII Semester (IV Year I Semester)**

S.NO	Subject Code	SUBJECT	L	T	P	C	MAX.MARKS	
							INT	EXT
1	R20A6703	Data Handling and Visualization	3	0	0	3	30	70
2	R20A6609	Natural Language Processing	3	0	0	3	30	70
3	R20A6610	Deep Learning	3	0	0	3	30	70
4	R20A6612 R20A0514 R20A7205 R20A7307	Professional Elective-V 1. Neural networks 2. Optimization techniques 3. Social Network Analytics 4. Recommender Systems	3	0	0	3	30	70
5	R20A1210 R20A0564 R20A7206 R20A6607	Professional Elective-VI 1. Augmented & Virtual Reality 2. MicroServices 3. Artificial Neural Network 4. Agile Methodologies	3	0	0	3	30	70
6	R20A6683	Deep Learning Lab	-	-	3	1.5	30	70
7	R20A6684	Natural Language Processing Lab	-	-	3	1.5	30	70
8	R20A7293	Mini Project	-	-	6	3	30	70
		<b>TOTAL</b>	<b>15</b>	<b>0</b>	<b>12</b>	<b>21</b>	<b>240</b>	<b>560</b>

**B.Tech (AI-DS)— VIII Semester (IV Year II Semester)**

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX.MARKS	
							INT	EXT
1	R20A0337	Innovation, Startups, and Entrepreneurship	3	1	-	4	30	70
2	R20A7294	Major Project	-	-	20	10	30	70
		<b>TOTAL</b>	<b>3</b>	<b>1</b>	<b>20</b>	<b>14</b>	<b>60</b>	<b>140</b>

OPEN ELECTIVE I		
S.NO	SUBJECT CODE	SUBJECT
1	R20A1251	WEB DESIGNING TOOLS
2	R20A0551	INTRODUCTION TO DBMS
3	R20A0351	INTELLECTUAL PROPERTY RIGHTS
4	R20A0051	ENTERPRISE RESOURCE PLANNING
5	R20A0451	BASICS OF COMPUTER ORGANIZATION
6	R20A6751	FOUNDATION OF DATA SCIENCE

OPEN ELECTIVE II		
S.NO	SUBJECT CODE	SUBJECT
1	R20A1252	MANAGEMENT INFORMATION SYSTEMS
2	R20A0552	JAVA PROGRAMMING
3	R20A1253	SOFTWARE PROJECT MANAGEMENT
4	R20A0452	INTERNET OF THINGS & ITS APPLICATIONS
5	R20A0553	OPERATING SYSTEM CONCEPTS
6	R20A0066	PUBLIC POLICY AND GOVERNANCE

OPEN ELECTIVE III		
S.NO	SUBJECT CODE	SUBJECT
1	R20A0453	ROBOTICS & AUTOMATION
2	R20A1254	BIG DATA ARCHITECTURE
3	R20A6251	INFORMATION SECURITY
4	R20A0555	CLOUD COMPUTING FUNDAMENTALS
5	R20A0352	DESIGN THINKING
6	R20A0065	BUSINESS ANALYTICS



# M R C E T CAMPUS

AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA

(Autonomous Institution – UGC, Govt. of India)

## COURSE STRUCTURE & SYLLABUS

### INDEX

COURSE STRUCTURE		
YEAR	SEMESTER	PAGE NO.
I B. Tech AI&DS	I Semester and II Semester	1
II B. Tech AI&DS	III Semester and IV Semester	2
III B. Tech AI&DS	V Semester and VI Semester	3 - 4
IV B. Tech AI&DS	VII Semester and VIII Semester	5
SYLLABUS		
YEAR	SEMESTER	PAGE NO.
I B. Tech AI&DS	I Semester (I Year I Semester)	
	II Semester (I Year II Semester)	
II B. Tech AI&DS	III Semester (II Year I Semester)	
	IV Semester (II Year II Semester)	
III B. Tech AI&DS	V Semester (III Year I Semester)	
	VI Semester (III Year II Semester)	
IV B. Tech AI&DS	VII Semester (IV Year I Semester)	
	VIII Semester (IV Year II Semester)	-

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- I Sem**  
**L/T/P/C**  
**2/-/-/2**

**(R20A0001) ENGLISH**

**INTRODUCTION**

English is a global language, which is a means to correspond globally. Keeping in account of its vital role in the global market, emphasis is given to train the students to acquire language and communication skills. The syllabus is designed to develop and attain the competency in communicative skills.

The lectures focus on the communication skills and the selected excerpts support as resources for the teachers to develop the relevant skills in the students. The lessons stimulate discussions and help in comprehending the content effectively. The focus is on skill development, nurturing ideas and practicing the skills.

**OBJECTIVES**

1. To enable students to enhance their lexical, grammatical and communicative competence.
2. To equip the students to study the academic subjects with better perspective through theoretical and practical components of the designed syllabus.
3. To familiarize students with the principles of writing and to ensure error-free writing.
4. To analyze, interpret and evaluate a text and critically appreciate it.
5. To improve the writing and speaking skills, the productive skills.

**SYLLABUS**

**Reading Skills:**

**Objectives**

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To augment the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc. Skimming the text
  - Understanding the gist of an argument
  - Identifying the topic sentence
  - Inferring lexical and contextual meaning
  - Understanding discourse features
  - Recognizing coherence/sequencing of sentences
  - Scanning the text

**NOTE:**

The students will be trained in reading skills using the prescribed text for detailed study. They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.



**Writing Skills:****Objectives**

1. To develop an awareness in the students about basic formal writing skills.
2. To equip students with the components of different forms of writing, beginning with the required ones:
  - Writing sentences
  - Use of appropriate vocabulary
  - Coherence and cohesiveness
  - Formal and informal letter writing

**Unit –I****“The Road not taken” by Robert Frost**

Grammar –Tenses and Punctuation (Sequences of Tenses) Vocabulary –Word Formation - Prefixes and Suffixes Writing –Paragraph Writing (Focusing on Tenses and Punctuations) Reading – The art of skimming and scanning -Reading Exercise Type 1(Match the statements to the text they refer to)

**Unit – II****Act II from ‘Pygmalion’ by G.B. Shaw**

Grammar –Direct and Indirect Speech Vocabulary– Synonyms, Antonyms  
Writing–Essay Writing (Introduction, body and conclusion)  
Reading –Comprehending the context– Reading Exercise Type 2(Place the missing statement)

**Unit – III****Satya Nadella’s Email to His Employees on his First Day as CEO of Microsoft**

Grammar – Voices  
Vocabulary –One-Word Substitutes, Standard Abbreviations  
Writing –E-mail Writing, Letter Writing (complaints, requisitions, apologies).  
Reading –Reading Comprehension- Reading Exercise Type 3  
(Reading between the lines)

**Unit – IV****J K Rowling’s Convocation Speech at Harvard** Grammar –Articles, Misplaced Modifiers

Vocabulary –Phrasal Verbs  
Writing – Précis Writing  
Reading –Reading Exercise Type 4(Cloze test)

**Unit –V****Abdul Kalam’s Biography**

Grammar – Subject-Verb Agreement, Noun-Pronoun Agreement Vocabulary –Commonly Confused Words  
Writing –Memo Writing  
Reading –Reading Exercise Type 5(Identifying errors)

\* Exercises apart from the textbook shall also be used for classroom tasks.

**REFERENCE BOOKS**

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

**COURSE OUTCOMES**

Students will be able to:

1. Gain competence and proficiency in 'productive' skills, i.e., writing and speaking with the recognition of the need for life-long learning of the same
2. Hone their language abilities in terms of comprehending complex technical texts with a potential to review literature
3. Present ideas clearly and logically to analyze data and provide valid conclusions in written communication
4. Enrich their grammatical accuracy and fluency to be adept at both the active and passive skills
5. Represent old conventions with a set of the new by professional verbal communicative ability

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- I Sem**  
**L/T/P/C**  
**3/1/-/4**

**(R20A0021) MATHEMATICS –I**

**COURSE OBJECTIVES:**

1. The concept of a Rank of the matrix and applying the concept to know the consistency and solving the system of linear equations.
2. The concept of Eigen values, Eigen vectors and Diagonalisation.
3. The maxima and minima of functions of several variables.
4. The Applications of first order ordinary differential equations and methods to solve higher order differential equations.
5. The properties of Laplace Transform, Inverse Laplace Transform and Convolution theorem.

**UNIT I: Matrices**

Introduction, Rank of a matrix - Echelon form, Normal form, Consistency of system of linear equations (Homogeneous and Non-Homogeneous)-Gauss-Jordan method, Linear dependence and independence of vectors, Eigen values and Eigen vectors and their properties (without proof), Cayley-Hamilton theorem (without proof), Diagonalisation of a matrix.

**UNIT II: Multi Variable Calculus (Differentiation)**

Functions of two variables, Limit, Continuity, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions, Jacobian-functional dependence and independence, Maxima and minima and saddle points, Method of Lagrange multipliers, Taylor's theorem for two variables.

**UNIT III: First Order Ordinary Differential Equations**

Exact, Equations reducible to exact form, Applications of first order differential equations - Newton's law of cooling, Law of natural growth and decay, Equations not of first degree - Equations solvable for  $p$ , equations solvable for  $y$ , equations solvable for  $x$  and Clairaut's type.

**UNIT IV: Differential Equations of Higher Order**

Linear differential equations of second and higher order with constant coefficients: Non-homogeneous term of the type  $f(x) = e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ ,  $x^n$ ,  $e^{ax} V$  and  $x^n V$  - Method of variation of parameters, Equations reducible to linear ODE with constant coefficients - Cauchy's Euler equation and Legendre's equation.

**UNIT V: Laplace Transforms**

Definition of Laplace transform, domain of the function and Kernel for the Laplace transforms, Existence of Laplace transform, Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied and divided by " $t$ ", Laplace transforms of derivatives and integrals of functions, Unit step function, Periodic function.

Inverse Laplace transform by Partial fractions, Inverse Laplace transform of functions when they are multiplied and divided by " $s$ ", Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem, Solving ordinary differential equations by Laplace transform.

**TEXT BOOKS**

1. Higher Engineering Mathematics by B V Ramana. Tata McGraw Hill.
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
3. Advanced Engineering Mathematics by Kreyszig, JohnWiley & Sons.

**REFERENCE BOOKS**

1. Advanced Engineering Mathematics by R.K Jain & S R K Iyengar, Narosa Publishers.
2. Ordinary and Partial Differential Equations by M.D. Raisinghania, S.Chand Publishers
3. Engineering Mathematics by N.P Bali and Manish Goyal.

**COURSE OUTCOMES:**

After learning, the concepts of this paper the student will be able to

1. Analyze the solutions of the system of linear equations and find the Eigen values and Eigen vectors of a matrix, which are used to analyze the long term behavior of any system.
2. Find the extreme values of functions of two variables with / without constraints.
3. Solve first order, first degree differential equations and their applications.
4. Form a differential equation for typical engineering problems and hence can solve those higher order differential equations.
5. Solve differential equations with initial conditions using Laplace Transformation.

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- I Sem**  
**L/T/P/C**  
**3/-/-/3**

**(R20A0201) BASIC ELECTRICAL ENGINEERING**

**COURSE OBJECTIVES:**

1. To understand the basic concepts of electrical circuits & networks and their analysis which is the foundation for all the subjects in the electrical engineering discipline.
2. To emphasize on the basic elements in electrical circuits and analyze Circuits using Network Theorems.
3. To analyze Single-Phase AC Circuits.
4. To illustrate Single-Phase Transformers and DC Machines.
5. To get overview of basic electrical installations and calculations for energy consumption.

**UNIT –I:**

**Introduction to Electrical Circuits:** Concept of Circuit and Network, Types of elements, R-L-C Parameters, Independent and Dependent sources, Source transformation and Kirchhoff's Laws

**UNIT –II:**

**Network Analysis:** Network Reduction Techniques- Series and parallel connections of resistive networks, Star-to-Delta and Delta-to-Star Transformations for Resistive Networks, Mesh Analysis, and Nodal Analysis,

Network Theorems: Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem and Superposition theorem, Illustrative Problems.

**UNIT-III:**

**Single Phase A.C. Circuits:** Average value, R.M.S. value, form factor and peak factor for sinusoidal wave form. Steady State Analysis of series R-L-C circuits. Concept of Reactance, Impedance, Susceptance, Admittance, Concept of Power Factor, Real, Reactive and Complex power and Illustrative Problems.

**UNIT –IV:**

**Electrical Machines** (elementary treatment only):

Single phase transformers: principle of operation, constructional features and emf equation. DC Generator: principle of operation, constructional features, emf equation. DC Motor: principle of operation, Back emf, torque equation.

**UNIT –V:**

**Electrical Installations:**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Types of Wires and Cables, Earthing. Elementary calculations for energy consumption and battery backup.

**TEXT BOOKS:**

1. Engineering Circuit Analysis - William Hayt, Jack E. Kemmerly, S M Durbin, Mc Graw Hill Companies.
2. Electric Circuits - A. Chakrabarhty, Dhanipat Rai & Sons.
3. Electrical Machines – P.S.Bimbhra, Khanna Publishers.

**REFERENCE BOOKS:**

1. Network analysis by M.E Van Valkenburg, PHI learning publications.
2. Network analysis - N.C Jagan and C. Lakhminarayana, BS publications.
3. Electrical Circuits by A. Sudhakar, Shyammohan and S Palli, Mc Graw Hill Companies.
4. Electrical Machines by I.J. Nagrath & D. P. Kothari, Tata Mc Graw-Hill Publishers.

**COURSE OUTCOMES:**

At the end of the course students, would be able to

1. Apply the basic RLC circuit elements and its concepts to networks and circuits.
2. Analyze the circuits by applying network theorems to solve them to find various electrical parameters.
3. Illustrate the single-phase AC circuits along with the concept of impedance parameters and power.
4. Understand the Constructional Details and Principle of Operation of DC Machines and Transformers
5. Understand the basic LT Switch gear and calculations for energy consumption.

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- I Sem**  
**L/T/P/C**  
**2/-/2/3**

<b>(R20A0301) COMPUTER AIDED ENGINEERING GRAPHICS</b>
---

**COURSE OBJECTIVES:**

1. To learn basic engineering graphic communication skills & concept.
2. To learn the 2D principles of orthographic projections and Multiple views of the same
3. To know the solid Projection and its Sectional Views
4. To gain the capability of designing 3D objects with isometric principles by using computer aided sketches
5. To know the conversion of Orthographic Views to isometric Views and isometric to Orthographic views

**UNIT-I****Introduction to Computer Aided Engineering Graphics**

Introduction, Drawing Instruments and their uses, BIS conventions, lettering Dimensioning & free hand practicing. AutoCAD User Interface – Menu system – coordinate systems, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse– tool bars (draw, modify, annotations, layers etc.) – status bar (ortho, grid, snap, iso etc.),

Generation of points, lines, curves, polygons, dimensioning, layers, blocks, electrical symbols.

**Geometrical constructions****Curves Used In Engineering Practice**

- a) Conic Sections (General Method only- Eccentricity Method)
- b) Cycloid, Epicycloids and Hypocycloid

**UNIT-II:****2D PRJECTIONS**

**Orthographic Projections:** – Conventions – First and Third Angle projections.

Projections of Points, Projections of Lines, Projections of planes, Circuits Designs – Basic Circuit Symbols & Sensors

**UNIT– III**

**Projections of Solids:** Projections of regular solids prism and pyramid inclined to both planes.

**Sections of solids:** Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone, True shapes of the sections.

**UNIT– IV****3D Projections**

**Isometric Projections:** Principles of Isometric Projection – Isometric Scale – Isometric Views, Commands for 3D UCS, Extrude, revolve, loft, 3D move, 3D rotate, dox, sphere, cone, wedge, cylinder, view ports.Plane

Figures, Simple and Compound Solids. 3D models of electrical components Switch, Diode, Resistor, Battery, Capacitor, Transistor, Motor

**UNIT– V**

**Transformation of Projections:** Visualize the 2D &3D View of Engineering Objects for Conversion of Isometric Views to Orthographic Views. Conversion of orthographic views to isometric views – simple objects in AutoCAD

**TEXT BOOKS:**

1. Engineering Drawing – N.D. Bhatt & V.M. Panchal, 48th edition, 2005 Charotar Publishing House, Gujarat.
2. "Computer Aided Engineering Drawing" by Dr. M H Annaiah, Dr C N Chandrappa and Dr B Sudheer Premkumar Fifth edition, New Age International Publishers

**REFERENCE BOOKS:**

1. Computer Aided Engineering Drawing – S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition-2006.
2. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.

**COURSE OUTCOMES:**

After the completion of course the student will be capable to

1. Produce geometric construction, dimensioning & Curves and detail drawings.
2. Compile Projections of points, lines ,planes then create virtual drawing by using computer
3. Sketch the Solid Projections & Sectioning of the solids
4. Develop isometric drawings of simple objects reading the orthographic projections of those objects.
5. Understand and visualize the 3-D view of engineering objects. Elaborate the conversions of 2D -3D and Vice-Versa



**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA****I Year B.Tech. AI&ML- I Sem****L/T/P/C****3/-/-/3**

(R20A0501)PROGRAMMING FOR PROBLEM SOLVING
---

**Objectives**

- To understand the use of computer system in problem solving
- To understand the various steps in Program development.
- To learn the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs
- To be able to write programs (using structured programming approach) in C to solve problems.

**UNIT - I**

**Introduction to Computing** – Computer Systems, Computing Environments, Computer Languages, Algorithms and Flowcharts, Steps for Creating and Running programs.

**Introduction to C** – History of C, Features of C, Structure of C Program, Character Set, C Tokens - keywords, Identifiers, Constants, Data types, Variables. Operators, Expressions, Precedence and Associativity, Expression Evaluation, Type conversion, typedef, enum

**Control Structures:** Selection Statements(Decision Making) – if and switch statements, Repetition Statements (Loops) - while, for, do-while statements, Unconditional Statements – break, continue, goto. Command line arguments.

**UNIT-II**

**Pointers** – Pointer variable, pointer declaration, Initialization of pointer, Accessing variables through pointers, Pointer Arithmetic, pointers to pointers, void pointers

**Arrays** – Definition, declaration of array, Initialization, storing values in array, Two dimensional arrays, Multi-dimensional arrays. Arrays and Pointers, Array of pointers

**Strings** – Declaration and Initialization, String Input / Output functions, Arrays of strings, String manipulation functions, Unformatted I/O functions, strings and pointers

**UNIT-III**

**Designing Structured Programs using Functions** - Types of Functions- user defined functions, Standard Functions, Categories of functions, Parameter Passing techniques, Scope – Local Vs Global, Storage classes, Recursive functions.

Passing arrays as parameters to functions, Pointers to functions, Dynamic Memory allocation

**UNIT-IV**

**Structures and Unions** - Declaration, initialization, accessing structures, operations on structures, structures containing arrays, structures containing pointers, nested structures, self referential structures, arrays of structures, structures and functions, structures and pointers, unions..

**Files** – Concept of a file, Streams, Text files and Binary files, Opening and Closing files, File input / output functions. Sequential Access and Random Access Functions

**UNIT-V**

**Basic Data Structures** – Linear and Non Linear Structures – Implementation of Stacks, Queues, Linked Lists and their applications.

**Case Studies Case 1: Student Record Management System**

The main features of this project include basic file handling operations; you will learn how to add, list, modify and delete data to/from file. The source code is relatively short, so thoroughly go through the mini project, and try to analyze how things such as functions, pointers, files, and arrays are implemented.

Currently, listed below are the only features that make up this project, but you can add new features as you like to make this project a better one!

- ❖ Add record
- ❖ List record
- ❖ Modify record
- ❖ Delete record

**Case 2: Library Management System**

This project has 2 modules.

1. Section for a librarian
2. Section for a student

**A librarian** can add, search, edit and delete books. This section is password protected. That means you need administrative credentials to log in as a librarian.

**A student** can search for the book and check the status of the book if it is available. Here is list of features that you can add to the project.

1. You can create a structure for a student that uniquely identify each Student. When a student borrows a book from the library, you link his ID to Book ID so that Librarian can find how borrowed particular book.
2. You can create a feature to bulk import the books from CSV file.
3. You can add REGEX to search so that a book can be searched using ID, title, author or any of the field.
4. You can add the student login section.

**TEXT BOOKS:**

1. Mastering C, K.R.Venugopal, S R Prasad, Tata McGraw-Hill Education.
2. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning
3. Data Structures and Algorithms Made Easy by Narasimha Karumanchi, Career Monk publications, 2017

**REFERENCE BOOKS:**

1. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
  2. Computer Programming, E.Balagurusamy, First Edition, TMH.
  3. C and Data structures – P. Padmanabham, Third Edition, B.S. Publications.
  4. Programming in C, *Ashok Kamthane*. Pearson Education India.
  5. Data Structures using C by Aaron M. Tenenbaum, Pearson Publications
  6. Data Structures using C by Puntambekar
-

**Course Outcomes:**

- Understand a problem and build an algorithm/flowchart to solve it
  - Interpret the structure of C program and various key features of C
  - Construct C programs using various control statements, arrays and pointers
  - Understand the concept of subprograms and recursion
  - Develop programs using structures and unions for storing dissimilar data items
  - Make use of files and file operations to store and retrieve data.
- 
-

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- I Sem**  
**L/T/P/C**  
**-/-/4/2**

**(R20A0081) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB**

The Language Lab focuses on the production and practice of sounds of the English language and familiarizes the students with its use in everyday situations and contexts.

**COURSE OBJECTIVES:**

1. To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in their pronunciation, ample speaking opportunities are provided.
4. To improve the fluency in spoken English and neutralize mother tongue influence
5. To train students to use language appropriately for interviews, group discussions and public speaking

English Language Communication Skills Lab has two parts:

- A. Computer Assisted Language Learning (CALL) Lab
- B. Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the English Language Communication Skills Lab

**UNIT –I**

**CALL Lab:** Introduction to Phonetics –Speech Sounds –Vowels and Consonants- Transcriptions

**ICS Lab:** Ice-Breaking activity - JAM session

**UNIT –II**

**CALL Lab:** Pronunciation: Past Tense Markers and Plural Markers

**ICS Lab:** Situational Dialogues/Role Plays—Greetings - Taking Leave – Introducing Oneself and Others - Requests and Seeking Permissions

**UNIT–III**

**CALL Lab:** Syllable and Syllabification

**ICS Lab:** Communication at Workplace- Situational Dialogues/Role Plays – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice

**UNIT –IV**

**CALL Lab:** Word Stress and Intonation

**ICS Lab:** Information transfer – from visual to verbal - maps, charts, tables and graphs

**UNIT –V**

**CALL Lab:** Errors in Pronunciation- Accent - the Influence of Mother Tongue (MTI)

**ICS Lab:** Making a Short Speech - Extempore

**ELCS Lab:****1. Computer Assisted Language Learning (CALL) Lab:**

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

**System Requirement (Hardware component):**

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

- i) P –IV Processor
- a) Speed –2.8 GHZ
- b) RAM –512 MB Minimum
- c) HardDisk –80 GB
- ii) Headphones of High quality

**2. Interactive Communication Skills (ICS) Lab :**

A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.

**COURSE OUTCOMES:**

After completion of the course the students will be able to:

1. Learn with precision through computer-assisted individualized and independent language learning to work independently in an engineering set-up.
  2. Improve conversational reception and articulation techniques in the course of repetitive instruction thereby gaining confidence both in institutional and professional environment.
  3. Acquire accuracy in pronunciation and restoring Standard English thereby crafting better command in English language so that the students have a cutting edge over others in society.
  4. Imbibe appropriate use of language in situations where one works as an individual and as a leader/team player.
  5. Display professional behaviors and body language.
-

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- I Sem**

**L/T/P/C**  
**-/-/3/1.5**

**(R20A0281) BASIC ELECTRICAL ENGINEERING LAB**

**COURSE OBJECTIVES:**

1. To design electrical systems.
2. To analyze a given network by applying various network theorems.
3. To expose the students to the operation of dc generator.
4. To expose the students to the operation of dc motor and transformer.
5. To examine the self excitation in dc generators.

**CYCLE – I**

1. Verification of KVL and KCL.
2. Verification of Thevenin's theorem.
3. Verification of Norton's theorem.
4. Verification of Super position theorem.
5. Verification of Maximum power transfer theorem.
6. Verification of Reciprocity theorem.

**CYCLE -II**

6. Magnetization characteristics of DC shunt generator.
7. Swinburne's test on DC shunt machine.
8. Brake test on DC shunt motor.
9. OC & SC tests on single phase transformer.
10. Load test on single phase transformer.

**NOTE:** Any 10 of above experiments are to be Conducted

**COURSE OUTCOMES:**

At the end of the course, students would be able to

1. Calculate the branch currents and mesh voltages by conducting KCL and KVL test on given circuit.
2. Prove the various circuit theorems like Superposition, Thevenin's, Norton's, Maximum power transfer and Reciprocity theorems.
3. Plot the Magnetization characteristics of DC shunt generator.
4. Plot the characteristics of DC shunt motor by conducting Brake Test.
5. Determine the Efficiency of single-phase transformer by conducting OC, SC and Load tests

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA****I Year B.Tech. AI&ML- I Sem****L/T/P/C****-/-/3/1.5****(R20A581) PROGRAMMING FOR PROBLEM SOLVING LAB****Program Objectives:**

1. To understand the various steps in Program development.
2. To understand the basic concepts in C Programming Language.
3. To learn how to write modular and readable C Programs.
4. To learn to write programs (using structured programming approach) in C to solve problems.
5. To introduce the students to basic data structures such as lists, stacks and queues.

**Week 1:**

- a) Write a program to find sum and average of three numbers
- b) Write a program to calculate simple interest(SI) for a given principal (P), time (T), and rate of interest (R)  $(SI = P \cdot T \cdot R / 100)$

**Week 2:**

- a) Write a program to swap two variables values with and without using third variable
- b) Write a program to find the roots of a quadratic equation.

**Week 3:**

- a) Write a program to find the sum of individual digits of a given positive integer.
- b) Write a 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)

**Week 4:**

- a) Write a program to find both the largest and smallest number in a list of integers.
- b) Write a program to find the sum of integer array elements using pointers

**Week 5:**

- a) Write a program to perform addition of two matrices.
- b) Write a program to perform multiplication of two matrices.

**Week 6:**

- a) Write a program to find the length of the string using Pointer.
- b) Write a program to count the number of lines, words and characters in a given text.

**Week 7:**

- a) Write a program to find factorial of a given integer using non-recursive function and recursive function.
- b) Write program to find GCD of two integers using non-recursive function and recursive function.

**Week 8:**

- a) Write a program using user defined functions to determine whether the given string is palindrome or not.
- b) Write a Program to swap the values of two variables using
  - i) Call by Value ii) Call by Reference

**Week 9:**

- a) Write a program to find the sum of integer array elements using pointers ,use dynamicmemory allocation to allocate memory.
- b) Write a program to perform subtraction of two matrices, Design functions to performread ,display and subtract

**Week 10:**

- a) Write a program to create a structure named book and display the contents of a book.
- b) Write a Program to Calculate Total and Percentage marks of a student using structure.

**Week 11:**

- a) Write a program that uses functions to perform the following operations:
  - i) Reading a complex number                      ii) Writing a complex number
  - iii) Addition of two complex numbers          iv) Multiplication of two complex numbers
- b) Write a program to reverse the first n characters in a file.  
(Note: The file name and n are specified on the command line.)

**Week 12:**

- a) Write a program to copy the contents of one file to another.
- b) Write a program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third).

**Week 13:**

- a) Write a program for static implementation of stack
- b) Write a program for static implementation of Queue

**Week 14:**

Write a program to perform various operations on single list

**Week 15:**

- a) Write a program for dynamic implementation of stack
- b) Write a program for Dynamic implementation of Queue

**Case Studies****Case 1: Student Record Management System**

The main features of this project include basic file handling operations; you will learn how to add, list, modify and delete data to/from file. The source code is relatively short, so

---



thoroughly go through the mini project, and try to analyze how things such as functions, pointers, files, and arrays are implemented.

Currently, listed below are the only features that make up this project, but you can add new features as you like to make this project a better one!

- ❖ Add record
- ❖ List record
- ❖ Modify record
- ❖ Delete record

### Case 2: Library Management System

This project has 2 modules.

1. Section for a librarian
2. Section for a student

**A librarian** can add, search, edit and delete books. This section is password protected. That means you need administrative credentials to log in as a librarian.

**A student** can search for the book and check the status of the book if it is available. Here is list of features that you can add to the project.

1. You can create a structure for a student that uniquely identify each student. When a student borrows a book from the library, you link his ID to Book ID so that librarian can find how a particular book is borrowed.
2. You can create a feature to bulk import the books from CSV file.
3. You can add REGEX to search so that a book can be searched using ID, title, author or any of the field.
4. You can add the student login section.

### TEXT BOOKS

1. C Programming and Data Structures, P.Padmanabham, Third Edition, BS Publications
2. Computer programming in C.V.RAJaraman, PHI Publishers.
3. C Programming, E.Balagurusamy, 3rd edition, TMH Publishers.
4. C Programming, M.V.S.S.N Venkateswarlu and E.V.Prasad, S.Chand Publishers
5. Mastering C, K.R.Venugopal and S.R.Prasad, TMH Publishers.

### Program Outcomes:

1. Ability to apply solving and logical skills to programming in C language.
  2. Able to apply various conditional expressions and looping statements to solve problems associated with conditions.
-

3. Acquire knowledge about role of Functions involving the idea of modularity.
  4. Understand and apply the Concept of Array, Strings and pointers dealing with memory management.
  5. Acquire knowledge about basic data structures and their implementation.
-

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- I Sem**

**L/T/P/C**  
**2/-/-/-**

<b>(R20A003) HUMAN VALUES AND PROFESSIONAL ETHICS</b>
---

**COURSE OBJECTIVES:**

This introductory course input is intended:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of value based living in a natural way.
3. To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

**UNIT - I:**

**Course Introduction** - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self-Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self-exploration. Continuous Happiness and Prosperity A look at basic Human Aspirations- Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

**UNIT - II:**

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' ( I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

**UNIT - III:**

Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect ( Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society ( Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

**UNIT - IV:**

Understanding Harmony in the nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature. Inter connectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-

existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

**UNIT - V:**

**Implications of the above Holistic Understanding of Harmony on Professional Ethics:** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

- a. Ability to utilize the professional competence for augmenting universal human order.
- b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.
- c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

**TEXT BOOKS:**

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

**REFERENCE BOOKS:**

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagaraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Susan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics ( including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

**Relevant CDs, Movies, Documentaries & Other Literature:**

1. Value Education website, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charle Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology - the Untold Story

**COURSE OUTCOMES:**

1. The students will be able to obtain happiness and prosperity in their life.
  2. They will develop harmony at all levels.
  3. They can have satisfying human behavior throughout their life.
-

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- II Sem**

**L/T/P/C**  
**2/-/-/2**

	<b>(R20A0002) PROFESSIONAL ENGLISH</b>	
--	--	--

**INTRODUCTION:**

English is a tool for global communication and is the dominant language, which is sweeping almost all the fields in the world. It has become a necessity for people to speak in English comfortably, if they want to enter the global workforce. Hence, the course is designed to help the students to meet the global standards. Each unit focuses on English skill-set to improve: Interview skills, giving presentations and professional etiquette.

**COURSE OBJECTIVES:**

1. To enrich students to express themselves appropriately and fluently in professional contexts.
2. To enhance their employability through regular participation in group discussions and interview skills.
3. To lay foundation with writing strategies for the future workplace needs.
4. To acquaint students with different components of professional presentation skills.
5. To equip students with necessary training in listening to comprehend dialects of English language.

**UNIT-I**

Listening - Listening for General Details.

Speaking - Description of Pictures, Places, Objects and Persons

**NOTE:** Listening and Speaking tasks are solely for lab purpose and not for testing in the examinations.

Extract - The summary of Asimov's *Nightfall*

Grammar - If clauses Vocabulary - Technical Vocabulary Writing - Paragraph Writing

**Unit –II**

Listening -Listening for Specific Details

Speaking - Oral presentations

**NOTE:** Listening and Speaking tasks are solely for lab purpose and not for testing in the examinations.

Extract - A literary analysis of Asimov's *Nightfall* Grammar - Transformation of Sentences

Vocabulary - Idioms

Writing -Abstract Writing

**Unit –III**

Listening - Listening for Gist Speaking - Mock Interviews

**NOTE:** Listening and speaking tasks are solely for lab purpose and not for testing in the examinations.

Extract - Character sketches of Asimov's *Nightfall's* - protagonists and antagonists - Dr. Susan Calvin, Mike Donovan, Stephen Byerley, Francis Quinn

Grammar - Transitive and Intransitive Verbs Vocabulary - Standard Abbreviations (Mini Project)

Writing - Job Application – Cover letter

**Unit – IV**

Listening - Listening for Vocabulary

Speaking - Telephonic Expressions

NOTE: Listening and Speaking tasks are solely for lab purpose and not for testing in the examinations.

Extract - Theme of Asimov's *Nightfall*

Grammar - Auxiliary verbs, Degrees of Comparison

Vocabulary - Word Analogy

Writing - Job Application - Resume

### Unit – V

Listening - Critical Listening (for attitude and Opinion)

Speaking - Group discussion

NOTE: Listening and Speaking tasks are solely for lab purpose and not for testing in the examinations.

Extract - Asimov's *Nightfall*: A Science Fiction

Grammar - Common Errors, Prepositions

Vocabulary - Homonyms, homophones and homographs

Writing - Report Writing

\* Isaac Asimov's *Nightfall* for intensive and extensive reading

\* Exercises apart from the text book shall also be referred for classroom tasks.

### REFERENCE BOOKS:

1. *Nightfall*, [Isaac Asimov](#); [Robert Silverberg](#), 1990
2. *Practical English Usage*. Michael Swan. OUP. 1995.
3. *Remedial English Grammar*. F.T. Wood. Macmillan. 2007
4. *On Writing Well*. William Zinsser. Harper Resource Book. 2001
5. *Study Writing*. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
6. *Communication Skills*. Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011.
7. *Exercises in Spoken English*. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

### COURSE OUTCOMES:

Students will be able to:

1. Analyze and interpret a diverse range of engineering concepts through the synthesis of information
  2. Understand the impact of professional engineering solutions in societal contexts and demonstrate its knowledge
  3. Achieve communicative ability in their personal and professional relations with clarity of speech and creativity in content
  4. Function effectively as an individual and a team; and would be able to prepare themselves to be market ready
  5. Comprehend and write effective reports and design documentation, manage projects and make effective presentations.
-

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- II Sem**

**L/T/P/C**  
**3/1/-/4**

**(R20A0022) MATHEMATICS-II**

**COURSE OBJECTIVES:**

1. The aim of numerical methods is to provide systematic methods for solving problems in a numerical form using the given initial data, also used to find the roots of an equation and to solve differential equations.
2. The objective of interpolation is to find an unknown function which approximates the given data points and the objective of curve fitting is to find the relation between the variables  $x$  and  $y$  from given data and such relationships which exactly pass through the data (or) approximately satisfy the data under the condition of sum of least squares of errors.
3. PDE aims at forming a function with many variables and also their solution methods, Method of separation of variables technique is learnt to solve typical second order PDE.
4. Evaluation of multiple integrals.
5. In many engineering fields the physical quantities involved are vector valued functions. Hence the vector calculus aims at basic properties of vector-valued functions and their applications to line, surface and volume integrals.

**UNIT – I: Solutions of algebraic, transcendental equations and Interpolation**

**Solution of algebraic and transcendental equations:** Introduction, Bisection Method, Method of false position, Newton-Raphson method and their graphical interpretations.

**Interpolation:** Introduction, errors in polynomial interpolation, Finite differences - Forward differences, Backward differences, Central differences. Newton's formulae for interpolation, Gauss's central difference formulae, Interpolation with unevenly spaced points - Lagrange's Interpolation.

**UNIT – II: Numerical Methods**

**Numerical integration :** Generalized quadrature - Trapezoidal rule, Simpson's  $1/3^{\text{rd}}$  and Simpson's  $3/8^{\text{th}}$  rules.

**Numerical solution of ordinary differential equations:** Solution by Taylor's series method, Euler's method, Euler's modified method, Runge-Kutta fourth order method.

**Curve fitting :** Fitting a straight line, second degree curve, exponential curve, power curve by method of least squares.

**UNIT III: Partial Differential Equations**

Introduction, formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order Lagrange's linear equation and non-linear equations, Charpit's method, Method of separation of variables for second order equations and applications of PDE to one dimensional equation (Heat equation).

**Unit IV: Double and Triple Integrals**

Double and triple integrals (Cartesian and polar), Change of order of integration in double integrals, Change of variables (Cartesian to polar).

**Unit V: Vector Calculus**

Introduction, Scalar point function and vector point function, Directional derivative, Gradient, Divergence, Curl and their related properties, Laplacian operator, Line integral - work done, Surface integrals, Volume integral. Green's theorem, Stoke's theorem and Gauss's Divergence theorems (Statement & their Verification).

**TEXT BOOKS:**

1. Higher Engineering Mathematics by B V Ramana ., Tata McGraw Hill.
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
3. Mathematical Methods by S.R.K Iyenger, R.K.Jain, Narosa Publishers.

**REFERENCE BOOKS:**

1. Elementary Numerical Analysis by Atkinson-Han, Wiley Student Edition.
2. Advanced Engineering Mathematics by Michael Greenberg –Pearson publishers.
3. Introductory Methods of Numerical Analysis by S.S. Sastry, PHI

**COURSE OUTCOMES:**

After learning the concepts of this paper the student will be able to independently

1. Find the roots of algebraic, non algebraic equations and predict the value at an intermediate point from a given discrete data.
  2. Find the most appropriate relation of the data variables using curve fitting and this method of data analysis helps engineers to understand the system for better interpretation and decision making.
  3. Solve first order linear and non-linear partial differential equations which are very important in engineering field.
  4. Evaluate multiple integrals; hence this concept can be used to evaluate Volumes and Areas of an object.
  5. Evaluate the line, surface, volume integrals and converting them from one to another using vector integral theorems.
-



**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- II Sem****L/T/P/C**  
**3/-/-/3****(R20A0011) APPLIED PHYSICS****COURSE OBJECTIVES:**

1. To analyze the ordinary light with a laser light and realize the transfer of light through optical fibers.
2. To identify dual nature of the matter and behavior of a particle quantum mechanically.
3. To explore band structure of the solids and classification of materials.
4. To acquire the basic knowledge of various types of semiconductor devices and find the applications in science and technology.
5. To Compare dielectric and magnetic properties of the materials and enable them to design and apply in different fields.

**UNIT – I****LASERS & FIBER OPTICS**

**Lasers:** Characteristics of lasers, Absorption, Spontaneous and Stimulated emissions, population inversion, meta stable state, types of pumping, lasing action, construction and working of Ruby Laser, Helium-Neon Laser, Semiconductor diode Laser, Applications of lasers.

**Fiber Optics:** Introduction to optical fiber, Construction and working principle of an Optical Fiber, Acceptance angle and Numerical aperture, Types of Optical fibers - Mode and Propagation through step and graded index fibers, Losses in optical fiber, Optical Fiber in Communication System, Applications of optical fibers.

**UNIT – II****QUANTUM MECHANICS**

Wave nature of particles, de Broglie's hypothesis, matter waves, Heisenberg's uncertainty principle, Davisson and Germer's experiment, G.P Thomson experiment, Schrodinger time-independent wave equation-significance of wave function, particle in one dimensional square well potential.

**UNIT – III****ELECTRONIC MATERIALS**

Free electron theory(Classical & Quantum)- Assumptions, Merits and drawbacks, Fermi level, Density of states, Periodic potential, Bloch's theorem, Kronig – Penny model (qualitative), E – K diagram, Effective mass, Origin of energy bands in solids, Classification of materials : Metals, semiconductors and insulators.

**UNIT-IV****SEMICONDUCTOR PHYSICS**

Intrinsic and extrinsic semiconductors, Direct and indirect band gap semiconductors, Carrier concentration in intrinsic and extrinsic semiconductors. Dependence of Fermi level on carrier concentration and temperature, carrier transport: mechanism of diffusion and drift, Formation of PN junction, V-I characteristics of PN diode, energy diagram of PN diode, Hall experiment, semiconductor materials for optoelectronic devices - LED, Solar cell.

**UNIT – V:****DIELECTRICS AND MAGNETIC PROPERTIES OF MATERIALS**

**Dielectrics:** Introduction, Types of polarizations (Electronic and Ionic) and calculation of their polarizabilities, internal fields in a solid, Clausius-Mossotti relation.

**Magnetism:** Introduction, origin of magnetism, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Properties of anti-ferro and ferri magnetic materials, Hysteresis curve based on domain theory, Soft and hard magnetic materials.

**TEXT BOOKS:**

1. Engineering Physics by Kshirsagar & Avadhanulu, S Chand publications.
2. Engineering Physics- B.K.Pandey, S.Chaturvedi, Cengage Learning.

**REFERENCES:**

1. Engineering Physics – R.K. Gaur and S.L. Gupta, DhanpatRai Publishers.
2. Engineering Physics, S Mani Naidu- Pearson Publishers.
3. Engineering physics 2<sup>nd</sup> edition –H.K. Malik and A.K. Singh.
4. Engineering Physics – P.K. Palaniswamy, Scitech publications.
5. Physics by Resnick and Haliday.

**COURSE OUTCOMES:**

After completion of studying Applied Physics the student is able to

- 1 Observe the properties of light and its engineering applications of laser in fiber opticcommunication systems.
  - 2 Apply the basic principles of quantum mechanics and the importance of behavior of a particle.
  - 3 Find the importance of band structure of solids and their applications in various electronicdevices.
  - 4 Evaluate concentration & estimation of charge carriers in semiconductors and workingprinciples of PN diode.
  - 5 Examine dielectric, magnetic properties of the materials and apply them in material technology.
-

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- II Sem**

**L/T/P/C**

**3/-/-/3**

**(R20A0401) ANALOG & DIGITAL ELECTRONICS**

**COURSE OBJECTIVES:**

The main objectives of the course are:

1. To familiarize with the principal of operation, analysis and design of pn junction diode.
2. To study the construction of BJT and its characteristics in different configurations.
3. To study the construction and characteristics of JFET and MOSFET.
4. To study basic number systems codes and logical gates.
5. To introduce the methods for simplifying Boolean expressions and design of combinational circuits.

**UNIT-I**

**P-N Junction diode:** Qualitative Theory of P-N Junction, P-N Junction as a diode, diode equation, volt-ampere characteristics temperature dependence of V-I characteristic, ideal versus practical, diode equivalent circuits, Zener diode characteristics.

**UNIT-II**

**Bipolar Junction Transistor:** The Junction transistor, Transistor construction, Transistor current components, Transistor as an amplifier, Input and Output characteristics of transistor in Common Base, Common Emitter, and Common collector configurations.  $\alpha$  and  $\beta$  Parameters and the relation between them, BJT Specifications.

**UNIT-III**

**FIELD EFFECT TRANSISTOR:** JFET-Construction, principle of Operation, Volt–Ampere characteristics, Pinch- off voltage. Small signal model of JFET. FET as Voltage Variable Resistor, Comparison of BJT and FET. MOSFET- Construction, Principle of Operation and symbol, MOSFET characteristics in Enhancement and Depletion modes.

**UNIT IV:**

**Number System and Boolean Algebra:** Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal, Unit Distance Code, Digital Logic Gates (AND, NAND, OR, NOR, EX-OR, EX-NOR), Properties of XOR Gates, Universal Gates, Basic Theorems and Properties, Switching Functions, Canonical and Standard Form.

**UNIT-V**

**Minimization Techniques:** The Karnaugh Map Method, Three, Four and Five Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Multilevel NAND/NOR realizations.

**Combinational Circuits:** Design procedure – Half adder, Full Adder, Half subtractor, Full subtractor, Multiplexer/Demultiplexer, decoder, encoder, Code converters, Magnitude Comparator.

**TEXT BOOKS**

1. "Electronic Devices & Circuits", Special Edition – MRCET, McGraw Hill Publications, 2017.
2. Integrated Electronics Analog Digital Circuits, Jacob Millman and D. Halkias, McGrawHill.
3. Electronic Devices and Circuits, S.Salivahanan, N.Sureshkumar, McGrawHill.
4. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003
5. Switching and Finite Automata Theory- ZviKohavi & Niraj K. Jha, 3rd Edition, Cambridge.

**REFERENCE BOOKS**

1. Electronic Devices and Circuits, K.Lal Kishore B.S Publications
2. Electronic Devices and Circuits, G.S.N. Raju, I.K. International Publications, New Delhi, 2006.
3. John F.Wakerly, Digital Design, Fourth Edition, Pearson/PHI, 2006
4. John.M Yarbrough, Digital Logic Applications and Design, Thomson Learning, 2002.
5. Charles H.Roth. Fundamentals of Logic Design, Thomson Learning, 2003.

**COURSE OUTCOMES**

After completion of the course, the student will be able to:

1. Understand the principal of operation, analysis and design of pn junction diode.
  2. Understand the construction of BJT and its characteristics in different configurations.
  3. Understand the construction and characteristics of JFET and MOSFET.
  4. Understand basic number systems codes and logical gates.
  5. Understand the methods for simplifying Boolean expressions and design of combinational circuits.
-

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- II Sem**

**L/T/P/C**  
**3/-/-/3**

**(R20A0502) PYTHON PROGRAMMING**

**COURSE OBJECTIVES:**

1. To read and write simple Python programs.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and call them.
4. To use Python data structures — lists, tuples, dictionaries.
5. To do input/output with files in Python.

**UNIT I**

**Introduction to Python Programming Language:** Introduction to Python Language and installation, overview on python interpreters, working with python, Numeric Data Types: int, float, Boolean, complex and string and its operations, Standard Data Types: List, tuples, set and Dictionaries, Data Type conversions, commenting in python.

**UNIT II**

**Variables and Operators:** Understanding Python variables, Multiple variable declarations, Python basic statements, Python basic operators: Arithmetic operators, Assignment operators, Comparison operators, Logical operators, Identity operators, Membership operators, Bitwise operators, Precedence of operators, Expressions.

**UNIT III**

**CONTROL FLOW AND LOOPS**

Conditional (if), alternative (if-else), chained conditional (if- elif -else), Loops: For loop using ranges,string, Use of while loops in python, Loop manipulation using pass, continue and break

**UNIT IV**

**Functions**

Defining Your Own Functions, Calling Functions, passing parameters and arguments, Python Function arguments: Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Powerful Lambda functions in python.

**UNIT V**

**I/O and Error Handling in Python**

Introduction, Access Modes, Writing Data to a File, Reading Data from a File, Additional File Methods introduction to Errors and Exceptions, Handling IO Exceptions, Run Time Errors, Handling Multiple Exceptions.

**Introduction to Data Structures:** What are Data structures, Types of Data structures, Introduction to Stacks and Queues.

**TEXT BOOKS**

1. R. Nageswara Rao, “Core Python Programming”, dreamtech
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
4. Data Structures and Algorithmic Thinking with Python by Narasimha Karumanchi

**REFERENCE BOOKS:**

1. Core Python Programming, W.Chun, Pearson.
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Learning Python, Mark Lutz, Orielly

**COURSE OUTCOMES:**

Upon completion of the course, students will be able to

1. Read, write, execute by hand simple Python programs.
2. Structure simple Python programs for solving problems.
3. Decompose a Python program into functions.
4. Represent compound data using Python lists, tuples, and dictionaries.
5. Read and write data from/to files in Python Programs

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- II Sem**

**L/T/P/C**  
**-/-/3/1.5**

**(R20A0082) APPLIED PHYSICS LAB**

**COURSE OBJECTIVES:**

Students can be able to

- 1 Identify the specific types of elastic and electrical nature of materials in physics lab.
- 2 Observe concepts of magnetism in physics lab.
- 3 Analyze propagation of light in various optical devices practically.
- 4 Examine various opto electronic devices practically
- 5 Well-equipped with the properties of semiconductor devices in physics lab.

**LIST OF EXPERIMENTS:**

1. Torsional pendulum-Rigidity modulus of given wire.
2. Melde's experiment –Transverse and Longitudinal modes.
3. Stewart and Gee's method- Magnetic field along the axis of current carrying coil.
4. Spectrometer-Dispersive power of the material of a prism
5. Diffraction grating-using laser -Wavelength of light.
6. Newton's Rings –Radius of curvature of Plano convex lens.
7. LED -Characteristics of LED.
8. Solar cell -Characteristics of a Solar cell.
9. Optical fiber- Evaluation of numerical aperture of optical fiber.
10. Hall Effect –To study Hall effect in semiconducting samples.

**REFERENCE BOOKS:**

1. Practical physics by Dr. Aparna, Dr K.V Rao, V.G.S.Publications.
2. Engineering physics practical lab manual – MRCET.

**COURSE OUTCOMES:**

- 1 Students are able to measure the elastic constants of the given material of the wire and determine the ac frequency  $f$  vibrating bar.
- 2 Students are able to determine the magnetic induction of a circular coil carrying current by applying the principles of terrestrial magnetism.
- 3 Students are able to frame relativistic ideas of light phenomenon
- 4 Students are able to achieve the analysis of V-I characteristics of opto electronic devices
- 5 Students are able to determine the carrier concentration and identify the given semiconductor material with the help of Hall Effect.

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- II Sem**

**L/T/P/C**  
**-/-/3/1.5**

**(R20A0582) PYTHON PROGRAMMING LAB**

**COURSE OBJECTIVES:**

1. Syntax and Semantics and create Functions in Python.
2. Different data types Lists, Dictionaries in Python.
3. how to execute the programs using loops and control statements
4. Decision Making and Functions in Python
5. Files and exception Handling in Python

**Week 1:**

- A) Write python program to print Hello World
- B) Write a python program to get string, int, float input from user
- C) Write a python program to add 2 numbers

**Week 2:**

- A) Create a list and perform the following methods  
1) insert() 2) remove() 3) append() 4) len() 5) pop() 6) clear()
- B) Write a python program to find the length of list?
- C) Write a python program to find the smallest and largest number in the list?

**Week 3:**

- A) Create a tuple and perform the following methods  
1) Add items 2) len() 3) check for item in tuple 4) Access items
- B) Write a python program using the following methods: 1) count 2) index
- C) Write a python program using "+" and "\*" operations which resulting a new tuple?

**Week 4:**

- A) Create a dictionary and apply the following methods  
1) Print the dictionary items 2) access items 3) use get() 4) change values 5) use len()
- B) Write a python code to convert list of tuples into dictionaries?
- C) Write python program to store data in list, tuple, set, dictionary and then try to print them.

**Week 5:**

- A) Write a python program to perform arithmetic, assignment, logical and comparison operators?
- B) Write a Python program to add two positive integers without using the '+' operator. (use bitwise operator)
- C) Write a Python program to perform the basic four operators (+, -, \*, /)

**Week 6:**

- A) Write a simple python program to declare a variable in different possible ways?
- B) Write a python program to show precedence of operators using the expression:  $z = (v+w) * x / y$
- C) Write a python program to check whether the values of a list exist or not (use membership operator) and also perform identity operation?



**Week 7:**

- A) Write a python program to print a number is positive/negative using if-else.
- B) Write a python program to find largest number among three numbers.
- C) Write a python Program to read a number and display corresponding day using if \_elif \_else?
- D) Write a python program to print list of numbers using range and for loop

**Week 8:**

- A) Write a python code to print the sum of natural numbers using while loop?
- B) Write a python program to print the factorial of given number?
- C) Write a python program to find the sum of all numbers stored in a list using for loop?

**Week 9:**

- A) Write a Python function that takes two lists and returns True if they are equal otherwise false
- B) Write python program in which an function is defined and calling that function prints Hello World
- C) Write python program in which an function(with single string parameter ) is defined and calling thatfunction prints the string parameters given to function.
- D) Write a python program using with any one of python function argument?

**Week 10:**

- A) Write a program to double a given number and add two numbers using lambda()?
- B) Write a program for filter() to filter only even numbers from a given list.
- C) Write a program for map() function to double all the items in the list?
- D)Write a program to find sum of the numbers for the elements of the list by using reduce()?

**Week 11:**

- A) Write a python program to open and write “hello world” into a file?
- B) Write a python program to write the content “hi python programming” for the existing file.
- C) Write a python program to read the content of a file?

**Week 12:**

- A) write a program to implement stack using array.
- B) write a program to implement Queue using array.

**TEXT BOOKS:**

1. R. Nageswara Rao, “Core Python Programming”, dream tech
2. Allen B. Downey , “ Think Python: How to Think Like a Computer Scientist”, Second Edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.

**COURSE OUTCOMES:**

After completion of the course, Students will be able to:

1. Evaluate Problem solving and programming capability
2. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
3. Implement conditional and loop for python programs
4. Express different Decision Making statements and Functions
5. Understand and summarize different File handling operations and exceptions

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- II Sem**

**L/T/P/C**  
**-/-/4/2**

**(R20A0083) ENGINEERING AND IT WORKSHOP LAB**

It is consisting of 3 parts:

- Part I: IT Workshop;
- Part-II: Enectrical & Electronics Workshop;
- Part III: Auto CAD Workshop

**Part I: IT Workshop:**

**Objectives:**

- Understand the internal structure and layout of the computer system.
- Learn to diagnose minor problems with the computer functioning.
- Know the proper usage and threats of the world wide web.
- Study in detail about the various features of Ms-Word, Excel, PowerPoint.
- Gain an awareness about the tools of LibreOffice.

**Task- 1: PC HARDWARE**

Identification of the peripherals of a computer, components in a CPU and its functions. Block diagram of the CPU along with the configuration of each peripherals. Functions of Motherboard. Assembling and Disassembling of PC. Installing of OS.

**Task- 2: TROUBLESHOOTING**

Hardware Troubleshooting: Students are to be given a PC which does not boot due to proper assembly or defective peripherals and the students should be taught to identify and correct the problem.

Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

**Task 3: INTERNET**

Web Browsers, Access of websites, Surfing the Web, Search Engines, Customization of web browsers, proxy settings, bookmarks, search toolbars, pop-up blockers. Antivirus downloads, Protection from various threats.

**MS OFFICE**

**Task 4: MICROSOFT WORD**

Introduction to Word Processor, Editing and Formatting features, overview of toolbars, saving files, Using help and resources, rulers, fonts, styles, format painter, Drop Cap in word, Applying Text

effects, Using Character Spacing, Borders and colors, Inserting Header and Footer, Using Date and Time option in Word & Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes. Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and MailMerge in word. Using Word to create Project Certificate, Project Abstract, News Letter, Resume.

**Task 5: MICROSOFT EXCEL**

Excel Orientation: The importance of Excel as a Spreadsheet tool, Accessing, overview of toolbars, saving excel files, Using help and resources. Excel formulae & Functions : formulae, logical functions, text functions, statistical functions, mathematical functions, lookup functions, conditional formatting, Charts, Hyper linking, Renaming and Inserting worksheets, Data Analysis functions.

Creating a Scheduler ( Features:- Gridlines, Format Cells, Summation, auto fill, Formatting)

Calculating GPA (Features:- Cell Referencing, Formulae and functions in excel )

**Task 6: MICROSOFT POWER POINT**

Basic power point utilities and tools, PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Drawing toolbar-Lines and Arrows, Text boxes, Clipart, Insertion of images, slide transition, Custom animation, Hyperlinks.

**Task 7: LIBRE OFFICE**

Overview of LibreOffice and its features of Writer, Calc, Impress, Draw, Base, Math, Charts.

**Libre office Math:** Introduction , Creating & Editing Formulas, formulas as separated documents or files, formulas in office document, Creating formulas, Formula layout

**Libre Office Draw :** Introduction, Basic shapes, working with objects, flowcharts, organization charts,

**Text Books:**

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
2. PC Hardware and A+ Handbook-Kate J. Chase PHI (Microsoft)
3. Excel Functions and Formulas, Bernd held, Theodor Richardson, Third Edition
4. Libre Office Documentation : <https://documentation.libreoffice.org/en/english-documentation>

**Outcomes:**

- Ability to identify the major components of a computer and its peripherals. They are capable of assembling a personal computer, and can perform installation of system software like MS Windows and required device drivers.
- Students can detect and perform minor hardware and software level troubleshooting.
- Capacity to work on Internet & World Wide Web and make effective usage of the internet for academics.

## **PART II: ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP**

### **Course Objectives:**

1. To get acquaintance with Residential house wiring procedure.
2. To obtain the knowledge about fluorescent lamp wiring procedure.
3. To get familiarized with staircase wiring.
4. To perform soldering and desoldering practice.

### **List of Experiments:**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lampwiring
3. Stair casewiring
4. Soldering and Desoldering practice – components, devices and circuits using general purpose PCB.

### **Course Outcomes:**

1. Students will able to understand domestic wiring procedurespractically.
2. Students will able to doFluorescent lamp wiring.
3. Students will able to do staircasewiring.
4. Student will able to soldering and disordering practice.

## **PART III: AUTOCAD WORKSHOP**

### **1. Introduction to AutoCAD**

Design Process, AutoCAD Installation Process, AutoCAD user Interface,Function Keys

### **2. Commands: Drawing Commands,Editing Commands, Drawings aids**

### **3. D Wireframe Modeling**

### **4. CAD Practice Exercises**

### **5. CAD -2D, CAD - Isometric**

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**I Year B.Tech. AI&ML- II Sem**  
**L/T/P/C**  
**2/-/-/-**

**(R20A0014) ENVIRONMENTAL SCIENCE**

**COURSE OBJECTIVES:**

On successful completion of this course, students will be able to:

1. Distinguish the inter relationship between living organism and environment.
2. Categorize various types of natural resources available on the earth surface.
3. Detect the causes, and control measures of various types of environmental pollution.
4. Articulate the issues related to solid waste and its management.
5. Explain and understand the importance of sustainable development.

**UNIT-I: ECOSYSTEMS:**

Definition, Scope, and Importance of ecosystem. Classification, natural and artificial ecosystems, structure - abiotic and biotic component, functions of an ecosystem, food chains, food webs and ecological pyramids.

**Activities:** Case studies, poster making.

**UNIT-II: NATURAL RESOURCES:**

Classification of Resources: Definition of natural resource, renewable and non-renewable resources. Renewable resources: Energy resources: growing energy needs solar energy, hydro energy, biogas, biofuel. Non-Renewable Resources: Fossil fuels, refining of Coal, Petroleum, and natural gas. Use of alternate energy source.

**Activities:** Case studies, seminars.

**UNIT-III: ENVIRONMENTAL POLLUTION AND TECHNIQUES:**

Definition, Types of pollution: Air pollution causes, effects, control measures of air pollution and prevention techniques. Water pollution causes, effects, control measures and techniques.

**Activities:** Debate, seminars

**UNIT-IV: SOLID WASTE MANAGEMENT:**

Definition of Solid waste, characteristics of solid waste, solid waste management: collection, transportation, processing treatment, disposal methods and e-waste management, 3R techniques: reduce, reuse, and recycle.

**Activities:** Seminars, Case studies.

**UNIT-V: SUSTAINABLE DEVELOPMENT:**

Definition of sustainable development, concept, sustainable development goals, threats to sustainability, strategies to achieve sustainable development. Introduction to green chemistry, green building concept.

**Activities:** Worksheets, seminars.

**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 Anubha Kaushik, 4 Edition, New age international publishers
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Pvt. Ltd, New Delhi
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHL Learning Pvt. Ltd, New Delhi
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition

**COURSE OUTCOMES:**

The basic concepts included in this course will help the student to:

1. Differentiate between various bDSic and abDSic components of ecosystem.
2. Describe the various types of natural resources.
3. Examine the problems associated with waste management.
4. Evaluate the causes, and apply control measures of various types of environmental pollutions.
5. Develop technologies on the basis of ecological principles on environment which in turn helps in sustainable development.

(R20A0503) DATA STRUCTURES USING PYTHON
---

**COURSE OBJECTIVES:**

This course will enable students to

1. Implement Object Oriented Programming concepts in Python.
2. Understand Lists, Dictionaries and Regular expressions in Python.
3. Understanding how searching and sorting in Python.
4. Understanding how liner and non-liner data structures works.
5. To learn the fundamentals of writing Python scripts.

**UNIT –I**

Oops Concepts-Class, object, types of variables, types of methods, inheritance, Encapsulation, Polymorphism, Abstraction, special functions, constructors.

**UNIT -II**

Data Structures, Types-User define, predefine, List, List comprehension, Arrays vs. List, Tuples, Set, Dictionaries, Expressions, Slicing, strings, String processing, Python memory model: names, mutable and immutable values.

**UNIT -III**

**Searching**-Linear Search and Binary search. **Sorting**- Bubble Sort, Selection Sort, Insertion Sort, Merge sort, Quick sort.

**UNIT -IV**

Stacks and Queues implementation, Linked List, Double Linked List, Circular Linked list, Heap

**UNIT -V**

**Graphs**-Breadth First Search, Depth First Search. **Trees** - Binary search trees: find, insert, delete | Height-balanced binary search trees.

**TEXTBOOKS:**

1. Data structures and algorithms in python by Michael t. Goodrich
2. Data Structures and Algorithmic Thinking with Python by Narasimha Karumanchi

**REFERENCE BOOKS:**

1. Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7, 2nd Edition by Dr. Basant Agarwal, Benjamin Baka.
2. Data Structures and Algorithms with Python by Kent D. Lee and Steve Hubbard.
3. Problem Solving with Algorithms and Data Structures Using Python by Bradley N Miller and David L. Ranum.
4. Core Python Programming -Second Edition, R. Nageswara Rao, Dreamtech Press

## **COURSE OUTCOMES:**

The students should be able to:

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Create, run and manipulate Python Programs using core data structures like Lists,
3. Dictionaries and use Regular Expressions.
4. Interpret the concepts of Object-Oriented Programming as used in Python.
5. Master object-oriented programming to create an entire python project using objects and classes.



<b>(R20A7203) COMPUTER ORGANISATION AND OPERATING SYSTEMS</b>
---

**Course Objectives:**

The course objectives are:

- To have a through understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.
- To study the hierarchical memory system including cache memories and virtual memory.
- To demonstrate the knowledge of functions of operating system memory management scheduling, file system and interface, distributed systems, security and dead locks.
- To implement a significant portion of an Operating System.

**UNIT - I:**

**Basic Structure of Computers:** Computer Types, Functional UNIT, Basic Operational Concepts, Bus, Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating - Point Representation.

**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, Instruction Codes, Computer Registers Computer Instructions - Instruction Cycle.

Memory - Reference Instructions, Input - Output and Interrupt, STACK Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

**UNIT - II:**

**Micro Programmed Control:** Control Memory, Address Sequencing, Microprogram Examples, Design of Control Unit, Hard Wired Control, Microprogrammed Control.

**The Memory System:** Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories Performance Considerations, Virtual Memories secondary Storage, Introduction to RAID.

**UNIT - III:**

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input-Output Processor (IOP), Serial Communication; Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE1394.

**UNIT - IV:**

**Operating Systems Overview:** Overview of Computer Operating Systems Functions, Protection and Security, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating System Generation.

**Process and CPU Scheduling** - Process concepts-The Process, Process State, Process Control Block, Threads, Inter process communication, Process Scheduling-Basic concepts, Scheduling Criteria, Scheduling algorithms

**UNIT - V:**

**Memory Management:** Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames,

**Principles of Deadlock:** System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock

**TEXT BOOKS:**

1. Computer Organization - Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer System Architecture - M. morismano, 3rd edition, Pearson
3. Operating System Concepts - AbrehamSilberchatz, Peter B. Galvin, Greg Gagne, 8th Edition, John Wiley.

**REFERENCE BOOKS:**

1. Computer Organization and Architecture - William Stallings 6th Edition, Pearson
2. Structured Computer Organization - Andrew S. Tanenbaum, 4th Edition, PHI
3. Fundamentals of Computer Organization and Design - SivaraamaDandamudi, Springer Int. Edition
4. Operating Systems - Internals and Design Principles, Stallings, 6th Edition - 2009, Pearson Education.
5. Modern Operating Systems, Andrew S Tanenbaum 2nd Edition, PHI
6. Principles of Operating System, B. L. Stuart, Cengage Learning, India Edition.

**Course Outcomes:**

Upon completion of the course, students will have through knowledge about:

- Basic structure of a digital computer
- Arithmetic operations of binary number system
- The organization of the Control Unit, Arithmetic and Logical Unit, Memory Unit and the I/O unit.
- Operating system functions, types, system calls.
- Memory management techniques and dead lock avoidance
- Operating system file system and implementation and its interface.

(R20A0505) DESIGN AND ANALYSIS OF ALGORITHMS
--

**COURSE OBJECTIVES:**

1. To analyze performance of algorithms.
2. To choose the appropriate data structure and algorithm design method for a specified application.
3. To understand how the choice of data structures and algorithm design methods impacts the performance of programs.
4. To solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.
5. To understand the differences between tractable and intractable problems and to introduce P and NP classes.

**UNIT I**

**Introduction:** Algorithms, Pseudo code for expressing algorithms, performance analysis- Space complexity, Time Complexity, Asymptotic notation- 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 set operations, Union and Find algorithms, Spanning trees, AND/OR graphs, connected components, Bi-connected components.

**UNIT III**

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

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

**UNIT IV**

**Backtracking:** General method, Applications- n-queue problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles.

**UNIT V**

**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, NP-Hard problems, Cook's theorem.

**TEXT BOOKS:**

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekharan, Universities press
2. Design and Analysis of Algorithms, P. h. Dave, 2nd edition, Pearson Education.

**REFERENCES:**

1. Introduction to the Design and Analysis of Algorithms A Levitin Pearson Education
2. Algorithm Design foundations Analysis and Internet examples, M.T. Goodrich and R. Tomassia John Wiley and sons
3. Design and Analysis of Algorithms, S. Sridhar, Oxford Univ. Press
4. Design and Analysis of Algorithms, Aho, Ulman and Hopcraft, Pearson Education.
5. Foundations of Algorithms, R. Neapolitan and K. Naimipour, 4th edition

**COURSE OUTCOMES:**

1. Ability to analyze the performance of algorithms.
2. Ability to choose appropriate algorithm design techniques for solving problems.
3. Ability to understand how the choice of data structures and the algorithm design methods to impact the performance of programs.
4. Describe the dynamic programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic programming algorithms and analyze them.
5. Describes the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms and analyze them.

<b>(R20A6701) INTRODUCTION TO DATA SCIENCE</b>
--

**COURSE OBJECTIVES:**

The course will enable the students to:

1. Understand the data science processing
2. Selecting the good practices of data science
3. Summarizes simple statistical models
4. Understand Model Development in data Science
5. Analyze Model Evaluation in data Science

**Unit – I: Introduction**

Introduction to Data Science – Evolution of Data Science –Data Science process – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

**Unit – II: Data Collection and Data Pre-Processing**

Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning and Munging – Data Integration and Transformation – Data Reduction – Data Discretization.

**Unit – III: Exploratory Data Analysis**

Descriptive Statistics – Mean, Median, Mode, Standard Deviation – Categorical Data, ANOVA, Skewness and Kurtosis – Histograms, Box Plots – Cross tabulation, Correlation and Covariance – Scatter plots

**Unit – IV: Model Development**

Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.

**Unit – V: Model Evaluation**

Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Over fitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.

**Text Books**

1. Data Science from Scratch by Joel Grus by O'Reilly
2. Introducing Data Science BIG DATA, MACHINE LEARNING, AND MORE, USING PYTHON TOOLS DAVY CIELEN, ARNO D. B. MEYSMAN, MOHAMED ALI

**REFERENCES**

1. Jojo Moolayil, "Smarter Decisions : The Intersection of IoT and Data Science", PACKT, 2016.
2. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.

3. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data Published by John Wiley & Sons, Inc

**COURSE OUTCOMES:**

The students should be able to:

1. List the steps involved in data science, from data acquisition to insight, and describe the role of each step
2. Distinguish different ways of collecting data, and their impact on the conclusions that can be drawn from the data
3. Demonstrate the significance of EDA in Data science
4. Describe model diagnostic and execution
5. Describe to select appropriate variables for model evaluation

**(R20A0024)PROBABILITY AND STATISTICS**

**COURSE OBJECTIVES:**

1. To identify a random variable that describes randomness or an uncertainty in certain realistic situation. It can be either discrete or continuous type.
2. To learn important probability distributions like: in the discrete case, study of the Binomial and the Poisson Distributions and in the continuous case the Normal Distributions.
3. To build the linear relationship between two variables and also to predict how a dependent variable changes based on adjustments to an independent variable.
4. To interpret the types of sampling, sampling distribution of means and variance, Estimations of statistical parameters.
5. To give comprehensive knowledge of probability theory to make inferences about a population from large and small samples.

**UNIT – I: Random Variables**

Single Random Variables -Discrete and Continuous, Probability distribution function, Probability mass and density functions, mathematical expectation and variance.

Multiple Random variables:Discrete and Continuous, Joint probability distribution, Marginal probability density functions, conditional probability distribution function and density functions.

**UNIT-II: Probability Distributions**

Binomial distribution – properties, mean, variance and recurrence formula for Binomial distribution, Poisson distribution – Poisson distribution as Limiting case of Binomial distribution, properties, mean variance and recurrence formula for Poisson distribution, Normal distribution – mean, variance, median, mode and characteristics of Normal distribution.

**UNIT -III: Correlation and Regression**

Correlation -Coefficient of correlation, Rank correlation, Regression- Regression coefficients, Lines of regression.

Multiple correlation and regression: Coefficient of multiple Correlations and multiple regression, multiple linear regression equations.

**UNIT –IV: Sampling and Testing of Hypothesis for Large Samples**

Sampling: Definitions - Types of sampling - Expected values of sample mean and variance, Standard error - Sampling distribution of means and variance. Estimation - Point estimation and Interval estimation.

Testing of hypothesis , Null and Alternative hypothesis, Type I and Type II errors, Critical region, confidence interval, Level of significance, one tailed and two tailed test.

Large sample Tests: Test of significance - Large sample test for single mean, difference of means, single proportion, and difference of proportions.

### **Unit-V: Testing of Hypothesis for Small Samples**

Small samples: Test for single mean, difference of means, paired t-test, test for ratio of variances(F-test), Chi- square test for goodness of fit and independence of attributes.

#### **TEXT BOOKS:**

1. Fundamental of Statistics by S.C. Gupta, 7<sup>th</sup> Edition, 2016.
2. Fundamentals of Mathematical Statistics by SC Gupta and V.K.Kapoor
3. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 35<sup>th</sup> Edition, 2000.

#### **REFERENCES BOOKS:**

1. Introduction to Probability and Statistics for Engineers and Scientists by Sheldon M.Ross.
2. Probability and Statistics for Engineers by Dr. J. Ravichandran

#### **COURSE OUTCOMES:**

After completion of the course, the student will be able to :

1. Evaluate randomness in certain realistic situation which can be either discrete or continuous type and compute statistical constants of these random variables.
2. Provide very good insight which is essential for industrial applications by learning probability distributions.
3. Higher up thinking skills to make objective, data-driven decisions by using correlation and regression.
4. Assess the importance of sampling distribution of a given statistic of a random sample.
5. Analyze and interpret statistical inference using samples of a given size which is taken from a population.



(R20A0061)MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
---

**COURSE OBJECTIVES:**

**The main objectives of the course are:**

1. To enable the student to understand and appreciate, with a practical insight, the importance of certain basic issues governing the business operations that are needed for sound economic decision making.
2. To provide inputs on an overall analysis of an individual firm, its production function, cost analysis and break-even-point
3. To make students understand different market structures, pricing of the product or services and different forms of business organizations.
4. To understand capital requirements of the business and basic rule of accounting of the business.
5. To learn analytical techniques and arriving at conclusions from financial information for the purpose of business decision making.

**Unit-I**

**Introduction to Managerial Economics:** Definition, Nature and Scope of Managerial Economics, Micro and Macroeconomic Concepts.

**Demand Analysis:** Demand Determinants, Law of Demand and exceptions.

**Elasticity of Demand:** Definition, Types, Measurement and Significance of elasticity of Demand. **Demand Forecasting:** Factors governing Demand Forecasting, Methods of Demand Forecasting (Survey Methods, Expert Opinion, Test Marketing, Controlled Experience, Judgmental Approach, and Time Series Analysis).

**Unit-II**

**Production & Cost Analysis:** Production Function- Isocost and Isoquants, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production Function, Laws of Returns, Internal and External Economies of Scale.

**Cost Analysis:** Cost Concepts. Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)

**Unit-III**

**Markets:** Types of Competition and Markets, Features of Perfect Competition, Monopoly and Monopolistic Competition;

**Pricing:** Objectives, Methods of Pricing;

**Business:** Features of different forms of Business Organization (Sole Trader, Partnership, Joint Stock Company, Cooperative Society, and Public Enterprises).

**Unit-IV**

**Introduction to Capital and Financial Accounting:** Need for Capital, Types of Capital, Working Capital Analysis, Methods and Sources of raising Finance.

**Accounting:** Definition, Concepts and Conventions (GAAP); Accounting Cycle; Formats for preparation of Trial Balance and Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet).

#### **Unit-V**

**Investment Decision:** Capital Budgeting - Features, Objectives, and Methods (Payback Method, Accounting Rate of Return and Net Present Value) - advantages & disadvantages. (Simple Problems)

**Financial Analysis:** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, Capital Structure Ratios and Profitability Ratios. (Simple Problems)

#### **References:**

1. Managerial Economics & Financial Analysis, Special Edition-MRCET. McGraw Hill Publications, 2017
2. D.N. Dwivedi, Managerial Economics, Vikas Publications.
3. Justin Paul, Leena, Sebastian, Managerial Economics, Cengage
4. P. L. Mehta, Managerial Economics: Analysis, Problems and Cases, Sultan Chand & Sons.
5. S. N. Maheswari & S. K. Maheswari, Financial Accounting, Vikas Publications.
6. M. Y. Khan and P. K. Jain, Financial Management, McGraw Hill

#### **COURSE OUTCOMES:**

##### **Following are the course outcomes:**

1. Makes students understand the concepts and applications of managerial economics in taking business decisions.
2. Empowers students to comprehend with the production process and technical relationship among factors of production, different cost concepts and optimization of cost.
3. Enables students to know the classification of markets and how firms determine their price/output decisions in different kinds of markets with different forms of business.
4. Allows students to know different sources of capital for the business and how financial accounting is done for smooth business functioning.
5. Equips students with different financial analysis tools and techniques to evaluate financial performance of the business.

(R20A0583) DATA STRUCTURES USING PYTHON LAB
---

**COURSE OBJECTIVES:**

1. To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
2. To understand the how linear and non-linear data structures works

**WEEK 1:** Write a Python program for class, Flower, that has three instance variables of type str, int, and float, that respectively represent the name of the flower, its number of petals, and its price. Your class must include a constructor method that initializes each variable to an appropriate value, and your class should include methods for setting the value of each type, and retrieving the value of each type.

**WEEK 2:** Write a Python program for class that extends the Progression class so that each value in the progression is the absolute value of the difference between the previous two values. You should include a constructor that accepts a pair of numbers as the first two values, using 2 and 200 as the defaults.

**WEEK 3:** Develop an inheritance hierarchy based upon a Polygon class that has abstract methods area ( ) and perimeter ( ). Implement classes Triangle, Quadrilateral, Pentagon, that extend this base class, with the obvious meanings for the area ( ) and perimeter ( ) methods. Write a simple program that allows users to create polygons of the various types and input their geometric dimensions, and the program then outputs their area and perimeter.

**WEEK 4:** Write a Python program that inputs a list of words, separated by white space, and outputs how many times each word appears in the list.

**WEEK 5:** Write a Python program to generate the combinations of n distinct objects taken from the elements of a given list.

**Example:** Original list: [1, 2, 3, 4, 5, 6, 7, 8, 9] Combinations of 2 distinct objects: [1, 2] [1, 3] [1, 4] [1, 5] [7, 8] [7, 9] [8, 9].

**WEEK 6:** Write a Python program for Linear Search and Binary search

**WEEK 7:** Write a program to implement Bubble Sort and Selection Sort

**WEEK 8:** Write a program to implement Merge sort and Quicksort.

**WEEK 9:** Write a program to implement stacks and Queues

**WEEK 10:** Write a program to implement linked list

**WEEK 11:** Write a program to implement Double Linked list

**WEEK 12:** Write a program to implement Binary search Tree

**Reference Books:**

1. Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7, 2nd Edition by Dr. Basant Agarwal, Benjamin Baka.
2. Data Structures and Algorithms with Python by Kent D. Lee and Steve Hubbard.
3. Problem Solving with Algorithms and Data Structures Using Python by Bradley N Miller and David L. Ranum.
4. Core Python Programming -Second Edition, R. Nageswara Rao, Dreamtech Press

**COURSE OUTCOMES:**

1. Student should be able to understand concepts of data structures
2. Ability to explore python especially the object-oriented concepts, and the built-in objects of Python.

<b>(R20A7282) COMPUTER ORGANISATION AND OPERATING SYSTEMS LAB</b>
---

**COURSE OBJECTIVES:**

This course will enable the students:

1. Introduce basic Linux commands, system call interface for process management, inter-process communication
2. Student will learn various process and CPU scheduling Algorithms through simulation programs
3. Student will have exposure to System calls and simulate them
4. implement string handling operations using ALP
5. solve simple problems using ALP&develop programs using procedures

**PART A(COMPUTER ORGANISATION LAB)**

**Exercises in 8086 Assembly Language Programming (ALP)**

**Write an Assembly Language Programs (ALP) for the following using GNU Assembler/Microsoft Assembler**

**WEEK 1 a)** Write an ALP to evaluate the expressions:

i)  $a = b + c - d * e$       ii)  $z = x * y + w - v + u / k$

b) Write an ALP to take N numbers as input. And do the following operations on them.

i) Arrange in ascending order ii) Arrange in descending order

**WEEK 2: a)** Write an ALP to take N numbers as input and find maximum, minimum and average

b) Write an ALP to take a string as input and do the following operations on it.

i) Find the length      ii) Check if it is a Palindrome or not

**WEEK 3:** Write an ALP to take a string as input and do the following operations on it

a. Find the Armstrong number      b. Find the Fibonacci series for n numbers

**WEEK 4:** Write an ALP to convert given lowercase letter to uppercase letter (using AND Logic Instruction)

**WEEK 5: a)** Write an ALP to compare two strings. (Uses subroutine)

b) Write an ALP to find the factorial of a given number as a Procedure and call from the main program which displays the result.

**PART B(OPERATING SYSTEMS LAB)**

**Use Linux operating system and GNU C compiler.**

**List of Programs:**

**WEEK 1:** Practice File handling utilities, Process utilities, Disk utilities, Networking commands, Filters,

Text, Processing utilities and Backup utilities.

**WEEK 2:** Simulate the following CPU scheduling algorithms

a) Round Robin      b) SJF   c) FCFS   d) Priority

**WEEK 3:** Simulate all page replacement algorithms

a) FIFO      b) LRU      c) LFU

**WEEK 4:** a) Write a C program to simulate Bankers Algorithm for DeadLock Avoidance

b) Write a C program to simulate Bankers Algorithm for DeadLock Prevention

**WEEK 5:** a) Write a C program that illustrates communication between two process using named pipes or FIFO.

**WEEK 6:** Write a C program to implement ipc between two unrelated processes using named pipe.

### **COURSE OUTCOMES:**

The student will have the ability to:

1. Introduce basic Linux commands, system call interface for process management, inter process communication.
2. Develop various process and CPU scheduling Algorithms through simulation programs
3. Student will have exposure to System calls and simulate them.
4. implement string handling operations using ALP
5. solve simple problems using ALP & develop programs using procedures

<b>(R20A0004) FOREIGN LANGUAGE-FRENCH</b>
---

### **INTRODUCTION**

In view of the growing importance of foreign languages as a communication tool in some countries of the world, French has been identified as one of the most popular languages after English. As a result, French program is introduced to develop the linguistic and communicative skills of engineering students and to familiarize them to the French communication skills. This course focuses on basic oral skills.

### **OBJECTIVES**

1. To inculcate the basic knowledge of the French language
2. To hone the basic sentence constructions in day to day expressions for communication in their vocation
3. To form simple sentences that aids in day-to-day communication
4. To prepare the students towards DELF A1
5. To develop in the student an interest towards learning languages.

### **UNIT - I:**

Speaking: Introduction to the French language and culture – Salutations - French alphabet - Introducing people

Writing: Understand and fill out a form

Grammar: The verbs “to be” and “to have” in the present tense of the indicative  
Vocabulary: The numbers from 1 to 20 - Professions- Nationalities

### **UNIT - II:**

Speaking: Talk about one’s family – description of a person - express his tastes and preferences - express possession - express negation

Writing: Write and understand a short message

Grammar: Nouns (gender and number) - Articles - The –er verbs in the present - Possessive adjectives - Qualifying adjectives

Vocabulary: The family – Clothes-Colors- The numbers from 1 to 100- The classroom

### **UNIT - III**

Speaking: Talk about your daily activities - be in time - ask and indicate the date and time - talk about sports and recreation - express the frequency

Writing: A letter to a friend

Grammar: The expression of time – The –ir verbs in the present- The verbs do, go, take, come, -Adverbs- Reflexive verbs

Vocabulary: The days and months of the year- The sports- Hobbies

### **UNIT - IV**

Speaking: Express the quantity - ask and give the price - express the need, the will and the capacity - compare (adjective) - speak at the restaurant / in the shops

Writing: A dialogue between a vendor and a customer at the market

Grammar: Verbs “to want”, “to can” - Express capacity / possibility- Express will / desire – the

future tense

Vocabulary: The food – Meals-Fruits and vegetables– The parts of the body

### **UNIT - V**

Speaking: Express the prohibition and the obligation - describe an apartment - talk about the weather / ask the weather - ask the opinion - give your opinion - express your agreement or disagreement

Writing: Descriptions

Grammar: Demonstrative adjectives- Prepositions- The verb 'must' to indicate obligation and necessity in the present

Vocabulary: Seasons – Holidays-The city– Furniture

NOTE: The students are exposed to simple listening and reading activities.

### **REFERENCE BOOKS**

1. Apprenons le François 1& 2, New Sarasvati House, 2015
2. A propos, A1, Langers International, 2010
3. Easy French Step-by-step by Myrna Bell Rochester
4. Ultimate French Beginner-Intermediate (Course book) By Livid Language
5. À L'Aventure: An Introduction to French Language and Francophone Cultures by EvelineCharvier-Berman, Anne C. Cummings.

### **COURSE OUTCOMES**

1. The students will be able to communicate in French at A1 level.
2. The student will have an advantage in the competitive job market.
3. This course benefits the graduates when pursuing study *opportunities* in the countries where French is the official language.



**(R20A0511) SOFTWARE ENGINEERING**

**COURSE OBJECTIVES:**

1. To provide the idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases
2. To understand software process models such as waterfall and evolutionary models and software requirements and SRS document.
3. To understand different software design and architectural styles & software testing approaches such as unit testing and integration testing.
4. To understand quality control and how to ensure good quality software through quality assurance.
5. To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in an object oriented software projects.

**UNIT - I:**

Introduction to Software Engineering: The evolving role of software, software characteristics, software Applications. A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI).

Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process, Agile Development Models.

**UNIT - II:**

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: Design process and Design quality, Design concepts, the design model. Creating an architectural design: Software architecture, Data design, Architectural styles and patterns, Architectural Design.

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

.Case Study software testing tool Junit / Selenium tool

**UNIT - IV:**

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMMPlan , Software cost estimation model

cocomo model Quality Management: Software Quality, Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

#### **UNIT - V:**

**Object-Oriented Software Engineering:** Object-Oriented Analysis, Domain Analysis, Generic Components of the OO Analysis Model, The OOA Process, The Object-Relationship Model, The Object-Behavior Model, Case Study – ATM Management System.

#### **TEXT BOOKS :**

1. Software Engineeringa practitioner's Approach, Roger S Pressman, 6th edition. McGrawHillInternational Edition.
2. Software Engineering, Ian Sommerville, 7th edition, Pearson education.

#### **REFERENCE BOOKS :**

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
2. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill,2008
3. Fundamentals of Software Engineering, Rajib Mall, PHI,2005
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1:Abstraction and modelling, Diner Bjorner, Springer Internationaledition,2006.
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, SpringerInternational edition2006.
7. Software Engineering Foundations, Yingux Wang, Auerbach Publications,2008.
8. Software Engineering Principles and Practice, Hans Van Vliet, 3rd edition, John Wiley & SonsLtd.
9. Software Engineering3: Domains, Requirements, and Software Design, D. Bjorner, SpringerInternational Edition.
10. Introduction to Software Engineering, R. J. Leach, CRC Press.

#### **COURSE OUTCOMES:**

1. Ability to decompose the given project in various phases of a lifecycle
2. 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).
3. Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
4. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report.
5. Ability to apply the knowledge, techniques, and skills in the development of a software product

<b>(R20A0508) OBJECT ORIENTED PROGRAMMING THROUGH JAVA</b>
--

### **COURSE OBJECTIVES:**

1. To understand object oriented principles like abstraction, encapsulation, inheritance, and polymorphism and apply them in solving problems.
2. To understand the implementation of packages and interfaces.
3. To understand the concepts of exception handling, multithreading and collection classes.
4. To understand how to connect to the database using JDBC.
5. To understand the design of Graphical User Interface using applets and swing controls.

### **UNIT-I**

**Java Programming-** History of Java, comments, Java Buzz words, Data types, Variables, Constants, Scope and Lifetime of variables, Operators, Type conversion and casting, Enumerated types, Control flow- block scope, conditional statements, loops, break and continue statements, arrays, simple java stand alone programs, class, object, and its methods constructors, methods, static fields and methods, access control, this reference, overloading constructors, recursion, exploring string class, garbage collection.

### **UNIT – II**

**Inheritance** – Inheritance types, super keyword, preventing inheritance: final classes and methods.

**Polymorphism** – method overloading and method overriding, abstract classes and methods.

**Interfaces-** Interfaces Vs Abstract classes, defining an interface, implement interfaces, accessing implementation through interface references, extending interface, inner class.

**Packages-** Defining, creating and accessing a package, importing packages.

### **UNIT-III**

**Exception handling-** Benefits of exception handling, the classification of exceptions - exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, creating own exception subclasses.

**Multithreading** – Differences between multiple processes and multiple threads, thread life cycle, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, producer consumer problem.

### **UNIT-IV**

**Collection Framework in Java** – Introduction to java collections, Overview of java collection framework, commonly used collection classes- Array List, Vector, Hash table, Stack, Lambda Expressions.

**Files-** Streams- Byte streams, Character streams, Text input/output, Binary input/output, File management using File class.

**Connecting to Database** – JDBC Type 1 to 4 drivers, connecting to a database, querying a database and processing the results, updating data with JDBC, Data Access Object (DAO).

### **UNIT-V**

**GUI Programming with Swing** - The AWT class hierarchy, Introduction to Swing, Swing Vs AWT,

Hierarchy for Swing components, Overview of some Swing components – JButton, JLabel, JTextField, JTextArea, simple Swing applications, Layout management – Layout manager types – border, grid and flow

**Event Handling-** Events, Event sources, Event classes, Event Listeners, Delegation event model, Examples: HandlingMouse and Key events, Adapter classes.

### **TEXT BOOK:**

1. Java Fundamentals – A Comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.
2. Core Java: An Integrated Approach – Dr R Nageswara Rao

### **REFERENCE BOOKS:**

1. Java for Programmers, P.J. Deitel and H.M. Deitel, PEA (or) Java: How to Program, P.J. Deitel and H.M. Deitel, PHI
2. Object Oriented Programming through Java, P. Radha Krishna, and Universities Press.
3. Thinking in Java, Bruce Eckel, PE
4. Programming in Java, S. Malhotra and S. Choudhary, Oxford Universities Press.
5. Design Patterns Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides.

### **COURSE OUTCOMES:**

1. A competence to design, write, compile, test and execute straightforward programs using a high level language;
2. An appreciation of the principles of object oriented programming;
3. Be able to make use of members of classes found in the Java API
4. Demonstrate the ability to employ various types of selection constructs in a Java program. Be able to employ a hierarchy of Java classes to provide a solution to a given set of requirements.
5. Able to develop applications using Applet, AWT, JDBC and Swing

<b>(R20A0509) DATABASE MANAGEMENT SYSTEMS</b>
---

**COURSE OBJECTIVES:**

1. To study the physical and logical database designs, database modeling, relational hierarchical, and network models
2. To understand and make use of data manipulation language to query, update and manage databases
- 3 To develop an understanding of various normalization techniques in DBMS.
- 4 To Understand Transaction concepts and different types of lock based protocols.
- 5 To learn about various Recovery mechanisms

**UNIT I:**

Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction – Instances and Schemas – Database Languages – database Access for applications Programs – Database Users and Administrator – Transaction Management –Database Architecture – Storage Manager – the Query Processor.

Data Models: Introduction to the Relational Model – Structure – Database Schema, Keys – Schema Diagrams. Database design– Other Models, ER diagrams – ER Model - Entities, Attributes and Entity sets – Relationships and Relationship sets – ER Design Issues – Concept Design – Conceptual Design with relevant Examples. Relational Query Languages, Relational Operations.

**UNIT II:**

Relational Algebra – Selection and projection set operations – renaming – Joins – Division –Examples of Algebra overviews – Relational calculus – Tuple Relational Calculus (TRC) –Domain relational calculus (DRC).

Overview of the SQL Query Language – Basic Structure of SQL Queries, Set Operations, Aggregate Functions – GROUPBY – HAVING, Nested Sub queries, Views, Triggers, Procedures.

**UNIT III:**

Normalization – Introduction, Non loss decomposition and functional dependencies, First, Second, and third normal forms – dependency preservation, Boyce/Codd normal form. Higher Normal Forms - Introduction, Multi-valued dependencies and Fourth normal form, Join dependencies and Fifth normal form

**UNIT IV:**

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- ValidationBased Protocols – Multiple Granularity.

**UNIT V:**

Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Check

Points - Buffer Management – Failure with loss of nonvolatile storage.

TEXT BOOKS:

1. Database System Concepts, Silberschatz, Korth, McGraw hill, Sixth Edition.(All UNITS except III th)
2. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition.

REFERENCE BOOKS:

1. Fundamentals of Database Systems, Elmasri Navathe Pearson Education.
2. An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson, Eight Edition for UNIT III.

COURSE OUTCOMES:

At the end of this course, students will be able to :

- Demonstrate the basic elements of a relational database management system
- Ability to identify the data models for relevant problems
- Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries
- Apply normalization for the given database
- Understand the various Recovery Mechanisms.

<b>(R20A0513) ARTIFICIAL INTELLIGENCE</b>
---

**COURSE OBJECTIVES:**

1. To train the students to understand different types of AI agents.
2. To understand various AI search algorithms.
3. Fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation.
4. Fundamentals of reasoning
5. Study of Markov Models enable the student ready to step into applied AI.

**UNIT- I:**

**Introduction:** AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A\*), Constraint Satisfaction (Backtracking, Local Search)

**UNIT- II:**

**Advanced Search:** Constructing Search Trees, Stochastic Search, A\* Search Implementation, Minimax Search, Alpha-Beta Pruning Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

**UNIT- III:**

**Advanced Knowledge Representation and Reasoning:** Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes

**Reasoning Under Uncertainty:** Basic probability, acting under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

**UNIT - IV:**

**Learning:** What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

**UNIT - V:**

**Expert Systems:** Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

**TEXT BOOKS:**

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice Hall, 2010.

**REFERENCES:**

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

**COURSE OUTCOMES:**

1. Understand the informed and uninformed problem types and apply search strategies to solve them.
2. Apply difficult real life problems in a state space representation so as to solve those using AI techniques like searching and game playing.
3. Design and evaluate intelligent expert models for perception and prediction from intelligent environment.
4. Formulate valid solutions for problems involving uncertain inputs or outcomes by using decision making techniques.
5. Demonstrate and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area



(R20A0026)DISCRETE MATHEMATICS

**COURSE OBJECTIVES:**

1. Describe mathematical concepts as applied in computer science for solving logical problems.
2. Understanding the concepts of sets, functions, relations, recurrence relations and Lattices.
3. Understand the concepts on elementary combinations and permutations.
4. To develop the mathematical skills needed for advanced quantitative courses.
5. Analyze the properties of graphs and trees.

**UNIT – I:**

**Mathematical Logic:** Statements and notations, connectives, well-formed formulas, truth tables, tautology, equivalence implication; Normal forms: Disjunctive normal forms, conjunctive normal forms, principle disjunctive normal forms, principle conjunctive normal forms.

**Predicates:** Predicative logic, statement functions, variables and quantifiers, free and bound variables, rules of inference, consistency, proof of contradiction, automatic theorem proving.

**UNIT – II:**

**Posets and Lattices:** Relations and their properties, Properties of binary relations, equivalence, compatibility and partial ordering relations, lattices, Hasse diagram; Functions- Inverse function, composition of functions, recursive functions.

Lattices as partially ordered sets; Definition and examples, properties of lattices, sub lattices, some special lattices.

**UNIT - III:**

**Groups: Algebraic** structure, Groupoid, Monoid, Semi groups, Group, Sub groups, Homomorphism and Isomorphism of groups.

**Elementary Combinatorics** : Basics of counting, The permutations, disarrangements, combinations, permutations and combinations with repetitions, constrained repetitions, the principal of Inclusion-Exclusion, Pigeon hole principle.

**UNIT-IV:**

**Advanced Counting Techniques** : Generating Function of Sequences, Recurrence relations, Solving Recurrence Relations by substitution and Generating function ,The method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.

**UNIT-V:**

**Graphs Theory:** Introduction to Graphs, Isomorphic graphs, Euler graphs, Hamiltonian graphs, planar graphs, Graph coloring, Directed graphs, weighted digraphs, chromatic numbers. Trees and their properties, Spanning trees, Directed trees, Binary trees Minimal Spanning Trees.

**TEXT BOOKS:**

1. C. L. Liu, D. P. Mohapatra, —Elements of Discrete Mathematics, Tata Mcgraw-Hill, India, 3<sup>rd</sup> Edition, 2008.
2. J. P. Tremblay, R. Manohar, Discrete Mathematical Structures with Applications to Computer Science , Tata McGraw Hill, India, 1<sup>st</sup> Edition, 1997.
3. Joe L. Mott, Abraham Kandel, Theodore P. Baker, —Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall of India Learning Private Limited, New Delhi, India, 2<sup>nd</sup> Edition, 2010.

**REFERENCE BOOKS:**

1. Kenneth H. Rosen, —Discrete Mathematics and Its Applications, Tata Mcgraw-Hill, New Delhi, India, 6<sup>th</sup> Edition, 2012.
2. Ralph P. Grimaldi, B. V. Ramana, —Discrete and Combinatorial Mathematics - An Applied Introduction, Pearson Education, India, 5<sup>th</sup> Edition, 2011.
3. D. S. Malik, M. K. Sen, —Discrete Mathematical Structures: Theory and Applications, Thomson Course Technology, India, 1<sup>st</sup> Edition, 2004.

**COURSE OUTCOMES:**

After learning the concepts of this paper the student will be able to

Apply Propositional and Predicate logic for a variety of problems in various domains.

1. Understand Set Theory, Venn Diagrams, relations, functions and apply them to Real-world Scenarios.
2. Understand General properties of Algebraic systems and study lattices as partially ordered sets and their applications.
3. Solve the recurrence relations and can be used to optimize algorithms.
4. To identify the basic properties of graphs and trees and use these concepts to model simple applications.

<b>(R20A0585) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB</b>
--

**COURSE OBJECTIVES:**

1. To prepare students to become familiar with the Standard Java technologies of J2SE
2. To prepare students to excel in Object Oriented programming and to succeed as a Java Developer through global rigorous education.
3. To provide Students with a solid foundation in OOP fundamentals required to solve programming problems and also to learn Advanced Java topics like J2ME, J2EE, JSP, JavaScript
4. To inculcate in students professional and ethical attitude, multidisciplinary approach and an ability to relate Java programming issues to broader application context.
5. To provide student with an academic environment aware of excellence, written ethical codes and guidelines and lifelong learning needed for a successful professional career.

**Week 1:**

- a) Write a java program to find the Fibonacci series using recursive and non-recursive functions
- b) Write a program to multiply two given matrices.
- c) Write a program for Method overloading and Constructor overloading

**Week 2:**

- a) Write a program to demonstrate execution of static blocks ,static variables & static methods.
- b) Write a program to display the employee details using Scanner class
- c) Write a program for sorting a given list of names in ascending order

**Week 3:**

- a) Write a program to implement single and Multi level inheritance
- b) Write a program to implement Hierarchical Inheritance.
- c) Write a program to implement method overriding.

**Week 4:**

- a) Write a program to create an abstract class named Shape that contains two integers and an empty method named printArea (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea () that prints the area of the given shape.
- b) Write a program to implement Interface .
- c) Write a program to implement multiple and Hybrid Inheritance

**Week 5:**

- a) Write a program to create inner classes
- b) Write a program to create user defined package and demonstrate various access modifiers.
- c) Write a program to demonstrate the use of super and final keywords.

**Week 6 :**

- a) Write a program if number is less than 10 and greater than 50 it generate the exception out of range. else it displays the square of number.
- b) Write a program with multiple catch Statements.
- c) write a program to implement nested try

**Week 7:**

- a) Write a Program to implement simple Thread by extending Thread class and implementing runnable interface.
- b) Write a program that implements a multi-thread application that has three threads
- c) Write a program to set and print thread priorities

**Week 8:**

Write a program to implement following collections

- a) Array List b) Vector
- c) Hash table d) Stack

**Week 9:**

- a) Write a program to demonstrate lambda expressions.
- b) Write a program for producer and consumer problem using Threads

**Week 10:**

- a) Write a program to list all the files in a directory including the files present in all its subdirectories.
- b) Write a Program to Read the Content of a File Line by Line

**Week 11:**

- a) Write a program that connects to a database using JDBC display all records in a table.
- b) Write a program to connect to a database using JDBC and insert values into it.
- c) Write a program to connect to a database using JDBC and delete values from it

**Week 12:**

Write a program that works as a simple calculator. Use a Grid Layout to arrange Buttons for digits and for the + - \* % operations. Add a text field to display the result.

**COURSE OUTCOMES:**

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

1. Analyze the necessity for Object Oriented Programming paradigm and over structured programming and become familiar with the fundamental concepts in OOP.
2. Demonstrate an ability to design and develop Java programs, analyze, and interpret object oriented data and report results.
3. Analyze the distinguish between various types of inheritance.
4. Demonstrate an ability to design an object oriented system, AWT components or multithreaded process as per needs and specifications.  
Demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks like console and windows applications for standalone programs.

<b>(R20A0586) Database Management Systems Lab</b>
---

**COURSE OBJECTIVES:**

1. To familiarize database design concepts using ER modeling and Relational model.
2. To enable students to use SQL to query database and perform all types of operations and understanding normalization and effective database design principles
3. To enable students to use Non-Relational DBMS and understand the usage of Document oriented and distributed databases.
4. To enable the students to use TCL and DCL Commands and perform all states of Transaction operations.
5. To familiarize issues of concurrency control and transaction management

A. Practice on SQL Queries to acquire knowledge on RDBMS.

B. Case Study:

Objective: This lab enables the students to practice the concepts learnt in the subject DBMS by developing a database for an example company named "Roadway Travels" whose description is as follows. The student is expected to practice the designing, developing and querying a database in the context of example database -Roadway travels". Students are expected to use "Mysql" database.

Roadway Travels: "Roadway Travels" is in business since 1997 with several buses connecting different places in India. Its main office is located in Hyderabad.

The company wants to computerize its operations in the following areas:

1. Reservations and Ticketing

- Cancellations

- Reservations & Cancellation:

Reservations are directly handled by booking office. Reservations can be made 30 days in advance and tickets issued to passenger. One Passenger/person can book many tickets (to his/her family).

Cancellations are also directly handed at the booking office.

In the process of computerization of Roadway Travels you have to design and develop a Database which consists the data of Buses, Passengers, Tickets, and Reservation and cancellation details. You should also develop query's using SQL to retrieve the data from the database.

The above Process involves many steps like 1. Analyzing the problem and identifying the Entities and Relationships, 2. E-R Model, 3. Relational Model 4. Normalization 5. Creating the database 6. Querying. Students are supposed to work on these steps week wise and finally create a complete "Database System" to Roadway Travels. Examples are given at every experiment for guidance to students.

**WEEK 1: E-R Model**

Analyze the problem carefully and come up with the entities in it. Identify what data has to be persisted in the database. This contains the entities, attributes etc.

Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any.

Example:

Entities:

1. BUS
2. Ticket
3. Passenger

Relationships:

1. Reservation
2. Cancellation

PRIMARY KEY ATTRIBUTES:

1. Ticket ID (Ticket Entity)
2. Passport ID (Passenger Entity)
3. Bus\_No (Bus Entity)

Apart from the above mentioned entities you can identify more. The above mentioned are few.

Ex: Bus Entity

Ex: Reservation relationship

Note: The student is required to submit a document by writing the Entities and Keys to the lab teacher

WEEK 2: Concept design with E-R Model Note: -

Relate the entities appropriately. Apply cardinalities for each relationship. Identify strong entities and weak entities (if any). Indicate the type of relationships (total/partial). Try to incorporate Generalization, Aggregation, Specialization etc wherever required.

Note: The student is required to submit a document by drawing the E-R diagram to the lab teacher.

WEEK 3: Relational Model

Represent all the entities (Strong, Weak) in tabular fashion.

Represent relationships in a tabular fashion. There are different ways of representing relationships as tables based on the cardinality. Represent attribute as columns in tables or as tables based on the requirement. Different types of attributes (Composite, Multi-valued and Derived) have different way of Representation.

Example: The Passenger table looks as like below...

Note: You can add more attributes based on your E-R-Model

This is not normalized table.

Passenger Name Age Gender Address Ticket\_Id Passport\_Id

Note: The student is required to submit a document by represent relationships in a tabular fashion to the lab teacher.

WEEK 4: Normalization

Database normalization is a technique for designing relational database tables to minimize duplication of information and, in so doing, to safeguard the database against certain types of logical or structural problems, namely data anomalies. For example, when multiple instances of a given piece of information occur in a table, the possibility exists that these instances will not be kept consistent when the data within the table is updated, leading to a loss of data integrity. A table that is sufficiently normalized is less vulnerable to problems of this kind, because its structure reflects the basic assumptions for when multiple instances of the same information should be represented by a single instance only.

For the above table in the First normalization we can remove the multi valued attribute Ticket\_id and place it in another table along with the primary key of passenger.

First Normal Form: The above table can be divided into two tables as shown below.

Passenger Name Age Gender Address Passport\_Id

Note: Apply the second and third normal forms for the same example (if required you can consider more attributes)

Passport\_Id Ticket\_id

WEEK 5: Installation of Mysql / MongoDB and practicing DDL, commands

Installation of MySql / MongoDB. In this week you will learn Creating databases, How to create tables, altering the database, dropping tables and databases if not required. You will also try truncate, rename commands etc.

5.a) Example for creation of a normalized "Passenger" table. CREATE TABLE Passenger (Passport\_id INTEGER PRIMARY KEY, Name VARCHAR (50) Not NULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) Not NULL);

Similarly create all other tables.

Note: Detailed creation of tables is given at the end.

5.b) Installation of MongoDB

Installation of MongoDB on Windows, MongoDB is a cross-platform, document oriented database that provides, high performance, high availability, and easy scalability. MongoDB works on concept of collection and document. In this week You will Learn with MongoDB. How to create Database, Collection, Document, Field, Embedded Documents. Relationships in MongoDB represent how various documents are logically related to each other. Relationships can be modeled via Embedded and Referenced approaches.

Example: MongoDB db.createCollection(name, options) is used to create collection.

Basic syntax of createCollection() method

>use test

switched to db test

>db.createCollection("mycollection")

{ "ok" : 1 }

>

created collection by using the command show collections.

>show collections

mycollection

system.indexes

Experiment 6: Practicing DML commands

DML commands are used to for managing data within schema objects. Some examples:

- SELECT - retrieve data from the a database
- INSERT - insert data into a table
- UPDATE - updates existing data within a table
- DELETE - deletes all records from a table, the space for The records remain

Inserting values into "Bus" table:

Insert into Bus values(1234,'hyderabad', 'tirupathi');

Insert into Bus values (2345,'hyderabd' 'Banglore');

Insert into Bus values (23,'hyderabd','Kolkata');

Insert into Bus values (45,'Tirupathi','Banglore');  
 Insert into Bus values (34,'hyderabd','Chennai');  
 Inserting values into "Passenger" table:  
 Insert into Passenger values (1, 45,'ramesh', 45,'M', 'abc123');  
 Insert into Passenger values (2, 78,'geetha', 36,'F','abc124');  
 Insert into Passenger values (45, 90,' ram', 30,'M','abc12');  
 Insert into Passenger values (67, 89,' ravi', 50,'M','abc14');  
 Insert into Passenger values (56, 22,'seetha', 32,'F','abc55');  
 Few more Examples of DML commands:  
 Select \* from Bus; (selects all the attributes and display) UPDATE BUS SET Bus No = 1 WHERE S NO=2;

#### WEEK 7: Querying

In this week you are going to practice queries (along with sub queries) using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.

Practice the following Queries:

Display unique PNR\_no of all Passengers. Display all the names of male passengers. Display the ticket numbers and names of all the passengers.

Find the ticket numbers of the passengers whose name start with 'r' and ends with 'h'. Find the names of passengers whose age is between 30 and 45.

Display all the passengers names beginning with 'A' Display the sorted list of passengers names

#### WEEK 8 and WEEK 9:

- 1) You are going to practice queries using Aggregate functions (COUNT, SUM, AVG, and MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
- 2) Write a Query to display the Information present in the Passenger and cancellation tables. Hint: Use UNION Operator.
- 3) Display the number of days in a week on which the 9W01 bus is available.
- 4) Find number of tickets booked for each PNR\_no using GROUP BY CLAUSE. Hint: Use GROUP BY on PNR\_No.
- 5) Find the distinct PNR numbers that are present.
- 6) Find the number of tickets booked by a passenger where the number of seats is greater than 1.Hint: Use GROUP BY, WHERE and HAVING CLAUSES.
- 7) Find the total number of cancelled seats.

#### WEEK 10: Triggers

In this week you are going to work on Triggers. Creation of insert trigger, delete trigger, update trigger. Practice triggers using the above database.

Eample: CREATE TRIGGER updcheck BEFORE UPDATE ON passenger FOR EACH ROW BEGIN

```
IF NEW.Tickent NO > 60 THEN
SET New.Tickent no = Ticket no;
ELSE
SET New.Ticket no = 0;
END IF;
END;
```

#### WEEK 11: STORED PROCEDURES

In this session you are going to learn Creation of stored procedure, Execution of procedure and modification of procedure. Practice procedures using the above database.

Eample: CREATE PROCEDURE myProc()  
 BEGIN



```
SELECT COUNT(Tickets) FROM Ticket WHERE age>=40; End;
```

#### WEEK 12: DCL Commands

DCL commands are used to for granting the permissions for security of data within the users.

#### REFERENCE BOOKS:

1. Introduction to SQL, RickF. VanderLans,Pearson education..
2. Oracle PL/SQL, B.Rosenzweig and E.Silvestrova,Pearson education.
3. SQL & PL/SQL for Oracle 10g,B lack Book, Dr.P.S.Deshpande, Dream Tech.
4. Ora cle D atab a se 11 g P L/S QL P rogramming, M .M c Laughlin,TMH.
5. SQL Fundamentals, J.J.Patrick,Pearson Education.

#### COURSE OUTCOMES:

The students will be able:

- 1 To design a database based on the requirements by applying ER and Relational model.
- 2 To use normal forms for Schema Refinement and Transaction Management and SQL to interact with database to perform all types of DB operations.
- 3 To analyze the business requirements and produce a viable model for the implementation of document oriented and distributed databases.
- 4 To apply TCL and DCL Commands and to visualize all states of transaction operations.
- 5Analyze and Select storage and recovery techniques of database system

<b>(R20A0008) GLOBAL EDUCATION AND PROFESSIONAL CAREER</b>
--

### **Introduction**

In every era of human life, studying abroad has allowed one to experience another part of oneself in a different setting. Additionally, if all that hurry is geared towards success in one's career, international education will most definitely be worth one's time. It is not only an expedition of self-discovery but also an investment in one's resume.

The world, today, is redefining knowledge and great leadership to encompass critical values that are key to meeting modern career challenges. To meet the current requirements, a study delineating Global Education is of utmost importance towards prospective growth.

### **Course Objectives:**

1. To assist students to understand the broad scope of engineering.
2. To equip the students to study the academic subjects with better perspective of the expectations of the international standards
3. To familiarize students with the financial requirements and ways to receive monetary aid
4. To enable students' understanding of the various admission tests
5. To acquaint them with their own skill set and train the students towards skills development

### **Unit 1**

Importance and relevance of Engineering in today's and futuristic contexts.

The jobs that will thrive in the market in the coming decades. For eg., Robot Manufacturer & service Management, Big Data & AI Scientists, Artificial Bodies Manufacturer, Gene Designers, etc

### **Unit 2**

Countries and their entry requirements

Non-immigrant student visas, Work Permit visas

### **Unit 3**

Admission tests to colleges and universities world-over PSAT, SAT, TOEFL, AP, IELTS...

### **Unit 4**

Financial capacity requirements

Scholarships, Full scholarships, merit scholarships, on-campus jobs

### **Unit 5**

Skills Mapping

Match one's skills with jobs, Skills development

### **COURSE OUTCOMES**

After completion of the course, the students will be able to:

1. Comprehend the usage of engineering in various fields and disciplines.
2. Identify the right college and country to pursue higher education.

3. Prepare themselves for the skill-oriented academics and prospective growth.
4. Plan for their future education with the precise financial management.
5. Discover and discuss their skill set and the jobs that map their skills.

<b>( R20A0518) MACHINE LEARNING</b>
-------------------------------------

**COURSE OBJECTIVES:**

The students will be able:

1. Recognize the basic terminology and fundamental concepts of machine learning.
2. Understand the concepts of Supervised Learning models with a focus on recent advancements.
3. Acquire the Concepts of Neural Networks Models of supervised Learning
4. Discover unsupervised learning paradigms of machine learning
5. Understand the concepts of Reinforcement learning and Ensemble methods.

**UNIT – I**

Introduction: Introduction to Machine learning, Supervised learning, Unsupervised learning, Reinforcement learning. Deep learning.

Feature Selection: Filter, Wrapper, Embedded methods.

Feature Normalization:- min-max normalization, z-score normalization, and constant factor normalization

Introduction to Dimensionality Reduction: Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA)

**UNIT – II**

Supervised Learning – I (Regression/Classification)

Regression models: Simple Linear Regression, multiple linear Regression. Cost Function, Gradient Descent, Performance Metrics: Mean Absolute Error(MAE), Mean Squared Error(MSE) R-Squared error, Adjusted R Square.

Classification models: Decision Trees-ID3, CART, Naive Bayes, K-Nearest-Neighbours (KNN), Logistic Regression, Multinomial Logistic Regression

Support Vector Machines (SVM) - Nonlinearity and Kernel Methods

**UNIT – III**

Supervised Learning – II (Neural Networks)

Neural Network Representation – Problems – Perceptrons, Activation Functions, Artificial Neural Networks (ANN) , Back Propagation Algorithm.

Convolutional Neural Networks - Convolution and Pooling layers, , Recurrent Neural Networks (RNN).

Classification Metrics: Confusion matrix, Precision, Recall, Accuracy, F-Score, ROC curves

**UNIT - IV**

Model Validation in Classification : Cross Validation - Holdout Method, K-Fold, Stratified K-Fold, Leave-One-Out Cross Validation. Bias-Variance tradeoff, Regularization , Overfitting, Underfitting. Ensemble Methods: Boosting, Bagging, Random Forest.

**UNIT – V**

Unsupervised Learning : Clustering-K-means, K-Modes, K-Prototypes, Gaussian Mixture Models, Expectation-Maximization.

Reinforcement Learning: Exploration and exploitation trade-offs, non-associative learning, Markov decision processes, Q-learning.

**TEXT BOOKS:**

1. Machine Learning –Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson .
2. Foundations of Machine Learning, Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, MIT Press.
3. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press,2012

**REFERENCE BOOKS:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
3. Machine Learning Yearning, Andrew Ng.
4. Data Mining—Concepts and Techniques - Jiawei Han and Micheline Kamber, Morgan Kaufmann

**COURSE OUTCOMES:**

The students will be able:

1. Analyze the concepts and able to prepare the dataset for different Machine learning models.
2. Identify and Apply appropriate Supervised Learning models.
3. Build and Design Neural Network models for the given data.
4. Perform Evaluation of Machine Learning algorithms and Model Selection.
5. Compare supervised, un-supervised and Reinforcement learning models.

(R20A0510) COMPUTER NETWORKS

**COURSE OBJECTIVES:**

1. To introduce the fundamental types of computer networks.
2. To demonstrate the TCP/IP & OSI model merits & demerits.
3. To know the role of various protocols in Networking.
4. To know about different error and flow controls
5. To know about Application layers

**UNIT - I:**

**Introduction:** Network, Uses of Networks, Types of Networks, Reference Models: TCP/IP Model, The OSI Model, and Comparison of the OSI and TCP/IP reference model.

**Physical Layer:** Guided transmission media, Wireless transmission media, Switching

**UNIT - II:**

**Data Link Layer** - Design issues, Error Detection & Correction, Elementary Data Link Layer Protocols, and Sliding window protocols. Multiple Access Protocols - ALOHA, CSMA, CSMA/CD, CSMA/CA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer.

**UNIT - III:**

**Network Layer:** Network Layer Design issues, store and forward packet switching connection less and connection oriented networks, routing algorithms: optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Link State Routing, Path Vector Routing, Hierarchical Routing; Congestion control algorithms, IP addresses, CIDR, Sub netting, Super Netting, IPv4, Packet Fragmentation, IPv6 Protocol, Transition from IPv4 to IPv6, ARP, RARP.

**UNIT - IV:**

**Transport Layer:** Services provided to the upper layers elements of transport protocol, addressing, connection establishment, Connection release, Error Control & Flow Control, Crash Recovery.

**The Internet Transport Protocols:** UDP, Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Sliding Window, The TCP Congestion Control Algorithm.

**UNIT - V:** Application Layer- Introduction, providing services, Applications layer paradigms: Client server model, HTTP, E-mail, WWW, TELNET, DNS.

**TEXT BOOKS:**

1. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
2. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.

**REFERENCES BOOKS:**

1. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3<sup>rd</sup> Edition, Pearson Education.

**COURSE OUTCOMES:**

1. Students should be understand and explore the basics of Computer Networks and Various Protocols.
2. Student will be in a position to understand the World Wide Web concepts.
3. Students will be in a position to administrate a network and flow of information further.
4. Student will be in position know various application layers.
5. Student will be know how work with error handlings.

<b>(R20A0516) FULL STACK WEB DEVELOPMENT</b>
--

**COURSE OBJECTIVES:**

1. To learn the core concepts of both the frontend and backend programming course.
2. To get familiar with the latest web development technologies.
3. To learn all about databases.
4. To learn complete web development process
5. To provide an in-depth study of the various web development tools

**UNIT - I:**

Web Development Basics: Web development Basics - HTML & Web servers Shell - UNIX CLI  
Versioncontrol - Git & Github HTML, CSS

**UNIT - II:**

Frontend Development: Javascript basics OOPS Aspects of JavaScript Memory usage and Functions in JS AJAX for data exchange with server jQuery Framework jQuery events, UI components etc.JSON data format.

**UNIT - III:**

REACT JS: Introduction to React Router and Single Page Applications React Forms, Flow Architecture and Introduction to Redux More Redux and Client-Server Communication

**UNIT- IV:**

Java Web Development:JAVA PROGRAMMING BASICS, Model View Controller (MVC)  
Pattern MVCArchitecture using Spring RESTful API using Spring Framework Building an application using Maven

**UNIT - V:**

Databases & Deployment:Relational schemas and normalization Structured Query Language (SQL) Data persistence using Spring JDBC Agile development principles and deploying application in Cloud

**TEXT BOOKS:**

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript forWeb Developers Book by Nicholas C. Zakas
2. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites byRobin Nixon
3. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015 BY AZAT MARDAN



**REFERENCE BOOKS:**

1. Full-Stack JavaScript Development by Eric Bush.
2. Mastering Full Stack React Web Development Paperback – April 28, 2017 by Tomasz Dyl , Kamil Przeorski , Maciej Czarnecki

**COURSE OUTCOMES:**

1. Develop a fully functioning website and deploy on a web server.
2. Gain Knowledge about the front end and back end Tools
3. Find and use code packages based on their documentation to produce working results in a project.
4. Create webpages that function using external data.
5. Gain an understanding about the databases.

**(R20A1204) IMAGE PROCESSING  
(PROFESSIONAL ELECTIVE-I)**

**OBJECTIVES:**

1. Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
2. Provides the knowledge of image acquisition; sampling and quantization.
3. Preprocessing and enhancement.
4. Image restoration, and segmentation.
5. Knowledge of different image compression techniques.

**UNIT - I**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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, 2<sup>nd</sup> Ed, 2004.

**REFERENCES:**

1. Fundamentals of Digital Image Processing: **A. K. Jain**, PHI.
2. Digital Image Processing using MATLAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wiley, 3<sup>rd</sup> Edition, 2004.

4. Image Processing, Analysis and Machine Vision, Second Edition, Milan Sonka, aclav Hlavac and Roger Boyle, Cengage learning.
5. Digital Image Processing, W.K.Pratt, 4<sup>th</sup> edition John Wiley & sons.
6. Digital Image Processing, S.Jayaraman, S.Esakkirajan, T.Veerakumar, TMH.
7. Digital Image Processing, S.Sridhar, Oxford University Press

**COURSE OUTCOMES:**

1. Understand the theoretical and mathematical foundations of Digital Image Processing.
2. Explain different image acquisition, sampling and quantization methods;
3. Perform Preprocessing and image enhancement operations on given images
4. Apply different Image restoration, and segmentation techniques.
5. Perform different image compression techniques.

**(R20A07302) INFORMATION RETRIEVAL SYSTEMS**  
**PROFESSIONAL ELECTIVE - I**

**Objectives:**

- To provide the knowledge on information retrieval system capabilities.
- To introduce different computational search problems and evaluate search engines.
- To introduce different applications of informational retrieval techniques in the internet or Web environment.
- To discuss about information visualization and system evaluation.

**Unit-1** Introduction to Information Retrieval Systems

Introduction: 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-2** Cataloging and Indexing

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-3** Automatic Indexing

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 User Search Techniques

**Unit-4**

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-5** Text Search Algorithms

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 BOOK**

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer
- 2.

## REFERENCES

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.

## Outcomes:

Students will be able to

- Understand various functionalities and capabilities of Information Retrieval System.
- Gain knowledge on cataloging and data structure methodology for IRS.
- Differentiate various clustering algorithms and indexing.
- Differentiate various user search techniques and system search techniques.
- Understand the concepts of information visualization and text search.

<p align="center"><b>(R20A7204) R PROGRAMMING PROFESSIONAL</b> <b>ELECTIVE - V</b></p>
--

Course objectives:

This course will enable students to

1. Understanding the basic concepts of R –programming
2. Gain knowledge in List and Frames in R –programming.
3. Understand Operators, Loops, Function in R –programming .
4. Understand Factors and Tables in R –programming .
5. Gain knowledge in R –programming Structures

**UNIT – I**

Introduction: R – OVERVIEW-Evolution of R -Features of R . Installaton- R – ENVIRONMENT SETUP - Local Environment Setup- BASIC SYNTAX -R Command Prompt - Script File - R – DATA TYPES -Vectors - Lists -Matrices –Arrays Factors -Data Frames - R – VARIABLES -Variable Assignment -Data Type of a Variable Finding Variables -Deleting Variables

**UNIT - II**

OPERATORS: R – OPERATORS -Types of Operators -Arithmetic Operators-Relational Operators-Logical Operators Assignment Operators-Miscellaneous Operators - R – DECISION MAKING -R - If Statement-R – If...Else Statement -The if...else if...else -Switch Statement - R – LOOP-R - Repeat LoopR - While Loop - R – For Loop -Loop Control Statements-R-Break statement -R – Next Statement . R – FUNCTION - Function Definition -Function Components -Built-in Function –User-defined Function Calling a Function -Lazy Evaluation of Function –User-defined Function -Calling a Function

**UNIT – III**

LISTS AND FRAMES: LISTS- LISTS -Creating a -Naming List Elements - Accessing List Elements - Manipulating List Elements -Merging Lists Converting List to Vector - R – MATRICES -Accessing Elements of a Matrix - Matrix Computation-ARRAYS -Naming Columns and Rows -Accessing Array Elements-Manipulating Array Elements - R – FACTORS -Factors in Data Frame -Changing the Order of Levels -Generating Factor Levels 16. R – DATA FRAMES -Extract Data from Data Frame

## **UNIT – IV**

FACTORS AND TABLES: Common Functions Used with Factors- The `tapply()` Function - The `split()` Function -The `by()` Function - Working with Tables- Matrix/Array-Like Operations on Tables- Extended Example: Extracting a Subtable- Extended Example: Finding the Largest Cells in a Table- Table-Related Functions- The `aggregate()` Function- The `cut()` Function

## **UNIT - V**

R PROGRAMMING STRUCTURES :Control Statements- Loops- Looping Over Nonvector Sets - if-else- Arithmetic and Boolean Operators and Values- Default Values for Argument- Return Values- Deciding Whether to Explicitly Call `return()` - Returning Complex Object- Functions Are Objects..

## **TEXT BOOKS**

1. Matloff, Norman. The art of R programming: A tour of statistical software design. No Starch Press, 2011.

## **REFERENCE BOOKS**

1. Crawley, Michael J. The R book. John Wiley & Sons, 2012.

## **Course outcomes:**

At the end of the course the students will be able to

1. Learn about R fundamentals
2. Know to implement R operator and R functions
3. Learn to work with Lists and Frames
4. Be able to work with Tables
5. Know about basic Programming Structures in R

(R20A7305) COMPUTER VISION  
PROFESSIONAL ELECTIVE - II

**COURSE OBJECTIVES**

1. To introduce various components of image processing techniques for computer vision.
2. To understand filters and computing Image Gradient.
3. To understand segmentation, model fitting and tracking
4. To impart knowledge about object registration and object matching
5. To implement various techniques available for object recognition.

**UNIT-I**

**IMAGE FORMATION:** Geometric Camera Models, Intrinsic and Extrinsic Parameters, Geometric Camera Calibration – Linear and Non – linear approach, Light and Shading - Inference from, Modeling Inter reflection, Human Color Perception.

**UNIT-II**

**EARLY VISION:** Linear Filters - Convolution, Fourier Transforms, Sampling and Aliasing, Filters as Templates, Correlation, Local Image Features - Computing the Image Gradient, Gradient-Based Edge Detectors, Orientations, Texture - Local Texture Representations Using Filters, Shape from Texture.

**UNIT-III**

**MID-LEVEL VISION:** Segmentation by Clustering - Basic Clustering Methods, The Watershed Algorithm, Segmentation Using K-means, Grouping and Model Fitting - Fitting Lines with the Hough Transform, Fitting Curved Structures, Tracking - Tracking by Detection, Tracking Translations by Matching, Tracking Linear Dynamical Models with Kalman Filters.

**UNIT-IV**

**HIGH-LEVEL VISION:** Registration, Registering Rigid and Deformable Objects, Smooth Surfaces and Their Outlines - Contour Geometry, Koenderink's Theorem, The Bitangent Ray Manifold, Object Matching using Interpretation Trees and Spin Images, Classification, Error, and Loss.

**UNIT-V**

**OBJECT DETECTION AND RECOGNITION:** Detecting Objects in Images - The Sliding Window Method, Face Detection, Detecting Humans, Boundaries and Deformable Objects, Object Recognition – Categorization, Selection, Applications – Tracking People, Activity Recognition.

**TEXT BOOKS:**

1. Forsyth, Jean Ponce David A. "Computer Vision: A Modern Approach", Second Edition, Pearson Education Limited 2015.
2. Szeliski, Richard, "Computer vision: algorithms and applications", Springer Science & Business Media, 2010.



**REFERENCE BOOKS:**

- 1.Hau, Chen Chi, "Handbook of pattern recognition and computer vision", World Scientific, Fifth Edition, 2015.
- 2.Muhammad Sarfraz, "Computer Vision and Image Processing in Intelligent Systems and Multimedia Technologies", IGI Global, 2014.
- 3.Theo Gevers, ArjanGijzenij, Joost van de Weijer, Jan-Mark Geusebroek "Color in Computer Vision: Fundamentals and Applications", Wiley, 2012.
- 4.Kale, K. V, Mehrotra S.C, Manza. R.R., "Advances in Computer Vision and Information Technology", IK International Pvt Ltd, 2013.

**COURSE OUTCOMES:**

1. Understand various image formation models.
2. Extract shape, texture and edge based features.
3. Detect region of interest using image segmentation and object localization techniques.
4. Identify and recognize objects using image registration and classification.
5. Explore various case studies on vision based applications.

**(R20A6604) SOFT COMPUTING  
PROFESSIONAL ELECTIVE - II**

**Course Objectives:**

1. Familiarize with soft computing concepts
2. Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
3. Familiarize the Neuro-Fuzzy modeling using Classification and Clustering techniques
4. Learn the concepts of Genetic algorithm and its applications
5. Acquire the knowledge of Rough Sets.

**UNIT - I**

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.

**UNIT-II**

Fuzzy Systems: Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems

**UNIT-III**

Fuzzy Decision Making, Particle Swarm Optimization

**UNIT-IV**

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

**UNIT-V**

Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

**TEXT BOOK:**

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha – Cengage Learning

**REFERENCE BOOKS:**

1. S. N. Sivanandam & S. N. Deepa, "Principles of Soft Computing", 2nd edition, Wiley India, 2008.
2. David E. Goldberg, "Genetic Algorithms-In Search, optimization and Machine learning", Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson Education, 2004.
4. G.J. Klir & B. Yuan, "Fuzzy Sets & Fuzzy Logic", PHI, 1995.

5. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.
6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw- Hill International editions, 1995

**Course Outcomes:**

On completion of this course, the students will be able to:

1. Identify the difference between Conventional Artificial Intelligence to Computational Intelligence.
2. Understand fuzzy logic and reasoning to handle and solve engineering problems
3. Apply the Classification and clustering techniques on various applications.
4. Understand the advanced neural networks and its applications
5. Perform various operations of genetic algorithms, Rough Sets.
6. Comprehend various techniques to build model for various applications

**(R20A1202) AUTOMATA & COMPILER DESIGN**

**COURSE OBJECTIVES: -**

- To provide an understanding of automata, grammars, language translators.
- To know the various techniques used in compiler construction.
- To be aware of the process of semantic analysis.
- To analyze the code optimization & code generation techniques.

**UNIT - I:**

**Formal Language and Regular Expressions:** Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Context Free grammars and parsing, derivation, parse trees, Application of Finite Automata.

**UNIT - II:**

**Introduction To Compiler,** Phases of Compilation, ambiguity LL(K) grammars and LL(1) parsing Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification.

**Semantics:** Syntax directed translation, S-attributed and L-attributed grammars,

**UNIT - III:** Intermediate code – abstract syntax tree, translation of simple statements and control flow statements. **Context Sensitive features** – Chomsky hierarchy of languages and recognizers, type checking, type conversions, equivalence of type expressions, overloading of functions and operations.

**UNIT - IV:**

**Run time storage:** Storage organization, storage allocation strategies scope access to nonlocal names, **Code optimization:** Principal sources of optimization, optimization of basic blocks, peephole optimization,

**UNIT - V:**

**Code generation:** Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block.

**TEXT BOOKS:**

1. Introduction to Theory of computation. Sipser, 2nd Edition, Thomson.
2. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

**REFERENCES:**

1. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.

2. Compiler Construction, LOUDEN, Thomson.
3. Elements of Compiler Design, A. Meduna, Auerbach Publications, Taylor and Francis Group.
4. Principles of Compiler Design, V. Raghavan, TMH.
5. Engineering a Compiler, K. D. Cooper, L. Torczon, ELSEVIER.
6. Introduction to Formal Languages and Automata Theory and Computation - Kamala Krithivasan and Rama R, Pearson.
7. Modern Compiler Design, D. Grune and others, Wiley-India.
8. A Text book on Automata Theory, S. F. B. Nasir, P. K. Srimani, Cambridge Univ. Press.
9. Automata and Language, A. Meduna, Springer.

***COURSE OUTCOMES:***

- Understand the necessity and types of different language translators in use.
- Apply the techniques and design different components (phases) of a compiler.
- Ability to implement practical aspects of automata theory.
- Use the tools Lex, Yacc in compiler construction

**(R20A6604) SOFT COMPUTING**  
**PROFESSIONAL ELECTIVE - II**

**Course Objectives:**

1. Familiarize with soft computing concepts
2. Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
3. Familiarize the Neuro-Fuzzy modeling using Classification and Clustering techniques
4. Learn the concepts of Genetic algorithm and its applications
5. Acquire the knowledge of Rough Sets.

**UNIT - I**

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.

**UNIT-II**

Fuzzy Systems: Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems

**UNIT-III**

Fuzzy Decision Making, Particle Swarm Optimization

**UNIT-IV**

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

**UNIT-V**

Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

**TEXT BOOK:**

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha –  
Cengage Learning

**REFERENCE BOOKS:**

1. S. N. Sivanandam & S. N. Deepa, "Principles of Soft Computing", 2nd edition, Wiley India, 2008.
2. David E. Goldberg, "Genetic Algorithms-In Search, optimization and Machine learning", Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson Education, 2004.
4. G.J. Klir & B. Yuan, "Fuzzy Sets & Fuzzy Logic", PHI, 1995.
5. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.

6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw- Hill International editions, 1995

**Course Outcomes:**

On completion of this course, the students will be able to:

7. Identify the difference between Conventional Artificial Intelligence to Computational Intelligence.
8. Understand fuzzy logic and reasoning to handle and solve engineering problems
9. Apply the Classification and clustering techniques on various applications.
10. Understand the advanced neural networks and its applications
11. Perform various operations of genetic algorithms, Rough Sets.
12. Comprehend various techniques to build model for various applications

**M R C E T CAMPUS | AUTONOMOUS INSTITUTION - UGC, GOVT. OF INDIA**  
**III Year B.Tech. AI&DS- I Sem**

**L/T/P/C**  
**0/-/3/1.5**

<b>(R20A0589) FULL STACK DEVELOPMENT LAB</b>
--

**COURSE OBJECTIVES:**

1. Systematic Introduction to Web Designing
2. Getting familiar with the front and back end tools
3. Creating applications using HTML, CSS, Javascript
4. Implementing various applications using JQuery
5. Creating Websites

**Week-1.** Write a program to create a simple webpage using HTML.

**Week-2.** Write a program to create a website using HTML CSS and JavaScript?

**Week-3.** Write a program to build a Chat module using HTML CSS and JavaScript?

**Week-4.** Write a program to create a simple calculator Application using React JS

**Week-5.** Write a program to create a voting application using React JS

**Week-6.** Write a program to create and Build a Password Strength Check using JQuery.

**Week-7.** Write a program to create and Build a star rating system using JQuery.

**Week-8.** Create a project on **Project Management application**

This is going to be the toughest of all with a lot of features. They should have a framework of a basic social media site with users being able to communicate with each other. Users should be able to create projects and tasks within projects.

Users must be able to assign tasks to other users and must be able to comment on it just like on a social media post. To start with, each user can have a calendar view and a kanban style board. Users must be able to close and archive tasks as well as projects when completed.

**Week-9.** Create a project on Content Management System for a blog

Using the CMS users must be able to design a web page using the drag and drop method. Users should be able to add textual or media content into placeholders that are attached to locations on the web page using drag and drop method.

**Week-10.** Create a project on **Grocery delivery application**

Assume this project is for a huge online departmental store. Assume that they have a myriad of grocery items at their godown. All items must be listed on the website, along with their quantities and prices.

Users must be able to sign up and purchase groceries. The system should present him with delivery slot options, and the user must be able to choose his preferred slot. Users must then be taken to the payment page where he makes the payment with his favourite method.

**Week-11.** Create a project **e-commerce portal for used furniture sales**

Assume this project is for a startup that is acquiring used furniture from users at a price, refurbishing them and selling them off at a margin. The website must display second-hand furniture that is currently being sold.

Users must be able to sign up on the site and set up their profile. Users must be able to search for their required products and checkout to the payment page. Once payment is successful, the expected time of product arrival must be communicated to the user via email as well as displayed on the order page.

Users must also be able to sell used furniture to the company. Users must be able to upload pictures of the items they intend to sell. Based on the images, company admins must be able to decide whether to buy or not.

**COURSE OUTCOMES:**

Students will be able to understand

1. Usage of various front and back end Tools
2. They can understand and create applications on their own
3. Demonstrate and Designing of Websites can be carried out.
4. Hands on experience on Databases.



5.Capable of working on both front and back end Tools

### **Lab Objectives**

1. Familiarity with the Prolog programming environment & Systematic introduction to Prolog programming constructs
2. Learning basic concepts of Prolog through illustrative examples and small exercises & Understanding list data structure in Prolog.
3. To introduce students to the basic concepts and techniques of Machine Learning.
4. To become familiar with regression methods, classification methods, clustering methods.
5. To become familiar with Dimensionality reduction Techniques.

### **Study of PROLOG; Write the following programs using PROLOG**

**Week 1:** Implementation of DFS for water jug problem using PROLOG

**Week 2:** Implementation of BFS for tic-tac-toe problem using PROLOG

**Week 3:** Solve 8-puzzle problem using best first search

**Week 4:** Write a program to solve 8 queens problem

**Week 5:** Implementation of TSP using heuristic approach using Prolog

**Week 6:** Implementation of Simulated Annealing Algorithm using PROLOG

**Week 7:** Implementation of Hill-climbing to solve 8- Puzzle Problem

### **Machine Learning Laboratory**

#### **Week-1**

##### **Data Extraction, Wrangling**

1. Loading different types of dataset in Python
2. Arranging the data

#### **Week-2**

##### **Data Visualization**

1. Handling missing values
2. Plotting the graphs

#### **Week-3**

##### **Supervised Learning**

1. Implementation of Linear Regression
2. Implementation of Logistic regression

**Week-4****Supervised Learning**

1. Implementation of Decision tree classification
2. Implementation of K-nearest Neighbor

**Week-5****Supervised Learning**

1. Implementation of Naïve Bayes classifier algorithm
2. Implementation of SVM Classification

**Week-6****Dimensionality Reduction**

1. Implementation of PCA
2. Implementation of LDA

**Week-7****Unsupervised Learning**

1. Implementing K-means Clustering
2. Implementing Hierarchical Clustering

**Lab Outcomes**

1. Apply various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction,)
2. Understand the fundamentals of knowledge representation, inference and theorem proving using AI tools
3. Gain knowledge about basic concepts of Machine Learning
4. Identify machine learning techniques suitable for a given problem & Solve the problems using various machine learning techniques
5. Apply Dimensionality reduction techniques
6. Design application using machine learning techniques.

**(R20A0006) TECHNICAL COMMUNICATION AND SOFT SKILLS**

**INTRODUCTION:**

‘Technical Communication and Soft skills’ focus on enhancing students’ communication skills. Various technical writing styles and skills are developed. Students’ placement needs met by giving them an exposure to group discussions and mock interviews. Soft skills such as building positive relationships and teamwork are also emphasized.

The trainee hones these skills under the guidance of the instructor whose constant evaluation helps in the professional development of students. This course fulfils the need of the aspirants in acquiring and refining the skills required for placements and professional success.

**COURSE OBJECTIVES:**

1. To make the students recognize the role of technical English in their academic and professional fields
2. To improve language proficiency and to develop the required professional ethics
3. To equip students, organize, comprehend, write, and present, short and long forms of any technical work within the broad framework of the Scientific Method
4. To facilitate communication about projects and ideas throughout the industry and also to the non-technical people
5. To display professional behaviors and body language

**UNIT I – Effective Presentations**

Just-a-Minute sessions, Formal versus informal communication, Non-verbal communication; Concord: Subject-verb agreement

**UNIT 2 - Professional Communication**

Role Plays, Persuasion techniques, Presentation aids, Body language, Importance of listening in effective communication; Email Writing, Business Letter Writing, Letters of complaint, enquiry, responses; Memo Writing; Transformation of Sentences

**UNIT 3 – Career Planning**

Oral Presentations, Techniques of Listening Skills, types of Group discussions; Etiquette, Protocol; Resume Writing, Cover letter, Writing a statement of purpose; Tenses

**UNIT 4 - Technical Writing**

Group Discussion, Principles of Effective Writing; Paragraph writing, Advanced Essay Writing, Expansion for or against the essay, Narrative essay, Descriptive essay; Technical Report Writing, Format & Style; Active & Passive Voice

**UNIT 5 – Academic Writing**

Mock Interview sessions, facing interviews; Correction of Sentences

**REFERENCE BOOKS:**

1. R.K. Narayan, The Guide, Viking Press, 1958

2. David F. Beer and David Mc Murrey, Guide to writing as an Engineer, John Willey. New York, 2004
3. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
4. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
5. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
6. Meenakshi Raman, Prakash Singh, Business communication, Oxford Publication, New Delhi 2012.
7. Dale Jung k, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
8. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
9. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

**COURSE OUTCOMES:**

After completion of the course, the Students will be able to

1. Understand information which assists in completion of the assigned job tasks more successfully.
2. Communicate his ideas by writing projects, reports, instructions, diagrams and many other forms of professional writing.
3. Adhere to ethical norms of scientific communication.
4. Strengthen their individual and collaborative work strategies.
5. Successfully market themselves and sell themselves to the employer of their choice.

**(R20A1205) DATA WAREHOUSING AND DATA MINING**

**COURSE OBJECTIVES:**

1. Study data warehouse principles
2. Study and its working learn data mining concepts
3. Understand association rules mining.
4. Discuss classification algorithms
5. Learn how data is grouped using clustering techniques.

**UNIT-I**

Data warehouse: Introduction to Data warehouse, Difference between operational database systems and data warehouses, Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction-Transformation-Loading, Logical(Multi-Dimensional), Data Modeling, Schema Design, Star and Snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi- Addictive, Non Addictive Measures; Fact-Less-Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

**UNIT-II**

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major issues in Data Mining.

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration & Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

**UNIT-III**

Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.

**UNIT-IV**

Classification: Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers , Classification techniques, Decision Trees-Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction ; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics.

**UNIT-V**

Clustering: Clustering Overview, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, , Partitioning Clustering-K-Means Algorithm, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Key Issues in Hierarchical Clustering, Strengths and Weakness, Outlier Detection.

**TEXT BOOKS:**

1. Data Mining- Concepts and -1.chniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers,Elsevier, 2 Edition, 2006.
2. Introduction to Data Mining, Psng-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.

**REFERENCE BOOKS:**

1. Data Mining Techniques, Arun KPujari, 3rd Edition, Universities Press.
2. Data Warehousing Fundament's, Pualraj Ponnaiah, Wiley Student Edition.
3. The Data Warehouse Life CycleToolkit — Ralph Kimball, Wiley Student Edition.
4. Data Mining, Vikaram Pudi, P Rddha Krishna, Oxford University Press

**OUTCOMES:**

1. Student should be able to understand why the data warehouse in addition to database systems.
2. Ability to perform the pre-processing of data and apply mining techniques on it.
3. Ability to identify the association rules,
4. Ability to identify classification techniques.
5. Ability to identify clusters in large data sets.

<b>(R20A0519) BIG DATA ANALYTICS</b>
--------------------------------------

**Course Objective:**

1. To study about design of Data and Management for Analysis
2. To introduce about the work place safety.
3. To introduce big data tools & Information Standard formats.
4. To study about Machine Learning Algorithms & Data Visualization.

**UNIT I**

**INTRODUCTION TO BIG DATA AND ANALYTICS**

Classification of Digital Data, Structured and Unstructured Data - Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Why Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments - Basically Available Soft State Eventual Consistency - Top Analytics Tools

**UNIT II**

**INTRODUCTION TO TECHNOLOGY LANDSCAPE**

NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem

**UNIT III**

**INTRODUCTION TO MONGODB AND MAPREDUCE PROGRAMMING**

MongoDB: Why Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language  
MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression

**UNIT IV**

**INTRODUCTION TO HIVE AND PIG**

Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having - RCFile Implementation - Hive User Defined Function - Serialization and Deserialization. Pig: Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution - Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive

**UNIT V**

**INTRODUCTION TO DATA ANALYTICS WITH R**

Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Machine Learning Algorithms: Regression Model, Clustering, Collaborative Filtering, Associate Rule Making, Decision Tree, Big Data Analytics with BigR.



**Text Book:**

1. Seema Acharya, SubhashiniChellappan, "Big Data and Analytics", Wiley Publications, First Edition,2015

**Reference Book:**

1. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big data for dummies", John Wiley & Sons, Inc. (2013)
2. Tom White, "Hadoop The Definitive Guide", O'Reilly Publications, Fourth Edition, 2015
3. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, "Hadoop For Dummies", Wiley Publications, 2014
4. Robert D.Schneider, "Hadoop For Dummies", John Wiley & Sons, Inc. (2012)
5. Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, "Hadoop In Action", Dreamtech Publications, 2010

**Course Outcomes:**

Upon completion of this course, student shall be able to

1. Design the Data for Data Analytics
2. Understand the work place Safety Features
3. Work on the tools like Hadoop, Scala
4. Obtain fair knowledge on Information standard formats
5. Understand the Machine learning algorithms and visualize the data

**(R20A0525) BLOCKCHAIN TECHNOLOGY**  
**PROFESSIONAL ELECTIVE - III**

**COURSE OBJECTIVES**

By the end of the course, students will be able to

1. Understand how blockchain systems (mainly Bitcoin and Ethereum) work,
2. To securely interact with them,
3. Design, build, and deploy smart contracts and distributed applications,
4. Integrate ideas from blockchain technology into their own projects.

**Unit I: Basics:**

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

**Unit II: Blockchain:**

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

**Unit III: Distributed Consensus:**

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

**Unit IV: Cryptocurrency:**

History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Solidity- Smart Contract, Truffle, GHOST, Vulnerability, Attacks, Sidechain, Namecoin comparing Bitcoin scripting vs. Ethereum Smart Contracts

**Unit V: Cryptocurrency Regulation:**

Stakeholders, Roots of Bitcoin, Legal Aspects- Currency, Token, Tokenizing, Cryptocurrency Exchange, Black Market and Global Economy.

**Text Book**

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
2. Draft version of "S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.

**Reference Books**

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger," Yellow

paper.2014.

4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smartcontracts

### **COURSE OUTCOMES**

1. Explain design principles of Bitcoin and Ethereum.
2. Explain Nakamoto consensus.
3. Explain the Simplified Payment Verification protocol.
4. List and describe differences between proof-of-work and proof-of-stake consensus.
5. Evaluate security, privacy, and efficiency of a given blockchain system.

**(R20A7201) TEXT ANALYTICS**  
**PROFESSIONAL ELECTIVE - III**

**COURSE OBJECTIVES:**

1. Describe text extraction techniques.
2. Differentiate clustering and classification techniques on text.
3. Analyze visualization methodologies.
4. Illustrate about event detection methods and embedding semantics in models.
5. Compare feature extraction methods

**UNIT - I: TEXT EXTRACTION**

Text Extraction: Introduction, Rapid automatic keyword extraction: candidate keywords, keyword scores, adjoining keywords, extracted keywords, Benchmark evaluation: precision and recall, efficiency, stop list generation, Evaluation on new articles.

**UNIT - II: CLUSTERING**

Clustering: Multilingual document clustering: Multilingual LSA, Tucker1 method, PARAFAC2 method, LSA with term alignments, LMSA, LMSA with term alignments.

**UNIT - III: CLASSIFICATION**

Classification: Content-based spam email classification using machine-learning algorithms, Utilizing nonnegative matrix factorization for email classification problems, Constrained clustering with k-means type algorithms.

**UNIT - IV: ANOMALY AND TREND DETECTION**

Anomaly and trend detection: Text Visualization techniques such as tag clouds, authorship and change tracking, Data Exploration and the search for novel patterns, sentiment tracking, visual analytics and Future Lens, scenario discovery, adaptive threshold setting for novelty mining.

**UNIT - V: TEXT STREAMS**

Text streams: Introduction, Text streams, Feature extraction and data reduction, Event detection, Trend detection, Event and trend descriptions, Embedding semantics in LDA topic models: Introduction, vector space modeling, latent semantic analysis, probabilistic latent semantic analysis, Latent Dirichlet allocation, embedding external semantics from Wikipedia, data-driven semantic embedding.

**TEXT BOOKS:**

1. Michael W. Berry & Jacob Kogan , "Text Mining Applications and Theory", Wiley publications.
2. Aggarwal, Charu C., and Cheng Xiang Zhai, eds. mining text data. Springer Science & Business Media, 2012.

**REFERENCE BOOKS:**

1. Miner, Gary, et al. Practical text mining and statistical analysis for non-structured text data applications. Academic Press, 2012.
2. Srivastava, Ashok N., and Mehran Sahami. Text mining: Classification, clustering, and applications, Chapman and Hall/CRC, 2009.
3. Buitelaar, Paul, Philipp Cimiano, and Bernardo Magnini, eds. Ontology learning from text: methods, evaluation and applications. Vol. 123. IOS press, 2005.

**COURSE OUTCOMES:**

Upon completion of this course, the students will be able to:

1. Design text extraction techniques.
2. Design clustering techniques for text.
3. Design classification techniques for text
4. Practice visualization methodologies using tools.
5. Practice feature extraction using tools

**(R20A6611) DESIGN PATTERNS USING PYTHON**  
**PROFESSIONAL ELECTIVE - III**

**Course Objectives:**

1. Understand the python programming concepts
2. Understand the concept of Design patterns and its importance .
3. Understand the behavioral knowledge of the problem and solutions.
4. Relate the Creational, Structural , behavioral Design patterns.
5. Apply the suitable design patterns to refine the basic design for given context.

**UNIT I:**

**A Brief Introduction to Python :** Variables and Syntax in Python , Making Decisions in Python , Development Environments , Python Collections and Files , Functions , Running Python programs

**Introduction:** Introduction to Objects, Visual Programming in Python, Visual Programming of Tables of Data, What Are Design Patterns

**UNIT II**

**Creational Patterns:** The Factory Pattern, the Factory Method Pattern, the Abstract Factory Pattern, the Singleton Pattern, the Builder Pattern, the Prototype Pattern

**UNIT III**

**Structural Patterns:** The Adapter Pattern , The Bridge Pattern , The Composite Pattern , The Decorator Pattern , The Façade Pattern , The Flyweight Pattern , The Proxy Pattern ,

**UNIT IV**

**Behavioral Patterns I:** Chain of Responsibility Pattern , The Command Pattern , The Interpreter Pattern , The Iterator Pattern , The Mediator Pattern , The Memento Pattern

**UNIT V**

**Behavioral Patterns II:** The Observer Pattern, the State Pattern, the Strategy Pattern, the Template Pattern, the Visitor Pattern

**Text Book:**

Python Programming with Design Patterns BY James W. Cooper, Addison- Wesley publisher

**References:**

1. Design patterns by Erich gamma, Pearson Education publisher
2. Mastering Python Design Patterns: A Guide to Creating Smart, Efficient, and Reusable Software, 2nd Edition by Kamon Ayea and Sakis Kasampalis

**Course Outcomes:**

1. Demonstrate python programming concepts
2. Identify the appropriate design patterns to solve object oriented design problems.
3. Develop design solutions using creational patterns.
4. Apply structural patterns to solve design problems.
5. Construct design solutions by using behavioral patterns.

**(R20A7303) HEALTH CARE ANALYTICS**  
**(PROFESSIONAL ELECTIVE-III)**

**OBJECTIVES:**

- 1: Understand the health data formats, health care policy and standards
- 2: Learn the significance and need of data analysis and data visualization
- 3: Understand the health data management frameworks
- 4: Learn the use of machine learning and deep learning algorithms in healthcare
- 5: Apply healthcare analytics for critical care applications

**UNIT I INTRODUCTION TO HEALTHCARE ANALYSIS :**

Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning , Probabilistic reasoning and Bayes Theorem, Weighted sum approach.

**UNIT II ANALYTICS ON MACHINE LEARNING :**

Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model : Sensitivity , Specificity , PPV ,NPV, FPR ,Accuracy , ROC , Precision Recall Curves , Valued target variables –Python: Variables and types, Data Structures and containers , Pandas Data Frame :Operations – Scikit – Learn : Pre-processing , Feature Selection.

**UNIT III HEALTH CARE MANAGEMENT :**

IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.

**UNIT IV HEALTHCARE AND DEEP LEARNING :**

Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.

**UNIT V CASE STUDIES :**

Predicting Mortality for cardiology Practice –Smart Ambulance System using IOT –Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.

**TEXT BOOKS:**

1. Chandan K.Reddy, Charu C. Aggarwal, “Health Care data Analysis”, First edition, CRC, 2015.
2. Vikas Kumar, “Health Care Analysis Made Simple”, Packt Publishing, 2018.

**REFERENCES:**

1. Nilanjan Dey, Amira Ashour , Simon James Fong, Chintan Bhatl, “Health Care Data Analysis and Management, First Edition, Academic Press, 2018

2. Hui Jang, Eva K.Lee, "HealthCare Analysis : From Data to Knowledge to Healthcare Improvement", First Edition, Wiley, 2016.
3. Kulkarni , Siarry, Singh ,Abraham, Zhang, Zomaya , Baki, "Big Data Analytics in HealthCare", Springer, 2020.

**OUTCOMES:**

- CO1: Use machine learning and deep learning algorithms for health data analysis
- CO2: Apply the data management techniques for healthcare data
- CO3: Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications
- CO4: Design health data analytics for real time applications
- CO5: Design emergency care system using health data analysis



(R20A7202) AI IN SPEECH PROCESSING  
(PROFESSIONAL ELECTIVE-IV)

**Course Objectives**

- To understand acoustic theory behind the human speech production and speech perception systems.
- To analyze the methods of speech recognition.
- To understanding the speech detection and pattern comparison.
- To learn source coding techniques for recognition enhancement.
- To understand the AI based algorithms used for speech modeling.

**UNIT –I**

**Fundamentals in Speech Recognition:** Introduction, Brief History of Speech Recognition, The Process of Speech production and perception, Speech production process, , Speech sound and features-the vowels, diphthongs, semivowels, nasal consonants.

**UNIT -II**

**Speech signal processing methods for speech recognition:** Introduction -Spectral analysis model, The bank-of-filters front end processor, Linear predictive coding model for Speech recognition, Vector Quantization, Auditory- Based Spectral Analysis model.

**UNIT-III**

**Pattern Comparison techniques:** Introduction, Speech (Endpoint) Detection, Distortion Measures-Mathematical considerations, Distortion Measures-Perceptual Considerations, Time Alignment and Normalization.

**UNIT-IV**

**Speech Recognition System Design and Implementation:** Application of source coding techniques to recognition, Template training methods, Performance analysis and recognition enhancement.

**UNIT-V**

**Implementation of Hidden Markov model:** Introduction, Discrete-Time Markov processes-Extension to hidden markov model, Types of HMMs-Basic problems in HMMs, Implementation issues for HMMs, HMM system for isolated word recognition.

### **Text Books**

1. 'Fundamentals of Speech Recognition', L. Rabiner, Biing-Hwang Juang and B. Yegnanarayana, Pearson Education Inc. 2009.
2. 'Speech Communication', Douglas O'Shaughnessy, University Press, 2001.

### **Reference Books**

1. 'Discrete Time Speech Signal Processing', Thomas F Quatieri, Pearson Education Inc., 2004

### **Course Outcomes**

The students will be able to:

- Understand the acoustics of speech production and perception.
- Analyze different speech recognition models.
- Classify various patterns of speech detection.
- Interpret different coding techniques for recognition enhancement.
- Illustrate the Hidden Markov model

**(R20A7203) BUSINESS INTELLIGENCE**  
**(PROFESSIONAL ELECTIVE-IV)**

**Course Objectives:**

1. Explain the Decision Support systems and Business Intelligence framework.
2. Illustrate the significance of computerized Decision Support, and understand the Mathematical modelling behind decision support.
3. Explain Data warehousing, its architecture and Extraction, Transformation, and Load (ETL) Processes. Explore knowledge management, explain its activities, approaches and its implementation.
4. Describe the Expert systems, areas suitable for application of experts system

**UNIT 1**

Decision Support and Business Intelligence: Opening Vignette, Changing Business Environments and Computerized Decision Support, Managerial Decision Making, Computerized Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems (DSS), A framework for Business Intelligence (BI), A Work System View of Decision Support.

**UNIT 2**

Computerised Decision Support: Decision Making, Models, Phases of the Decision Making Process, The Intelligence Phase, The Design Phase, The Choice Phase, The Implementation Phase, How Decisions Are Supported. Modelling and Analysis: Structure of Mathematical Models for Decision Support, Certainty, Uncertainty, and Risk, Management Support Systems, Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking

**UNIT 3**

Data Warehousing: Data Warehousing Definitions and Concepts, Data Warehousing Process Overview, Data Warehousing Architectures, Data Integration and the Extraction, Transformation, and Load (ETL) Processes.

**UNIT 4**

Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation.

**UNIT 5**

Expert Systems: Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Problem Areas Suitable for Expert Systems, Development of Expert Systems, Benefits, Limitations, and Critical Success Factors of Expert Systems.

**Textbooks:**

1. Business Intelligence, A managerial Perspective on Analytics. Sharda, R, Delen D, Turban E. Pearson. 2014

**Reference Books:**

1. Data Mining Techniques. For Marketing, Sales and Customer Relationship Management Berry M. & Linoff G. Wiley Publishing Inc 2004
2. Data Science for Business, Foster Provost and Tom Fawcett, O'Reilly Media, Inc 2013

**Course outcomes:**

The students should be able to:

2. Apply the basics of data and business to understand Decision Support systems and Business Intelligence framework.
3. Describe the significance of Computerized Decision Support; apply the basics of mathematics to understand the mathematical modelling behind decision support.
4. Explain Data warehousing, its architecture and Extraction, Transformation, and Load (ETL) Processes.
5. Analyze the importance of knowledge management and explain its activities, approaches and its implementation.
6. Describe the Expert systems and analyze its development, discuss areas suitable for application of experts system.

**(R20A6601) IMAGE PROCESSING  
(PROFESSIONAL ELECTIVE-IV)**

**OBJECTIVES:**

6. Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
7. Provides the knowledge of image acquisition; sampling and quantization.
8. Preprocessing and enhancement.
9. Image restoration, and segmentation.
10. Knowledge of different image compression techniques.

**UNIT - I**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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, 2<sup>nd</sup> Ed, 2004.

**REFERENCES:**

8. Fundamentals of Digital Image Processing: **A. K. Jain**, PHI.
9. Digital Image Processing using MATLAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
10. Digital Image Processing: William K. Pratt, John Wiley, 3<sup>rd</sup> Edition, 2004.
11. Image Processing, Analysis and Machine Vision, Second Edition, Milan Sonka, Jiri Hlavac and Roger Boyle, Cengage learning.
12. Digital Image Processing, W.K. Pratt, 4<sup>th</sup> edition John Wiley & sons.
13. Digital Image Processing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, TMH.
14. Digital Image Processing, S. Sridhar, Oxford University Press

**COURSE OUTCOMES:**

6. Understand the theoretical and mathematical foundations of Digital Image Processing.
7. Explain different image acquisition, sampling and quantization methods;
8. Perform Preprocessing and image enhancement operations on given images
9. Apply different Image restoration, and segmentation techniques.
10. Perform different image compression techniques.

**(R20A6608) REINFORCEMENT LEARNING**  
**PROFESSIONAL ELECTIVE - IV**

**COURSE OBJECTIVES:**

1. Learn the concepts of reinforcement learning, Multi Armed bandits problem, Finite Markov Decision Process.
2. Provide approximate solutions methods for Reinforcement learning.
3. Introduce Dynamic programming, Monte Carlo methods and Temporal-Difference Learning.
4. Excel with Tabular Methods and Prediction with Approximation.
5. Familiarize with applications and case studies of reinforcement learning

**UNIT – I:**

Learn the concepts of reinforcement learning, Multi Armed bandits problem, Finite Markov Decision Process. Introduction and Basics of RL, Defining RL Framework, Probability Basics: Probability Axioms, Random Variables, Probability Mass Function, Probability Density Function, Cumulative Distribution Function and Expectation. Introduction to Agents, Intelligent Agents – Problem Solving – Searching, Logical Agents.

**UNIT – II:**

Finite Markov Decision Process: Basics, The Agent-Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notation for Episodic and Continuing Tasks, Policies and Value Functions, Optimal Policies and optimal Value Functions, Optimality and Approximation.

**UNIT – III:**

Dynamic Programming: Definition, Policy Evaluation (Prediction), Policy Improvement, Policy Iteration, Value Iteration, Asynchronous dynamic programming, Generalized Policy Iteration, Efficiency of dynamic programming.

Monte Carlo Methods: Definition, Monte Carlo Prediction, Monte Carlo Estimation of Action values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy prediction via Importance Sampling, Incremental implementation.

**UNIT – IV:**

Temporal-Difference Learning: TD Prediction, Advantages of TD Prediction Methods, Optimality of TD(0), Sarsa: On-policy TD control, Q-learning Off-policy TD control.

**UNIT – V:**

Planning and Learning with Tabular Methods: Models and Planning, Dyna: Integrated Planning, acting and learning, Prioritized Sweeping, Expected vs Sample updates, Trajectory sampling, Real-time dynamic programming, Planning at decision time, Heuristic search, Rollout algorithms, Monte carlo tree search.

**TEXT BOOKS:**

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning: An Introduction", 2nd Edition

**REFERENCE BOOKS:**

1. Daniel Jurafsky & James H Martin, Speech and Natural Language Processing - Pearson Publications.

2. Alberto Leon-Garcia, "Probability, Statistics, and Random Processes for Electrical Engineering", 3rd Edition,
3. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective".

**COURSE OUTCOMES:**

1. Understand the concepts of Reinforcement Learning to solve real world problems.
2. Solve problems using Finite Markov Decision process and dynamic program.
3. Apply Monte Carlo, Temporal Difference methods for policy evaluation and prediction.
4. Analyze the Tabular Methods and On-policy Prediction with Approximation.
5. Solve problems using deep reinforcement learning.
6. Recognize current advanced techniques and applications using RL



**(R20A1282) DATA WARE HOUSING AND DATA MINING LAB**

**COURSE OBJECTIVES:**

1. Learn how to build a data warehouse and query it (using open source tools like Pentaho Data Integration and Pentaho Business Analytics)
2. Learn to perform data mining tasks using a data mining toolkit (such as open source WEKA), Understand the data sets and data preprocessing
3. Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification, clustering and regression,
4. Exercise the data mining techniques with varied input values for different parameters.

**LIST OF EXPERIMENTS: -**

Experiments using Weka & Clementine Tool

**WEEK 1:** Data Processing Techniques:

(i) Data cleaning (ii) Data transformation – Normalization (iii) Data integration

**WEEK 2:** Data Warehouse schemas – star, snowflake, fact constellation

**WEEK 3:** Data cube construction – OLAP operations

**WEEK 4:** Data Extraction, Transformations & Loading operations

**WEEK 5:** Implementation of Attribute oriented induction algorithm

**WEEK 6:** Implementation of apriori algorithm

**WEEK 7:** Implementation of FP – Growth algorithm

**WEEK 8:** Implementation of Decision Tree Induction

**WEEK 9:** Calculating Information gain measures

**WEEK 10:** Classification of data using Bayesian approach

**WEEK 11:** Classification of data using K – nearest neighbor approach

**WEEK 12:** Implementation of K – means algorithm

**WEEK 13:** Implementation of PAM algorithm

**COURSE OUTCOMES:**

- Ability to add mining algorithms as a component to the existing tools
- Ability to apply mining techniques for realistic data.

## **(R20A0593) BIGDATA ANALYTICS LAB**

### **Course Objectives:**

#### **List of Experiments:**

1. Implement the following Data structures in Java
  - A. Linked Lists
  - B. Stacks
  - C. Queues
  - D. Set
  - E. Map
2. Perform setting up and Installing Hadoop in its three operating modes:  
Standalone, Pseudo distributed, Fully distributed.
3. Implement the following file management tasks in Hadoop:
  - A. Adding files and directories
  - B. Retrieving files
  - C. Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Write a Map Reduce program that mines weather data. Weather Report POC- Map Reduce Program to analyse time-temperature statistics and generate report with max/min temperature.
6. Implement Matrix Multiplication with Hadoop Map Reduce
7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
9. Solve some real life big data problems.

### **Course Outcomes:**

<b>(R20A0007) CONSTITUTION OF INDIA</b>
---

## **INTRODUCTION**

The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

This course “Indian Constitution” has been designed to develop understanding of the Indian Constitution among the students.

## **COURSE OBJECTIVES:**

1. To enrich the students’ understanding of the constitution’s origin and its power
2. To facilitate students to analyze the political principles
3. To assist the students to be aware of their fundamental rights and duties
4. To enable learning about the federal structure Parliamentary form of government
5. To be acquainted with the historical perspectives of the constitutional amendments

The following course content is prescribed for this course.

### **UNIT –I**

Meaning of constitution law and constitutionalism  
Historical perspective of the constitution of India  
Salient features and characteristics of the constitution of India

### **UNIT –II**

Scheme of fundamental rights  
The scheme of the fundamental duties and its legal status  
The Directive Principles of State Policy-its importance and implementation

### **UNIT–III**

Federal structure and distribution of legislative and financial powers between the Union and the States, Parliamentary Form of Government in India-the constitution powers and status of the president of India, Amendment of the Constitutional Powers and Procedure

### **UNIT –IV**

The historical perspectives of the constitutional amendments in India., Emergency provisions: National Emergency, President Rule, Financial Emergency, Local self government-Constitutional

scheme in India

#### **UNIT –V**

Scheme of fundamental Right to quality Scheme of fundamental Right to certain Freedom under Article 19 Scope of the Right to Life and Personal Liberty under Article 21

#### **COURSE OUTCOMES:**

After completion of the course, Students will be able to:

1. Improve their knowledge about Indian constitution
2. Value their identity and exercise their fundamental rights
3. Comprehend how differently government bodies function
4. Define their rights as voters of the country
5. Analyze the constitution and become responsible citizens