SRI VENKATESWARA COLLEGE OF ENGINEERING

An Autonomous Institution,

Affiliated to Anna University, Chennai

SRIPERUMBUDUR TK - 602 117

REGULATIONS 2018

B.TECH - ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Choice Based Credit System

Curriculum and Syllabus

(Semester I to IV)

SEMESTER I

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C	Prerequisites	Fixed/Movable
THEORY										
1.	HS18151	Communicative English **(Common to all Branches)**	HS	3	3	0	0	3	NIL	F
2.	MA18151	Engineering Mathematics I **(Common to all branches except MR)**	BS	4	3	1	0	4	NIL	F
3.	PH18151	Engineering Physics **(Common to all branches)**	BS	3	3	0	0	3	NIL	F
4.	CY18151	Engineering Chemistry **(Common to all branches except MR)**	BS	3	3	0	0	3	NIL	F
5.	EE18151	Basic Electrical and Electronics Engineering **(Common to AE, BT, CE, CS, IT, MR & ME)**	ES	3	3	0	0	3	NIL	F
6.	IT18101	Programming for Problem Solving **(Common to all branches except MR)**	ES	3	3	0	0	3	NIL	F
PRACTICAL										
7.	PC18161	Physics and Chemistry Laboratory **(Common to all branches)**	BS	2	0	0	2	1	NIL	F
8.	GE18161	Engineering Practices Laboratory **(Common to all branches)**	ES	3	0	0	3	1.5	NIL	F
9.	IT18111	Programming for Problem Solving Laboratory **(Common to all branches except MR)**	ES	3	0	0	3	1.5	NIL	F
TOTAL				**27**	**18**	**1**	**8**	**23**	**-**	**-**

(Recommended by BoS - Meeting held on 04.03.2020)

SEMESTER II

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C	Prerequisites	Fixed/Movable
THEORY										
1.	MA18251	Engineering Mathematics II (Common to all branches except MR)	HS	4	3	1	0	4	NIL	F
2.	MA18253	Algebra for Data Science	BS	4	3	1	0	4	NIL	F
3.	GE18151	Engineering Drawing **(Common to all branches)**	BS	5	3	0	2	4	NIL	F
4.	AD18201	Digital Logic Design	BS	4	3	1	0	4	NIL	F
5.	AD18202	Data Structures and Algorithm Analysis	ES	4	3	1	0	4	NIL	F
6.	AD18203	Object Oriented Paradigm and Programming	PC	4	3	1	0	4	NIL	F
PRACTICAL										
7.	AD18211	Data Structures and Algorithm Analysis Laboratory	PC	4	0	0	4	2	NIL	F
8.	AD18212	Object Oriented Paradigm and Programming Laboratory	PC	4	0	0	4	2	NIL	F
TOTAL				**33**	**18**	**5**	**10**	**28**	-	-

(Recommended by BoS - Meeting held on 04.03.2020)

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C	Prerequisites	Fixed/Movable
THEORY										
1.	MA18353	Probability and Statistics for Data Science	BS	4	3	1	0	4	-	F
2.	MA18354	Mathematics for Data Analysis	BS	4	3	1	0	4	-	F
3.	CS18402	Operating Systems	PC	3	3	0	0	3	-	F
4.	AD18301	Foundations to Computer Systems Design	PC	3	3	0	0	3	-	F
5.	AD18302	Intelligent Database Management Systems	PC	3	3	0	0	3	-	F
6.	AD18303	Programming for Data Science	PC	3	3	0	0	3	-	F
PRACTICAL										
7.	CS18411	Operating Systems Laboratory	PC	3	0	0	3	1.5	-	F
8.	AD18311	Intelligent Database Management Systems Laboratory	PC	3	0	0	3	1.5	-	F
9.	AD18312	Programming for Data Science Laboratory	PC	3	0	0	3	1.5	-	F
TOTAL				**29**	**18**	**2**	**9**	**24.5**	-	-

(Recommended by BoS - Meeting held on 03.12.2020)

SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C	Prerequisites	Fixed/Movable
THEORY										
1.	MA18456	Queuing Theory and Optimization	PC	4	3	1	0	4	P&S, AMDS	F
2.	AD18401	Intelligent Computer Networks	PC	3	3	0	0	3	-	F
3.	AD18402	Principles of Artificial Intelligence	PC	3	3	0	0	3	-	F
4.	AD18403	Applied Machine Learning	PC	3	3	0	0	3	-	F
5.	AD18404	Object Oriented Software Engineering	PC	3	3	0	0	3	-	F
6.	GE18251	Environmental Science and Engineering	BS	3	3	0	0	3	-	F
PRACTICAL										
7.	AD18411	Intelligent Computer Networks Laboratory	PC	3	0	0	3	1.5	-	F
8.	AD18412	Artificial Intelligence Laboratory	PC	3	0	0	3	1.5	-	F
9.	AD18413	Applied Machine Learning Laboratory	PC	3	0	0	3	1.5	-	F
TOTAL				**29**	**18**	**1**	**9**	**23.5**	-	-

(Recommended by BoS - Meeting held on 10.04.2021)

HS18151	COMMUNICATIVE ENGLISH (Common to all Branches except Marine Engineering)	L	T	P	C
		3	0	0	3

OBJECTIVES

- To enable learners to interact fluently on everyday social contexts.
- To enable learners engage in conversations in an academic/scholarly setting.
- To enable learners overcome public speaking barriers.
- To develop learners' ability to take notes and in the process, improve their listening skills
- To develop learners' reading skill through reading text passages for comprehension and contemplation.
- To enable learners write on topics of general interest and drafting correspondences for general purposes.

UNIT I **9**

Listening – short video clips – conversational scenes form movies, celebrities' speeches/interviews. Speaking – several ways of introducing oneself at several situations, introducing others at several situations, inviting people for several occasions, describing people and their places. Reading – short comprehension passages – making inferences, critical analysis. Writing – completing the incomplete sentences– developing hints from the given information. Grammar – Wh- Questions and Yes or No questions –Parts of speech. Vocabulary development– prefixes- suffixes- articles – countable / uncountable nouns.

UNIT II **9**

Listening – customer care voice files, short narratives – identifying problems and developing telephone etiquettes. Speaking – speaking over skype/whatsapp, making business calls, making self-recorded informative videos, inquiring about a concept/activity, describing a concept/activity. Reading – reading the headlines on news magazines – slogans and taglines from advertisements. Writing - free writing – writing - headlines, slogans and taglines individual inspirations. Grammar – conjunctions, idioms, phrases, quotes. Vocabulary development – guessing the meanings of words in various different contexts.

UNIT III **9**

Listening – courtroom scenes from movies, debates and talks from news channels, notes taking. Speaking – language and tone for arguments, discussion, deliberation, contemplation, expressing opinions, reacting to different situations in an alien country. Reading–language used in instruction manuals of household appliances, cookery and other basic instructions. Writing- understanding the structure of texts - use of reference words, discourse markers-coherence, rearranging the jumbled sentences. Grammar – adjectives - degrees of comparison, framing direct and indirect questions. Vocabulary development – concise approach, single word substitution.

UNIT IV **9**

Listening – Sports commentaries, advertisements with users' criticisms; Speaking –for social causes, for promoting a concept, negotiating and bargaining; Reading – review of a product, movie, movement or a system; Writing – writing for advertisements, selling a product; Grammar – Tenses – Simple Past, Present and Future, Continuous - Past, Present and Future; Vocabulary Development – synonyms, antonyms and phrasal verbs.

UNIT V **9**

Listening – video lectures, video demonstration of a concept; Speaking – presenting papers/concepts, delivering short speeches, discourses on health, suggesting natural home remedies, cleanliness, civic sense and responsibilities; Reading – columns and articles on home science; Writing – correspondences of requests, basic enquiry/observation and basic complaints; Grammar - modal verbs, perfect tenses – Vocabulary development – collocations.

TOTAL (L): 45 Periods

OUTCOMES:

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

- Read articles and infer meanings from specific contexts from magazines and newspapers.
- Participate effectively in informal/casual conversations; introduce themselves and their friends and express opinions in English.
- Comprehend conversations and short talks delivered in English
- Write short write-ups and personal letters and emails in English.

REFERENCES:

1. Mindscapes : English for Technologists and Engineers. Orient Black swan, Chennai. 2017
2. Downes, Colm, Cambridge English for Job-hunting, Cambridge University Press, New Delhi. 2008
3. Murphy, Raymond, Intermediate English Grammar with Answers, Cambridge University Press 2000
4. Thomson, A.J. Practical English Grammar 1& 2 Oxford 1986.

WEBSITES

1. http://www.usingenglish.com
2. http://www.uefap.com3
3. https://owl.english.purdue.edu/owl/
4. www.learnenglishfeelgood.com/esl-printables-worksheets.html

SOFTWARE

1. Face 2 Face Advance – Cambridge University Press, 2014
2. English Advance Vocabulary- Cambridge University Press
3. IELTS test preparation – Cambridge University Press 2017
4. Official Guide to the TOEFL Test With CD-ROM, 4th Edition
5. CAMBRIDGE Preparation for the TOEFL TEST- Cambridge University Press, 2017

MA18151	ENGINEERING MATHEMATICS – I (Common to all except Marine Engineering)	L	T	P	C
		3	1	0	4

OBJECTIVES

- To understand and apply matrix techniques for engineering applications.
- To make the student knowledgeable in statistical methods of analyzing and interpret the data for engineering problems.
- To familiarize the student with basic calculus including functions of several variables and how to apply the transformation of variables.
- To acquaint the student with Mathematical tools needed in evaluating multiple integrals and their usage

UNIT I MATRICES **9+3**

Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors – Statement and Applications of Cayley-Hamilton Theorem – Diagonalization of matrices– Reduction of a quadratic form into canonical form by orthogonal transformation-Nature of quadratic forms

UNIT II STATISTICAL METHODS **9+3**

Scatter diagram- Karl Pearson coefficient of correlation for raw data- Spermann rank correlation coefficient- lines of regression – Regression equation X on Y and Y on X- Curve fitting by Principle of least squares – Fitting a straight line $y = ax + b$ and a parabola $y = ax^2 + bx + c$

UNIT III APPLICATION OF DIFFERENTIAL CALCULUS **9+3**

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes

UNIT IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES **9+3**

Limits and Continuity - Partial derivatives – Total derivatives – Differentiation of implicit functions – Jacobians and properties– Taylor's series for functions of two variables – Maxima and Minima of functions of two variables – Lagrange's method of undetermined multipliers

UNIT V MULTIPLE INTEGRALS **9+3**

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves - Change of variables in double integrals – Triple integrals – Volume of solids.

TOTAL (L:45+T:15):60 Periods

OUTCOMES:

- This course equips the students to have basic knowledge and understanding of fundamental statistics to analyze and interpret data.
- Basic application of calculus in Engineering problems and to tackle for different geometries.
- To apply the idea of reducing complex Engineering problems into simple form using matrix technique.

TEXT BOOKS:

1. ErwinKreyszig, Advanced Engineering Mathematics,8thEdition, John Wiley, (1999)
2. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd., (2011).
3. Grewal. B.S, "Higher Engineering Mathematics", 41stEdition, Khanna Publications, Delhi, (2011).

REFERENCES:

1. S C Gupta and V K Kapoor, Fundamentals of Mathematical Statistics, S.Chand Private Ltd.,11th Edition (2005)
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rdEdition, Pearson Education, (2012)
3. Peter V.O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning, (2012)
4. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company New Delhi, (2008)
5. Sivarama Krishna Das P and Rukmangadachari E, "Engineering Mathematics", Volume I, Second Edition, Pearson Publishing (2011)

PH18151	ENGINEERING PHYSICS (Common to all Branches except Marine Engineering)	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT – I CRYSTAL PHYSICS **12**

Unit cell – Bravais Lattices – Miller indices – Distance between Inter planar distance 'd' (derivation) – discussion of various crystal structures : calculation of Atomic radius, Coordination number, effective number of lattice points and Atomic Packing Factor for the SC, BCC, FCC, HCP, Diamond Cubic (derivation) – discussion about the NaCl, Graphite structures. **Crystal defects :** Zero dimensional, one dimensional, Two dimensional and Three dimensional defects.

Diffraction of X-rays by crystal planes - Bragg's spectrometer – Powder Diffraction method

UNIT – II THERMAL PHYSICS **6**

Modes of heat transfer: Newton's law of cooling – thermal conductivity- Lee's disc method (derivation and expt) – Radial heat flow – Rubber tube method – conduction through compound media (series and parallel).

UNIT– III WAVE MECHANICS **9**

Quantum principles: Black body radiation-Planck Hypothesis (qualitative), Compton's effect (derivation).

Wave-particle duality - de-Broglie matter waves – Heisenberg's uncertainty principle - Wave function and its significance - Schrödinger's wave equation (time dependent and Time independent) (derivation) – Application of Schrodinger's wave equation - Particle in one dimensional box (derivation) – Degenerate and non-degenerate energy states.

UNIT– IV ACOUSTICS AND ULTRASONICS **9**

Acoustics: Classification of Sound – Characteristics of Musical Sound : Quality (Timbre), Pitch, Intensity of Sound – Units of Sound – decibel - Reverberation of sound – Reverberation time – absorption of sound energy by materials – Absorption coefficient – Sabine's Formula (derivation) – Factors affecting the acoustics of buildings – Remedies.

Ultrasonics: Introduction to ultrasonics – Properties of ultrasonic waves – Production of Ultrasonics :Magnetostriction method, Piezo electric method – detection of ultrasonics – Ultrasonic Acoustic grating - Applications of ultrasonic waves – SONAR, NDT, Sonogram.

UNIT – V OPTOELECTRONICS AND FIBER OPTICS 9

Lasers: Basic properties of Lasers - Einstein's coefficients (Derivation) – Population inversion – Types of Lasers – Molecular Gas Lasers (CO_2 Laser) – Solid state Laser (Nd: YAG Laser) – Applications of Lasers in Engineering and Medicine.

Fibreoptics:Introduction - Principle and structure of optical fibers-Acceptance angle-Numerical aperture-Types of optical fibers-Optical fiber communication system (block diagram) - Advantages and its applications.

TOTAL (L):45 Periods

OUTCOMES:

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

- Working knowledge of fundamental physics and basic engineering principles to include advanced knowledge in one or more engineering disciplines
- Understand and to compute problems in Quantum Physics.
- Use modern engineering physics techniques and tools.
- Enhance knowledge about photonics and optical fiber communication system

TEXT BOOKS

1. Engineering Physics – R.K. Gaur and S.L. Gupta, Dhanput Publications, 2015
2. A text book of Engineering Physics – M. N. Avadhnaulu, and P. G. Kshirsagar, S. Chand & Co. 2006
3. Engineering Physics – V. Rajendran, Tata McGraw Hill, 2009
4. Materials Science – M. Arumugam, Anuradha Publications, 2015

REFERENCE BOOKS

1. Principles of Physics - Resnick, Halliday& Walker (Wiely)
2. Peter Atkins & Julio De Paula, Physical Chemistry 10thEdn., Oxford University Press,2014
3. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
4. Materials Science and Engineering – V.Raghavan, PHI Learninig Pvt. Ltd. 2010

CY18151	ENGINEERING CHEMISTRY	L	T	P	C
	(Common to all branches except Marine Engineering)	3	0	0	3

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and the water treatment techniques.
- To develop an understanding the principle, types and mechanism of corrosion and protective coatings.
- To acquaint the students with the basics of nanomaterials, their properties and applicants.
- To develop an understanding of the laws of photochemistry and basic spectral analysis.
- To enable the students to understand the types of fuels, its calorific values and significance of flue gas analysis.

UNIT I WATER TECHNOLOGY 9

Sources, hard and soft water, estimation of hardness by EDTA method, boiler feed water, boiler problems, cause and preventive measures, softening of water - zeolite process and demineralization by ion exchangers, internal treatment methods, specifications for drinking water, BIS and WHO standards, treatment of water for domestic use, desalination - reverse osmosis and electrodialysis.

UNIT II CORROSION AND ITS CONTROL 9

Corrosion: Basic concepts - mechanism of chemical, electrochemical corrosion - Pilling Bedworth rule – Types of Electrochemical corrosion - galvanic corrosion - differential aeration corrosion - pitting corrosion – stress corrosion – factors influencing corrosion. Corrosion control: Cathodic protection – sacrificial anodic method - corrosion inhibitors. Protective coatings: surface preparation for metallic coatings - electro plating (copper plating) and electroless plating (Nickel plating) - chemical conversion coatings - anodizing, phosphating and chromate coating.

UNIT III NANOCHEMISTRY 9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles, nanocluster, nanorod, - nanotube(CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and applications of nanomaterials.

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY 9

Laws of photochemistry –Grotthuss-Draper law, Stark–Einstein law and Lambert Beer Law. Quantum efficiency – Photo processes - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence and Photo-sensitization. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram only) and applications.

UNIT V FUELS AND COMBUSTION 9

Fuel: Introduction- classification of fuels - calorific value- higher and lower calorific values- analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) - petroleum- refining- manufacture of synthetic petrol (Bergius process)- knocking - octane number - diesel oil- cetane number - natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG)- producer gas- water gas. Combustion of fuels: introduction- theoretical calculation of calorific value- calculation of stoichiometry of fuel and air ratio - flue gas analysis by ORSAT Method.

TOTAL (L): 45 Periods

OUTCOMES:

The knowledge acquired on fuels, corrosion and its control, nanochemistry and water treatment techniques will make better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010.
2. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
3. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.

REFERENCES:

1. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
2. B.R. Puri, L.R. Sharma, M.S. Pathania., "Principles of Physical Chemistry" Vishal Publishing Company, 2008.

EE18151	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

(Common to all branches except ECE, EEE & CE)

OBJECTIVES

- To understand the basic theorems used in Electrical circuits and the principles of measuring instruments.
- To educate the different concepts and function of electrical machines.
- To introduce the fundamentals of semiconductor and applications.
- To explain the principles of digital electronics.
- To impart knowledge of communication.

UNIT I ELECTRICAL CIRCUITS & MEASURMENTS **10**

Ohm's Law – Kirchhoff's Laws – Steady State Solution of DC Circuits using Mesh Analysis – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase AC Balanced Circuits. Construction and working Principle of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters (Qualitative treatment only)

UNIT II ELECTRICAL MACHINES **10**

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single phase induction Motor-,Single Phase Transformer

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS **9**

Characteristics of PN Junction Diode – Zener Effect – Zener Diode – LED, Photo diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Photo transistors

UNIT IV DIGITAL ELECTRONICS **9**

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING **7**

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.

Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fiber (Block Diagram Approach only)

TOTAL (L): 45 Periods

OUTCOMES:

- Study the fundamental laws governing electrical circuits and to describe the working of measuring instruments.
- Understand the construction and characteristics of different electrical machines.
- Describe the fundamental behavior of different semiconductor devices and circuits.
- Learn the fundamental concepts of digital electronics circuits.
- Recognize the type of signals, data transfer and able to apply in communication systems

TEXT BOOKS:

1. Mittle V.N, Arvind Mittal "Basic Electrical Engineering", Tata McGraw Hill(India), Second Edition,2013.
2. Sedha R.S., "A Text Book of Applied Electronics", S. Chand & Co., 2014.

REFERENCES:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics Engineering", Tata McGraw Hill, 2013.
2. I.J.Nagrath and D.P. Kothari, "Basic Electrical Engineering", Tata McGraw Hill ((India), Third Edition, 2010.
3. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, 2010.
4. M.Morris Mano, "Digital Logic & Computer Engineering",Printice Hall of India, 2004.
5. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, Fourth Edition,2007.

IT18101	PROGRAMMING FOR PROBLEM SOLVING	L	T	P	C
	(Common to All Branches Except Marine)	3	0	0	3

OBJECTIVES

The students should be made to:

- Learn the organization of a digital computer.
- Learn to think logically and write algorithms or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION TO PROBLEM SOLVING 9

Simple model of a Computer – Hardware – Software – Data Representation, Introduction to Computer Networks and Internet, Problem Solving Techniques – Bottom up design and Top down design - applications, Introduction to Algorithms and Flow Chart.

UNIT II C PROGRAMMING BASICS 9

Introduction to 'C' programming – structure of a 'C' program – compilation and linking processes. Conversion of simple algorithm to program. Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays - String- String operations –Arrays of strings.

UNIT IV FUNCTIONS AND USER DEFINED DATA TYPES 9

Function – definition of function – Declaration of function – Pass by value - Pass by reference– Recursion - Enumerators - Structures - Unions.

UNIT V POINTERS AND FILES 9

Macros - storage classes - Pointers- Definition – Initialization – Pointers arithmetic – Double Pointers, Basic file operations-Example problems.

TOTAL (L): 45 Periods

OUTCOMES:

At the end of the course, the student should be able to:

- Design and represent solutions to problems as algorithm and flow chart
- Write simple C Programs
- Develop modularized applications in C

TEXT BOOKS:

1. PradipDey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.
2. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Third Edition, Tata McGraw-Hill, 2010.

REFERENCES:

1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.
2. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.
3. Paul J Deitel,Dr.Harvey M.Deitel,"C How to Program", Seventh Edition, Pearson Education, 2016.

PC18161	PHYSICS AND CHEMISTRY LABORATORY (Common to ALL branches)	L T P C 0 0 2 1

PHYSICS LABORATORY

OBJECTIVES

To make the student to acquire practical skills in the determination of various physical properties of materials.

List of Experiments (Any 5 experiments to be conducted)

1. Determination of compressibility of the liquid - Ultrasonic interferometer.
2. Determination of thickness of the given object by Air wedge method.
3. Determination of dispersive power of a prism by Spectrometer.
4. Determination of Young's modulus of wooden scale by Non-Uniform bending.
5. Determination of wavelength, particle size and numerical aperture of fibre using Lasers.
6. Lee's Disc – Thermal conductivity of the poor conductor.
7. Torsional Pendulum – Determination of Rigidity modulus and moment of inertia.

OUTCOMES:

At the end of the course,

- The student will be able to analyze the physical principle using the various instruments, also relate the principle to engineering applications.
- The various experiments in the areas of optics, mechanics and thermal physics will nurture the students in all branches of Engineering.
- The students will be able to think innovatively and also improve the creative skills that are essential for engineering.

LIST OF EQUIPMENTS FOR THE BATCH OF 30 STUDENTS :

Spectrometer, Mercury Vapour lamp, Lee's disc exptl setup, Travelling microscope, ultrasonic interferometer, Sodium vapour lamp, diode laser, optical fiber kit.

CHEMISTRY LABORATORY

OBJECTIVES

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometery.

List of Experiments (Any 5 experiments to be conducted)

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Estimation of copper by EDTA.

3. Conductometric titration of a strong acid with a strong base
4. Estimation of iron content of the given solution using potentiometer.
5. Estimation of iron content of the water sample using spectrophotometer.
6. Determination of molecular weight of polymer using viscometer.
7. Determination of Alkalinity in water.

OUTCOMES:

Upon completion,

- The students will be equipped with hands - on knowledge in the quantitative chemical analysis of water quality related parameters.

TEXT BOOKS

1. Vogel‘s Textbook of Quantitative Chemical Analysis (8 TH edition, 2014)

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Conductivity meter – 10 Nos
2. Spectrophotometer – 10 Nos
3. Ostwald Viscometer – 10 Nos
4. Potentiometer - 10 Nos
5. Electronic Balance - 2 Nos

Common Apparatus: Pipette, Burette, conical flask, iodine flask, porcelain tile, dropper (each 30 Nos.)

TOTAL: 30 Periods

GE18161 ENGINEERING PRACTICES LABORATORY

L	T	P	C
0	0	3	1.5

OBJECTIVES :

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

LIST OF EXPERIMENTS

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

a) Study of the joints in roofs, doors, windows and furniture.
b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

Welding:

a) Preparation of arc welding of butt joints, lap joints and tee joints.
b) Gas welding practice

Basic Machining:

a) Simple Turning and Taper turning
b) Drilling Practice

Sheet Metal Work:

a) Forming & Bending:
b) Model making – Trays, funnels, etc.
c) Different type of joints.

Machine assembly practice:

a) Study of centrifugal pump
b) Study of air conditioner

Demonstration on:

a) Smithy operations, upsetting, swaging, setting down and bending.
Example – Exercise – Production of hexagonal headed bolt.
b) Foundry operations like mould preparation for gear and step cone pulley.
c) Fitting – Exercises – Preparation of square fitting and vee – fitting models

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement and comparison of energy for resistive and LED load using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE

1. Identification of circuit components
   a) Resistor, capacitor, diode (PN & Zener),transistors
   b) Soldering practice – Circuits – Using general purpose PCB.
2. Evaluating the parameters for DC power supply and AC power supply (peak-peak, rms, average, period, frequency) using function generator and CRO.
3. Study and implementation of logic functions using NAND, NOR, and NOT gates.
4. VI Characteristics of PN Junction diode.
5. VI Characteristics of Solar photovoltaic panel.
6. Design a 5V/12V Regulated Power Supply: using FWR rectifier and IC7805/IC7812.

TOTAL : 45 Periods

COURSE OUTCOMES

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

- Fabricate carpentry components and to lay pipe connections including plumbing works.
- Use welding equipments to join the structures.
- Wiring of basic electrical system and measurement of electrical parameters.
- Study and implementation of basic electronic components, circuits and solar photovoltaic panel.
- Design a basic regulated power supply.

REFERENCES

1. Jeyachandran K., Natarajan S. & Balasubramanian S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
2. Jeyapoovan T., Saravanapandian M. & Pranitha S., "Engineering Practices Lab

Manual", Vikas Puplishing House Pvt.Ltd, 2006.
3. Bawa H.S., "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2007.
4. Rajendra Prasad A. and Sarma P.M.M.S., "Workshop Practice", Sree Sai Publication, 2002.
5. Kannaiah P. & Narayana K.L., "Manual on Workshop Practice", Scitech Publications, 1999.
6. Mittle V.N, Arvind Mittal, "Basic Electrical Engineering", Tata McGraw Hill(India), Second Edition,2013.
7. Sedha R.S., "A Text Book of Applied Electronics", S. Chand & Co., 2014.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
3. Standard woodworking tools 15 Sets.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools:

a. Rotary Hammer 2 Nos
b. Demolition Hammer 2 Nos
c. Circular Saw 2 Nos
d. Planer 2 Nos
e. Hand Drilling Machine 2 Nos
f. Jigsaw 2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
8. Power Tool: Angle Grinder 2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner One each.

ELECTRICAL

1. Assorted electrical components for house wiring 15 Sets

2. Electrical measuring instruments 10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each
4. Megger (250V/500V) 1 No.
5. Power Tools: (a) Range Finder 2 Nos (b) Digital Live-wire detector 2 Nos
6. LED lamp 8W 2 Nos., 16W 2 Nos.

ELECTRONICS

1. Soldering guns 10 Nos.
2. Assorted electronic components for making circuits 50 Nos.
3. Small PCBs 10 Nos.
4. Multimeters 10 Nos.
5. Study purpose ICs: IC7805/IC7812
6. Photovoltaic panel 5W/10W: 2 Nos.
7. Light Source for PV panel 1 Nos.

IT18111	PROGRAMMING FOR PROBLEM SOLVING LABORATORY	L	T	P	C
		0	0	3	1.5

(Common to All Branches Except Marine)

OBJECTIVES

The students should be made to:

- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

List of Exercises

1. Usage of Basic Linux commands
2. C Programming using Simple statements and expressions
3. Scientific problem solving using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings
6. C Programming using Pointers
7. C Programming using user defined functions (Pass by value and Pass by reference)
8. C Programming using Recursion
9. C Programming using structures and union
10. C Programming using enumerated data types
11. C Programming using macros and storage classes
12. C Programming using Files

TOTAL: 45 Periods

OUTCOMES:

At the end of the course, the student should be able to:

- Write simple C Programs
- Able to solve scientific problems using C

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Standalone desktops with C compiler 30 Nos. or
- Server with C compiler supporting 30 terminals or more

MA18251 ENGINEERING MATHEMATICS II

L	T	P	C
3	1	0	4

OBJECTIVES

- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated

UNIT I VECTOR CALCULUS 9+3

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 9+3

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT III LAPLACE TRANSFORM 9+3

Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transforms -Statement of Convolution theorem – Initial and final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

UNIT IV ANALYTIC FUNCTION 9+3

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping-Translation, rotation and inversion ($w = z+c$, cz, $1/z$, z^2) - Bilinear transformation.

UNIT V COMPLEX INTEGRATION 9+3

Complex integration –Statement and applications of Cauchy's integral theorem and Cauchy's integral formula –Taylor's and Laurent's series expansions – Singular points– Residues –

Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

TOTAL(L:45+T:15):60 Periods

OUTCOMES:

At the end of the course,

- The subject helps the student to develop the fundamental and basic concepts in vector calculus, ODE, Laplace Transforms and complex functions.
- Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:

1. Erwin Kreyszig, Advanced engineering mathematics, 8th Edition, John Wiley, 1999.
2. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth edition, Laxmi Publications Pvt Ltd., (2011).
3. Grewal. B.S, "Higher Engineering Mathematics", 41stEdition, Khanna Publications, Delhi, (2011).

REFERENCES:

1. Dass, H.K., and Er.Rajnish Verma, "Higher Engineering Mathematics", S.Chand Private Ltd., (2011).
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education (2012).
3. Peter V.O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning (2012).
4. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company New Delhi (2008).
5. Sivarama Krishna Das P. and Rukmangadachari E., "Engineering Mathematics", Volume 1, Second Edition, PEARSON Publishing, 2011.

MA18253	ALGEBRA FOR DATA SCIENCE	L	T	P	C
		3	1	0	4

OBJECTIVES

The Student should be made to:

- Extend student‘s logical and mathematical maturity and ability to deal with abstraction
- Familiarize the applications of algebraic structures.
- Introduce and apply the concepts of Rings, Fields and Polynomials.
- Understand the concepts and significance of lattices and boolean algebra which are widely used in data science.

UNIT I PROPOSITIONAL LOGIC **9+3**

Propositional Logic – Propositional equivalences – Normal forms – Principal Conjunctive Normal Forms – Principal Disjunctive Normal Forms – Inference Theory

UNIT II PREDICATE LOGIC AND PROOF **9+3**

Predicates and Quantifiers – Nested Quantifiers – Introduction to proofs – Proof methods and strategy

UNIT III ALGEBRAIC STRUCTURES **9+3**

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism‘s – Normal subgroup and cosets – Lagrange‘s theorem

UNIT IV RINGS AND FIELDS **9+3**

Rings: Definition - Sub rings - Integral domain - Field - Integer modulo n – Ring homomorphism. Rings - Polynomial rings - Irreducible polynomials over finite fields

UNIT V LATTICES AND BOOLEAN ALGEBRA **9+3**

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra

TOTAL (L:45+T:15): 60 Periods

OUTCOMES:

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

- Have knowledge of the concepts needed to test the logic of a program.
- Be exposed to concepts and properties of algebraic structures.
- Have an understanding in identifying structures on many levels.
- Apply the basic notions of groups, rings, fields which will be used to solve related problems.
- Explain the fundamental concepts of advanced algebra and their role in applied context.

TEXT BOOKS:

1. Grimaldi, R.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, New Delhi, 2007.
2. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Publications. Co. Ltd., New Delhi, Special Indian Edition, 2011.

REFERENCES:

1. Lidl, R. and Pitz, G, "Applied Abstract Algebra", Springer Verlag, New Delhi, 2nd Edition, 2006.

GE18151	ENGINEERING DRAWING (Common to ALL Branches of B.E. / B.Tech)	L	T	P	C
		3	0	2	4

OBJECTIVES

- This course will introduce students to Engineering Drawing and build their ability to read drawings and interpret the position and form of simple geometry, culminating into understanding of simple technical assemblies.

UNIT 0 ENGINEERING DRAWING FUNDAMENTALS (Not for Exams) 2

Drawing standard: BIS, Lettering, Dimensioning, Type of lines, Conventions, Geometrical constructions: Dividing a straight line into equal parts, Bisecting a given angle, Construction of polygon – Triangle, Square, Pentagon and Hexagon using drawing tools.

UNIT I CURVES AND PROJECTION OF POINTS AND LINES 18

Construction of Engineering Curves: Conic Sections – Ellipse,Parabola, Hyperbola using Eccentricity method, Cycloid, Involute of Circle and Pentagon.

Projection: Orthographic Projection – Principal Planes, Projection of Points using Four Angles of Projection, Projection of Straight Lines – Lines parallel or inclined to one or both planes using Rotating Line Method in First Angle of Projection.

UNIT II PROJECTION OF PLANES AND SOLIDS 15

Projection of Plane Figures – Inclined to any one Principal Plane, Projection of Solids – Simple Solids (Prisms, Pyramids, Cone and Cylinder) axis inclined to any one Principal Plane.

UNIT III SECTION OF SOLIDS & DEVELOPMENT OF SURFACES 15

Section of Solids –Sectional views of simple vertical solids cut by section plane inclined to any one Principal Plane. Development of Surfaces – Development of lateral surfaces of truncated and frustum of simple solids.

UNIT IV PICTORIAL PROJECTION 15

Introduction to Pictorial Projection, Isometric Projection – Principle, Isometric Planes, Isometric Scales, Isometric Projection of simple solids and their combination.

Free Hand Drawing - Orthographic views of simple blocks from their Isometric view, Isometric view of simple blocks from their Orthographic views.

UNIT V PERSPECTIVE PROJECTION 10

Perspective Projection of full solids in simple positions with respect to projection planes by visual ray and vanishing point method.

TOTAL (L+T): 75 Periods

OUTCOMES:

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

- Understand the importance of BIS Standards in Engineering Drafting
- Graphically construct and understand the importance of Conic sections and special curves in Engineering applications
- Given a problem statement in geometric elements such as points, lines, planes, solids, Orthographic projections will be drafted.
- Draw the orthographic projections of sectioned solids and also will Develop their surfaces
- Interpret Orthographic ,Isometric and Perspective views of objects

TEXT BOOKS:

1. N.D.Bhatt, V.M. Panchal Pramod, R. Ingle, "Engineering Drawing", Charotar Publishing House, 2014.

REFERENCES:

1. K.Venugopal&V.PrabhuRaja, "Engineering Graphics", New Age International (P) Limited, 2009.
2. M.B.Shah & B.C. Rana, "Engineering Drawing", Pearson Education, 2009.
3. K.R. Gopalakrishna, "Engineering Drawing" (Vol..I&II), Subhas Publications, 2010.
4. K.V.Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2006.
5. S. Gowri and T. Jeyapoovan, "Engineering Graphics", Vikas Publishing House Pvt Ltd., 2011.

AD18201	DIGITAL LOGIC DESIGN	L	T	P	C
		3	1	0	4

OBJECTIVES

- To understand various number systems, different methods used for the simplification of Boolean functions
- To design and implement a system that uses combinational logic for the given specification; Simulate combinational logic systems using verilog or VHDL
- To design and implement synchronous sequential system for the given specification; simulate sequential logic systems using verilog or VHDL.
- To design and implement Asynchronous sequential system for the given specification.
- To design and implement memory accessing systems and systems using PLA, PAL.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Digital Systems and Binary Numbers-Review of Number Systems – Arithmetic Operations – Binary Codes – Boolean Algebraic Axioms – Boolean Functions, Truth Table, Canonical Forms - Gate Level Minimization – Simplification of Boolean Functions using Karnaugh Map and Tabulation Methods-NAND & NOR Implementation

UNIT II COMBINATIONAL CIRCUITS 9

Combinational Circuits – Analysis and Design Procedures –Binary Adder-Subtractor – Decimal Adder- Binary Multiplier – Magnitude Comparator- Decoders – Encoders – Multiplexers – HDL Models for Combinational Circuits

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9

Latches and Flip Flops – Analysis and Design Procedures –State Reduction and Assignment – Registers –Mealy/Moore Finite State Machines- Shift Registers – Counters –State Diagram, State Table, State Assignment & Minimization

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9

RAM - Memory Decoding - Error Detection and Correction –ROM - Programmable Logic Array – Programmable Array Logic –Sequential Programmable Devices – RTL

TOTAL (L+T): 60 Periods

OUTCOMES:

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

- Perform arithmetic operations in any number system & to simplify the Boolean expression using K –Map and Tabulation techniques
- Use Boolean Simplification techniques to design a combinational hardware circuit & Design and analysis of a given digital Combinational circuit
- Design and analysis of a given digital Sequential hardware circuit
- Design and analysis of a given digital asynchronous sequential circuits
- Design using PLD

TEXT BOOKS:

1. **"**Digital Design with An Introduction to Verilog HDL" by M. Morris Mano and Michael D.Ciletti, 5th Edition, 2013.

REFERENCES:

1. John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson Education,2007.
2. Charles H. Roth Jr, "Fundamentals of Logic Design", Fifth Edition – Jaico Publishing House, Mumbai, 2003.
3. Donald D. Givone, "Digital Principles and Design", Tata McGraw Hill, 2003.
4. Kharate G. K., "Digital Electronics", Oxford University Press, 2010.
5. https://www.cs.tcd.ie/John.Waldron/CS1026/lec9adder.pdf
6. http://digitalbyte.weebly.com/code-converters.html
7. http://www.learnabout-electronics.org/Digital/dig44.php
8. http://ece.gmu.edu/~clorie/Spring11/ECE-301/Lectures/Lecture_16.pdf
9. Morris Mano, "Computer System Architecture", Third Edition, Pearson Education
10. https://www.iitg.ernet.in/asahu/cs221/Lects/Lec11.pdf

AD18202	DATA STRUCTURES AND ALGORITHM ANALYSIS	L	T	P	C
		3	1	0	4

OBJECTIVES

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

- Familiar with the algorithm analysis techniques and orders of growth.
- Familiar with the linear data structures and its applications.
- Familiar with the tree data structures, hashing techniques and priority queues.
- Understand graph algorithms and its applications.
- Understand he various classes of algorithm design techniques.

UNIT I FOUNDATION OF ALGORITHM ANALYSIS 9+3

The Role of Algorithms in Computing - Growth of Functions - Asymptotic Notations – Analysis of Non recursive Algorithms - Divide and Conquer – Analysis of recursive algorithms – The backward substitution for solving recurrences - The master method for solving recurrences - Sorting: Selection sort - Bubble sort – Insertion Sort - Merge Sort - Quick sort – Searching: Linear Search – Binary Search.

UNIT II LINEAR DATA STRUCTURES 9+3

List: Array Implementation of List – Linked List – Doubly Linked List – Circular Linked List; Stack: Array and Linked List Implementation – Applications; Queues: Array and Linked List Implementation – Applications.

UNIT III TREES, HASHING AND PRIORITY QUEUES 9+3

Trees: Binary trees – Binary Search Trees – AVL Trees – Splay Trees – B-Trees; Hashing: Hash Function – Separate Chaining – Open Addressing – Linear Probing; Priority Queues – Binary Heap Operations.

UNIT IV GRAPH ALGORITHMS 9+3

Representation of Graphs – Breadth First Search – Depth First Search - Topological Sort – Shortest Path Algorithms: Dijkstra’s Algorithm - Floyd Warshall's algorithm – Minimum Spanning Tree: Prim’s Algorithm – Kruskal’s Algorithm.

UNIT V ADVANCED ALGORITHM DESIGN TECHNIQUES 9+3

Dynamic Programming: Longest Common Subsequence - Optimal Binary Search Trees; Greedy Algorithm: Huffman Codes; Backtracking: n-Queens Problem - Subset-sum Problem; Branch and Bound: Assignment Problem – Knapsack Problem.

TOTAL (L+ T): 60 Periods

OUTCOMES:

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

- Analyze the time complexity of algorithms using asymptotic notations.
- Apply linear data structures to various applications.
- Develop different tree data structures and apply hashing techniques.
- Apply graph algorithms to real time applications.
  Develop solutions to various classes of algorithms.

TEXT BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2013.

REFERENCES:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3, Pearson Education, 2009.
4. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
5. http://nptel.ac.in/

AD18203	OBJECT ORIENTED PARADIGM AND PROGRAMMING	L	T	P	C
		3	1	0	4

OBJECTIVES

- Familiar with the basic concepts of object oriented programming.
- Familiar with the basic concepts of C++ programming language.
- Familiar with the generic programming, exception and file handling in C++.
- Understand object oriented concepts and basic characteristics of Java.
- Understand the advanced programming concepts in Java.

UNIT I OBJECT ORIENTED PARADIGM 9+3

Object oriented programming concepts – objects – classes – data members and member functions - abstraction and encapsulation – inheritance – polymorphism. Introduction to C++ – classes – access specifier – function and data members – default arguments –friend functions – const and volatile functions - static members – Objects – pointers and objects – constant objects – nested classes- constructors –default constructor –parameterized constructors –constructor with dynamic allocation –copy constructor –destructors.

UNIT II POLYMORPHISM AND INHERITANCE 9+3

Compile time polymorphism- function overloading –operator overloading –overloading through friend functions – type conversion - Runtime Polymorphism – virtual function – pure virtual functions – abstract class- RTTI- Inheritance – private, public protected derivations – multiple Inheritance – multilevel Inheritance – Hierarchical Inheritance – Hybrid Inheritance - virtual base class.

UNIT III TEMPLATES, EXCEPTION HANDLING AND FILES 9+3

Templates – Function templates – class templates - Exception handling – try-catch-throw paradigm– exception specification – terminate and Unexpected functions – Uncaught exception - Streams and formatted I/O – I/O manipulators - file handling – random access – object serialization – namespaces - Standard template library.

UNIT IV JAVA OOPS CONCEPTS 9+3

Data types – Variables – Arrays – Operators - Control statements - Classes, objects, and methods - Method overloading and overriding – Inheritance - Interfaces and packages.

UNIT V ADVANCED JAVA PROGRAMMING 9+3

Exception handling - Multithreaded programming - The I/O classes – Generics - String handling.

TOTAL (L+ T): 60 Periods

OUTCOMES:

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

- Apply the concepts of object oriented programming for practical problem solutions.
- Apply generic data type for the data type independent programming which relates to reusability.
- Design the exception handling techniques for resolving run-time errors and handle large data set using file I/O
- Develop Java programs using object oriented concepts.
- Design and develop real world problems in Java.

TEXT BOOKS:

1. B. Trivedi, ―Programming with ANSI C++, Second Edition, Oxford University, Press, 2012.
2. Herbert Schildt, Java: The Complete Reference, Eleventh Edition, 11th Edition, McGraw Hill, 2018.

REFERENCES:

1. Deitel and Deitel, "C++ How to Program", Tenth Edition, Pearson Education, 2017
2. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers, 3rd Edition, Pearson, 2015
3. Herbert Schildt, - C++: The Complete Reference, Fourth Edition, McGraw Hill, 2013
4. Bjarne Stroustrup, "The C++ programming language", Fourth Edition, Addison Wesley, 2013
5. Ira Pohl, ― Object oriented programming using C++, Second Edition, Pearson Education Asia, 2012

AD18211	DATA STRUCTURES AND ALGORITHM ANALYSIS LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES

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

- Familiar with the applications of different linear data structures.
- Understand the tree data structures and its representation.
- Familiar with the implementation of graph algorithms and its applications.

LIST OF EXPERIMENTS

1. Sorting
    - Selection Sort
    - Bubble Sort
    - Insertion Sort
    - Quick Sort
    - Merge Sort
2. Searching
    - Linear Search
    - Binary Search
3. Array Implementation of List
4. Linked List Implementation of List
5. Array Implementation of Stack
6. Linked List of Stack
7. Applications of Stack
    - Infix to Postfix Expression
    - Evaluation of Postfix Expression
8. Array Implementation of Queue
9. Linked List of Queue
10. Binary Search Tree with Tree traversal Techniques – Preorder, Post order and In order.
11. AVL tree
12. Binary Heap
13. Graph Traversal Algorithm
    - Breadth-first search
    - Depth-first search
14. Shortest Path Algorithm
    - Dijkstra’s algorithm
    - Floyd – Warshall’s algorithm
15. Minimum Spanning Tree
    - Kruskal's algorithm
    - Prim's algorithm

TOTAL: 60 Periods

OUTCOMES:

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

- Apply linear data structures to real word problems.
- Develop recursive algorithms for tree data structures and implement its different traversals.
- Apply graph algorithms to various real time applications.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Standalone desktops with C / C++ and Java compiler 30 Nos. or)
- Server with C/C++ and Java compiler supporting 30 terminals or more

AD18212	OBJECT ORIENTED PARADIGM AND PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES

This course will develop the student's ability to

- Be familiarized with good programming design methods
- Getting exposure in implementing various OOPS Concepts
- Appreciate recursive algorithms.

LIST OF EXPERIMENTS

Implement the following topics:

C++

1. Programs Using Functions
   - Functions with default arguments
   - Implementation of call by value, call by address and call by reference
2. Classes with data members, member functions and constructors
   - Static data member and static member function
   - Const data member and const member function
3. Compile time polymorphism
   - Function Overloading
   - Unary and Binary Operator Overloading
   - Unary and Binary Operator Overloading using friend functions
4. Inheritance
   - Single Inheritance
   - Multiple Inheritance
   - Multilevel Inheritance
   - Hierarchical Inheritance
   - Hybrid Inheritance
5. Runtime Polymorphism
   - Virtual functions
   - Pure virtual functions
6. Templates
   - Function Templates
   - Class Templates
7. Exception Handling
8. File Handling
   - Sequential access
   - Random access
9. Formatted and Unformatted I/O Manipulators
10. Standard Template Library

Java

11. Simple Java application
12. Package creation
    Handling in built packages
    Creating user defined packages
13. Interfaces
14. Threading and Synchronization
15. Exception handling
    - Handling pre-defined exceptions
    - Handling user-defined exceptions

TOTAL: 60 Periods

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Design and implement C++ programs for implementing OOPS concepts.
- Apply good programming design methods for program development.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Standalone desktops with C++ compiler 30 Nos. or
- Server with C++ compiler supporting 30 terminals or more

MA18353	PROBABILITY & STATISTICS FOR DATA SCIENCE	L	T	P	C
		3	1	0	4

OBJECTIVES

The student should be made to:

- Understand the basic concepts of the probability and to apply the same for Engineering Problems
- Understand the fundamentals of one and two dimensional random variables and to introduce some standard distributions applicable to data science.
- Provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.
- Identify of appropriate test in Statistics based on the given Data and also to apply and validate
- Understand the concept of Random Process and Applications to Engineering Problems

UNIT I DESCRIPTIVE STATISTICS AND PROBABILITY 9+3

Introduction – Measures of central tendency-Mean, Median, Mode – Measures of Dispersion – Range, Interquartile range, Standard deviation – Probability – Axioms of probability – Conditional probability – Bayes' theorem.

UNIT II RANDOM VARIABLES 9+3

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson and Normal distributions. Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS – LARGE SAMPLES 9+3

Sampling distributions – Population and Samples – Estimation of parameters – Statistical hypothesis – Confidence Interval – Large sample test for single mean, single proportion, difference of means and difference of proportions.

UNIT IV TESTING OF HYPOTHESIS – SMALL SAMPLES 9+3

Tests based on t, F and chi-square distributions for mean, variance and proportion – Tests for independence – Goodness of fit.

UNIT V INTRODUCTION TO RANDOM PROCESS 9+3

Introduction – Classification – Stationary Processes – Auto correlation functions – Cross correlation functions – Properties –Power spectral density – Cross spectral density.

TOTAL (L+T): 60 Periods

OUTCOMES:

Upon completion of the course,

- The students will have a fundamental knowledge of the concepts of probability.
- The students will have knowledge of standard distributions which is more relevant to Data Science and its Applications
- The students will have a notion of sampling distributions and statistical techniques used in Data science.
- To analyse and interpret the data based on the sample tests
- The students will acquire knowledge on Random processes and its applications

TEXT BOOKS:

1. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2. Richard A J, Irwin Miller, John Freund, Miller and Freund's - Probability and Statistics for Engineers, Pearson Education, Asia, Eighth Edition, 2007.

REFERENCES:

1. Johnson. R.A. and Gupta. C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th Edition, 2007.
2. Walpole R E, Myres, R H, Myres SL and Ye K, Probability and Statistics for Engineers and Scientists, Pearson Education, Asia, Eighth Edition, 2007.
3. Spiegel M R, Schiller J and Srinivasan R A, Schaum Outline of Theory and Problems of Probability and Statistics, Tata McGraw Hill Edition, 2004.

MA18354	MATHEMATICS FOR DATA ANALYSIS	L	T	P	C
		3	1	0	4

OBJECTIVES

The student should be made to:

- Apply the concepts of basic principles of Combinatorics and its Applications.
- Understand the basic concepts in Number Theory and its Applications in Data Science.
- Understand the fundamental concepts of graph theory.
- Understand the advanced concepts of graph theory and its applications to computer science.
- Provide the required support to develop regression models which can be used in data analytics.

UNIT I COMBINATORICS **9+3**

Sets - Operations - Inclusion and exclusion principle and its applications – Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions.

UNIT II DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS **9+3**

Division algorithm – Base - b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.

UNIT III REGRESSION ANALYSIS **9+3**

Introduction – The Simple Linear Regression Model – Estimating Model Parameters. Inferences about the Slope Parameter and the Prediction of Future Y Values. Introduction to Non-Linear and Multiple Regression Models.

UNIT IV FUNDAMENTALS OF GRAPH THEORY **9+3**

Graphs and Interconnection Networks – Types of Graphs – Trees and Decision Trees – Planar Graphs – Kuratowski's Theorem – Degree Sequence – Matrix Representation of Graphs and Graph Isomorphism, Spectrum of Graphs – Graph Measurements: Length, Distance, Diameter, Eccentricity, Bisection width and Betweenness Centrality. Euler and Hamilton Concepts.

UNIT V APPLICATIONS OF GRAPH THEORY **9+3**

Connectivity and Paths: Cuts and Connectivity, Menger’s Theorem, *k*-Network Flow – Ford-Fulkerson Algorithm, Max-Flow Min-cut Theorem – Labeling: Graceful and Cordial

– Domination: Independent and Connected, Matching: Matching and Perfect Matching applications to optimal assignment problem- Colouring and Vizing's Theorem – Timetabling Problem.

TOTAL: (L+ T): 60 PERIODS

OUTCOMES:

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

- Apply the Counting Principles to compute the running time algorithm.
- Apply integrated approach to number theory and algebra and provide a firm basis for further reading and study in the subject.
- Use graph models and their connectivity, to study the interconnection network architecture in related to Computer Science
- Use graph theoretical problem to solve real world problem in the area of optimization and data analytics.
- Understand and characterize phenomenon which evolve with respect to time in a probabilistic manner.
- Have basis to develop regression models

TEXT BOOKS:

1. Koshy, T., "Elementary Number Theory with Applications", Elsevier Publications, New Delhi, 2002.
2. J. A. Bondy and U. S. R. Murty, Graph Theory and Applications, The Macmillan Press Ltd. New York 1982.
3. Johnson. R.A. and Gupta. C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th Edition, 2007.

REFERENCES:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2012.
2. Niven, I., Zuckerman. H.S., and Montgomery, H.L., ―An Introduction to Theory of Numbers, John Wiley and Sons , Singapore, 2004.
3. Kenneth H. Rosen and K. Krithivasan, Discrete. Mathematics and Its Applications With Combinatorics and Graph Theory. McGraw-Hill Companies Seventh Edition 2012.

CS18402	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES

- Understand the basic concepts and functions of operating systems.
- Understand Processes and Threads.
- Analyze Scheduling algorithms.
- Understand the concept of Deadlocks.
- Analyze various memory management schemes.
- Understand I/O management and File systems.

UNIT I OPERATING SYSTEMS OVERVIEW 9

Computer System Organization – Computer System Architecture – Evolution of Operating System – Operating System Structures – Services and Operations – System Calls – System Programs – Operating System Generation and System Boot – Computing Environments.

UNIT II PROCESS MANAGEMENT AND SCHEDULING 9

Process Concept – Process Scheduling – Operations on Processes – Interprocess Communication – Shared Memory – Message Passing – PIPES. Threads – Overview – Multicore Programming – Multithreading Models – Thread Libraries – Threading Issues – Windows 7 – Thread and SMP Management. CPU Scheduling – Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling – Real time scheduling – Algorithm Evaluation. Case study: Process scheduling in Linux.

UNIT III PROCESS SYNCHRONIZATION AND DEADLOCK 9

Process Synchronization – The critical-section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors. Deadlock – System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock.

UNIT IV MEMORY MANAGEMENT 9

Main Memory – Memory Partitioning – Memory Allocation Algorithms – Segmentation – Paging – 32 and 64 bit architecture – Virtual Memory – Data structures – Management Policies – Demand Paging – Replacement Algorithms – Allocation – Thrashing – Allocating Kernel Memory - Case Study: Windows, Solaris OS.

UNIT V FILE SYSTEM AND SECONDARY STORAGE STRUCTURE 9

File System Storage – File Concepts – Access Methods – File Sharing and Protection – File System Structure – File System Implementation – Directory Structure – Allocation

Methods – Free Space Management – Mass Storage Structure – Overview – Disk Scheduling and Management – Swap Space Management – RAID Structure – Kernel I/O Systems. Case Study: Mobile OS – iOS and Android.

TOTAL (L): 45 Periods

OUTCOMES:

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

- Apply the functionality of Operating Systems.
- Design various Scheduling algorithms.
- Apply the principles of concurrency and to design deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes
- Design and Implement a prototype file systems.

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.

REFERENCES:

1. William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
3. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 1996.
4. Neil Smyth, ―iPhone iOS 4 Development Essentials – Xcode, Fourth Edition, Payload media, 2011.

AD18301	FOUNDATION TO COMPUTER SYSTEMS DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES

This course will develop the student's ability to

- Be familiar with the various types of performance metrics
- Be familiar with the basic instruction sequencing.
- Be familiar with the different I/O interfaces
- Be familiar with an ALU

UNIT I BASIC STRUCTURE OF COMPUTERS 9

Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions.

UNIT II INPUT/OUTPUT ORGANIZATION 9

Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB.

UNIT III ARITHMETIC 9

Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division.

UNIT IV BASIC PROCESSING UNIT 9

Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Micro programmed Control.

UNIT V PIPELINING 9

Basic concepts of pipelining, Data Hazards, Instruction hazards, Influence on Instruction sets, Data path and control considerations, Super scalar operation.

TOTAL (L): 45 Periods

OUTCOMES:

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

- Explain the basic organization of a computer system.
- Demonstrate functioning of different sub systems, such as processor, Input/output,

and memory.

- Design and analyze simple arithmetic and logical units.
- Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.
- Demonstrate the effects of hazards

TEXT BOOKS:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2014.

REFERENCES:

1. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2013

AD18302 INTELLIGENT DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To learn about the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
- To have an introductory knowledge about the Storage and Query processing Techniques and NoSQL.

UNIT I RELATIONAL DATABASES **9**

Purpose of Database System -– Views of data – Data Models – Database System Architecture Introduction to relational databases - Relational Model – Keys – Relational Algebra – Relationa Calculus – SQL fundamentals - Advanced SQL features – Triggers – Embedded SQL – Dynami SQL – Database connectivity.

UNIT II DATABASE DESIGN **9**

Entity-Relationship Model – E-R Diagrams **–** Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III TRANSACTION MANAGEMENT **9**

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit -- Save Points – Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Recovery Isolation Levels

UNIT IV IMPLEMENTATION TECHNIQUES **9**

Overview of Physical Storage Media – RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Catalog Information for Cost Estimation - Query Optimization

UNIT V INTELLIGENT DATABASES **9**

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases TSQL2- Deductive Databases-Recursive Queries in SQL- Spatial Databases- Spatial Data Types -

Spatial Relationships- Spatial Data Structures-Spatial Access Methods- Spatial DB Implementation.

TOTAL (L): 45 Periods

OUTCOMES:

At the end of the course, the student should be able to:

- To design database schema models with constraints.
- To design database using E-R modeling and apply normalization techniques over it.
- To manage the transactions that happens in a database.
- To analyze the recent advancements in databases.
- To design and implement database for real world applications.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ― Database System Concepts, Sixth Edition, Tata McGraw Hill, 2019.
2. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S. Subrahmanian, Roberto Zicari, "Advanced Database Systems", Morgan Kaufmann publishers, 2006.

REFERENCES:

1. Ramez Elmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2010.
2. C.J. Date, A. Kannan, S. Swamynathan, ― An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006..
3. Leskovec, J., Rajaraman, A., & Ullman, J. D.-Mining of massive datasets. Cambridge university press, 2014.
4. Raghu Ramakrishnan, Johannes Gehrke ―Database Management Systems, Fourth Edition, Tata Mc Graw Hill, 2010.
5. G.K. Gupta, ―Database Management Systems, Tata McGraw Hill, 2011.
6. Carlos Coronel, Steven Morris, Peter Rob, ―Database Systems: Design, Implementation and Management, Ninth Edition, Cengage Learning, 2011
7. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", Wiley and SAS Business Series, 2012.

AD18303	PROGRAMMING FOR DATA SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES

The Student should be made to:

- Understand writing simple programs using Python and R.
- Understand the concepts of data structures such as Lists, Vectors etc.
- Understand the concepts of dataframes and ndarray
- Understand the concepts of data storage, transformation, visualization and modeling

UNIT I INTRODUCTION TO BASICS OF PROGRAMMING 9

Introduction to Python and R- Variables - Expressions and Statements - Operators-String Operations - Functions-Control and Iterative structures.

UNIT II CLASS, DATA STRUCTURES 9

Objects and Classes, Data structures - List - Tuple - Set - Dictionary: Operations and Methods.

UNIT III ARRAYS, DATAFRAME 9

Creating ndarrays - Arithmetic with Arrays - Basic Indexing and Slicing - Transposing Arrays and Swapping Axes - File Input and Output with Arrays - Mathematical and Statistical Methods. Introduction to DataFrame - fundamental methods to interact with DataFrame, Arithmetic and Data Alignment, Summarizing and Computing Descriptive Statistics.

UNIT IV DATA STORAGE AND DATA TRANSFORMATION 9

Reading and Writing Data - Data Cleaning-Data transformation- Data Wrangling, Interacting with databases.

UNIT V VISUALIZATION AND MODELING 9

Data aggregation - Group Operations-Introduction to Data Plotting and Visualization, Modeling Libraries - Introduction to Statistics model.

TOTAL (L): 45 Periods

OUTCOMES:

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

- Develop simple programs using python/R.
- Apply the concepts of lists, tuples, dictionaries and sets.
- Write programs using ndarray and dataframes.
- Apply the concepts of data storage and data transformation
- Apply the concepts of data visualization and develop models.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, O'Reilly Publishers, 2016
2. Hadley Wickham & Garrett Grolemund, "R for Data Science", O'Reilly Media, 1st edition, 2016

REFERENCES:

1. Wes McKinney, "Python for Data Analysis", O'Reilly Media, 2nd edition, 2017
2. Mark Lutz, Learning Python, 5th edition, Updated for Python 3.3, O'Reilly Publishers 2013. (Revised in 2020)
3. John V Guttag, "Introduction to Computation and Programming Using Python", Revise and expanded Edition, MIT Press, 2013
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd. 2016

CS18411 OPERATING SYSTEMS LABORATORY

L	T	P	C
0	0	3	1.5

OBJECTIVES

- Learn Unix commands and shell programming.
- Be exposed to programming in C using system calls.
- Learn to implement process creation and inter process communication.
- Be familiar with implementation of CPU Scheduling Algorithms
- Be familiar with implementation of page replacement algorithms
- Be familiar with implementation of Deadlock avoidance and detection algorithms.
- Be familiar with implementation of File Organization and File Allocation Strategies.

List of Experiments

1. Study of UNIX Commands.
2. Study of Shell Programming.
3. Implement system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir.
4. Simulate Unix commands cp, mv, ls, grep.
5. Implement the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority.
6. Implement all file allocation strategies.
   a) Sequential b) Indexed c) Linked.
7. Implement Producer Consumer Problem using Semaphores.
8. Implement all File Organization Techniques.
   a) Single level directory b) Two level c) Hierarchical d) DAG
9. Implement Bankers Algorithm for Dead Lock Avoidance.
10. Implement an algorithm for Dead Lock Detection.
11. Implement the following page replacement algorithms.
    a) FIFO b) LRU c) LFU
12. Implement Shared memory, message passing and pipes.
13. Implement Paging and Segmentation Technique of memory management.
14. Implement Threading & Synchronization Applications for Reader Writer Problem.
15. Study of Mimix Operating System.

TOTAL: 45 Periods

OUTCOMES:

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

- Implement system calls in UNIX.
- Compare the performance of various CPU Scheduling Algorithms
- Implement Deadlock avoidance and Detection Algorithms.
- Implement semaphores, create processes and perform IPC.

- Implement the various Page Replacement Algorithms and File Organization and File Allocation Strategies.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
HARDWARE:

1. Standalone desktops 30 Nos. (or) Server supporting 30 terminals or more.

SOFTWARE:

Standalone desktops with C / C++ / Java / Equivalent complier 30 Nos.

(or)

Server with C / C++ / Java / Equivalent complier supporting 30 terminals

AD18311	INTELLIGENT DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- Learn to create and use a database.
- Be familiarized with a query language.
- Have hands on experience on DDL Commands.
- Have a good understanding of DML Commands and DCL Commands.
- Familiarize advanced SQL queries.
- Be exposed to different applications.

LIST OF EXPERIMENTS:

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
7. Write a PL/SQL block that handles all types of exceptions.
8. Creation of Procedures.
9. Creation of database triggers and functions
10. Intelligent database interface
11. Database Connectivity with Front End Tools
12. Case study of Big Data and NoSQL.
13. Mini project
    a. Inventory Control System.
    b. Material Requirement Processing.
    c. Hospital Management System.
    d. Railway Reservation System.
    e. Personal Information System.
    f. Web Based User Identification System.
    g. Timetable Management System.
    h. h) Hotel Management System

TOTAL: 45 Periods

OUTCOMES:

At the end of the course, the student should be able to:

- Design and implement a database schema for a given problem-domain
- Populate and query a database.
- Create and maintain tables using PL/SQL.
- Implement triggers for application specific actions.
- Establish database connectivity with Front End tools.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:

- Standalone desktops 30 Nos. (or) Server supporting 30 terminals or more

SOFTWARE:

- OS: Fedora / Linux, Hadoop package.
- Front end: VB/VC ++/JAVA or Equivalent,
- Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent, Logica

AD18312	PROGRAMMING FOR DATA SCIENCE LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES

The Student should be made to:

- Write basic programs using Python and R.
- Be familiar with data structures such as Lists, Vectors, Tuples etc.,
- Learn the concepts of using dataframes and ndarray.
- Learn the concepts of data storage, transformation.
- Learn the concepts of data visualization and modeling techniques.

List of Experiments

1. Write simple programs using Python/R.
2. Write programs using control and iterative structures.
3. Write programs using functions.
4. Write programs using classes and objects.
5. Develop simple programs using vectors, lists and tuples.
6. Develop simple programs using set and dictionary.
7. Write programs for accessing ndarray and perform various operations on it.
8. Write programs to interact with dataframe and perform various operations.
9. Write programs to perform data transformation.
10. Develop programs to perform data wrangling.
11. Develop programs to interact with database.
12. Write programs for data aggregation and grouping functions
13. Create various graphical plots for analysing data.
14. Select appropriate functions for estimation of samples.
15. Develop mathematical and statistical models.

TOTAL: 45 Periods

OUTCOMES:

At the end of the course, the student should be able to:

- Develop basic programs using Python and R.
- Implement data structures using Lists, Vectors, Tuples etc., using Python/R.
- Use dataframes and ndarray in Python/R.
- Implement the concepts of data storage, data transformation, data wrangling and database connectivity.
- Visualize data using various plots.
- Build mathematical and statistical models.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Standalone desktops with Python and R computers 30 Nos.

(or)

- Server with Python and R supporting 30 terminals or more.

MA18456	QUEUEING THEORY AND OPTIMIZATION	L	T	P	C
		3	1	0	4

OBJECTIVES

The student should be made to:

- Understand the concepts of Linear Programming Problems and its Applications
- Learn the basic concepts of Transportation and Assignment problems
- Understand the fundamental concepts of Queueing systems and its Applications
- Gain more knowledge in analysing queuing models.
- Understand the basic concepts of Optimization and apply the same to problems in Machine Learning

UNIT I QUEUEING MODELS **9+3**

Markovian queues – Birth and Death processes – Single and multiple server queueing models—Little's formula- Queues with finite waiting rooms - Finite source models

UNIT II ADVANCED QUEUEING MODELS **9+3**

M/G/1 queue - Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases-Series queues – Open Jackson networks.

UNIT III LINEAR PROGRAMMING MODELS **9+3**

Mathematical Formulation –Graphical solution of LP models – Simplex method – Artificial Variable Techniques—Variants of Simplex method- Primal and Dual relationships - Dual-simplex method-post optimal Analysis

UNIT IV TRANSPORTATION AND ASSIGNMENT MODELS **9+3**

Mathematical Formulation of Transportation problem – Methods for finding Initial Basic Feasible solution – Optimum solution – Degeneracy - Mathematical Formulation of Assignment Models – Hungarian Algorithm – Variants of Assignment problem

UNIT V CLASSICAL OPTIMIZATION THEORY **9+3**

Unconstrained and Constrained optimization - Numerical optimization techniques for constrained and unconstrained optimization: KKT conditions - Newton's method - Steepest descent method - Penalty function method.

TOTAL (L+ T): 60 Periods

OUTCOMES:

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

- Identify, formulate Linear Programming Problems and analyze the same
- Analyze and evaluate the various methods under transportation, assignment models
- Acquire skills in analyzing queueing models
- Design networks using Queueing theories in domain specific situations.
- Apply optimization techniques to problems in Machine Learning

TEXT BOOKS:

1. Taha H.A. “Operations Research”, Pearson Education, Asia, 8th Edition, 2007.
2. Gross.D. and Harris.C.M, “Fundamentals of Queueing Theory”, Wiley student Edition,2004

REFERENCES:

1. Hira and Gupta “Problems in Operations Research”, S. Chand and Co., 2008
2. J. Nocedal and S. J. Wright, Numerical Optimization. New York: Springer Science+Business Media, 2006
3. Winston. W.L. “Operations Research”, Fourth Edition, Thomson – Brooks/Cole, 2003

AD18401	INTELLIGENT COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The learner should be made to:

- Understand the concepts of computer network and Internet.
- Be familiar with real time applications of networks.
- Learn the Transport Layer, flow control and congestion control algorithms.
- Be exposed to various addressing schemes and routing protocols.
- Understand the better manage and control networking, the intelligent awareness of network traffic.
- Understand the link, physical layers and error detection-correction of data.

UNIT I INTRODUCTION TO COMPUTER NETWORK AND INTERNET **9**

What is Internet-The Network Edge-The Network Core- Delay, Loss, and Throughput in Packet Switched Networks- Protocol Layers and Their Service Models- Networks Under Attack- History of Computer Networking and the Internet.

UNIT II APPLICATION LAYER **9**

Principles of Network Applications- The Web and HTTP- File Transfer: FTP- Electronic Mail in the Internet- DNS—The Internet‘s Directory Service- Peer-to-Peer Applications- Socket Programming: Creating Network Applications.

UNIT III TRANSPORT AND NETWORK LAYER **9**

Introduction and Transport-Layer Services- Multiplexing and De-multiplexing- Connectionless Transport: UDP- Principles of Reliable Data Transfer- Connection-Oriented Transport: TCP Principles of Congestion Control- TCP Congestion Control- Routing Algorithms- Routing in the Internet- Broadcast and Multicast Routing.

UNIT IV LINK AND PHYSICAL LAYER **9**

Introduction- Introduction to the Link Layer- Error-Detection and –Correction Techniques- Multiple Access Links and Protocols- Physical Layer: Digital Transmission – Multiplexing and Spread Spectrum - Transmission Media, Virtual Circuit and Datagram Networks- What‘s Inside a Router- The Internet Protocol (IP), Forwarding and Addressing in the Internet- Routing Algorithms.

UNIT V INTELLIGENT NETWORK **9**

Intrusion Detection System Based on Multi-Level Semi-Supervised Machine Learning- Intrusion Detection Based on Hybrid Multi-Level Data Mining- Framework of HMLD-Abnormal Network Traffic Detection Based on Big Data Analysis.

TOTAL (L): 45 Periods

OUTCOMES:

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

- Learners will be able to choose the required functionality at each layer for given application
- Choose the required functionality at each layer for given application
- Detect and Correct the error in the frame
- Apply the knowledge of addressing scheme and various routing protocols in data communication to select optimal path.
- Trace the flow of information from one node to another node in the network
- Apply the intelligent awareness of network traffic

TEXT BOOKS:

1. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Seventh Edition, Pearson Education, 2017.
2. Yao, Haipeng, Jiang, Chunxiao, Qian, Yi, Developing Networks using Artificial Intelligence, Springer, 2019.

REFERENCES:

1. Behrouz A. Forouzan, "Data Communications and Networking", Fourth Edition, McGrawHill, 2011.
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.
3. John Anderson,"Intelligent Networks: Principles and applications", IET Publications, 2002.
4. Syed V Ahamed," Intelligent Networks", First Edition, Elsevier, 20213.
5. GerardusBlokdyk,"Intelligent Network A Complete Guide",5STARCooks,2020.

AD18402	PRINCIPLES OF ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the various Intelligent agents and problem solving search strategies
- To learn about game playing and constraint satisfaction problems
- To learn to represent knowledge in solving AI problems
- To combine problem-solving strategies with knowledge representation mechanism for solving hard problems
- To understand the role of expert systems

UNIT I PROBLEM SOLVING METHODS **9**

Foundations of Artificial Intelligence, State of the Art; Intelligent Agents - Characteristics of Intelligent Agents, Typical Intelligent Agents; Problem solving - Search Strategies, Uninformed, Informed, Heuristic Functions; Production Systems – Introduction and Characteristics, Water Jug Problem

UNIT II ADVERSARIAL SEARCH **9**

Game Playing - Optimal Decisions in Games, Alpha-Beta Pruning, Stochastic Games; Constraint Satisfaction Problems – Inference, Backtracking Search and Local Search

UNIT III KNOWLEDGE REPRESENTATION **9**

Representing Knowledge using Rules; Predicate logic - Syntax and Semantics, Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution; Semantics Nets, Frames and Scripts; Dempster-Shafer Theory and Fuzzy Logic

UNIT IV PLANNING **9**

Planning - Overview, Components of a Planning System, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting

UNIT V EXPERT SYSTEMS **9**

Expert Systems – Introduction, Architecture, Knowledge acquisition; Expert System Shells; Typical Expert Systems – MYCIN, ONCOCIN, Dxplain, PUFF, DART and XCON

TOTAL (L): 45 Periods

OUTCOMES:

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

- Use appropriate search algorithms for any AI problem.
- Make inferencing in game playing
- Represent a problem using predicate logic
- Solve hard problems using problem-solving strategies with knowledge representation mechanism
- Design and develop expert system for real-time applications

TEXT BOOKS:

1. Peter Norvig and Stuart Russel, Artificial Intelligence: A Modern Approach, Pearson, 4th Edition, 2020
2. Elaine Rich, Kevin Knight and B.Nair, Artificial Intelligence 3rd Edition, McGraw Hill, 2008

REFERENCES:

1. Melanie Mitchell, Artificial Intelligence: A Guide for Thinking Humans. Series: Pelican Books, 2020
2. Ernest Friedman-Hill, Jess in Action, Rule-Based Systems in Java, Manning Publications, 2003
3. Nils J. Nilsson, The Quest for Artificial Intelligence, Cambridge University Press, 2009
4. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems,1st Edition by Patterson, Pearson, India, 2015

AD18403	APPLIED MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the fundamental concepts of Machine learning techniques
- To enable the students to gain knowledge of parameter estimation methods
- To study the concepts of non-parameter estimation methods and dimensionality reduction techniques.
- To understand various discriminative learning models
- To understand decision tree algorithm and schemes of combining models.

UNIT I INTRODUCTION **9**

Overview of Machine Learning-Applications-Types of learning -Supervised learning-Classification, Regression, Unsupervised learning, Reinforcement learning; Bayesian Decision Theory-Classification-Losses and Risks- Discriminant Functions – Utility Theory, Learning Associations-Association Rules.

UNIT II PARAMETERIC METHODS **9**

Maximum Likelihood Estimation-Bernoulli Density, Multinomial Density, Gaussian (Normal) Density; Evaluating an Estimator-Bias and Variance, Bayes Estimator-Parametric Classification, Regression, Tuning Model Complexity-Bias-Variance Dilemma-Model Selection Procedures.

UNIT III NON-PARAMETRIC METHODS AND DIMENSIONALITY REDUCTION **9**

Non parametric Density Estimation-Non parametric Classification - K-Nearest neighbor, Non parametric Regression - Smoothing models ; Clustering - K-means – K –Medoid Hierarchical clustering Dimensionality reduction - Principal Component Analysis-Fisher Discriminant Analysis – Independent Component Analysis.

UNIT IV DISCRIMINATIVE LEARNING MODELS **9**

Logistic regression –Artificial neural networks- Perceptrons - Training a Perceptron-Learning Boolean Functions - Multilayer Perceptrons - Back propagation Algorithm, Training Procedures and Tuning Network Size; Kernel Machines - Optimal Separating Hyperplane - The Nonseparable Case: Soft Margin Hyperplane - Kernel Trick .

UNIT V TREE MODELS AND COMBINING CLASSIFIERS **9**

Decision trees – Classification trees - Regression trees –Pruning; Rule extraction from trees- Combining Multiple Learners, Voting- Generating Diverse Learners-Model Combination Schemes-Voting-Error-Correcting Output Codes-Random Forests-Bagging-Boosting-Mixture of Experts.

TOTAL (L): 45 Periods

OUTCOMES:

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

- Develop an appreciation for what is involved in learning models from real world data.
- Use parametric methods to obtain AI based solution.
- Implement machine learning solutions to clustering problems.
- Use discriminative models to evaluate data
- Apply the decision tree and mixture of experts algorithms to real-world problems.

TEXT BOOKS:

1. Peter Norvig and Stuart Russel, Artificial Intelligence: A Modern Approach, Pearson, 4th Edition, 2020
2. Alpaydin, E., "Introduction to machine learning" MIT press, 2020

REFERENCES:

1. Bratko, ―Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
2. Deisenroth, Marc Peter, A. Aldo Faisal, and Cheng Soon Ong. Mathematics for machine learning. Cambridge University Press, 2020.
3. Kroese, Dirk P., Zdravko Botev, Thomas Taimre, and Radislav Vaisman. Data Science and Machine Learning: Mathematical and Statistical Methods. CRC Press, 2019.
4. Marsland, Stephen. Machine learning: an algorithmic perspective. CRC press, 2015.

AD18404 OBJECT ORIENTED SOFTWARE ENGINEERING L T P C

3 0 0 3

OBJECTIVES

The student should be made to:

- Understand generic process models to structure the software development process.
- Understand fundamental concepts of requirements engineering and Modelling using UML concepts.
- Understand the principles, process and concepts of various design models.
- Learn various conventional and object oriented testing strategies.
- Learn the concepts of Software maintenance and Reengineering.

UNIT I SOFTWARE PROCESS AND PROJECT MANAGEMENT 9

Introduction - Process models- Agile Development- Process and Project Metrics: Software Measurement - LOC & FP based estimation - Empirical estimation models – Risk analysis -Software project scheduling and Tracking.- Object Oriented concepts, Principles & Methodologies- Object Oriented Estimation & Scheduling.

UNIT II REQUIREMENTS ANALYSIS AND MODELING 9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process -Requirement Modeling: Scenario based Modeling(Use Case, Swimlane and Activity),Class based modelling – Flow & behaviour based Modeling – Structured analysis.

UNIT III SOFTWARE DESIGN 9

Design Principles – Design Process and Concepts – Architectural Design – Architectural styles, Architectural Mapping using Data Flow Diagram (DFD) - User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNIT IV TESTING AND IMPLEMENTATION 9

Software Testing Strategies: Unit Testing- Integration Testing- Validation Testing – System Testing – Art of Debugging, Testing Conventional applications: White Box Testing & Black Box Testing, Testing Object oriented Applications: Object oriented testing strategies & methods – Testing at class level.

UNIT V MAINTENANCE & RE-ENGINEERING 9

Software Maintenance – Software supportability – Reengineering – Business process Reengineering – Software Reengineering – Reverse Engineering – Restructuring – Forward Engineering – The Economics of Reengineering.

TOTAL (L): 45 Periods

OUTCOMES:

At the end of the course, the student should be able to:

- Identify the key activities in managing a software development and management process.
- Compare different process models. Concepts of requirements engineering and Modelling using UML concepts.
- Apply systematic procedure for conventional and object oriented software design and deployment.
- Compare and contrast the various testing strategies of conventional and object oriented applications.
- Learn the concepts of Software Maintenance and Reverse Engineering**.**

TEXT BOOKS:

1. Roger. S. Pressman and Bruce R. Maxim, "Software Engineering – A Practitioner's Approach", seventh Edition, McGraw Hill, 2015.

REFERENCES:

1. Ian Sommerville, "Software Engineering", eighth edition, Pearson Education, New Delhi, 2011.
2. Bill Brykczynski, Richard D. Stutz, "Software Engineering Project Management", Wiley India Edition, IEEE computer society, 2007.
3. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development" (3rd Edition), Pearson Education, 2008.

GE18251	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To study the nature and facts about environment.
- To study the interrelationship between living organism and environment.
- To implement scientific, technological, economic, and political solutions to envir problems.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems, Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT II NATURAL RESOURCES AND DISASTER MANAGEMENT 9

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT III ENVIRONMENTAL POLLUTION 9

Definition – causes, effects and control measures Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes, e-Waste, risk related to e-Waste – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides, land degradation, man induced landslides, soil erosion and desertification.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT **9**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – Principles of green chemistry, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – Environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – central and state pollution control boards - Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT **9**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS, Swine flu, Dengue fever – women and child welfare – role of information technology in environment and human health management – case studies.

TOTAL (L): 45 Periods

OUTCOMES:

- Solve problems that cannot be solved by mere environmental laws.
- Acquire awareness on environmental issues at their infant stage.
- Integrate facts, concepts and methods for multiple disciplines and apply them to solve environmental and social problems.
- Analyse the connectivity between manmade activities – pollution – environmental issues – social problem and provide eco-friendly solutions.

TEXT BOOKS:

1. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill, New Delhi, 2012.
2. Gilbert M.Masters, Introduction to Environmental Engineering and Science, 2nd edition, Pearson Education, 2010.

REFERENCES:

1. Dharmendra S. Sengar, Environmental law‘, Prentice hall of India PVT LTD, New Delhi, 2012.
2. Erach Bharucha, ―Textbook of Environmental Studies, Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. Rajagopalan, R, Environmental Studies-From Crisis to Cure, Oxford University Press, 2011.

4. Tyler Miller. G and Scott E. Spoolman, ―Environmental Science, Cengage Learning India PVT, LTD, Delhi, 2013.

AD18411	INTELLIGENT COMPUTER NETWORKS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES

- Learn socket programming.
- Be familiar with simulation tools.
- Have hands on experience on various networking protocols

LIST OF EXPERIMENTS

1. Write a program to implement A. bit stuffing B. CRC
2. Study of Socket Programming and Client – Server model
3. Applications using TCP Sockets 1. Date and Time server & client 2. Echo server & client, etc. 3. Chat
4. Applications using UDP Sockets a. DNS
5. Simulation of Stop and Wait Protocol and Sliding Window Protocol
6. Simulation of ARP /RARP protocols
7. Simulation of PING and TRACEROUTE commands
8. Write a program to implement subnetting and find the subnet for a given IP
9. Using Cisco Packet Tracer, do the following a). Establish a Local Area Network (LAN) with 4 hosts and a switch/Hub b). Connect two LANs using multi-router topology with static routes
10. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS
11. Demonstrate intrusion detection system (ids) using any tool e.g. Snort or any other software
12. Write a program to implement signature based intrusion detection system used to detect network attacks

TOTAL: 45 Periods

OUTCOMES:

At the end of the course, the student should be able to:

- Use simulation tools
- Implement the various protocols.
- Analyze the performance of the protocols in different layers.
- Analyze various routing algorithms
- Understand the major software and hardware technologies used on computer networks and intelligent networks.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- C / C++ / Java / Equivalent Compiler 30 Network simulator like NS2/Glomosim/OPNET/ Equivalent/Snor.

AD18412	ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES

- Design and implement methods of solving problems using Artificial Intelligence.
- Implement various Expert Systems and machine learning strategies.

List of Experiments

1. Implement Breadth First Search & Depth first Search for Water Jug problem
2. Implement Minimax search Procedure for game playing
3. Implement Constraint Satisfaction Problems – Cryptarithmetic, Map Colouring
4. Implement various Python packages for Predicate Logic
5. Implement Unification algorithm using Python / JESS
6. Implement forward chaining and backward chaining using Python / JESS
7. Implement Dempster-Shafer using Python
8. Implement Fuzzy set operations using Python
9. Implement Goal Stack Planning using Python
10. Implement Expert system for the field of Medicine using JESS

TOTAL: 45 Periods

OUTCOMES:

At the end of the course, the student should be able to:

- Implement appropriate AI methods to solve a given problem.
- Implement and carry out an empirical evaluation of different algorithms on a problem
- Represent knowledge and perform inferencing using Python and JESS
- Design and implement an expert system for any domain

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Standalone desktops with C/C++/Java/Python/JESS compiler 30 Nos.
  - (or)
- Server with C/C++/Java/Python/JESS compiler supporting 30 terminals

AD18413	APPLIED MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES

The student should be made to:

- Understand the implementation of machine learning algorithms in python.
- Make use of appropriate data sets for implementing the machine learning algorithms**.**

List of Experiments

1. Introduction to Python Libraries- Numpy, Pandas, Matplotlib, Scikit.
2. Perform Data exploration and preprocessing in Python.
3. Implement Naive Baye's classification.
4. Implement Linear regression.
5. Implement K-Nearest Neighbor classification.
6. Build model to perform Clustering using K-mean algorithm.
7. Implement regularized logistic regression.
8. Build model using Back Propagation Neural Network.
9. Build model using SVM with different kernels.
10. Build model using Decision trees.

TOTAL: 45 Periods

OUTCOMES:

At the end of the course, the student should be able to:

- Identify the implementation procedures for the machine learning algorithms.
- Design Python programs for various Learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:

- Standalone desktops – 30 Nos. (or) Server supporting 30 terminals or more

SOFTWARE:

- Python compiler in Ubuntu OS.