SCHOOL OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

Scheme of Studies & Syllabus

B.Tech (Data Science)

(Batch 2023-27)

SEMESTER - I				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	PCC	ESC-101	Programming for Problem Solving Using C	3
2	BSC	BS-107	Mathematics-I	4
3	BSC	BS-109	Physics	4
4	ESC	EC-101	Basic Electrical and Electronics Engineering	3
5	HSMC	HSS-101	Effective Technical Communication	3
6	ESC	ME-151	Workshop Practice	2
7	PCC	ESC-151	Programming for Problem Solving Using C Lab	1
8	PCC	CS-155	PC Configuration Lab	1
9	ESC	EC-151	Basic Electrical and Electronics Engineering Lab	1
10	HSMC	HSS-151	English Communication Lab	1
11	BSC	BS-159	Physics Lab	1
12			YOGA	0
TOTAL				24

SEMESTER - II				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	BSC	BS-108	Mathematics-II	4
2	PCC	CS-106	Object Oriented Programming Using Java	3
3	PCC	CS-206	Database Management System	3
4	BS	BS-110	Environment Science and Chemistry	3
5	ESC	ME-152	Engineering Graphics Lab	1
6	PCC	CS-156	Object Oriented Programming Using Java Lab	1
7	PCC	CS-256	Database Management System Lab	1
8	BSC	BS-106	Environment Science and Chemistry Lab	1
9	PDP	PEP-102	Universal Human Values	2
TOTAL				19

SEMESTER - III				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	BS	EC-203C	Digital Electronics	3
2	PCC	CS-211	Python for Data Science	3
3	PCC	CS-207	Computer Architecture and Organization	4
4	PCC	CS-209	Discrete Mathematics & Graph Theory	4
5	PCC	CS-202	Operating System	3
6	PCC	CS-103	Data Structure Using C	3
7	PCC	CS-153	Data Structure Using C Lab	1
8	PCC	CS-261	Python for Data Science Lab	1
9	BS	EC-253C	Digital Electronics	1
10	PCC	CS-252	Operating System Lab	1
11	PDP		Soft Skill –I	1
12			Yoga	0
13	PEC	VAC-101	Valued Added-I	0
TOTAL				25

***MOOC/NPTEL:** Student is required to do certification on any MOOC Course of his/her choice running during the time period of semester on SWAYAM portal & submit the certificate.

SEMESTER – IV				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	PCC	CS-315	Business Analytics	4
2	PCC	CS-212	Design and Analysis of Algorithm	4
3	PCC	CS-216	Data Mining & Visualization	3
4	PCC	CS-305	Artificial Intelligence	3
5	PCC	CS-218	Applied Statistics & EDA	3
6	PCC	CS-303	Formal Language Automata Theory	4
7	PCC	CS-266	Data Mining & Visualization Lab	1
8	PCC	CS-355	Artificial Intelligence Lab	1
9	PCC	CS-268	Applied Statistics & EDA Lab	1
10	PDP	PDP-202	Life Skill	1
11		RA-101	Reasoning & Aptitude-I	1
12	PEC		Value Added-II	0
TOTAL				26

***EDU SKILL :** Student is required to do certification on any EDU Skill Course of his/her choice running during the time period of semester submit the certificate.

SEMESTER – V				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	PCC	CS-309	Predictive Analytics and Machine Learning	3
2	PCC	CS-304	Software Engineering	3
3	PCC	CS-317	Cognitive Science & Big Data Analytics	3
4	DE		Elective-I	3
5	OE		Open Elective-I	3
6	PCC	CS-319	Computer Network & Security	4
7	PCC	CS-359	Predictive Analytics and Machine Learning Lab	1
8	PCC	CS-367	Cognitive Science & Big Data Analytics Lab	1
9	PCC		Elective-I Lab	1
10	PCC	CS-354	Software Engineering Lab	1
11	PROJ	PROJ-301	Capstone Project-I	2
12	PDP	PDP-301	Leadership & Entrepreneurship Development	1
13	PEC		Value Added -III	
TOTAL				26

***MOOC/NPTEL:** Student is required to do certification on any MOOC Course of his/her choice running during the time period of semester on SWAYAM portal & submit the certificate.

SEMESTER- VI				
SN	**Category**	**Course Code**	**Course Name**	**Credits**
1	PCC	CS-403	Deep Learning	3
2	PCC	CS-308	Compiler Design	4
3	PCC	CS-421	Cloud Computing	4
4	PCC	CS-320	Business Economics	4
5	DE		Elective-II	3
6	OE		Open Elective-II	3
7	PCC	CS-453	Deep Learning Lab	1
8	PCC	CS-471	Cloud Computing Lab	1
9	PROJ	PROJ-302	Capstone Project-II	2
10		QA-101	Quantitative Aptitude	1
11	PEC		Value Added-IV	0
TOTAL				26

***EDU SKILL :** Student is required to do certification on any EDU Skill Course of his/her choice running during the time period of semester submit the certificate.

SEMESTER – VII				
SN	**Category**	**Course Code**	**Course Name**	**Credits**
1	PCC	CS-409	Soft Computing	3
2	PCC	CS-423	Social Network Analytics	3
3	PCC	CS-425	Cyber Forensic Analytics	3
4	PCC	CS-427	Time Series Analysis & Forecasting	4
5	DE		Elective-III	3
6	OE		Open Elective-III	3
7	PCC	CS-459	Soft Computing Lab	1
8	PCC	CS-473	Social Network Analytics Lab	1
9	PCC	CS-475	Cyber Forensic Analytics Lab	1
10	PROJ	PROJ-401	Capstone Project-III	4
11	PDP	PD-401	Campus to Corporate	1
TOTAL				27

***MOOC/NPTEL:** Student is required to do certification on any MOOC Course of his/her choice running during the time period of semester on SWAYAM portal & submit the certificate.

SEMESTER- VIII				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	PROJ	CS-490	Major Project/ Internship	15
2	PCC	CS-492	Seminar	5
TOTAL				20

TOTAL CREDITS

SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	SEM VIII	TOTAL
24	19	25	26	26	26	27	20	193

Departmental Elective

	Code	**Subject**
Elective-I	CS-306	Cryptography and Network Security
	CS-313	Statistical Inference for Data Science
	CS-216	Internet of Things
Elective-II	CS-314	Image Analytics
	CS-316	Stream Processing and Analysis
	CS-318	Natural Language Processing
Elective-III	CS-415	High-Dimensional Data Analytics
	CS-417	Nature Inspired Computing
	CS-419	Blockchain Technology

Value Added-I		
S.No	**Course Code**	**Course Name**
1	VAC-101	Advance Excel

Value Added-II		
S.No	**Course Code**	**Course Name**
1	VAC-201	Investment Avenue
2	VAC-202	Trading & Investment in Stock Market

Value Added-III		
S.No	**Course Code**	**Course Name**
1	VAC-301	Introduction to Research

Value Added-IV		
S.No	**Course Code**	**Course Name**
1	VAC-401	Interview Skills
2	VAC-402	Introduction to Research – I

BS-107	MATHEMATICS – I	L T P	Cr
		3 1 0	4

OBJECTIVES

The objective of this subject is to understand the major problems of differential and integral calculus and to appreciate how calculus allows us to solve important practical problems in an optimal way.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Calculate limits, derivatives and indefinite integrals of various algebraic and trigonometric functions of a single variable.

CO2: Use the fact that the derivative is the slop of the tangent line to the curve at a given Point.

CO3: Use the properties of limits and the derivative to analyze graphs of various functions of a single variable

CO4: Apply derivative tests in optimization problems appearing in social sciences, physical sciences, life Sciences and a host of other disciplines.

UNIT I

MATRIX ALGEBRA: Elementary operations and their use in getting the Rank, Inverse of a matrix and solution of linear simultaneous equations. Orthogonal, Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, Normal & Unitary matrices and their elementary properties. Eigen-values and Eigenvectors of a matrix, Cayley-Hamilton theorem, Diagonalization of a matrix.

UNIT II

DIFFERENTIAL CALCULUS: Limit, Continuity and differentiability of functions of two variables, Euler's theorem for homogeneous equations, Tangent plane and normal. Change of variables, chain rule, Jacobians, Taylor's Theorem for two variables, Error approximations. Extrema of functions of two or more variables, Lagrange's method of undetermined multipliers.

UNIT III

INTEGRAL CALCULUS: Review of curve tracing and quadric surfaces, Double and Triple integrals, Change of order of integration. Change of variables. Gamma and Beta functions. Dirichlet's integral. Applications of Multiple integrals such as surface area, volumes, centre of gravity and moment of inertia.

UNIT IV

VECTOR CALCULUS: Differentiation of vectors, gradient, divergence, curl and their physical meaning. Identities involving gradient, divergence and curl. Line and surface integrals. Green's, Gauss and Stroke's theorem and their applications.

REFERENCES

1. Shanti Narayan (2005), Differential Calculus, S. Chand Limited, ISBN 978-8-121-90471-4
2. P. K. Mittal (2005), Integral Calculus, S. Chand Limited, ISBN-13**:** 978-8-121-90681-4
3. Thomas (1996), Calculus and Analytical Geometry, Pearson Education, ISBN: 978-8-817- 758325-0.
4. Erwin Kreyszig, Herbert Kreyszig, Edward J. Norminton (2011), Advanced Engineering Mathematics, Wiley. ISBN: 978-0-470-45836-5.
5. R. K. Jain, S. R. K. Iyengar (2004), Advanced Engineering Mathematics, Alpha Science International. ISBN: 978-1-842-65185-8.

BS-109	PHYSICS	L T P	Cr
		3 1 0	4

OBJECTIVES

To familiar the students with the very basic knowledge of concepts and tools of applied physics and guide them to understand the various engineering subject.

COURSE OUTCOMES:

CO1: Examine the different phenomenon related with wave nature of light and significance in applications of engineering

CO2: Analyze the basics of laser and types of lasers & apply them to diverse engineering problems

CO3: Understand the concept of fundamental forces and apply the various laws in different engineering situations

CO4: Apply laws of the electrostatic and magnetostatic in different engineering situations

UNIT I

MECHANICS: Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical Coordinates.

UNIT II

WAVE OPTICS: Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer.

Fraunhauffer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

UNIT III

LASERS: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine.

UNIT IV

ELECTROSTATICS: Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential, Boundary conditions of electric field and electrostatic potential; method of images; energy of a charge distribution and its expression in terms of electric field.

UNIT V

MAGNETOSTATICS: Principle of work and energy for a particle and a rigid body in plane motion – Conservation of energy - Principle of impulse and momentum for a particle and a rigid bodies in plane motion – Conservation of momentum – System of rigid bodies – Impact - direct and central impact – coefficient of restitution.

REFERENCES

1. David J. Griffiths Pati (2017), Introduction to Electrodynamics, Cambridge University Press. ISBN: 978-1-108-35714-2.
2. W H Hayt Jr, , J A Buck, M Jaleel Akhtar (2020), Engineering Electromagnetics, 9th Edition, McGraw-Hill International Edition. ISBN: 978-9-353-16973-2
3. Manoj K. Harbola (2009), Engineering Mechanics , 2nd Edition, Cengage Learning India Private Limited. ISBN: 978-8-131-50990-6
4. Mahendra K. Verma (2019), Introduction to Mechanics, Taylor & Francis Group. ISBN: 978-1-138-11677-1
5. Robert Eisberg, Robert Martin Eisberg, Robert Resnick, David O. Caldwell, Edward Derringh (1985), Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles, Wiley Publishers. ISBN: 978-0-471-87373-0.

EC-101	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L T P	Cr
		3 0 0	3

OBJECTIVES

1. To understand and analyze basic electric and Electronics concepts.
2. To study the working principles of electrical machines and power converters.
3. To study the Network Theorems.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Understand and analyze basic electric and magnetic circuits
CO2: Understand the working principles of electrical machines and power converters.
CO3: Understand the components of low voltage electrical installations and power converters.

UNIT I

HISTORICAL BACKGROUND: Vacuum tubes; working of vacuum tube and their characteristics; vacuum diode; triode; tetrode and pentode. PN JUNCTION: Depletion layer; Barrier potential; Forward and reverse bias; Breakdown voltage; PIV; switching characteristics of p-n junction diode; knee voltage; load line; and operating Point Ideal p-n junction diode; junction capacitance; Zener diode.

UNIT II

RECTIFIERS AND FILTERS: Half wave; centre tap full wave and bridge rectifier; percentage of regulation; PIV; ripple factor; C; RC; LC and PI filter; voltage doubler; clipping and clamping circuit; voltage regulation. Bipolar Junction Transistor: Introduction; basic theory of operation of PNP ad NPN transistor-l characteristics; CB; CE and CC configuration; different biasing techniques.

UNIT III

FET: Introduction; Theory of operation; JFET Parameters; and JFET Amplifiers. MOSFET: Introduction; theory of operation; MOSFET parameters; application; graphical analysis of BJT and FET circuits; linear models of BJT and FET; pulse and large signal models of BJT and FET.

UNIT IV

DC CIRCUITS: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real Power, reactive power, apparent power, power factor. Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin, Norton and maximum power transfer Theorems.

UNIT V

ELECTRICAL MACHINES: Three phase balanced circuits, voltage and current relations in star and delta connections. Generation of rotating magnetic fields, Construction and working of a three-phase induction Motor, Significance of torque-slip characteristic, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of dc motor. Construction and working of synchronous generators.

REFERENCES

1. Millman and Halkias (2000), Electronic Devices and Circuits, 2nd Edition, Tata McGraw Hill Publication, ISBN: 978-0-070-42380-0.
2. D P Kothari, I J Nagrath (2020), Basic Electrical and Electronics Engineering,Second Edition, McGraw-Hill Education, ISBN: 978-9-389-81125-4.
3. W.A.J.Chapman (2001), Workshop Technology, Vol 1, 5th Edition, CBS Publishers, ISBN: 978-8-123-90401-6.
4. Boylestad and Nashelsky (1999) , Electronic Devices and Circuit , 4th Edition, Pearson Education, ISBN: 978-9-332-54260-0.

ESC-101	PROGRAMMING FOR PROBLEM-SOLVING USING C	L T P	Cr
		3 0 0	3

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Know the basic concepts of programming languages as well as operating system

CO2: Learn the basics of programming using C

CO3: undergo the functions and pointers

CO4: Learn about the structures, unions as well as functions using recursion

CO5: Know about the dynamic programming as well as file handling

UNIT I

INTRODUCTION TO COMPUTER SYSTEMS, PROGRAMMING LANGUAGES, OPERATING SYSTEM, NETWORKING, AND SECURITY: Overview of Computer Systems: Characteristics of Computer- speed, storage, Accuracy, Categories of computer- Micro Computers, Mini Computers, Main Frames, Super Computers, Computer Organization- Central processing unit, Arithmetic and Logic Unit, Control Unit, Memory System- Primary memory, secondary memory. Data Representation in a Computer System- Number system - decimal, Binary, Octal, Hexadecimal representation and conversion.

SOFTWARE BASICS: Application software, System Software, Programming languages: Low level languages, Machine language, Assembly language, High Level languages, Translator, Assembler, Interpreter, Compiler, Operating System: Need of Operating System, Function of Operating System, Types of Operating System, Introduction to Networking: Local and Wide Area Networks.

SECURITY THREATS: Intruders, Password Cracking, Types of malicious Software- Virus, Worms, Trojan Horse, Prevention from malicious Software- Antivirus

UNIT II

BASICS OF PROGRAMMING USING C: Problem definition, Representation of Algorithms: Flow charts/ Pseudocode with example, Types of programming languages, Translators, From algorithms to programs; source code, variables and memory location, Introduction to C: Structure of C program, C character set, Identifier and Keywords, Data types, constants, variables, Declaration, Arithmetic expressions & precedence , statements, Symbolic constants, type conversion, Types of operators, Input and output functions in C, header files, common programming errors, Control Statements, Sequencing, Selection, Condition and iteration, Arrays and Strings: Declaring, Referencing and initializing arrays, array subscript, using for loop for sequential access, multi-dimensional array, String basics string library functions, assignment and substring, concatenation, string comparison.

UNIT III

FUNCTIONS AND POINTERS: Definition of function, function prototype, Purpose of main function, passing parameters, Scope of function, recursion, Call by value and reference, Types of storage classes, Scope of variable: Global and local, static variables, Recursion. Pointer variables, initializing pointers, pointer operators, pointer expressions, pointers and arrays, pointer and functions.

UNIT IV

STRUCTURES, UNIONS & RECURSION: Defining a structure, Declaring structure variables, Structure initialization, Copying and Comparing Structure variables, Array of structures, Arrays within structure, nested structures, Unions. Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

UNIT V

DYNAMIC ALLOCATION, AND FILE HANDLING: C's dynamic allocation functions. Streams and file types, opening and closing a data file, input and output operations, text mode versus binary mode, formatted input output operations with files, random access to files.

REFERENCES

1. Pradeep K. Sinha, Priti Sinha (2004), Computer Fundamentals, BPB Publications, ISBN: 9788176567527.
2. Byron S. Gottfried (1996), Programming with C, McGraw-Hill Education, ISBN:9780070240353.
3. E. Balagurusamy (1990), Programming in C, Tata McGraw-Hill Publishing ISBN: 9780074600474

HSS-101	EFFECTIVE TECHNICAL COMMUNICATION	L T P	Cr
		3 0 0	3

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Comprehend and summarize characteristics & various structural principles prerequisite to Technical Communication

CO2: Classify and formulate the elementary intricacies of Scientific and Technical Writing using applicative grammar construct

CO3: Create cohesive technical paragraphs & text

CO4: Paraphrase text(s) and use appropriate referencing styles

CO5: Design and present/publish technical documents

UNIT I

INTRODUCTION TO TECHNICAL WRITING: An overview of Technical Writing, Nature of Scientific English & Technical writing, Taxonomy of Technical writing, Examples of Technical Writing

UNIT II

TECHNICAL WRITING DESIGN & DEVELOPMENT: Linguistic know-how in Technical Writing, Techniques of precision, Organization of Technical contents

UNIT III

SIGNPOSTING PARAGRAPH STRUCTURE & DEVELOPMENT: Signposting with strong Topic Sentence, Writing for Purpose: Explanation, Instruction, Description, Definition, Comparison & Contrast, Classification, Narration, Hypotheses

UNIT IV

FINDING DATA & INCORPORATING SOURCES: Finding data & incorporating sources, Paraphrasing, Avoiding Plagiarism, Referencing styles

UNIT V

CREATING TECHNICAL DOCUMENTS: Creating Technical Documents – Report, Manuals, Brochures etc. (Selected), Technical Presentation in Groups

REFERENCES

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta
2. Modern Technical Writing by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; U.S.
3. A Text Book of Scientific and Technical Writing by S.D. Sharma; Vikas Publication, Delhi.
4. Rizvi, M.A. Academic Writing: A course in English for Science and Technology, Nabodaya
5. Price, Jonathan and Korman H., (1993) How to Communicate Technical Information: The Benjamin Cummings Publishing Company.
6. Muralikrishna and S. Mishra (2011) Communication Skills for Engineers, Pearson education. ISBN: 9788131733844.
7. Murphy, R. (2007) Essential English Grammar, CUP. ISBN: 8175960299.

ME-151	WORKSHOP PRACTICE	L T P	Cr
		0-0-4	2

UNIT I: MACHINE SHOP

Step turning & Taper turning Operation

Exercise 1: To obtain required diameters (steps) on a cylindrical work piece with the given lengths.

Shoulder Turning

Exercise 2: To obtain required diameters on a cylindrical work piece with the given dimensions.

UNIT II: CARPENTARY SHOP

Dove Tail Lap Joint

Exercise 3: To make a dovetail lap joint Cross Half Lap Joint Exercise 4: To make a Cross Half Lap Joint

UNIT III: SHEET METAL SHOP

Exercise 5: To make a funnel using G.I Sheet as per dimensions provided. Exercise 6: To make a square box using G.I Sheet as per the dimension.

UNIT IV: WELDING SHOP

Exercise 7: To make a single v-butt joint, using the given mild steel pieces of and by arc welding.
Exercise 8: To make a T- joint using the given mild steel pieces and by arc welding.

UNIT V: FOUNDARY SHOP

Mould For A Solid

Exercise 9 To prepare a sand mould, using the given Single piece pattern.
Exercise 10. To prepare a sand mould, using the given Split piece pattern.

BS-159	PHYSICS LAB	L T P	Cr
		0-0-2	1

COURSE OUTCOMES

CO1: To formulate and solve the engineering problems on Electromagnetism

CO2: Analyze the intensity variation of light due to Polarization, interference and diffraction

CO3: Differentiate between the terms atomic number, atomic mass, isotopes etc and apply various rules such as Hund's rule, octet rules and Bohr's energy levels

CO4: Determine gradient, divergence and curl of scalar and vector fields

CO5: Explain types of waves and interference of light

LIST OF EXPERIMENTS

1. To study response curve of a series LCR circuit.
2. To determine the Planck's constant using LEDs.
3. To determine the Rydberg's constant of Hydrogen atom.
4. To find the refractive index and Cauchy's constants of a prism.
5. To find the wavelength of light by Newton's rings experiment.
6. To determine the thickness of a thin wire by interference.
7. To determine the wavelength of LASER using diffraction grating.
8. To determine the resolving power of a telescope.
9. To find the numerical aperture of an optical fiber cable.
10. To find the wavelength of light using Michelson's interferometer.

EC-151	BASIC ELECTRICAL AD ELECTRONICS ENGINEERING LAB	L T P	Cr
		0-0-2	1

COURSE OUTCOMES

CO1: Verify the theoretical characteristics of diodes, transistors, OP-amps and digital electronic components experimentally

CO2: Implement and analyze various circuits viz. Rectifiers, Voltage Regulators, Amplifier circuits, Op-Amp based linear & non-linear circuits

CO3: Design Op-amp based circuits and Combinational and Sequential logic circuits.

LIST OF EXPERIMENTS

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi – meter, oscilloscope. Resistors, capacitors and inductors.
2. To study V-I characteristics of diode; and its use as a capacitance.
3. Study of the characteristics of transistor in Common Base configuration.
4. Study of the characteristics of transistor in Common Emitter configuration.
5. Study of characteristics of MOSFET/JFET is CS configuration.
6. To verify the Thevenin's & Norton's theorem.
7. To verify the Superposition theorem.
8. To study frequency response of series & parallel RLC Circuit.
9. Demonstration of cut – out sections of machines:
10. Load test on D.C. Shunt generator

HSS-151	ENGLISH COMMUNICATION LAB	L T P	Cr
		0-0-2	1

COURSE OUTCOMES

CO1: Effective use of Vocabulary
CO2: Perfection in writing.
CO3: Accuracy in writing and editing.
CO4: Develop technical writing skill.
CO5: Skilled in professional and technical oral communication.

LIST OF TOPICS

1. Intro - Lab & Seating Plan/Ice-breaking
2. Basic Ear training & Listening Skills: Practice
3. Listening Skills Test: Graded Exercise
4. International Phonetic Alphabet & Mispronounced Words: Practice.
5. International Phonetic Alphabet-2: Practice
6. Group Discussion Techniques – Dos & Don'ts – Practice GD
7. Extempore based on Cue Cards
8. Individual Speaking Activity: Graded Exercise.
9. Reading Skills & Comprehension: Practice
10. Reading Skills & Comprehension - Graded Exercise
11. Creating Technical Posters
12. Technical Poster Presentation Graded Exercise

REFERENCES

1. Jones, D. (1909), "The Pronunciation of English", Cambridge: CUP; rpt in facsimile in Jones (2002).
2. Jones, D. (1918), "An Outline of English Phonetics", Leipzig: Teubner; rpt in Jones (2002).
3. Jones, D. (1909) "The Dictionary of English Phonetics" Cambridge: CUP (2002).
4. Bansal, R.K. The Intelligibility of Indian English, Monograph, 4 CIEFL, Hyderabad, Second abridged edition, 1976.
5. Jones, Daniel, English Pronouncing Dictionary, revised by A.C. Gimson, 14th Edition, The English Language Book Society and JM Dent Sons Ltd. London 1977.
6. Senthi. J and P.V. Dhamija, A Course in Phonetics and Spoken English Prentice Hall of India Private Ltd. New Delhi, 1989.
7. Taylor, Ken, Telephoning and Teleconferencing Skills. Orient Black Swan, 2008.
8. Dignen, Bob. Presentation Skills in English. Orient Black Swan, 2007.
9. Murphy, R. (2007) Essential English Grammar, CUP. ISBN: 8175960299.
10. C. Muralikrishna and S. Mishra (2011) Communication Skills for Engineers, Pearson education. ISBN: 9788131733844.

ESC-152	PROGRAMMING FOR PROBLEM-SOLVING USING C LAB	L T P	Cr
		0-0-2	1

COURSE OUTCOMES

CO1 Read, understand and trace the execution of programs written in C language.
CO2 Write the C code for a given algorithm.
CO3 Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
CO4 Write programs that perform operations using derived data types.

List of Topics (Students have to do at 3-4 programs from each section)

SEQUENTIAL CONTROL STATEMENTS

1. Write a program to Print HELLO
2. Write a program to add two numbers
3. Write a program to calculate simple interest
4. Write a program to calculate average of three numbers
5. Write a program to swap two numbers
6. Write a program to illustrate mixed data types
7. Write a program to calculate area and circumference of circle
8. Write a program to evaluate a polynomial expression
9. Write a program to add digits of a four digit number
10. Write a program to check whether the person if eligible for voting or not

CONDITIONAL CONTROL STATEMENTS

11. Write a program to find greatest of two numbers
12. Write a program to find out which type of triangle it is
13. Write a program to find out greatest of three numbers
14. Write a program to evaluate performance of the student
15. Write a program to make a basic calculator

LOOP CONTROL STATEMENTS

16. Write a program to print Fibonacci up-to the given limit
17. Write a program to find the sum of digits of a number
18. Write a program to find factorial of a number
19. Write a program to print table of any number
20. Write program for printing different pyramid pattern

ARRAYS AND STRINGS

21. Write a program to enter the elements in a one dimensional array
22. Write a program to find the sum and average of five numbers
23. Write a program to sort the array elements
24. Write a program to enter the marks of 50 students an calculate the average
25. Write a program to add 2 matrix
26. Write a program to multiply 2 matrices
27. Write a program to calculate the length of string
28. Write a program to concatenate 2 strings
29. Write a program to reverse the string
30. Write a program to count the numbers of characters in a string
31. Write a program that converts lower case characters to upper case
32. Write a program without using predefined functions to check whether the string is palindrome or not

FUNCTIONS & POINTERS

33. Write a program using function to find the largest of three numbers
34. Write a program using function to sum the digits of a number
35. Write a program to calculate factorial of a number using recursive function
36. Write a program to print first n Fibonacci using recursive function
37. Write a program to illustrate the concept of chain of pointers
38. Write a program using function to swap two numbers using call by reference
39. Write a program to calculate the area and perimeter of circle using pointers
40. Write a program to copy the contents of one array into another in the reverse order using pointers

STRUCTURES

41. Write a program to read an employee record using structure and print it
42. Write a program to prepare salary chart of employee using array of structures
43. Write a program to print the name and percentage of 20 students (array of structures and arrays within structures).
44. Write a program to demonstrate structure within structure.

FILE HANDLING

45. Write a program to create, open, and close files.
46. Write a program to demonstrate the purpose of different file opening modes.
47. Write a program to count the number of characters, spaces, tabs, new line characters in a file.
48. Write a program to receive strings from keyboard and write them to a file.
49. Write a program to copy a file to another.
50. Write a program to read strings from a file and display them on screen

SYLLABUS OF SEMESTER -II

BS-108	MATHEMATICS-II	L T P	Cr
		3-1-0	4

UNIT I SEQUENCE, POWER SERIES AND FOURIER SERIES : Sequence, Convergentce of Sequence, Series, geometric series, Convergence of series, comparision test, p-test, Leibnits Test, Periodic Function, Fourier series, Dirichlet's condition for Fourier series, Determination of Fourier coefficients (Euler's formulae), Fourier series for discontinuous, even, and odd functions.

UNIT II COMPLEX VARIABLE: Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm), Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof) singularities, Laurent's series; Residues, Cauchy Residue theorem.

UNIT III ORDINARY DIFFERENTIAL EQUATIONS (ODS): First order ordinary differential equations, Separation of varables, Exact, Linear and Bernoulli's equations, Second order differential equation with constant coefficients, Cauchy-Euler equation, Sturm-Liouville's problems.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS (PDES): Formation and classification of first-order PDEs, Linear first-order PDEs, Lagrange's method, Nonlinear first-order PDEs, Charpit's method, Linear partial differential equations with constant coefficients, Method of separation of Variables, Heat Equation, Wave Equation.

UNIT V INTEGRAL TRANSFORMS: Definition and properties of Laplace Transform, Transform of a periodic function, Dirac delta Function, Laplace Transform, Fourier Transforms, Properties of Fourier Transforms, Convolution Theorem for Fourier Transforms Application of Laplace and Fourier transform in finding the solution of differential equations.

TEXTS BOOKS

1. Advanced Engineering Mathematic By D. G. Zill and W. S. Wright.
2. Advanced Engineering mathematics by Erwin Kreyszig.

REFERENCE BOOKS

1. Higher Engineering mathematics By B.S. Grewal.
2. Mathematical Analysis. By S.C. Malik and Savita Arora.
3. Higher Engineering Mathematics By H.K. Dass and Er. Rajnish Verma

CS-106	Object Oriented Using JAVA	L T P	Cr
		3-0-0	3

OBJECTIVE

To relay the theoretical and practical knowledge of Java programming language

PRE-REQUISITES

Basic Knowledge of programming language and object oriented programming

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To learn about the basics of objects, object behavior & storage of different objects

CO2: To know about the basics of Java programming language

CO3: To learn how to create a package as well as handling of exceptions

CO4: To learn about the multithreading as well as synchronization of threads to ovoid deadlocks

CO5: To aware about the database connectivity using JDBC as well as other APIs

UNIT I

INTRODUCTION TO JAVA & PRINCIPLES OF OBJECT ORIENTED PROGRAMMING: Basic Concepts of OOP and itS Benefits, Application of OOP, Features of Java. Data types & Operators available in java; Control Structures: if, while, do while, for, switch; Break & Continue Statement; Arrays and Strings: Arrays, Arrays of Characters; String handling Using String Class; Operations on String Handling Using; String Buffer Class.

UNIT II

OBJECT-ORIENTATION: Object-Oriented Programming in Java, Java Program Structure. Defining of a Class, Definition of Methods, Constructors, Creating Objects of a Class, Assigning Object Reference Variables, The keyword "this", Defining and Using a Class, Automatic Garbage Collection. Extending Class and Inheritance: Using Existing Classes, Class Inheritance, Choosing Base Class, Access Attributes, Polymorphism, Multiple Levels of Inheritance, Abstraction through Abstract Classes, Using Final Modifier, the Universal Super class-Object Class.

UNIT III

PACKAGE & EXCEPTION: Understanding Packages, Defining a Package, Packaging up your Classes, Adding Classes from a Package to your Program, Understanding CLASSPATH, Standard Packages, Access Protection in Packages, Concept of Interface. Exception Handling: The Idea behind Exceptions, Types of Exceptions, Dealing with Exceptions, Exception Objects, Defining Your Own Exceptions, Checked and Unchecked Exceptions.

UNIT IV

MULTITHREADING PROGRAMMING: The Java Thread Model, Understanding Threads, The Main Thread, Creating a Thread: extending Thread and implementing Runnable, Creating Multiple Threads, Thread Priorities, Synchronization, Deadlocks inter-thread communication, Deadlocks. Input/Output in Java: I/O Basic, Byte and Character Structure, I/O Classes, Reading Console Input, Writing to Console Output, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File. Stream Benefits.

UNIT V

JAVA DATA BASE CONNECTIVITY (JDBC): Database Connectivity- Relation Databases; JDBC API; Reusing Database Objects; Transactions; Advance Techniques. Java Utilities (java.util Package) The Collection Framework : Collections of Objects; Collection Types; Sets Sequence Map; Understanding Hashing; Use of Array List & Vector.

TEXT BOOK:

Balaguruswamy , E., ""Programming with Java", Tata Mcgraw Hill.

REFERENCE BOOKS

1. Horetmann Cay and Cornell Gary, "Core JavaTM 2, Volume II – Advanced Features", 7th Edition, Pearson Publisher, 2004.
2. Horetmann Cay and Cornell Gary, "Core Java Volume – I", Pearson Education.
3. Callway Dustin R., "Inside Servlets", Pearson Education.
4. Goodwill James and Bryan Morgan, "Developing Java Servlets", Techmedia.
5. "Java Server Programming, Volume I and II", Wrox Press

CS-206	DATABASE MANAGEMENT SYSTEM	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To provide knowledge about various organizations and management information systems, keeping in view the aspects of shareability, availability, evolvability and integrity.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of database & its architecture
CO2: To aware about the existing data models, entities as well as constraints
CO3: To learn about the different anomalies of the data and ways to normalize it
CO4: To know about the storage of data in the files & organization of files
CO5: To learn about the transactions and its ways done on the database

UNIT I

INTRODUCTION: Purpose of database system; characteristics of database approach; advantages of using DBMS; database concept and architecture; data abstraction, data models; instances and schema; data independence; schema architecture; database languages; database manager; database administrator; database users.

UNIT II

DATA MODELING: Introduction to Hierarchical model, Network model. Relational model, E-R Model, Entity sets attributes and keys; relationships (ER); database modelling using entity; type role and structural constraints; weak and strong entity types; entity-relationship diagram-basic concepts; Enforcing Data Integrity Constraints; Relational-Algebra Operations; Introduction on views; Codd's Rules.

UNIT III

NORMALIZATION& SQL: Database design process; relational database design; relation schema; anomalies in a database; functional dependencies; 1NF, 2NF, 3NF and BCNF. ; Reduction of an E-R schema to Tables; Introduction to SQL; basic queries in SQL; advanced queries in SQL; functions in SQL; basic data retrieval; updates in SQLs, views in SQL.

UNIT IV

FILE ORGANIZATION: indexing and hashing; overview of file organization techniques; secondary storage devices; operations in files; heap files and sorted files; Indexing and Hashing- Basic concepts; Static Hashing; Dynamic Hashing; ordered indices; single level ordered index; multi-level index.

UNIT V

TRANSACTION PROCESSING & QUERY PROCESSING: Desirable properties of transactions; implementation of atomicity and durability; schedules and recoverability; serializability of schedules; concurrency control. Deadlock handling - detection and resolution.

TEXT BOOK

1. Silberschatz A., Korth H. F. and Sudarshan S., "Database System Concepts", 3rd edition, McGraw-Hill, International Edition, 1997

REFERENCE BOOKS

1. Date C. J., "An Introduction to Database Systems", 7th edition, Addison- Wesley, Low Priced Edition, 2000 .
2. Desai Bipin, "Introduction to Database Management System", Galgotia Publications, 1991
3. Elmasri R. and Navathe S. B., "Fundamentals of Database Systems", 3rd edition, Addison-Wesley, Low Priced Edition, 2000

BS-110	ENVIRONMENTAL SCIENCE AND CHEMISTRY	L T P	Cr
		3-0-0	3

UNIT I

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Basic definitions related to environment; Scope, vis-à-vis environmental science and environmental engineering; a uses of environmental degradation, atmospheric composition and associated spheres, habitat and climate; objective, goals and principals involved in environmental education, environmental awareness, Environmental ethics, environmental organization and their involvement.

UNIT II

NATURAL RESOURCES: Renewable and non-renewable resources; forest resources, over-exploitation, and deforestation / afforestation; water resources, impact of over-utilization of surface and ground water, floods, drought, conflicts over water, dams; mineral resources: dereliction of mines, environmental effects of extracting and using mineral resources; Food resources, modern agriculture and its impact, problem associated with fertilizer and pesticide, water logging, salinity ; energy resources, renewable, non-renewable energy sources, solar energy, wind energy, hydro energy, biomass energy, geothermal energy, nuclear energy and its associated hazards; land as a resource, land degradation, man induced landslides, soil erosion and desertification.

UNIT III

ECOSYSTEMS: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids; characteristic features, structure and function of the following ecosystem - forest ecosystem, grassland ecosystem desert ecosystem and aquatic ecosystems.

UNIT IV

BIODIVERSITY AND ITS CONSERVATION: Bio-geographical classification of India; biodiversity at global, national and local levels, India as a mega-diversity nation, hot-spots of biodiversity; value of biodiversity-consumptive use, productive use, social, ethical aesthetic and option values; threats to biodiversity; conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT V

ENVIRONMENTAL POLLUTION: Causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution; solid waste management, e-waste management; disaster management –floods, earthquake, cyclone and landslides.

UNIT VI

SOCIAL ISSUES AND THE ENVIRONMENT: Water conservation, rain water harvesting, watershed management; climate change, global warming, acid rain, ozone layer depletion; Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.

UNIT VII

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, population explosion – family welfare programmes; role of information technology in environment and human health; case studies, Chipko movement, Sardar Sarovar dam, mining and quarrying in Udaipur, salinity and water logging in Punjab, Haryana and Rajasthan, Bhopal gas tragedy, Chernobyl nuclear disaster, arsenic pollution in ground water.

TEXT BOOK

Kaushik, Anubha, and Kaushik, C.P., "Perspectives in Environmental Studies", 4th Edition,

New Age International Publishers, 2004

REFERENCE BOOKS

1. Agarwal, K.C., "Environmental Biology", 2nd Edition, Nidhi Publ. Ltd., Bikaner, 2001.
2. Bharucha Erach, "The Biodiversity of India", 2nd Edition, Mapin Publishing Pvt. Ltd., 2006.
3. Brunner R. C., "Hazardous Waste Incineration", 1st Edition McGraw Hill Inc., 1989.
4. Clark R.S., "Marine Pollution", 1st Edition Clanderson Press Oxford,1989
5. .Cunningham, W.P., Cooper, T.H. Gorhani, E. & Hepworth, M.T., Environmental Encyclopedia", 2nd Edition, Jaico Publ. House, 2001.
6. De, A. K., "Environmental Chemistry", 2nd Edition, Wiley Eastern, 1989
7. Jadhav, H. and Bhosale, V.M ., "Environmental Protection and Laws", 1st Edition, Himalaya Pub. House, Delhi, 1995.

PEP-102	UNIVERSAL HUMAN VALUES	L T P	Cr
		2-0-0	2

OBJECTIVE

The present course deals with meaning, purpose, and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realise one's potentials.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.

CO2: Learn from case studies of lives of great and successful people who followed and practised human values and achieved self-actualisation.

CO3: Become conscious practitioners of human values.

CO4: Realise their potential as human beings and conduct themselves properly in the ways of the world.

Module 1: Love & Compassion - 4 Hours

- Introduction: What is love? Forms of love—for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness - Love, compassion, empathy, sympathy and non-violence
- Individuals who are remembered in history for practicing compassion and love.: Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn/gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
- Sharing learner's individual and/or group experience(s)

Module 2: Truth - 4 Hours

- Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value: Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
- Learners' individual and/or group experience(s)

Module 3: Non-Violence - 4 Hours

- Introduction: What is non-violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence
- Ahimsa as non-violence and non-killing
- Individuals and organisations that are known for their commitment to nonviolence: Narratives and anecdotes about non-violence from history, and literature including local folklore
- Practicing non-violence: What will learners learn/gain if they practice nonviolence?
- What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about non-violence

Module 4: Righteousness - 2 Hours

- Introduction: What is righteousness?
- Righteousness and *dharma*, Righteousness and Propriety
- Individuals who are remembered in history for practicing righteousness: Narratives and anecdotes from history, literature including local folklore
- Practicing righteousness: What will learners learn/gain if they practice righteousness?
- What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)

Module 5: Peace - 2 hours

- Introduction: What is peace? Its need, relation with harmony and balance.
- Individuals and organisations that are known for their commitment to peace: Narratives and Anecdotes about peace from history, and literature including local folklore
- Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about peace

Module 5: Service - 4 Hours

- Introduction: What is service? Forms of service, for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.
- Individuals who are remembered in history for practicing this value: Narratives and anecdotes dealing with instances of service from history, literature including local folklore
- Practicing service: What will learners learn/gain if they practice service? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s) regarding service

Module 6: Renunciation (Sacrifice) - 4 Hours

- Introduction: What is renunciation? Renunciation and sacrifice.
- Self-restrain and Ways of overcoming greed.
- Renunciation with action as true renunciation
- Individuals who are remembered in history for practicing this value: Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice
- Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)

ADDITIONAL PRACTICAL MODULES or OPERATIVE ELECTIVES:

NOTE: The faculty/institution may choose any/some of the following modules keeping in mind the level and specific needs of learners.

MODULE A - Integral Human Well-Being

Importance of well-being, inter-relatedness of different kinds of well-being and definition of well-being (state of being comfortable, healthy, happy and equanimity)

Well-being and its Kinds

(i) Physical (physical strength and endurance)

(ii) Emotional (ability to respond to emotions and control them)
(iii) Aesthetic (faculty to see and appreciate beauty in all beings)
(iv) Intellectual (rational, logical well-being)
(v) Relational well-being (obligation to self, parents, family society, nation humanity and other beings in the universe; living with others with their acceptance)
(vi) Moral (difference between good and evil and practicing goodness; righteousness)
(vii) Spiritual (thinking beyond self and journey from senses to spiritual level)

- Establish and recognise various states of well-being, embedded in different creatures, but consciously understood by humans.
- Identify the most pronounced emotions in the individual through given activities- Anecdotes/video/activity to help identify different well-beings
- Discussion of related values to well-beings: Aesthetics, ethics, gratitude, forgiveness, and spiritual health i.e., thinking beyond senses and self and for the welfare of others
- Importance and practice of well-being through case study/ activity Ways to attain different kinds of well-being
- Activities

MODULE B - Yoga & Pranayama 5 Hours Importance of Yoga and Pranayama

- Yoga and pranayama for integral well-being and balance in life
- Yoga & Pranayama: Introduction
- Mind - Body – Intellect
- Difference between Yoga and Pranayama and their inter-relatedness.
- Basic Yogasans and pranayamas for students:

a) Every morning
b) Before bedtime
c) Before a presentation
d) Before examination
e) To fight stomach cramps
f) To fight stress

- Healthy diet
- Healthy mind
- Recommended routine for yoga and pranayama

MODULE C - Gratitude

Outlines:

- Gratitude, a great embellishment to a person’s mental quality
- Duty versus Rights
  - What is duty?
  - What is right?
- Wonderment and simplicity
- Gratitude to one's family
- Gratitude to one's teachers
- Gratitude to one's society
- Gratitude to one's nation
- Gratitude to the universe
- Count your blessings (activity)
- Live in an attitude of gratitude

SUGGESTED READINGS

1. Mookerji Radha Kumud, *Ancient Indian Education*, Motilal Banarasidass
2. Saraswati Swami Satyananda, *Asana Pranayama Mudra Bandha*, Bihar School of yoga
3. Joshi Kireet, *Education for Character Development*, Dharma Hinduja Center of Indic Studies Joshi Rokeach (1973). The Nature of Human Values. New York: The Free Press
4. Ghosh, Sri Aurobindo. 1998. *The Foundations of Indian Culture*. Pondicherry: Sri Aurobindo Ashram

ME-152	ENGINEERING GRAPHICS LAB	L T P	Cr
		0-0-4	2

OBJECTIVE

- To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare you to communicate effectively
- to prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Introduction to engineering design and its place in society
CO2: Exposure to the visual aspects of engineering design
CO3: Exposure to engineering graphics standards
CO4: Exposure to solid modelling

UNIT I

INTRODUCTION TO ENGINEERING DRAWING: Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Dimensioning

UNIT II

ORTHOGRAPHIC PROJECTIONS: Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes;

UNIT III

PROJECTIONS OF SOLIDS: Projections of planes inclined Planes - Auxiliary Planes; Projection of Regular Solids covering those inclined to both the planes, Auxiliary Views; Section of such solids and the true shape of the section.

UNIT IV

SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS: Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; objects from industry and dwellings (foundation to slab only) Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids Conversion of Isometric Views to Orthographic Views and Vice-versa

UNIT V

OVERVIEW OF COMPUTER GRAPHICS: Introduction to Computer Aided Drafting and CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

REFERENCE BOOKS:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech
5. Publishers (Corresponding set of) CAD Software Theory and User Manuals

CS-156	Object Oriented Using JAVA Lab	L T P	Cr
		0-0-2	1

OBJECTIVE

To relay the practical knowledge of Java programming language

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To learn about operators used in Java Programming

CO2: To know about loops implemented in Java programming language

CO3: To implement the arrays and strings

CO4: To learn about the inheritance, packages & exception handling

CO5: To aware about the database connectivity using JDBC

LIST OF EXPERIMENTS

The following programs on different topic are to be done in this lab.

1. Sample Program

(a) Write a Java program to print "Hello Java"

2. Operators and Expressions

(a) Write a java program to find the area of a rectangle.

(b) To write a java program to find the result of the following expressions

(i) (a<<2) +(b>>2)

(ii) (b>0)

(iii) (a+b*100)/10

(iv) a & b

Assume a=10, b=5

(c) To write a java program to print the individual digits of a 3 digit number using Command line arguments.

3. Decision making statements

(a) Write a java program to read two integers and print the larger number. followed by the words "is larger". If the numbers are equal print the message "These numbers are equal"

(b) Write a java program to read an integer and find whether the number is odd or even.

(c) Write a java program to find the number of and sum of all integers greater than 100 and less than 200 that are divisible by 7.

4. Looping Statements

(a) Write a Java program to find the sum of digits of a given number.

(b) Write a java program to find the first 15 terms of Fibonacci sequence.

(c) Write a java program to print the Armstrong numbers.

(d) Given a number, write a program using while loop to reverse the digits of the number.

For example, the number

12345

should be written as 54321.

5. Array & Strings

(a) Write a java program to find the largest and smallest number in an array.

(b) Write a java program to multiply two matrices.

(c) Write a java program to sort the following numbers in descending order.

{55, 40, 80, 65, 71}

(d) Write a java program that creates a string object and initializes it with your name and performs the following operations

(i) To find the length of the string object using appropriate String method.

(ii) To find whether the character 'a' is present in the string. If yes find the number of times 'a' appear in the name and the location where it appears.

(e) Write a java program to arrange the following word in alphabetical order

{Madras, Delhi, Ahmadabad, Calcutta, Bombay}

6. Classes & Objects

(a) Write a java program to display total marks of 5 students using student class. Given the following attributes: Regno(int), Name(string), Marks in subjects(Integer Array), Total (int).
(b) Write a java program to find the area of a room using constructor.
(c) Write a java program to implement method overloading.
(d) Write a java program to show the use of "static" members.

7. Inheritance

(a) Write a java program to implement single inheritance using "super" keyword.
(b) Write a java program to implement method overriding.
(c) Write a java program to implement multiple inheritances.

8. Package & Multithreading

(a) Write a program to create your own package and use that package in another program to print " Hello package".
(b) Write a program to implement multithreading using the system function like yield(), stop(), sleep().

9. Exception Handling & File handling

(a) Write a java program to implement multiple try/catch statements.
(b) Write a program to copy the content of one file into another using character stream classes.
(c) Write a program to copy the content of one file into another using byte stream classes

10. Database Connectivity

(a) Write a programme to connect java application GUI with database.(JDBC)
(b) Write a program to select all the information of a table named as "Student".

TEXT BOOK

Herbert Schildt , "The Complete Reference Java 2 fifth edition, McGraw Hill.

REFERENCE BOOKS

1. Balaguruswamy , E., ""Programming with Java", Tata Mcgraw Hill
2. Horetmann Cay and Cornell Gary, "Core Java Volume – I", Pearson Education.

CS-256	DATABASE MANAGEMENT SYSTEM LAB	L-T-P	Cr
		0-0-2	1

OBJECTIVE

To provide knowledge about implementation of practical aspects of database i.e. creation of tables and applying queries using SQL queries

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of structured query language

CO2: To aware about applying different queries on database structured in the form of tables

CO3: To learn about the different SQL queries performed using operators as well as constraints

CO4: To create views from created table to further organize the data

CO5: To learn about the basic operations of relational algebra

LIST OF EXPERIMENTS/EXERCISES

1. Introduction to SQL.
2. Write a query for:

(i) Creation of table.
(ii) Insertion of data into table
(iii) Displaying the data of table.
(iv) Deletion of data from table
(v) Updating the data
(vi) Modifying the structure of a table.

3. Finding unique names of all salesmen, deletion of the structure of a table, use of delete command with conditions, updating records of a table with conditions, altering structure of a table and changing size of existing column in the table
4. Arithmetic operators, logical operators and pattern matching operator.
5. Key constraints: primary key constraints, foreign key constraints, not null constraints and unique constraints; use of check constraints.
6. Aggregate and mathematical functions: count, count(*), Avg, max, min, sum, lower, upper, power , sqrt.
7. Creating views from single and multiple tables, drop views and creating index on the table and drop them.
8. Binary operations in Relational Algebra: Union, Intersection, Set Difference, Join, Cartesian product.
9. Grouping of data into tables and listing records in ascending order or descending order.
10. Creation of sequences and explain use of sequences.
11. Access permissions in SQL.

BS-160	ENVIRONMENTAL SCIENCE AND CHEMISTRY LAB	L T P	Cr
		0-0-2	1

COURSE OBJECTIVES:

An important objective of environmental science and chemistry Lab is to understand the experimental techniques for the students to determine amount of hardness as well as understanding the complexometric titration method

COURSE OUTCOMES:

CO1. Analyze & generate experimental skills.

CO2. To understand the composition of water along with the hardness and their determination for treatments.

CO3. To learn about the complexometric titration.

CO4. To determine the total dissolved Oxygen and solid in water sample.

Experiment

1. Determination of Ca^{2+} & Mg^{2+} Hardness of water sample by EDTA Method.
2. Determination of Alkalinity in given water sample by volumetric method.
3. To determine the CO_3^{2-} & HCO_3^- in a given water sample.
4. Estimation of Calcium in limestone or dolomite ore.
5. To estimate the amount of Dissloved Oxygen (DO) in given water sample.
6. To estimate the amount of Chloride ion present in water sample by Argentomentric Method (Mohr's Method)
7. Water sampling, total dissolved solids and total suspended solids.
8. To estimate the amount of Chemical Oxygen Demand (COD) in given water sample

TEXT BOOKS/REFERENCE BOOKS:

1) Vogel's Textbook of Quantitative chemical analysis, J. Mendham et.al. (Pearson Education).
2) Concise Inorganic Chemistry, J. D. Lee (Blackwell Science).

EC-203C	DIGITAL ELECTRONICS	L T P	Cr
		3 0 0	3

OBJECTIVE

Modern world deals with digital conditioning of various signals. Digitally manipulating signals or using digital circuits have a lot of advantages in terms of accuracy etc. This subject introduces concept of basic digital electronics: gates; combinational and sequential circuits and their designing.

COURSE OUTCOMES

CO1: Convert different type of codes and number systems which are used in digital communication and computer systems.

CO2: Employ the codes and number systems converting circuits and Compare different types of logic families which are the basic unit of different types of logic gates in the domain of economy, performance and efficiency.

CO3: Analyze different types of digital electronic circuit using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods.

CO4: Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.

CO5: Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

UNIT I

INTRODUCTION OF GATES, COMBINATIONAL DESIGN BY USING GATES AND SIMPLIFICATION : Digital signal; logic gates: AND; OR; NOT; NAND; NOR; EX-OR; EX-NOR; Boolean algebra. Review of Number systems. Binary codes: BCD; Excess- 3; Gray; EBCDIC; ASCII; Error detection and correction codes; Design using gates; Karnaugh map and Quine Mcluskey methods of simplification.

UNIT II

COMBINATIONAL DESIGN USING MSI DEVICES: Multiplexers and Demultiplexers and their use as logic elements; Decoders; Adders/Subtractors; BCD arithmetic circuits; Encoders; Decoders/Drivers fordisplay devices.

UNIT III

SEQUENTIAL CIRCUITS: Flip Flops : S-R; J-K; T; D; master-slave; edge triggered; shift registers; sequence generators; Counters; Asynchronous and Synchronous Ring counters and Johnson Counter; Design of Synchronous and Asynchronous sequential circuits.

UNIT IV

DIGITAL LOGIC FAMILIES: Bipolar logic families:RTL; DTL; DCTL; HTL; TTL; ECL; MOS; and CMOS logic families. Tristate logic; Interfacing of CMOS and TTL families.

UNIT V

A/D AND D/A CONVERTERS & PLD: Sample and hold circuit; weighted resistor and R -2 R ladder D/A Converters; specifications for D/A converters. A/D converters : successive approximation; counting type; ROM; PLA; PAL; FPGA and CPLDs.

TEXT BOOK

Jain, R.P., “Modern Digital Electronics”, 4th Ed.; Tata McGraw Hill, 2003.

REFERENCE BOOKS

1. Taub and Schilling, ”Digital Integrated Electronics” Tata McGraw Hill,1997
2. Malvino and Leach; ”Digital Principles and Applications”, 6th Edition, Tata McGraw Hill, 2006
3. Mano, Morris, “Digital Design”, 3rd Edition, Prentice Hall of India,1994
4. Gupta and Singhal, “Digital Electronics”, 2nd Edition, Dhanpat Rai and Sons, 2000.
5. Wakerly, John F, ”Digital Design Principles and Practices”, 4th Edition, Prentice Hall of India,2005.

CS-211	PYTHON FOR DATA SCIENCE	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To build programming logic and thereby developing skills in problem solving using Python programming language; To be able to do testing and debugging of code written in Python Emphasize the concepts and constructs rather than on language features.

PRE-REQUISITES

The students are expected to have basic knowledge of programming and DBMS.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: To learn and understand Python programming basics, looping, control statements and string manipulations.

CO2: To learn basic concepts of list, tuple and dictionary data structures.

CO3: To learn and know the concepts of Structure and Functions.

CO4: To learn and know the concepts of file handling, exception handling.

CO5: To learn how to analyze and visualize the data.

UNIT I:

Introduction to Python: History, Features & Benefits of Python, Structure of a Python Program, Identifiers and Keywords, Concept of Variable, Memory Allocation for Variable, Data Types in Python, Conversion Functions, Operators (Arithmetic Operator, Relational, Logical or Boolean Operator, Assignment, Bitwise Operator, Membership Operator).Input and Output Function, Control Statements (Looping- while Loop, for Loop, Loop Control, Conditional Statement-if...else), Difference between break, continue and pass.

UNIT II:

Data Structures & Function: String, Lists, Tuples, Sets, Dictionary Data Structure, Built-in Library Function, Method and Operation on these Data Structure. Defining Function, Type of Function Arguments (Required Arguments, Keyword Arguments, Default Arguments, Variable-Length Arguments), Scope of a Variable, Global Vs Local Variable, Python Modules & Packages, Import Statement, dir(), globals(), locals() and reload() Functions.

UNIT III:

Python Object Oriented Programming: Features of Object Oriented Programming, Creating Classes, _init_() Method, Creating Instance Object, Class Attributes, Access Specifiers in Python, Instance Method Vs Class Method. Inheritance & Polymorphism, Overriding and Overloading Methods.

UNIT IV:

Python File Handling, Exception Handling: Opening & Closing Files, File Access Modes, File Object Attributes, Reading and Writing Files, Manipulating File Pointer using seek and tell. Programming using File Operations. Exception Handling in Python.

UNIT V:

Data Analysis: Dataset generation, Importing Dataset: Importing and Exporting Data, Basic Insights from Datasets, Cleaning and Preparing the Data: Identify and Handle Missing Values. Numpy and Scipy Package, Understanding and creating N-dimensional arrays, basic indexing and slicing, Boolean indexing, fancy indexing, Universal functions, Data processing using arrays, File input and output with arrays.

Data Visualization: Basic Visualization Tools, Specialized Visualization Tools, Creating and Plotting Maps.

TEXT BOOKS

1. John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of India.
2. T. Budd, Exploring Python, TMH, 1st Ed, 2011

REFERENCE BOOKS

1. Python Tutorial/Documentation www.python.or 2010
2. Allen Downey, Jeffrey Elkner, Chris Meyers ,How to think like a computer scientist :Learning with Python,Freelyavailableonline.2012
3. http://docs.python.org/3/tutorial/index.html
4. http://interactivepython.org/courselib/static/pythonds

CS-207	COMPUTER ARCHITECTURE & ORGANIZATION	L T P	Cr
		3 0 0	3

OBJECTIVE

To provide basic knowledge of internals of computer, its architecture, components, terminologies, etc. atminute level and ultimately about the working of a digital computer hardware as a whole.

PRE-REQUISITES

Knowledge of data structures, microprocessors and interfacing.

COURSE OUTCOMES

CO1: Understand the theory and architecture of central processing unit. Analyze some of thedesign issues in terms of speed, technology, cost, performance.
CO2: Design a simple CPU with applying the theory concepts. Use appropriate tools to design verifyand test the CPU architecture.
CO3: Learn the concepts of parallel processing, pipelining and inter-processor communication
CO4: Exemplify in a better way the I/O and memory organization.
CO5: Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

UNIT I

GENERAL SYSTEM ARCHITECTURE: Functions and block diagram of computer, store program control concept, Flynn's classification of computers (SISD, MISD, MIMD); CPU, caches, main memory, secondary memory units & I/O; Counters and Designing of counters.

UNIT II

INSTRUCTION SET ARCHITECTURE: Instruction codes, instruction set formats(fixed, variable, hybrid), types of instructions, memory reference, register reference, I/O reference; addressing modes: register, immediate, direct, indirect, indexed; operations in the instruction set; arithmetic and logical, data transfer, control flow; types of interrupts; timing and control; instruction set based classificationof processors (RISC, CISC, and their comparison).

UNIT III

BASIC ARITHMETIC AND PROCESSING MODULE: Addition and subtraction of signed Numbers-Design of fast adders-Multiplication of positive numbers-Signed operand multi-plication and fast multiplication –integer devision

Fundamental Concept-Execution of complete instruction-Multiple bus organization –Hardwired control-MicroProgrammed control-Pipelining and its types.

UNIT IV

MEMORY HIERARCHY & SYSTEM: Need for a memory hierarchy (Locality of Reference Principle, memory hierarchy in practice: cache, main memory and secondary memory); Basic Concept Main memory (semiconductor RAM & ROM , Speed, Size and Cost, static & dynamic memory types); cache memory: associative &direct mapped cache organizations.

UNIT V

INTRODUCTION TO PARALLELISM: Goals of parallelism (exploitation of concurrency, throughput enhancement); Amdahl's law; instruction level parallelism (pipelining, super scaling-basic features); processor level parallelism (multiprocessor systems overview).

TEXT BOOK

1. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third
2. edition, 1998.
3. 2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", V edition, McGraw-Hill Inc, 1996.
4. Carpinelli, —Computer Organization & Architecture‖ Tata McGraw Hill, 2000

CS-209	DISCRETE MATHEMATICS and GRAPH THEORY	L T P	Cr
		3 1 0	4

OBJECTIVES

To lay mathematical foundation for the fundamentals of various computational structures such as Boolean algebra, propositional logic, graph and trees.

PRE-REQUISITES: Knowledge of Data Structure

COURSE OUTCOMES

CO1: Perform operations on various discrete structures such as sets, functions, relations, and sequences.
CO2: Ability to solve problems using Counting techniques, Permutation and Combination, Recursion and generating functions
CO3: Ability to solve problems of Recursion and Recurrence Relation
CO4: Understand the various properties of algebraic systems like Rings, Monoids and Groups
CO5: Apply algorithms and use of graphs and trees as tools to visualize and simplify Problems.

UNIT I

SET THEORY: Introduction to set theory; set operations; algebra of sets: duality, finite and infinite sets, classes of sets, power sets, multi sets, Cartesian product, representation of relations, types of relation, equivalence relations and partitions, partial ordering relations and lattices; function and its types, composition of function and relations; cardinality and inverse relations.

UNIT II

PROPOSITIONAL CALCULUS AND TECHNIQUES OF COUNTING: Basic operations: AND (Λ), OR (V), NOT (~), truth value of a compound statement, propositions, tautologies, contradictions, Permutations with and without repetition, combination.

UNIT III

RECURSION AND RECURRENCE RELATION: Polynomials and their evaluation; sequences, introduction to AP, GP and AG series, partial fractions; linear recurrence relation with constant coefficients; homogeneous solutions, particular solutions, total solution of a recurrence relation using generating functions.

UNIT IV

ALGEBRIC STRUCTURES: Definition and examples of a monoid, semigroup, groups and rings; homomorphism, isomorphism and auto morphism; subgroups and normal subgroups; cyclic groups, integral domain and fields; co-sets; Lag range‘s theorem

UNIT V

GRAPHS: Introduction to graphs, directed and undirected graphs; homomorphic and isomorphic graphs; subgraphs; cut points and bridges; multigraph and weighted graph; paths and circuits, shortest path in weighted graphs; Eulerian path and circuits, Hamilton paths and circuits; planar graphs; Euler‘s formula.

TEXT BOOK

Liu C. L., Elements of Discrete Mathem atics‖, McGraw Hill, 1989

REFERENCE BOOKS

1. Johnson Bough R., ―Discrete Mathematics‖, 5th Edition, Pearson Education, 2001
2. Graham Ronald, Knuth Donald E. and Patashik Oren, ―Concrete Mathematics: A Foundation for Computer Science‖ , Addison-Wesley, 1989
3. Gersting Judith L., ―Mathematical Structures for Computer Science‖, Computer Science

Press, 1993
4. Chtewynd A. and Diggle P.. , Discrete Mathem atics‖ , Modular Mathematics Series, Edward Arnold, London, 1995
5. Lipshutz S ., —S chaums Outline series: Theory and problems of Probability‖, McGraw Hill Singapore, 1982
6. Kolm an B. and Busby R. C., —Discrete Mathematical Structures‖, Prentice Hall of India,
7. 1996
8. Trembley and Manohar, —Discrete Mathematical Structures with Applications to Com puters‖, McGraw Hill, 1995

CS-202	OPERATING SYSTEMS	L T P	Cr
		3 0 0	3

COURSE OBJECTIVE

To provide the knowledge of internals, different types and purpose of operating systems

PRE-REQUISITES

Knowledge of computer organization and architecture programming skills

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Understand the basics of operating systems like kernel, shell, types and views of operating systems

CO2: Describe the various CPU scheduling algorithms.

CO3: Explain various process synchronization and removing deadlock.

CO4: Use disk management and disk scheduling algorithms for better utilization of external memory.

CO5: Understand various file system.

UNIT I

INTRODUCTION: Introduction to operating system concepts (including multitasking, multiprogramming, multi user, multithreading, etc)., types of operating systems: batch operating system, time-sharing systems, distributed OS, network OS, real time OS, embedded and smart card OS, various operating system services, architecture, system programs and calls.

UNIT II

PROCESS MANAGEMENT: Process concept, Life cycle and implementation of process, Thread usage and implementation in user space and in kernel, process scheduling, operation on processes, CPU scheduling, scheduling criteria, scheduling algorithms -First Come First Serve (FCFS), Shortest-Job-First (SJF), priority scheduling, Round Robin (RR), multilevel feedback queue scheduling.

UNIT III

DEADLOCK: Deadlocks, Deadlock characteristics, prevention, avoidance using banker's algorithm, detection and recovery;

Process Synchronization: Critical section problems, mutual exclusion with busy waiting, Process synchronization, semaphores: binary and counting semaphores, Classical IPC problems: dining philosophers' problem, readers-writers problem.

UNIT IV

MEMORY MANAGEMENT: Logical & physical address space, swapping, contiguous memory allocation, non-contiguous memory allocation paging and segmentation techniques, segmentation with paging, virtual memory management - demand paging & page-replacement algorithms, demand segmentation.

UNIT V

I/O AND FILE YSTEMS: I/O hardware, device controllers, interrupt handlers, device drivers, application I/O interface, kernel, transforming I/O requests, performance issues, Different types of files and their access methods, directory structures, various allocation methods, disk scheduling and management and its associated algorithms, introduction to distributed file system.

TEXT BOOK

1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014, ISBN10: 0133805913 • ISBN13: 9780133805918
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons ,Inc., 9th Edition,2012, ISBN 9781118063330
3. Maurice J. Bach, "Design of UNIX Operating System", PHI
4. T1: Silberchatz et al, "Operating System Concepts", 5th edition, Addison-Wesley, 1998

REFERENCE BOOKS

1. Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, Inc., 1st Edition, 2007.ISBN10: 0596009526 | ISBN13: 9780596009526

CS-103	DATA STRUCTURE USING C	L T P	Cr
		3-0-0	3

COURSE OBJECTIVE: To relay the theoretical and practical fundamental knowledge of most basic data structure like array linked list, stack, queue, tree & graph. To understand the implementation of these data structure to be familiar with basic techniques of algorithm analysis and analysis of the algorithms used for implementation of these data structure.

PRE-REQUISITES: Knowledge of basic computer programming.

COURSE OUTCOMES

CO1: Understand the concept of dynamic memory management, data types, algorithm, Big O notation.
CO2: Understand basic data structures such as arrays, linked list, stack and queue.
CO3: Describe the hash function and concepts of collision and its resolution methods.
CO4: Solve problem involving graph, trees and heaps.
CO5: Apply algorithm for solving problems like sorting, searching, insertion and deletion of data.

UNIT I: INTRODUCTION TO DATA STRUCTURES AND RUNNING TIME:
Definition of data structures and abstract data types; linear vs. non-linear data structure; primitive vs. non-primitive data structure; static and dynamic implementations; arrays, 1,2-dimensional arrays, insertion & deletion in 1-D array; examples and real life applications. Time complexity; Big Oh notation; running times; best case, worst case, average case; factors depends on running time; introduction to recursion.

UNIT II: STACKS AND QUEUES:
Stacks: definition, array based implementation of stacks, examples: infix, postfix, prefix representation; conversions, applications; definition of queues, circular queue; array based implementation of queues.

UNIT III: LINKED LISTS:
Lists; different type of linked Lists; implementation of singly linked list, linked list implementation of stacks and queues; implementation of circular linked list; implementation of doubly linked list, applications.

UNIT IV: TREES AND GRAPHS:
Definition of trees and binary trees; properties of binary trees and implementation; binary traversal pre-order, post-order, in-order traversal; binary search trees: searching, insertion & deletion. Definition of undirected and directed graphs; array based implementation of graphs; adjacency matrix; path matrix implementation; linked list representation of graphs; graph traversal: breadth first traversal, depth first traversal; implementations and applications.

UNIT V: SORTING AND SEARCHING ALGORITHMS:
Introduction, selection, insertions, bubble sort, efficiency of above algorithms; merge sort, merging of sorted arrays and algorithms; quick sort algorithm analysis, heap sort, searching algorithms: straight sequential search, binary search (recursive & non–recursive algorithms).

TEXT BOOK

1. Langsam, Augentem M.J. and Tenenbaum A. M., ―Data Structures using C & C++‖, Prentice Hall of India, 2009.
2. R. S.Salariya, Data Structure and Algorithm, Khanna Publications.

REFERENCE BOOKS

1. Aho A. V., Hopcroft J. E. and Ullman T. D., ―Data Structures and Algorithms‖, Original Edition, Addison-Wesley, Low Priced Edition, 1983.
2. Horowitz Ellis and S ahni S artaj, ―Fundamentals of Data Structures‖, Addison-Wesley Pub, 1984.
3. Horowitz, S ahni and Rajasekaran, ―Fundamentals of Computer Algorithms‖ 2007.
4. Kruse Robert, ―Data Structures and Program Design in C‖, Prentice Hall of India, 1994
5. Lipschetz Jr. Seymour, ―Theory & Problems of Data Structures‖, S chaum ‘s Outline, Tata McGraw Hill
6. Weiss Mark Allen, ―Data Structures and Algorithms Analysis in C‖, Pearson Education, 2000
7. Corm en T . H . et al., ―Introduction to Algorithms‖, 2nd Edition, Prentice Hall of India, 2001.
8. Dasgupta Sanjay, Christos P. and Vazirani Umesh, ―Algorithms‖, Tata McGraw Hill, 2008

CS-153	DATA STRUCTURES USIN C LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

ARRAY OPERATIONS

1. Write a program to insert an element at given position in linear array
2. Write a program to insert an element in sorted array.
3. Write a program to delete an element from given position in linear array
4. Perform following operations on matrices using functions only
   a) Addition b) Subtraction c) Multiplication d) Transpose

SEARCHING

5. Search an element in a linear array using linear search.
6. Using iteration and recursion concepts write programs for finding the element in the array using Binary Search Method

RECURSION

7. Write a program to compute factorial of given number using recursion
8. Write as program to solve Tower of Hanoi problem using recursion
9. Write a program to find power of given number using recursion

STACK & QUEUE

10. Write a program for static implementation of stack
11. Write a program for dynamic implementation of queue
12. Write a program for static implementation of circular queue
13. Write a program for dynamic implementation of queue
14. Write a program to evaluate a postfix operation

LINKED LIST

15. Create a linear linked list & perform operations such as insert, delete at end , at beg & reverse the link list
16. Create a circular linked list & perform search, insertion & delete operation
17. Create a doubly linked list & perform search, insertion & delete operation

SORTING ALGORITHMS

18. Write program to implement Bubble, Insertion & selection sort.
19. Write program to implement quick sort
20. Write program to implement merge sort

TEXT BOOK

1. A.K. Sharma – Data structure Using C, 2nd edition pearson 2013
2. Langsam, Augentem M.J. and Tenenbaum A. M., ―Data Structures using C & C++‖, Prentice Hall of India, 2009.

REFERENCE BOOKS

1. R. S. Salaria -Data Structure Using C
2. Kruse Robert, ―Data Structures and Program Design in C‖, Prentice Hall of India, 1994
3. Lipschitz Jr. Seymour, ―Theory & Problems of Data Structures‖, Schaum‘s Outline, 2nd Edition, Tata McGraw Hill

CS-261	PYTHON FOR DATA SCIENCE LAB	L T P	Cr
		0 0 2	1

COURSE OUTCOMES

CO1: Define basic concepts of python programming if statement, loops.
CO2: Define and demonstrate the use of built-in data structures "lists" and "dictionary".
CO3: Design and implement a program to solve a real-world problem
CO4: Design and implement GUI application and how to handle exceptions and files.

LIST OF PROGRAMS

Program 1: Programs using if else structure

a) Find the Largest Among Three Numbers
b) Python Program to Check Leap Year
c) Python Program to Take in the Marks of 5 Subjects and Display the Grade

Program 2: Programs using for and while loop

a) Python Program to check whether given number is Prime Number or not.
b) Python Program to Find the Sum of Digits in a Number.
c) Python Program to convert binary number to decimal number.

Program 3: Program using List and String data structure

a) Write Python Program to input a list of integers, (1) display the no of elements in the list (2) display minimum and maximum element in the list (3) display sum of square of all the element in the list (4) (5) add a new element at end and display the list (6) add a new element at given index and display list (7) display the occurrence of given element in the list (8) remove the given element in the list (9) add element from a new list from given list (10) sort the given list & reverse the given list (11) also perform slicing, concatenation and multiplication operation.
b) A fruit seller sells different type of fruits. Type of fruits and corresponding rates are stored in two different lists. Customer can order any type of fruit (one or more type) in any quantity. If total bill of customer is greater than 500, customer is given 10% discount. If any of the fruits required by the customer is not available in the store, then consider the bill amount to be -1. Write a Python program to calculate and display the bill amount.
c) Accept two strings 'string1' and 'string2' as input from the user. Generate a resultant string-1, such that it is a concatenated string of all upper case alphabets from both the strings in the order they appear. Generate a resultant string-2 that contain character which are in both string1 and 2. Print the actual resultant string-1 and resultant string-2.

Program 4: Programs using concept of list, tuple & dictionary

a) Write a Python program that take a string as input and store the character and occurrence of each character in a dictionary. Create two lists from dictionary first having each character in sorted order of their frequency and second having corresponding frequency.
b) A furniture seller sells different type of furniture, Type of Furniture and rates are stored in a dictionary. Customer can order any type of furniture (one or more type) in any quantity. If total bill of customer is greater than 10,000, customer is given 5% discount. 8% GST is charged on total bill. If any of the furniture required by the customer is not available in the store, then consider the bill amount to be -1. Write a Python program to calculate and display the bill amount.
c) Students name and their corresponding marks are stored in a dictionary. Write a Python program to perform following (1) Display name and marks of each student (2) Display the names of top two scorer (3) display the class average for this course (4) check if the marks for given student is stored in dictionary or not, if not add the name and marks in the dictionary else display his/her marks (5) delete the name and marks of a given student in the dictionary (6) add name and marks from another dictionary and display combined dictionary.

Program 5: Program using Function in Python:

a) Write Python functions using the concept of Keyword & default arguments and write a program to use them.
b) Write python functions to use the concept of variable length argument & global variable.

Program 6: Program using concept of Class, object, class variable, class method:

a) Create a class Account with name, account no and balance as attribute and no_of_accounts as class variable. Account no should be generated automatically (starting from 1) using the class variable no_of_account. Add the methods for displaying the account information, depositing given amount, withdrawing given amount and initializer method to initialize the object. Create objects of Account class and call different method to test the class.
b) Create a class Employee with name , empid ,salary as attribute and no_of_ employee and annual_incr (% annual increment) as class variable. empid should be generated automatically (starting from 1) using the class variable, no_of_employee. Add the instance methods for displaying the employee information, annually increasing the salary with help of class variable annual_incr , class method to change the value of annual_incr and initializer method to initialize the object. Create objects of employee class and call different method to test the class (program using class method).

Program 7: Program using the concept of Inheritance

a) Create a class Polygon to represent a polygon having no of sides and a list having magnitude of each side as attribute. Add the inputSides() to input sides and displaySides() to display sides as methods. Derive a class Triangle from Polygon and add an additional method displayArea() to display area. Create object of Triangle and call different methods to test the class.

b) Create a class Person having name, age, as attributes, __init__() method to initialize the object and display() to display person information. Derive a class Student from Person having roll no, University name, branch as additional attributes and __init__(), display() to display student information and change_Branch() method. Create object of Student type and call different methods to test the class.

Program 8: Program using the concept of Polymorphism, Operator Overloading

a) In a retail outlet there are two modes of bill Payment (1) Cash : Calculation includes VAT(10%) Total Amount = Purchase amount + VAT (2) Credit card: Calculation includes processing charge and VAT Total Amount = Purchase amount + VAT (10%) + Processing charge (2%) The act of bill payment is same but the formula used for calculation of total amount differs as per the mode of payment. Can the Payment maker simply call a method and that method dynamically selects the formula for the total amount? Demonstrate this Polymorphic behaviour with code.
b) Write a program to create a class to represent length in feet and inch. Overload the "+" operator to add the two object of length type.

Program 9: Program on file handling and Exception handling in Python

a) Write a python program to write few lines on a file, read it back and create a dictionary having each word in file as keys in dictionary and occurrence of these word as values and print the dictionary.
b) Write a function divide (arg1, arg2) to divide arg1 by arg2. Use the exception handling mechanism to handle all type of possible exceptions that may occur. Take the value of

arg1 and arg2(of any type) from user as input and call the function divide to print the result of division or suitable message if any type of exception occurs(use also else and finally block).

Program 10: Program on Data Analysis and Visualization

a) Importing and Exporting Data, Basic Insights from Datasets, Cleaning and Preparing the Data: Identify and Handle Missing Values.
b) Basic Visualization Tools, Specialized Visualization Tools, Creating and Plotting Maps.

EC-253C	DIGITAL ELECTRONICS LAB	L T P	Cr
		0 0 2	1

COURSE OUTCOMES

CO1 Perform conversions among different number systems, became familiar with basic logic gates and understand Boolean algebra and simplify simple Boolean functions by using basic Boolean properties & design of combinational circuits such as MUX, DEMUX, Encoder and Decoder etc.
CO2 Understand the design of sequential Circuits such as Flip-Flops, Registers, and Counters
CO3 Obtain a basic level of Digital Electronics knowledge and set the stage to perform the analysis and design of Complex Digital electronic Circuits.

LIST OF EXPERIMENTS

1. Study of TTL gates – AND; OR; NOT; NAND; NOR; EX-OR; EX-NOR.
2. Design and realize a given function using k-maps and verify its performance.
3. To verify the operation of multiplexer and demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R; J-K; T and D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design and verify the operation of 3-bit synchronous counter.
8. To design and verify the operation of synchronous up/down decade counter using JK flip-flops and drive a seven-segment display using the same.
9. To design and verify the operation of asynchronous up/down decade counter using JK flip-flops and drive a seven-segment display using the same.
10. To design and realize a sequence generator for a given sequence using J-K flip-flops.
11. Study of CMOS NAND and NOR gates and interfacing between TTL and CMOS gates.
12. Design a 4-bit shift-register and verify its operation. Verify the operation of a ring counter and a johnson counter.

CS-252	OPERATING SYSTEMS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Basics of UNIX commands.
2. Shell programming

3. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority

4. Implement all file allocation strategies

5. Implement Process System call.

6. Implement I/O system call.

7. Implement Bankers algorithm for Dead Lock Avoidance

8. Implement Producer/Consumer problem using semaphore.

9. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU

10. Implement first fit, best fit algorithm for memory management.

11. To write a program for file manipulation for displays the file and directory in memory

REFERENCE BOOKS

1. Bach Maurich, “Design of the Unix Operating System”, Prentice Hall of India, 1986
2. Prato Stephen, “Advanced Unix Programmer’s Guide”, BPB Publications, 2006
3. Das Sumitabha, “Unix- Concept and Applications”, Tata McGraw Hill, 2002.

SYLLABUS OF SEMESTER - IV

CS-315	BUSINESS ANALYTICS	L T P	Cr
		3-1-0	4

Prerequisites: Basic Knowledge of Statistics, Weka Tool and Excel

Objective: To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.

Course Outcomes

CO1 Understand the essentials of BI & data analytics and the corresponding terminologies

CO2 Analyze the steps involved in the BI - Analytics process

CO3 Illustrate competently on the topic of analytics

CO4 Understand & Implement the K-Means Clustering with Iris Dataset

CO5 Demonstrate the real time scenario (Case study) by using BI & Analytics techniques

UNIT-I Introduction - History and Evolution: Effective and Timely decisions, Data Information and Knowledge, Architectural Representation, Role of mathematical Models, Real Time Business Intelligent System.

UNIT-II Data Mining - Introduction to Data Mining, Architecture of Data Mining and How Data mining works(Process) , Functionalities & Classifications of Data Mining, Representation of Input Data, Analysis Methodologies.
Data Warehousing - Introduction to Data Warehousing, Data Mart, Online Analytical Processing (OLAP) – Tools, Data Modelling, Difference between OLAP and OLTP, Schema – Star and Snowflake Schemas, ETL Process – Role of ETL

UNIT-III Data Validation - Introduction to Data Validation, Data Transformation – Standardization and Feature Extraction, Data Reduction – Sampling, Selection, PCA, Data Discretization

UNIT-IV Introduction to analytics process, Types of Analytical Techniques in BI – Descriptive, Predictive, Perspective, Social Media Analytics, Behavioral, Iris Datasets

UNIT-V Business Activity Monitoring, Complex Event Processing, Business Process Management, Metadata, Root Cause Analysis.

TEXTBOOK:

Carlo-Vercellis, “Business Intelligence Data Mining and Optimization for Decision-Making”, First Edition
Link : https://bit.ly/3d6XxOr

Drew Bentely, “Business Intelligence and Analytics” ,@2017 Library Pres., ISBN: 978-1-9789- 2136-8
Link : https://www.academia.edu/40285447/Business_Intelligence_and_Analytics

REFERENCE BOOK:

Cindi Howson, “Successful Business Intelligence”, Second Edition, McGraw-Hill Education, 2013

CS-212	DESIGN & ANALYSIS OF ALGORITHMS	L T P	Cr
		3-1-0	4

OBJECTIVE

To relay the theoretical and practical aspects of design of algorithms

PRE-REQUISITES

Knowledge of fundamentals of basic computer programming for implementing algorithms

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Define the basic concepts of algorithms and analyze the performance of algorithms.

CO2: Discuss various algorithm design techniques for developing algorithms.

CO3: Discuss various searching, sorting and graph traversal algorithms.

CO4: Understand NP completeness and identify different NP complete problems.

CO5: Discuss various advanced topics on algorithms.

UNIT I

BRIEF REVIEW: Growth of functions, Asymptotic Notations, Representation of Graphs, Breadth First Search, Depth First Search and Data Structures for Disjoint Sets.

UNIT II

DIVIDE AND CONQUER: General method; binary search; merge sort; quick sort; Strassen‘s matrix multiplication algorithms and analysis of algorithms for these problems.

UNIT III

GREEDY METHOD: General method; knapsack problem, job sequencing with deadlines; minimum spanning trees Algorithm of Kruskal’s and Prim’s; single source paths and analysis of these problems.

UNIT IV

DYNAMIC PROGRAMMING AND BACK TRACKING: General method; optimal binary search trees; O/I knapsack; the traveling salesperson problem, 8 queens ‘problem; graph coloring; Hamiltonian cycles

UNIT V

NP HARD AND NP COMPLETE PROBLEMS: Basic concepts; Cook‘s theorem; NP hard graph and NP scheduling problems; some simplified NP hard problems.

TEXT BOOK

Horowitz Ellis and Sahni Sartaj, ―Fundamental of Computer Algorithms‖, Galgotia Publications, 1978

REFERENCE BOOKS

1. Cormen Thomas H., Leiserson Charles E. and Rivest Ronald L., ―Introduction to Algorithms‖, Tata McGraw Hill, 1990
2. Aho A. V. and Hopcroft J. E., ―The Design and Analysis of Computer Algorithm‖, Addison Wesley, 1974
3. Berlion P., and Bizard P., Algorithms – The Construction, Proof and Analysis of Programs, John Wiley & Sons, 1986.
4. Bentley J. L., ―Writing Efficient Programs‖, Prentice Hall of India, June 1982.
5. Goodman S. E. and Hedetnieni, ―Introduction to Design and Analysis of Algorithm‖, McGraw Hill, 1997
6. Trembley Jean Paul and Bunt Richard B., ―Introduction to Computers Science - An Algorithms Approach‖, Tata McGraw Hill, 2002
7. Knuth Donald E., ―Fundamentals of Algorithms: The Art of Computer Programming‖, Vol. l, Naresh Publications, 1985
8. Goodrich Michael T. and Roberto Tamassia, ―Algorithm Design: Foundations, Analysis & Internet Examples‖, Wiley Student Ed., 2002

CS-216	DATA MINING & VISUALIZATION	L T P	Cr
		3 0 0	3

Pre-Requisites:

- A course on "Database Management Systems"
- Knowledge of probability and statistics

Course Objectives:

1. It presents methods for mining frequent patterns, associations, and correlations.
2. It then describes methods for data classification and prediction, and data–clustering approaches.
3. It covers mining various types of data stores such as spatial, textual, multimedia, streams.

Course Outcomes:

CO1: Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
CO2: Apply preprocessing methods for any given raw data.
CO3: Extract interesting patterns from large amounts of data.
CO4: Discover the role played by data mining in various fields.
CO5: Choose and employ suitable data mining algorithms to build analytical applications
CO6: Evaluate the accuracy of supervised and unsupervised models and algorithms.

UNIT - I

Data Mining: Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns– Classification of Data Mining systems– Data mining Task primitives –Integration of Data mining system with a Data warehouse–Major issues in Data Mining–Data Preprocessing.

UNIT - II

Association Rule Mining: Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining. Graph Pattern Mining, SPM.

UNIT - III

Classification: Classification and Prediction – Basic concepts–Decision tree induction–Bayesian classification, Rule–based classification, Lazy learner.

UNIT - IV

Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis.

UNIT - V

Advanced Concepts: Basic concepts in Mining data streams–Mining Time–series data—Mining sequence patterns in Transactional databases– Mining Object– Spatial– Multimedia–Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.

2. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

REFERENCE BOOK:

1. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, 2005

CS-305	ARTIFICIAL INTELLIGENCE	L T P	Cr
		3 0 0	3

OBJECTIVES

To introduce about artificial intelligence approaches to problem solving, various issues involved and application areas

PRE-REQUISITES: Knowledge of neural networks, data structures

COURSE OUTCOMES

CO1: Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems. Solve basic AI based problems

CO2: Define the concept of Artificial Intelligence and Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

CO3: Apply AI techniques to real-world problems to develop intelligent systems.

CO4: Select appropriately from a range of techniques when implementing intelligent systems.

CO5: Discuss the basics of ANN and different optimizations techniques

UNIT I

INTRODUCTION TO AI AND SEARCH TECHNIQUES: Foundation and history of AI; data, information and knowledge; AI problems and techniques – AI programming languages, problem space representation with examples; blind search strategies, breadth first search, depth first search, heuristic search techniques: hill climbing: best first search, A * algorithm AO* algorithm, Minimax search procedure for Game Playing.

UNIT II

KNOWLEDGE REPRESENTATION ISSUES AND TECHNIQUES: Predicate logic; representing knowledge using rules. Semantic nets, partitioned nets, parallel implementation of semantic nets; frames, forward and backward chaining; frame based systems.

UNIT III

REASONING UNDER UNCERTAINITY: Reasoning under uncertainty, non monotonic reasoning; Review of probability; Baye's probabilistic interferences and Dumpster Shafer theory; statistical reasoning, fuzzy reasoning.

UNIT IV

PLANNING & LEARNING: Goal stack planning; non linear planning, hierarchical planning representation for planning; partial order planning algorithm. Basic concepts of Learning ; rote learning, learning by taking advices, learning by problem solving, learning from examples, discovery as learning, learning by analogy; explanation based learning; neural nets; genetic algorithms.

UNIT V

EXPERT SYSTEM AND APPLICATIONS OF ARTIFICIAL INTELLIGENCE: Expert systems: rule based systems architecture: Principles of natural language processing: knowledge acquisition concepts; AI application to robotics, and current trends in intelligent systems; parallel and distributed AI.

TEXT BOOK

Rich Elaine and Knight Kevin, ―Artificial Intelligence 3rd Edition, Tata McGraw Hill, 1991

REFERENCE BOOKS

1. Nilson Nils J., ―Artificial Intelligence‖, McGraw-Hill, New York 1971
2. Russell Stuart and Norvig Peter, ―Artificial Intelligence: A Modern Approach‖, Prentice Hall of India, 1998
3. Negnevitsky, ―Artificial Intelligence: A Guide to Intelligent System ‖, Pearson Education, 2004.
4. Patterson O. W., ―Introduction to Artificial Intelligence & Expert Systems‖, Prentice Hall of India, 1996.
5. Winston Patrick Henry, ―Artificial Intelligence, 3rd Edition, Addition Wesley, 1992
6. Clockson & Mellish, ―Programming PROLOG‖, 3rd Edition, Narosa Publications, 2002.

CS-218	Applied Statistics & EDA	L T P	Cr
		3 0 0	3

OBJECTIVES

- The chief aim to apply statistical analysis and technologies on data to find trends and solve problems.
- Students will be able to understand basic theoretical and applied principles of statistics needed to enter the job force.
- Students will be able to communicate key statistical concepts to non-statisticians.
- Students will gain proficiency in using statistical software for data analysis.

PRE-REQUISITES

Fundamental Knowledge of R programming and Statistics.

COURSE OUTCOMES

Students after undergoing this course will be able to:
CO1: Understand the basics of R Programming and Apply OOP concepts in R programming.
CO2: Explain the use of data structure and loop functions. Analyse data and generate reports based on the data.
CO3: Organize, manage and present data. Analyse statistical data graphically using frequency distributions and cumulative frequency distributions.
CO4: Extract the scene with different visualization in R Programming methods and perform different types of testing used in statistics on data.
CO5: Explore the different types of models used in statistics with r programming.

Unit I

Introduction to R Programming: R and R Studio, Logical Arguments, Missing Values, Characters, Factors and Numeric, Help in R, Vector to Metrix, Matrix Access, Data Frames, Data Frame Access, Basic Data Manipulation Techniques, Usage of Various apply functions – apply, lappy, sapply and tapply, outliers' treatment.

Unit II

Descriptive Statistics: Types of Data, Nominal, Ordinal, Scale and Ratio, Measure of Central Tendency, Mean, Median and Mode, Bar Chart, Pie Chart, Box Plot, Scatter Plot, Measure of Variability, Range, Inter-Quartile Range, Standard Deviation, Skewness and Kurtosis, Histogram, Stem and Leaf Diagram, Standard Error of Mean and Confidence Intervals.

Unit III

Probability and Sampling Distribution: Experiment, Sample Space and Events, Classical Probability, General Rules of Addition, Conditional Probability, General Rules for Multiplication, Independent Events, Bayes' Theorem, Discrete Probability Distribution: Binomial, Poisson, Continuous Probability Distribution, Normal Distribution & t-distribution, Sampling, Distribution and Central Limit Theorem.

Unit IV

Statistical Inference and Hypothesis Testing: Population and Sample, Null and Alternate Hypothesis, Level of Significance, Type I and Type II Error, Confidence Interval, One Sample Test, Paired Sample T Test, Independent Sample t Test, One Way ANOVA and Chi Square Test.

Unit V

Correlation and Regression Analysis of Relationship: Positive and Negative Correlation, Perfect Correlation, Correlation Matrix, Scatter Plots, Simple Linear Regression, R Square, Adjusted R Square, Testing of Slope, Standard Error of Estimate, Overall Model Fitness, Assumption of Linear Regression, Multiple Regression, Coefficient of Partial Determination, Durbin Watson Statistics, Variance Inflation Factor.

Textbooks:

1) Hadley Wickham "R for Data Science: Import, Tidy, Transform, Visualize, and Model Data" 1st edition O′Reilly
2) Tilman M. Davies "The Book of R: A First Course in Programming and Statistics" 1st edition. Starch Press

Reference books:

1) Andrie de Vries "R For Dummies" 2nd edition John Wiley & Sons
2) Andy Field "Discovering Statistics Using R" 1st edition SAGE Publications Ltd
3) Norman Matloff "The Art of R Programming: A Tour of Statistical Software Design."1st edition Starch Press.

CS-303	Formal Language Automata	L T P	Cr
		3-1-0	4

PRE-REQUISITES: Knowledge of basic computer programming.

COURSE OUTCOMES

CO1: Understand the relation between types of languages and types of finite automata.
CO2: An ability to design grammars and automata for different language classes.
CO3: Understanding the Context free languages and grammars and also normalizing CFG.
CO4: Understand the concept of pushdown automata and its application.
CO5: To understand basic properties of Turing machines and computing with Turing machines.

UNIT I: FINITE AUTOMATA AND REGULAR EXPRESSIONS: Finite state systems; basic definitions non-deterministic finite automata (NDFA), deterministic finite automata (DFA), equivalence of DFA and NDFA, finite automata with e-moves, limitations of FSM, Moore and Mealy Machines, equivalence of Moore and Mealy Machines, Minimization of Finite Automata.

UNIT II: PROPERTIES OF REGULAR SETS: Regular expressions, equivalence of finite automata and regular expressions, regular expression conversion and vice versa, Arden's theorem. The Pumping Lemma for regular sets, applications of the pumping lemma, closure properties of regular sets.

UNIT III: CONTEXT FREES GRAMMARS & GREIBACH NORMAL FORM: Definition, context free and context sensitive grammar; ambiguity regular grammar; reduced forms; Chomsky Normal Form (CNF), Greibach Normal Form (GNF).

UNIT IV: PUSHDOWN AUTOMATA: Introduction to pushdown machines; design of PDA; conversion of PDA to CFG and vice versa, application of pushdown machines.

UNIT V: TURING MACHINES: Basic concepts of Turing machines, deterministic and non-deterministic Turing machines; design of Turing machines; halting problem of Turing machines.

TEXT BOOK

1. Mishra K. L. P. and Chandrasekaran N., "Theory of Computer Science - Automata, Languages and Computations", Prentice Hall of India, 2000.
2. Hopcroft, Ullman O. D. and Mothwani R., "Introduction to Automata Theory, Language & Computations", Addison Wesley, 2001.

REFERENCE BOOKS

1. Linz Peter, "Introduction to Formal Languages & Automata", Narosa Publications, 2001
2. Greenlaw Ramond and Hoover H. James, "Fundamentals of the Theory of Computation - Principles and Practice", Harcourt India Pvt. Ltd., 1998

CS-266	DATA MINING AND VISUALIZATION LAB	L T P	Cr
		0-0-2	1

LIST OF EXPERIMENTS

1. Build Data Warehouse and Explore WEKA
2. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
3. Demonstrate performing classification on data sets
4. Demonstrate performing clustering on data sets
5. Demonstrate performing Regression on data sets
6. Design of fact & dimension tables
7. Generating graphs for star schema.
8. To Construct Decision Tree for Weather data and classify it.
9. Write a procedure for Visualization for Weather Table.
10. Write a procedure for Visualization for Weather Table.

CS-355	ARTIFICIAL INTELLIGENCE LAB	L T P	Cr
		0-0-2	1

COURSE OUTCOMES

CO1 Explain artificial intelligence, its characteristics and its application areas.

CO2 Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems

CO3 Select and apply appropriate algorithms and AI techniques to solve complex problems.

CO4 Design and develop an expert system by using appropriate tools and techniques.

LIST OF EXPERIMENTS

1. Study of Python programming language.
2. Write a program to find out route distance between two cities using Python.
3. Write a program to implement Tower of Hanoi using Python.
4. Write a program to calculate factorial of a number using Python.
5. Write a program to print the list of customer having different colored cars with price and model available using Python.
6. Write a program to implement water jug problem using Python.
7. Write a program to implement Breadth First Search using Python
8. Write a program to implement Depth First Search using Python
9. Write a program to solve 8-Queens problem using Python.
10. Write a program to solve Monkey Banana problem using Python.

CS-268	Applied Statistics & EDA Lab	L T P	Cr
		0 0 2	1

COURSE OUTCOMES:

CO1: Understand the basic concepts of R Programming.
CO2: apply the concepts of control statements, looping and class.
CO3: graphically using frequency distributions and cumulative frequency distributions on data.
CO4: Understanding the type of testing used in statistics**.**
CO5: Understand the practical implementation of model.

LIST OF EXPERIMENTS

1.Reading Excel data sheet in R.
2.Reading XML dataset in R
3.Write an R script, to create R objects for calculator application and save in a specified location in disk.
4. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars & cars datasets.
5. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.
6. Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location.
7.Find the data distributions using box and scatter plot.
8.Find the outliers using plot. c. Plot the histogram, bar chart and pie chart on sample data.
9.Find the correlation matrix.
10.Perform the Inverse Probability Cumulative Density Analysis on t-Distribution in R Programming – qt() Function.
11.Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.
12. Perform Linear Regression Analysis in R Programming – lm() Function.
13. Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).
14. Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.
15. Write a program using any machine learning model to perform Cross-Validation in R programming.

PDP-202	LIFE SKILLS	L T P	Cr
		0 0 2	1

COURSE OUTCOMES

The students undergoing this course will be able to**:**

CO1: Develop and exhibit and accurate sense of self.

CO2: Assess and analyze the symptoms, causes and effects of personal and academic stressors in order to implement appropriate stress management techniques.

CO3: Analyze time management techniques

CO4: Assess Self and become better decision makers

CO5: Build stronger relationships and achieve career and personal goals.

UNIT I

PERSONALITY DEVELOPMENT & TA– Concept of PD- Significance of PD. The 4 OK States & PAC Concept

SWOT Analysis, Success & Failure, Dimensions of Personality – Theories of Freud & Erickson, Transactional Analysis – Dr. Eric Berne

UNIT II

STRESS MANAGEMENT – Meaning of Stress, Effects of Stress on Body & Mind. How to overcome stress

UNIT III

TIME MANAGEMENT – Concept of TM, Time Matrix, 24 hr Time tracker. How to manage time effectively?

UNIT IV

SELF -AWARENESS & SELF - ESTEEM – What is SA & SE? Importance of Self Awareness, Emotional Intelligence – Definition and significance

UNIT V

ART OF CONVERSATION – Conversational Skills - How to start, sustain and conclude conversation?

UNIT VI

MOTIVATION – Meaning, Internal & External Motivation, How to stay motivated? Self Motivation

RA-101	Reasoning & Aptitude-I	L T P	Cr
		1 0 0	1

UNIT 1 – Logical Reasoning – Logical Deductions (Syllogism & Venn Diagrams) logical connectives
UNIT 2- Analytical Reasoning – Seating Arrangements, combinations, selections, comparisons, blood relations, directions etc

UNIT 3 – Non – Verbal Reasoning (Alpha Numeric & Visual Puzzles) – To solve problems on numbers, alphabet, symbols, visuals, problem types and series, analogies, odd man out, coding, decoding and symbols & notations.

UNIT 4 – Higher Maths – Algebra & Mensuration

UNIT 5- Business Maths – Number system, ratios & averages, time & work, time & distance, percentages, profit & loss, simple & compound interest

UNIT 6 –Date Interpretation & Sufficiency – Tables, Bar Chart, Line Graph & Pie Chart

CS-309	PREDICTIVE ANALYTICS AND MACHINE LEARNING	L-T-P	Cr
		3-0-0	3

UNIT I:

Linear Methods for Regression and Classification: Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection, Ridge regression, Lasso regression, Linear Discriminant Analysis, Logistic regression, Perceptron learning algorithm.

UNIT II:

Model Assessment and Selection: Bias, Variance, and model complexity, Bias-variance trade off, Optimism of the training error rate, Estimate of In-sample prediction error, Effective number of parameters, Bayesian approach and BIC, Cross-Validation, Boot, strap methods, conditional or expected test error.

UNIT III:

Additive Models, Trees, and Boosting: Generalized additive models, Regression and classification trees, Boosting methods-exponential loss and AdaBoost, Numerical Optimization via gradient boosting, Examples (Spam data, California housing, NewZealand fish, Demographic data)

UNIT IV:

Neural Networks (NN), Support Vector Machines (SVM), and K-nearest Neighbor: Fitting neural networks, Backpropagation, Issues in training NN, SVM for classification, Reproducing Kernels, SVM for regression, K-nearest –Neighbor classifiers (Image Scene Classification)

UNIT V:

Unsupervised Learning and Random forests: Association rules, Cluster analysis, Principal Components, Random forests, and analysis.

TEXTBOOKS:

1. Subasi, A. (2020). *Practical Machine Learning for Data Analysis Using Python*. Academic Press.
2. Kelleher, J. D., Mac Namee, B., & D'arcy, A. (2020). *Fundamentals of machine learning for predictive data analytics: algorithms, worked examples, and case studies*. MIT press.

REFERENCE BOOKS

1. Dong, G., & Liu, H. (Eds.). (2018). *Feature engineering for machine learning and data analytics*. CRC Press.
2. Gollapudi, S. (2016). *Practical machine learning*. Packt Publishing Ltd.

CS-304	SOFTWARE ENGINEERING	L T P	Cr
		3 0 0	3

COURSE OBJECTIVE

To provide basic knowledge of properties of software and its development processes, software quality, CASE tools, etc.

PRE-REQUISITES

Knowledge of computer programming, principles of management

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Plan a software engineering process life cycle, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements

CO2: Able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project

CO3: Analyze and translate a specification into a design, and then realize that design practically,
using an appropriate software engineering methodology.

CO4: Know how to develop the code from the design and effectively apply relevant standards
and perform testing, and quality management and practice

CO5: Able to use modern engineering tools necessary for software project management, time management and software reuse.

UNIT I

INTRODUCTION: Definition and Emergence of Software Engineering, Evolving Role of Software, Software Life Cycle Models, Software Characteristics, Applications, Software Product, Software Process, Software Crisis, Software Myths.

UNIT II

SOFTWARE PROJECT MANAGEMENT: Project management concepts, software process and project metrics project planning, project size estimation metrics, project estimation techniques, empirical estimation techniques, COCOMO- a heuristic estimation techniques, staffing level estimation, team structures, staffing, risk analysis and management, project scheduling and tracking.

UNIT III

REQUIREMENTS ANALYSIS AND SPECIFICATION: Requirements engineering, system modeling and simulation, analysis principles: modeling, partitioning, software, prototyping: methods and tools; specification principles, representation, the software requirements specification and reviews analysis modeling: data modeling, functional modeling and information flow: data flow diagrams, behavioral modeling; the mechanics of structured

analysis: creating entity/ relationship diagram, data flow model, control flow model, the control and process specification.

UNIT IV

SYSTEM DESIGN AND COMPUTERAIDEDSOFTWARE ENGINEERING: Design Process: design and software quality, design principles; design concepts: abstraction, refinement, modularity, software architecture, control hierarchy, structural partitioning, software procedure, information hiding; functional independence, cohesion, coupling; design heuristics for effective modularity; design model; design documentation, architectural design: software architecture, CASE, building blocks; integrated case environments and architecture, repository.

UNIT V

TESTING AND MAINTENANCE: Software testing techniques, software testing fundamentals: objectives, principles, testability; test case design, white box testing, basis path testing: control structure testing: black box testing, testing for specialized environments, architectures and applications. software testing strategies: verification and validation, unit testing, integration testing, validation testing, alpha and beta testing; system testing, acceptance testing debugging approaches; software re-engineering, reverse engineering, restructuring, forward engineering, Software maintenance, Adaptive , corrective and perfective, software reliability: measures of reliability and availability, software safety.

TEXT BOOK

Pressman Roger S., ―Software Engineering – A Practitioner‘s Approach‖ , McGraw Hill, 2004

REFERENCE BOOKS

1. Jalote P ankaj, ―An Integrated Approach to Software Engineering‖, 3rd edition, Narosa Book Distributors Private Ltd, 2005
2. Mall Ra jib, ―Fundamentals ofSoftware Eng ineering ‖, Prentice Hall of India,2003
3. Sommerville Ian, ―Software Engineering‖, 8th edition, Addison Wesley, 2007
4. Gustafson David, ―Software Eng ineering ‖, Tata McGraw Hill, 2002
5. Behforooz Ali and Hudson Frederick J., ―Software Engineering Fundamentals‖, Oxford University press, John Wiley & Sons, 2005.

CS-317	COGNATIVE SCIENCES AND BIG DATA ANALYTICS	L T P	Cr
		3-0-0	3

COURSE OUTCOMES

CO1: Understand basics of Cognitive Computing and its differences from traditional Approaches of Computing.

CO2: Plan and use the primary tools associated with cognitive computing.
CO3: Plan and execute a project that leverages Cognitive Computing.
CO4: Identify Big Data and its Business Implications and list the components of Hadoop and Hadoop Eco-System

CO5: Manage Job Execution in Hadoop Environment and develop Big Data Solutions using Hadoop Eco System

UNIT I

INTRODUCTIONTO COGNITIVE SCIENCES:Cognitive science and cognitive Computing with AI, Cognitive Computing - Cognitive Psychology - The Architecture of the Mind - The Nature of Cognitive Psychology – Cognitive architecture – Cognitive processes – The Cognitive Modeling Paradigms - Declarative / Logic based Computational cognitive modeling – connectionist models – Bayesian models. Introduction to Knowledge-Based AI – Human Cognition on AI – Cognitive Architectures

UNIT II

COGNITIVE COMPUTING WITH INFERENCE AND DECISION SUPPORT SYSTEMS: Intelligent Decision making, Fuzzy Cognitive Maps, Learning algorithms: Non linear HebbianLearning – Data driven NHL - Hybrid learning, Fuzzy Grey cognitive maps, Dynamic Random fuzzy cognitive Maps.

UNIT III

COGNITIVE COMPUTING WITH MACHINE LEARNING: Machine learning Techniques for cognitive decision making – Hypothesis Generation and Scoring - Natural Language Processing - Representing Knowledge - Taxonomies and Ontologies - Deep Learning.

UNIT IV

INTRODUCTION TO BIG DATA AND HADOOP : Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System. The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT V

MAP REDUCE : Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features. **Hadoop Eco System :**

Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

Hbase :HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.

REFERENCES

1. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
2. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
3. Peter Fingar, Cognitive Computing: A Brief Guide for Game Changers, PHI Publication, 2015
4. Gerardus Blokdyk ,Cognitive Computing Complete Self-Assessment Guide, 2018
5.Rob High, Tanmay Bakshi, Cognitive Computing with IBM Watson: Build smart applications using Artificial Intelligence as a service, IBM Book Series, 2019

CS-319	COMPUTER NETWORK & SECURITY	L T P	Cr
		3-1-0	4

OBJECTIVES

The main objective behind this course is to learn about the various network attacks and preventing attacks. This course is designed to cover Application security, Network security, Web security etc.

PREREQUISITE

Data Communications and Computer Networks, Computer Programming, Data Structures, Prime Number Theory

COURSE OUTCOMES

The students undergoing this course will be able to:
CO1: Understand and analyze public-key cryptography, RSA and other public-key cryptosystems
CO2: Analyze and design hash and MAC algorithms, and digital signatures.
CO3: Design network application security schemes, such as PGP, S/ MIME, IPSec, SSL, TLS, HTTPS, SSH, etc.
CO4: Understand key management and distribution schemes and design User Authentication Protocol
CO5: Know about Intruders and Intruder Detection mechanisms, Types of Malicious software, Firewall Characteristics, Types of Firewalls, Firewall Location and Configurations.

UNIT I

ATTACKS ON COMPUTERS & COMPUTER SECURITY: Introduction; The need of Security ; Security Approaches; Principal of Security; Types of Attacks,

CRYPTOGRAPHY : Introduction; Plain Text & Cipher Text; Substitution Techniques; Transposition Techniques; Types of Cryptography; Steganography; Symmetric Key Algorithm: Algorithm Types and Modes, DES; Asymmetric Key Algorithm: RSA, Digital Signatures

UNIT II

DIGITAL CERTIFICATES AND PUBLIC KEY INFRASTRUCTURE: Digital Certificates ; Private Key Management; The PKIX Model ; Public Key Cryptography Standards; Creating Digital certificates using Java

UNIT III

INTERNET SECURITY PROTOCOLS: Introduction; Secure Socket Layer(SSL); Secure Electronic Transaction (SET); Electronic Money; Email security; Wireless application protocol (WAP); Security in GSM: Security in 3G

UNIT IV

USER AUTHENTICATION AND KERBEROS: Introduction, Authentication Basics; Passwords; Authentication Tokens; Certificate Based Authenticaton; Biometric Authentication; Kerberos

UNIT V

NETWORK SECURITY, FIREWALL AND VPN: Introduction, Firewalls: Types of Firewalls ; IP Security; Virtual Private Network; Intrusion,

CASE STUDIES ON NETWORK SECURITY : Introduction ; secure Inter branch payment transactions; Denial of Service attacks; IP Spoofing attacks; Contract Signing; Secret Splitting ; Virtual elections

TEXT BOOKS

1. Stallings William, "Cryptography and Network Security", 4th Edition, Prentice-Hall, Englewood Cliffs, 2006
2. Behrouz A. Forouzan "Cryptography and Network Security", TMH

REFERENCE BOOKS

1. Atul Kahate , "Cryptography and Network Security", 3rd Edition, Tata Mcgraw Hill.
2. Mani Subramanian, "Network Management Principles & Practices", Addison Wesley, 1999
3. Kauffman C., Perlman R. and Spenser M., "Network Security", 2nd Edition, Prentice Hall, 2002.
4. Menezes Alfred, van Oorschot Paul, and Vanstone Scott, "Handbook of Applied Cryptography", CRC Press, NY, 2004.
5. Bellovin S. and Chesvick W., "Internet Security and Firewalls", 2nd Edition, Addison Wesley, 1998.
6. Schneier Bruce, "Applied Cryptography", Wiley Student Edition, 2nd Edition

CS-359	PREDICTIVE ANALYTICS AND MACHINE LEARNING LAB	L-T-P	Cr
		0-0-2	1

LIST OF EXPERIMENTS

1. Simple and multiple linear regression,

2. Logistic regression,

3. Linear discriminant analysis,

4. Ridge regression, Cross-validation, and bootstrap,

5. Fitting classification models like (Decision Trees, J48, SVM, Random Forest, Naïve Bayes, K-nearest neighbors, etc.),

7. Factor Analysis and Principal Component Analysis,

8. K-means clustering analysis.

CS-354	SOFTWARE ENGINEERING LAB	L-T-P	Cr
		0-0-2	1

LIST OF EXPERIMENTS

1. Phases in software development project, overview, need, coverage of topics
2. To assign the requirement engineering tasks
3. To perform the system analysis : Requirement analysis, SRS
4. To perform the function oriented diagram : DFD and Structured chart
5. To perform the user's view Analysis: Use case diagram
6. To draw the structural view diagram: Class diagram, object diagram
7. To draw the behavioural view diagram: Sequence diagram, Collaboration diagram
8. To draw the behavioural view diagram: State-chart diagram, Activity diagram
9. To draw the implementation view diagram: Component diagram
10. To draw the environmental view diagram : Deployment diagram

PDP-301	LEADERSHIP & ENTREPRENUERSHIP DEVELOPMENT	L T P	Cr
		0 0 2	1

COURSE OUTCOMES: Students will be able to:

- CO1: Demonstrate an ability to engage in critical thinking by analyzing situations and constructing and selecting viable solutions to solve problems.
- CO2: Identify own strengths and weaknesses and gain the ability to take better decisions
- CO3: Develop the skills to reflect on their learning and turn their understanding of their current knowledge and skills into a drive to learn more
- CO4: Develop an understanding of change processes and be able to think critically about obstacles to change

Unit Wise Syllabus:

UNIT 1- Leadership- Concept, styles of Leadership, Qualities to become a Leader. Case study on world renowned leaders

UNIT 2- Teamwork & Team Building – Importance of Team Work, Stages of Team Formation,
Benefits of Working in a Team.

UNIT 3- Decision Making -7 steps of DM, Strategies to make good decisions

UNIT 4- Goal Setting – Difference between Goal & Dreams. SMART Technique of setting Goals, Types of Goals, Goal Tracker

UNIT 5 – Entrepreneurship – Concept of Entrepreneurship, Qualities of Entrepreneur,

SYLLABUS OF SEMESTER- VI

CS-403	DEEP LEARNING	L T P	Cr
		3 0 0	3

Course Objectives

1. Introduce major deep neural network frameworks and issues in basic neural networks.

2. To solve real world applications using Deep learning

Course Outcomes

CO 1. Understand the methods and terminologies involved in deep neural network, differentiate the learning methods used in Deep-nets.

CO 2. Identify and apply suitable deep learning approaches for given application.

CO 3. Design and develop custom Deep-nets for human intuitive applications.

CO 4. Design of test procedures to assess the efficiency of the developed model.

CO 5. making the algorithms used for learning easier and better to use, make advances that are revolutionary as far as deep learning is concerned and essentially achieve artificial intelligence.

UNIT I-A REVIEW OF MACHINE LEARNING

Machine Learning Basics, Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, building a Machine Learning Algorithm, Challenges Motivating Deep Artificial Neural Networks (ANN), Functions in ANN Activation function, Loss function - L1, L2 - Function approximation, classification / clustering problems - Applications

UNIT II – DEEP NETWORKS

Fundamentals of Deep Networks, Major Architectures of Deep Networks, Unsupervised Pretrained Networks, Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks, Building Deep Networks, Tuning Deep Networks, Tuning Specific Deep Network Architectures, Vectorization, Back propagation training, Learning the weights,

Chain rule, Stochastic gradient descent, Sigmoid units and vanishing gradient, Rectified Linear Unit (ReLU) and its variants - Cross entropy for classification and activation, Batch learning.

UNIT III -DEEP NEURAL NETWORKS

Hyper-parameter tuning, Regularization - Dropouts, Minibatch gradient descent, Data Augmentation, Stratification, Generalization Gap – Under-fitting Vs Over-fitting - Optimization Momentum, Learning rate schedules, AdaGrad, RMSProp and Adam optimization, Internal Co-variant and Batch Normalization, Initialization – weights, Bias, CONVOLUTION NEURAL NETWORKS, CNN Operations, Pooling, Basic architecture, Variants of the Basic Convolution Model – Advanced architectures : AlexNet, ResNet and others. recursive neural networks The Challenge of Long-Term Dependencies, Echo State Networks, Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory

UNIT IV - RECURRENT NETWORKS

Recurrent Neural Networks - Bidirectional RNNs, Encoder, Decoder, Sequence-to-Sequence Architectures, Deep Recurrent Networks, Auto encoders, transfer learning, transfer learning strategy, generative adversarial networks, Gan and their variants, r-CNN, yolo and SSD

UNIT V- DEEP LEARNING RESEARCH

Linear Factor Models, Autoencoders, Representation Learning, Structured Probabilistic Models for Deep Learning, Monte Carlo Methods, Confronting the Partition Function, Approximate Inference, Deep Generative Models,

TEXT BOOKS

1. Deep Learning, Ian Goodfellow Yoshua Bengio Aaron Courville, MIT Press, 2017

2. Neural Networks and Deep Learning, Michael Nielsen, Determination Press

REFERENCE BOOKS

3. Deep Learning with Python", Francois Chollet, Manning Publications, 2017.

CS-308	COMPILER DESIGN	L T P	Cr
		3-0-0	3

COURSE OBJECTIVE

To make the student to understand the process involved in a compiler, create an overall view of various types of translators, linkers, loaders, and phases of a compiler, understand what is syntax analysis, various types of parsers especially the top down approach, awareness among students the various types of bottom up parsers, understand the syntax analysis and, intermediate code generation, type checking, the role of symbol table and its organization, Code generation, machine independent code optimization and instruction scheduling.

PRE-REQUISITES

Knowledge of automata theory, context free languages, computer architecture, data structures and simple graph algorithms, logic or algebra.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Student will be familiar with the front-end as well as back-end stages of compiler design and Design Lexical analyzer for given language using LEX tools

CO2: understand the differences between constructing lexers/parsers by hand versus using automated generators

CO3: Hands-on experience with generating intermediate representations, which in turn will let them appreciate the importance of designing simpler languages

CO4: To appreciate the nuances of analyzing and transforming programs for performance

CO5: Experience of working with relatively large programming environments, which will also inculcate a sense of good software design

UNIT I

INTRODUCTION TO COMPILING & LEXICAL ANALYSIS: Introduction of Compiler, Major data Structure in compiler, BOOT Strapping & Porting, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Lexical analysis: Input buffering, Specification & Recognition of Tokens, LEX

UNIT II

SYNTAX ANALYSIS: Basic Parsing Techniques: Parsers, Shift reduce parsing, Operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers,

the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

UNIT III

SYNTAX DIRECTED TRANSLATION: Syntax directed definitions: Construction of Syntax trees, Bottom up evaluation of S-attributed definition, L-attribute definition, Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation, Analysis of Syntax directed definition.

UNIT IV

CODE GENERATION: Intermediate code generation: Declarations, Assignment statements, Boolean expressions, Case statements, Procedure calls Code Generation: Issues in the design of code generator, Basic block and flow graphs, register allocation and assignment, DAG representation of basic blocks, peephole optimization, generating code from DAG.

UNIT V

CODE OPTIMIZATION: Introduction to Code optimization: sources of optimization of basic blocks, loops in flow graphs, dead code elimination, loop optimization, Introduction to global data flow analysis, Code Improving transformations, Data flow analysis of structure flow graph Symbolic debugging of optimized code.

REFERENCES:

1. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools, Pearson Education
2. Raghavan, Compiler Design, TMH Pub.
3. Louden. Compiler Construction: Principles and Practice, Cengage Learning
4. Holub. Compiler Design in C , Prentice-Hall Inc., 1993.
5. Mak, writing compiler & Interpreters, Willey Pub.

CS-421	CLOUD COMPUTING	L-T-P	Cr
		3-0-0	3

OBJECTIVE

It aims to provide students an overview of the field of Cloud Computing, and an in-depth study into its enabling technologies and main building blocks. Students will gain hands-on experience solving relevant problems through projects that will utilize existing public cloud tools.

Pre-Requisites:

Knowledge of Operating Systems, Networking and Internet-scale distributed systems.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know about the core concepts of the cloud computing paradigm

CO2: To Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost

CO3: To outline the role of system, network and storage virtualization.

CO4: To illustrate the fundamental concepts of cloud storage

CO5: To analyze various cloud programming models

UNIT I

BASIC CONCEPTS: The idea of concept of "cloud computing"; history of cloud computing, enabling technologies in cloud computing, advantages and disadvantages of the cloud paradigm, the economic benefits as well as issues/risks of the cloud paradigm for businesses as well as cloud providers, various layers in the cloud building block, differentiate cloud service models, SLAs and SLOs, various threats in cloud security, common cloud providers and their associated cloud stacks, popular cloud use case scenarios.

UNIT II

CLOUD INFRASTRUCTURE: Evolution of data centers*;* architecture of a modern data center, design considerations and their impact, the ability to calculate various power requirements of a data center, challenges and requirements for a cloud-centric data center, cloud software stack and the role of each layer within it, need for and techniques behind automation and orchestration of resources, programming, deployment and failure considerations when programming the cloud, implications of building a multi-tier cloud application to achieve resiliency and elasticity, and the latency implications of such applications, various cloud pricing models and their applicability to various business use cases, cloud management techniques such as middleware, resource provisioning, metering, and orchestration, different cloud software deployment considerations such as scaling strategies, load balancing, fault tolerance, accounting for tail latencies and optimizing for cost.

UNIT III

CLASSIFICATION OF CLOUD IMPLEMENTATIONS: Amazon Web Services, The Elastic Compute Cloud (EC2), The Simple Storage Service (S3), The Simple Queuing Services (SQS), Google AppEngine - PaaS, Windows Azure, Aneka, A Comparison of Cloud Computing Platforms.

UNIT IV

VIRTUALIZATION: Virtualization, Advantages and disadvantages of Virtualization, Types of Virtualization: Resource Virtualization i.e. Server, Storage and Network virtualization, Migration of processes, VMware vCloud – IaaS

UNIT V

CLOUD BASED DATA STORAGE: Introduction to Map Reduce for Simplified data processing on Large clusters, Design of data applications based on Map Reduce in Apache Hadoop, Task Partitioning, Data partitioning, Data Synchronization, Distributed File system,

Textbook:

Raj Kumar Buyya, James Broberg, AndrezeiM.Goscinski, Cloud Computing: Principles and paradigms, 2011

References Books:

1. Michael Miller, Cloud Computing, Que Publishing, 2008.
2. Cloud Computing: A practical Approach Anthony Velte, Toby Velte and Robert Elsenpeter by Tata McGrawHill
3. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, Cloud Computing for dummies, 2009.

CS-320	BUSINESS ECONOMICS	L T P	Cr
		3 1 0	4

Unit 1 –

M.E. – Meaning, Nature, Scope, relationship with other sciences & its Significance, Economics applied to Business Decisions, Theory of firm & industry Demand Analysis – Law of demand, determinants of demand, demand curve, consumer surplus, Elasticity of demand & Demand forecasting.

Unit 2 –

Cost – Average, Marginal & total cost, Basic cost curves, Relation between production & cost, Break Even Analysis – Break Even point, Managerial use of B.E.P. and its limitation. Factors influencing P/V decisions.

Unit 3 –

Price output decisions, classification of markets. Structures and their making features, Pricing under Perfect Competition and Monopoly. Profit Planning & Management – Types of Profit, some concepts related to profit, factors determining, profit in short & long term Dynamics of surplus, Theory & residual claimant theory of Profit.

Reference:

Managerial Economics – D. N. Dwivedi

Managerial Economics – Varshney & Varshney

CS-453	DEEP LEARNING LAB	L T P	Cr
		0 0 0	2

List of Experiments

1. **Demonstration and implementation of Shallow architecture, using Python, TensorFlow and Keras**

✓ Google Collaboratory - Cloning GitHub repository, Upload Data, Importing Kaggle's dataset, Basic File operations

✓ Implementing Perceptron

✓ Digit Classification: Neural network to classify MNIST dataset

2. **Hyper parameter tuning and regularization practice**

✓ Multilayer Perceptron (BPN)

✓ Minibatch gradient descent,

3. **Convolution Neural Network application using TensorFlow and Keras,**

✓ Classification of MNIST Dataset using CNN

✓ Face recognition using CNN

4. **Object detection using Transfer Learning of CNN architectures**

5. **Image denoising (Fashion dataset) using Auto Encoders**

   Handling Color Image in Neural Network aka Stacked Auto Encoders (Denoising)

6. **Text processing, Language Modeling using RNN.**

7. **Time Series Prediction using RNN.**

8. **Sentiment Analysis using LSTM.**

9. **Image generation using GAN.**

Project Guidelines

1. A team may include to a maximum of 4 members.
2. Concepts studied in the subject has to be used.

3. Real time innovative ideas should have been attempted.

CS-471	CLOUD COMPUTING LAB	L T P	Cr
		0-0-2	1

LIST OF EXPRIMENTS

1. How to install and configure virtualization software (e.g. VMware, VirtualBox)?
2. How to create and manage virtual machines?
3. How to set up networking in a virtual environment?
4. How to perform storage management in a virtual environment?
5. What are the basics of cloud computing?
6. How to set up a cloud environment (e.g. Amazon Web Services, Microsoft Azure)?
7. How to deploy applications in the cloud?
8. How to perform load balancing in the cloud?
9. How to implement backup and disaster recovery in the cloud?
10. What is Database as a Service (DBaaS) and how to set it up?
11. How to ensure security in the cloud?
12. How to perform monitoring and logging in the cloud?
13. How to optimize cost in the cloud?
14. How to implement continuous integration and continuous deployment in the cloud?
15. What is serverless computing in the cloud and how to implement it?
16. How to perform containerization and container orchestration (e.g. Docker, Kubernetes)?
17. What is Infrastructure as Code (IaC) and how to implement it?
18. What is hybrid cloud computing and how to set it up?
19. How to implement a multi-cloud strategy and implementation?
20. How to perform cloud migration and modernization

SYLLABUS OF SEMESTER- VII

CS-409	SOFT COMPUTING	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To introduce the soft computing concepts and techniques and to foster their abilities in designing appropriate technique for a given scenario. To implement soft computing based solutions for real world problems. T give students knowledge about non-traditional techniques and fundamentals of artificial neural networks, fuzzy logic and genetic algorithms. To provide students hands-on experience on MATLAB to implement various strategies

PRE-REQUISITES

Knowledge of Mathematics.

COURSE OUTCOMES

The students undergoing this course will be able:

CO-1 Identify and describe soft computing techniques and their roles in building intelligent machines.

CO-2 Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.

CO-3 Apply genetic algorithms to combinatorial optimization problems.

CO-4 Evaluate and compare solutions by various soft computing approaches for a given problem.

CO-5 Use various tools to solve soft computing problems.

UNIT I

INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics.

UNIT 2

FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT 3

NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT 4

GENETIC ALGORITHMS: Goals of optimization, comparison with traditional methods, schemata, Terminology in GA – strings, structure, parameter string, data structures, operators, coding fitness function, algorithm, applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.

UNIT 5

Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

TEXT BOOKS :

1. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
2. Genetic Algorithms: Search and Optimization, E. Goldberg.
3. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI.
   Build_Neural_Network_With_MS_Excel_sample by Joe choong.

REFERENCE BOOKS:

1. Jyh Shing Roger Jang, Chuen Tsai Sun, Eiji Mizutani, Neuro-Fuzzy and Soft Computing, Prentice Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995.
3. MATLAB Toolkit Manual
4. Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill
5. Goldberg, D. E, Genetic algorithm in search, optimization and machine learning, AddisonWesley, Reading Mass
6. S.N.Sivanandam, S.N.Deepa , Principles of Soft Computing, 2e, Wiley India Pvt. Ltd

CS-423	SOCIAL NETWORK ANALYSIS	L-T-P	Cr
		3-0-0	4

OBJECTIVES:

- To understand the concept of the semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behavior in the social web and related communities.
- To learn visualization of social networks.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: Develop semantic web-related applications.
CO2: Represent knowledge using ontology.
CO3: Predict human behavior in social web and related communities.
CO4: Visualize social networks.

UNIT I:

INTRODUCTION

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

UNIT II:

MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT III:

EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.

UNIT IV:

PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES

Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context -

Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT V:

VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

TEXT BOOKS:

1. Peter Mika, ―Social Networks and the Semantic Web‖, First Edition, Springer 2007.
2. Borko Furht, ―Handbook of Social Network Technologies and Applications‖, 1st Edition, Springer, 2010.

REFERENCES:

1. Guandong Xu ,Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, ―Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling‖, IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, ―The Social Semantic Web‖, Springer, 2009.

CS-425	Cyber Forensic Analytics	L T P	Cr
		3 0 0	3

COURSE OUTCOMES

CO1: Outline the Cyber crime and its types.
CO2: Explore the Cyber Forensics Techniques
CO3: Use the Cyber Investigation Techniques
CO4: Explore the Cyber Evidence Management Techniques
CO5: Outline the Cyber Laws in India

UNIT-I CYBER CRIME - Cyber Space – Cyber Crime – Criminal Behaviour – Jurisdictional Concerns - Jurisprudential Inconsistency– eCash Security – Prepaid Cards – Stored Values Cards – Mobile Payments – Internet Payment Services - Cyber stalking - Cyber extortion – Cyber terrorism - Cyber warfare –Cyber weapons -ATM frauds – Phreaking – Internet Gambling

UNIT-II CYBER FORENSIC - Digital device – Hard disk –Disk characteristics - Disk imaging - Data Carving – Techniques - commercialpiracy - soft lifting – Steganography – Network components - Port scans - Wireshark - pcap analysis - Trojans and Backdoors – Botnets - DoS – DDoS Attacks - Honey Pots – Malware – Virus and Worms

UNIT-III CYBER INVESTIGATION - **C**oncepts of Investigation - cyber investigation, Network Investigation - Investigating audit logs -Investigating Web attacks - Investigating Computer Intrusions - Profiling – Cyber Criminal profiling –Stylometric Techniques – Warranted searches – Warrantless searches – Undercover Techniques

UNIT-IV EVIDENCE MANAGEMENT - Evidence – Digital Evidence - Types – physical evidence – Real evidence – Circumstantial evidence – network evidence - Evidence collection – Evidence Analysis - Contextual Information –Evidence Management – pre search activities – On Scene activities – Report Preparations

UNIT-V CYBER LAWS and AUTHORITIES - Information Technology Act 2000 – Digital signature - Electronic Governance - Secure electronic records- Regulation of certifying authorities – CERNTin - Electronic signature certificates - Penaltiescompensation - Future Trends and Emerging Concerns

REFERENCES:

1. Marjie T. Britz, "Computer Forensics and Cyber Crime", Pearson, 2013.

2. Garima Tiwari, "Understanding Laws– Cyber Laws And Cyber Crimes", Lexis Nexis, 2014.

CS-427	TIME SERIES ANALYSIS AND FORECASTING	L T P	Cr
		3-1-0	4

Aims To introduce a variety of statistical models for time series and cover the main methods for analyzing the models.

CO1: Compute and interpret a correlogram and a sample spectrum
CO2: Derive the properties of ARIMA and state-space models
CO3: Choose an appropriate ARIMA model for a given set of data and fit the model using an appropriate package
CO4: Compute forecasts for a variety of linear methods and models.

UNIT-I Introduction: Examples, simple descriptive techniques, trend, seasonality, the correlogram.

UNIT-II Probability models for time series: stationarity. Moving average (MA), Autoregressive (AR), ARMA and ARIMA models.

UNIT-III Estimating the autocorrelation function and fitting ARIMA models. Forecasting: Exponential smoothing, Forecasting from ARIMA models.

UNIT-IV Stationary processes in the frequency domain: The spectral density function, the periodogram, spectral analysis.

UNIT-V State-space models: Dynamic linear models and the Kalman filter.

TEXTBOOK:

Shumway & Stoffer (2011) Time Series Analysis and its applications, with examples in R , 3rd edition, Springer.

REFERENCE BOOK:

1. Brockwell & Davis (2016) Introduction to Time Series and Forecasting, 3rd edition, Springer
2. Cryer & Chan (2008) Time Series Analysis with Applications in R, Springer
3. Prado & West (2010) Time Series: Modeling, Computation, and Inference Chapman & Hall
4. Petris, Petrone, Campagnoli (2009) Dynamic Linear Models with R, Springer
5. Ruppert & Matteson (2016) Statistics and Data Analysis for Financial Engineering with R examples, 2nd Edition, Springer

CS-459	SOFT COMPUTING LAB	L-T-P	Cr
		0-0-2	1

EASY

1. Create a perceptron with appropriate no. of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights.
2. Create a simple ADALINE network with appropriate no. of input and output nodes. Train it using delta learning rule until no change in weights is required. Output the final weights.
3. Train the autocorrelator by given patterns: A1=(-1,1,-1,1), A2=(1,1,1,-1), A3=(-1, -1, - 1, 1). Test it using patterns: Ax=(-1,1,-1,1), Ay=(1,1,1,1), Az=(-1,-1,-1,-1).
4. Train the hetrocorrelator using multiple training encoding strategy for given patterns: A1=(000111001) B1=(010000111), A2=(111001110) B2=(100000001), A3=(110110101) B3(101001010). Test it using pattern A2.
5. Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform maxmin composition on any two fuzzy relations.

MODERATE

6. Solve Greg Viot's fuzzy cruise controller using MATLAB Fuzzy logic toolbox.
7. Solve Air Conditioner Controller using MATLAB Fuzzy logic toolbox
8. Implement TSP using GA.
9. Write a program to implement artificial neural network without back propagation.
10. Write a program to implement artificial neural network with back propagation.

HARD

11. Implement linear regression and multi-regression for a set of data points.
12. Implement crisp partitions for real-life iris dataset.
13. Write a program to implement Hebb's rule Write a program to implement Delta rule.
14. Write a program to implement logic gates. Week-10 CLASSIFICATION
15. Implement SVM classification by Fuzzy concepts.

CS-473	SOCIAL NETWORK ANALYTICS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Working of Semantic Web and How it is useful for Developers.
2. Perform Design modelling, Aggregating of Semantic Web.
3. Perform Knowledge Representation of Semantic Web.
4. Representation of OWL Ontology
5. Installation of Gephi Software for Network Visualisation and Analysis.
6. Making of Network Graphs and Conducting Analysis on the dataset from Kaggle.
7. Perform Collaborative Filtering Recommendation on the Dataset.
8. Perform Classification and Clustering on the Dataset.
9. Perform Outlier Detection Analysis with example.
10. Perform K-Nearest Neighbour's Algorithm with Example.

CS-475	CYBER FORENSIC ANALYTICS LAB	L-T-P	Cr
		0-0-2	1

OBJECTIVE

Understanding Computer Investigations: This topic explains how to manage a computing investigation. You will learn about the problems and challenges that examiners face when preparing and processing investigation, including the ideas and questions they must consider.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: Able to penetrate the Vulnerable Systems as an Ethical Hacker and Conclude the system is vulnerable or secure system.

CO2: Evaluate the effectiveness of available digital forensics tools and use them in a way that optimizes the efficiency and quality of digital forensics investigations

CO3: Create a method for gathering, assessing and applying new and existing legislation and industry trends specific to the practice of digital forensics.

CO4: Able to analyse the role of digital forensics in the field of information assurance and cyber security and recognize the opportunities to benefit from and support the goals of those fields.

LIST OF EXPERIMENTS/EXERCISES

1.Lab to implement Port Redirection

2.Lab to analyse hidden data files

3.Lab to implement Steganography

4.Lab to implement viewing Microsoft Internet Explorer cache

5. Determine what data to analyze in a computer forensics investigate

6. Explain tools used to validate data

7. Explain common data-hiding techniques.

8. Describe methods of performing a remote acquisition.

PDP-401	CAMPUS TO CORPORATE	L T P	Cr
		0 0 2	1

COURSE OUTCOMES: Students will be able to:

- CO1: Enhance their performance, minimize errors and promote collaboration with their coworkers, enabling them to perform their role more effectively.
- CO2: Improve their thinking, listening and speaking skills and promote level of self-confidence.
- CO3: Critically analyse the internal and external environments in which businesses operate and assess their significance for strategic planning

Unit Wise Syllabus:

UNIT 1 –Employability Quotient - Resume Writing, Types of Resume, Profile Building
Resume Writing Practice
UNIT 2 – Group Discussion – Definition of GD, Difference between GD and debate, Do's and don'ts of GD. Mock GD sessions

UNIT 3 – Interview Skills – Facing Personal, Technical & HR, FAQ and their answers
Mock interviews

UNIT 4 – Organizational Skills at Work place – focus & productivity, delegation, resource management & management skills

UNIT 5 – Corporate Policies, Corporate Life, Corporate Etiquette Corporate Truths for every Fresher

UNIT 6 – Presentation Skills – how to prepare an effective Presentation Skills, do and don'ts of presentation. Mock presentations

SYLLABUS OF DEPARTMENTAL ELECTIVES

	Code	Subject
Elective-I	CS-306	Cryptography and Network Security
	CS-313	Statistical Inference for Data Science
	CS-216	Internet of Things
Elective-II	CS-314	Image Analytics
	CS-316	Stream Processing and Analysis
	CS-318	Natural Language Processing
Elective-III	CS-415	High-Dimensional Data Analytics
	CS-417	Nature Inspired Computing
	CS-419	Blockchain Technology

CS-306	ELECTIVE-I(CRYPTOGRAPHY AND NETWORK SECURITY)	L T P	Cr
		3-1-0	4

OBJECTIVES

The main objective behind this course is to learn about the various network attacks and preventing attacks. This course is designed to cover Application security, Network security, Web security etc.

PREREQUISITE

Data Communications and Computer Networks, Computer Programming, Data Structures, Prime Number Theory

COURSE OUTCOMES

The students undergoing this course will be able to:
CO1: Understand and analyze public-key cryptography, RSA and other public-key cryptosystems
CO2: Analyze and design hash and MAC algorithms, and digital signatures.
CO3: Design network application security schemes, such as PGP, S/ MIME, IPSec, SSL, TLS, HTTPS, SSH, etc.
CO4: Understand key management and distribution schemes and design User Authentication Protocol
CO5: Know about Intruders and Intruder Detection mechanisms, Types of Malicious software, Firewall Characteristics, Types of Firewalls, Firewall Location and Configurations.

UNIT I

ATTACKS ON COMPUTERS & COMPUTER SECURITY: Introduction; The need of Security ; Security Approaches; Principal of Security; Types of Attacks,

CRYPTOGRAPHY : Introduction; Plain Text & Cipher Text; Substitution Techniques; Transposition Techniques; Types of Cryptography; Steganography; Symmetric Key Algorithm: Algorithm Types and Modes, DES; Asymmetric Key Algorithm: RSA, Digital Signatures

UNIT II

DIGITAL CERTIFICATES AND PUBLIC KEY INFRASTRUCTURE: Digital Certificates ; Private Key Management; The PKIX Model ; Public Key Cryptography Standards; Creating Digital certificates using Java

UNIT III

INTERNET SECURITY PROTOCOLS: Introduction; Secure Socket Layer(SSL); Secure Electronic Transaction (SET); Electronic Money; Email security; Wireless application protocol (WAP); Security in GSM: Security in 3G

UNIT IV

USER AUTHENTICATION AND KERBEROS: Introduction, Authentication Basics; Passwords; Authentication Tokens; Certificate Based Authenticaton; Biometric Authentication; Kerberos

UNIT V

NETWORK SECURITY, FIREWALL AND VPN: Introduction, Firewalls: Types of Firewalls ; IP Security; Virtual Private Network; Intrusion,

CASE STUDIES ON NETWORK SECURITY : Introduction ; secure Inter branch payment transactions; Denial of Service attacks; IP Spoofing attacks; Contract Signing; Secret Splitting ; Virtual elections

TEXT BOOKS

3. Stallings William, "Cryptography and Network Security", 4th Edition, Prentice-Hall, Englewood Cliffs, 2006
4. Behrouz A. Forouzan "Cryptography and Network Security", TMH

REFERENCE BOOKS

7. Atul Kahate , "Cryptography and Network Security", 3rd Edition, Tata Mcgraw Hill.
8. Mani Subramanian, "Network Management Principles & Practices", Addison Wesley, 1999
9. Kauffman C., Perlman R. and Spenser M., "Network Security", 2nd Edition, Prentice Hall, 2002.
10. Menezes Alfred, van Oorschot Paul, and Vanstone Scott, "Handbook of Applied Cryptography", CRC Press, NY, 2004.
11. Bellovin S. and Chesvick W., "Internet Security and Firewalls", 2nd Edition, Addison Wesley, 1998.
12. Schneier Bruce, "Applied Cryptography", Wiley Student Edition, 2nd Edition

CS-313	ELECTIVE-I (Statistical Inference for Data Science)	L-T-P	Cr
		3-0-0	3

OBJECTIVE

Statistical inference is a method of making decisions about the parameters of a population, based on random sampling. It helps to assess the relationship between the dependent and independent variables. The purpose of statistical inference to estimate the uncertainty or sample to sample variation.

PRE-REQUISITES

Python for Data Science/ R for Data Science.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Perform exploratory analysis on the datasets
CO2: Understand the various distribution and sampling.
CO3: Perform Hypothesis Testing on datasets.
CO4: Apply statistical inference for Regression
CO5: Apply statistical inference for Classification

UNIT I:

EXPLORATORY ANALYSIS: Elements of Structured, Estimates of Location - Mean, Median, Mode, Outliers, Estimates of Variability- Standard Deviation, Z-Score, Frequency Table and Histograms, Correlation

UNIT II:

DATA SAMPLING AND DISTRIBUTION: Normalization, Sampling Data-Simple Random sampling**,** Stratified, Cluster Sampling, Sampling Error/Bias. Bootstraping, Central Limit Theorem, Confidence intervals, Normal distribution, Binomial distribution, Poisson distribution

UNIT III:

HYPOTHESIS: A/B Testing, Hypothesis Tests- null, one-way, two-way, P-value, Type 1 & 2 errors, t-tests, multiple testing, degrees of freedom, ANOVA, Chi-Square Tests, Power and Sample Size.

UNIT IV:

REGRESSION AND PREDICTION: Simple Linear Regression, Multiple Linear Regression, Confidence and Prediction Intervals, Categorical Variables, Multicollinearity, Polynomial Regression.

UNIT V:

CLASSIFICATION: Naive Bayes, Discriminant Analysis, Logistic Regression, Evaluating Classification Models, Strategies for Imbalanced Data.

TEXT BOOKS

1. Bruce, Peter, and Andrew Bruce. Practical statistics for data scientists: 50 essential concepts." O'Reilly Media, Inc.", 2017.

REFERENCE BOOKS

1. Dodge, Yadolah, ed. Statistical data analysis and inference. Elsevier, 2014.
2. Ismay, Chester, and Albert Y. Kim. Statistical Inference via Data Science: A Modern Dive into R and the Tidyverse. CRC Press, 2019.

CS-216	ELECTIVE-I (INTERNET OF THINGS)	L-T-P	Cr
		3-0-0	3

OBJECTIVE

It enables the students to describe what IoT is and how it works today, Recognise the factors that contributed to the emergence of IoT and Design and program IoT devices.

Pre-Requisites:

Basic knowledge of passive electrical & electronics components, basic programming such as C language, accessibility to the Hardware such as Arduino UNO & Arduino IDE.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To Use real IoT protocols for communication

CO2: To Secure the elements of an IoT device

CO3: To Design an IoT device to work with a Cloud Computing infrastructure

CO4: Transfer IoT data to the cloud and in between cloud providers

CO5: To Define the infrastructure for supporting IoT deployments

UNIT I

IOT: What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues

UNIT II

IOT PROTOCOLS: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFIDProtocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security

UNIT III

IOT ARCHITECTURE:

IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

UNIT IV

WEB OF THINGS:

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.

UNIT V

IOT APPLICATIONS:

IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc

Textbook:

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

References Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014
2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013 Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1- 4493-9357-1

CS-314	ELECTIVE-II (IMAGE ANALYTICS)	L T P	Cr
		3 0 0	3

OBJECTIVES

Image analysis is a broad term that covers a range of techniques that generally fit into these subcategories:

- Image enhancement to prepare images for display or analysis
- Image segmentation to isolate regions and objects of interest
- Noise removal using morphological filtering or deep learning

PRE-REQUISITES: Digital Signal Processing

COURSE OUTCOMES

CO1: Infer the basics and fundamentals of digital image processing and apply the various techniques for intensity transformations functions. Implement Color image Smoothing and Sharpening.

CO2: Illustrate Morphological operation and Apply Some Basic Morphological Algorithms.

CO3: Apply image segmentation techniques such as Optimum Global Thresholding using Otsu's Method, Active Contours: Snakes and Level Sets for various real-time applications.

CO4: Analysis various Feature Extraction methods and implement for various real-time applications.

CO5: Apply and Analysis various Image Pattern Classification methods such as Minimum-Distance Classification, Optimum (Bayes) Statistical Classification, and Deep Convolutional Neural Network.

UNIT I

DIGITAL IMAGE FUNDAMENTALS: Introduction – Fundamental steps in Image Processing Systems – Image Acquisition – Sampling and Quantization – Pixel Relationships – Mathematical Tools Used in Digital Image Processing. Some Basic Intensity Transformation Functions: Image Negatives, Log Transformations, Power-Law Transformations - Histogram Processing. Color Fundamentals - Fundamentals of Spatial Filtering - Smoothing Spatial Filters - Sharpening Spatial Filters.

UNIT II

MORPHOLOGICAL IMAGE PROCESSING: Morphological Image Processing: Fundamentals - Erosion and Dilation - Opening and Closing – Hit or Miss Transform - Some Basic Morphological Algorithms – Morphological Reconstruction – Grayscale Morphology

UNIT III

IMAGE SEGMENTATION: Introduction - Point, Line, and Edge Detection – Thresholding: Foundation, Basic Global thresholding, Optimum Global Thresholding using Otsu's Method, Multiple Thresholds, Variable Thresholding – Segmentation by Region Growing and by

Region Splitting and Merging – Image Segmentation: Active Contours: Snakes and Level Sets.

UNIT IV

FEATURE EXTRACTION: Background - Representation – Boundary Preprocessing – Boundary Feature Descriptors: Some Basic Boundary Descriptors, Shape Numbers, Fourier Descriptors, Statistical Moments - Regional Feature Descriptors: Some Basic Descriptors, Topological and Texture Descriptors, Moment Invariants – Principal Components as Feature Descriptors – Whole-image Features Object – Scale-Invariant Feature Transform (SIFT).

UNIT V

IMAGE PATTERN CLASSIFICATION: Background -Patterns and Pattern Classes – Pattern Classification by Prototype Matching: Minimum- Distance Classifier, Using Correlation for 2-D prototype matching, Matching SIFT Features, Matching Structural Prototypes - Optimum (Bayes) Statistical Classifiers - Neural Networks and Deep Learning: Background - The Perceptron - Multilayer Feedforward Neural Networks - Deep Convolutional Neural Networks

TEXT BOOK

1.Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", 4th Edition, Pearson, 2018.

REFERENCE BOOKS

1. Kenneth R. Castleman,Digital Image Processing Pearson, 2006.
2. Anil K.Jain, "Fundamentals of Digital Image Processing", Person Educaiton, 2003.

CS-316	ELECTIVE-II (Stream Processing and Analytics)	L T P	Cr
		3 0 0	3

Prerequisites: Python programming

COURSE OUTCOMES:

CO1. Explain the need for stream processing.

CO2. Comprehend the architectures of stream processing.

CO3. Explain and run Distributed Processing and Resilience Model.

CO4. Design effective streaming solutions using Structured Streaming.

CO5. Design effective streaming solutions using Spark Streaming

Unit I: INTRODUCTION TO STREAM PROCESSING MODEL

Fundamentals of Stream Processing: What Is Stream Processing? Examples of Stream Processing- Scaling Up Data Processing- Distributed Stream Processing- Introducing Apache Spark.

Stream-Processing Model: Sources and Sinks- Immutable Streams Defined from One Another- Transformations and Aggregations- Window Aggregations - Stateless and Stateful Processing- The Effect of Time.

Unit II: STREAMING ARCHITECTURES

Components of a Data Platform- Architectural Models- The Use of a Batch-Processing Component in aStreaming Application- Referential Streaming Architectures- Streaming Versus Batch Algorithms.

Apache Spark as a Stream-Processing Engine: Spark's Memory Usage- Understanding Latency-Throughput- Oriented Processing- Fast Implementation of Data Analysis.

Unit III: DISTRIBUTED PROCESSING AND RESILIENCE MODEL

Spark's Distributed Processing Model: Running Apache Spark with a Cluster Manager- Spark's Own Cluster Manager - Resilience and Fault Tolerance in a Distributed System- Data Delivery Semantics- Microbatching and One-Element-at-a-Time - Bringing Microbatch and One-Record-at a- Time Closer Together- Dynamic Batch Interval- Structured Streaming Processing Model. Spark's Resilience Model: Resilient Distributed Datasets in Spark - Spark Components - Spark's Fault-Tolerance Guarantees.

Unit IV: STRUCTURED STREAMING

Introducing Structured Streaming- The Structured Streaming Programming Model – Structured Streaming in Action – Structured Streaming Sources – Structured Streaming Sinks - Event Time–Based Stream Processing.

Unit V: SPARK STREAMING

Introducing Spark Streaming - The Spark Streaming Programming Model - The Spark Streaming ExecutionModel - Spark Streaming Sources - Spark Streaming Sinks - Time-Based Stream Processing- Working with Spark SQL – Checkpointing - Monitoring Spark Streaming- Performance Tuning.

TEXT BOOK:

1. Gerard Maas and François Garillot , "Stream Processing with Apache Spark: Mastering Structured Streaming and Spark Streaming", O'Reilly, 2019.

REFERENCE BOOKS:

1. Henrique C. M. Andrade, Buğra Gedik and Deepak S. Turaga, "Fundamentals of Stream Processing: Application Design, Systems, and Analytics", Cambridge University Press, 2014.

2. Bryon Ellis, "Real-Time Analytics: Techniques to Analyze and Visualize Streaming Data", Wiley, 1st edition, 2014.

3. Anindita Basak, Krishna Venkataraman, Ryan Murphy, Manpreet Singh, "Stream Analytics with Microsoft Azure", Packt Publishing, December 2017.

E BOOKS/SUPPORTING RESOURCES:

1. https://github.com/stream-processing-with-spark

CS-318	ELECTIVE-II (NATURAL LANGUAGE PROCESSING)	L T P	Cr
		3 0 0	3

COURSE OUTCOMES

CO1: Understand Natural Language Processing and Probabilistic model of defining language and techniques
CO2: Applying Hidden Markov model and Speech Recognition
CO3: Application of context free grammar and language parsing
CO4: Implement probabilistic and language parsing.
CO5: Differentiation of semantic and discourse in terms of NLP

UNIT I

INTRODUCTION TO NATURAL LANGUAGE PROCESSING: Why is NLP hard, Empirical Laws, Text Processing: Basics, Spelling Correction: Edit Distance, Weighted Edit Distance, Other Variations, Noisy Channel Model for Spelling Correction, N-Gram Language Models, Evaluation of Language Models, Basic Smoothing

UNIT II

LANGUAGE MODELING: Advanced Smoothing Models, Computational Morphology, Finite - State Methods for Morphology, Introduction to POS Tagging, Introduction to POS Tagging, Viterbi Decoding for HMM, Parameter Learning, Baum Welch Algorithm, Maximum Entropy Models – I,II, Conditional Random Fields

UNIT III

SYNTAX: Introduction, Parsing I, CKY, PCFGs- Inside-Outside Probabilities, Dependency Grammars and Parsing – Introduction, Transition Based Parsing : Formulation, Learning , MST-Based Dependency Parsing-Learning

UNIT IV

DISTRIBUTIONAL SEMANTICS: Introduction, Structured Models, Word Embeddings, Lexical Semantics – Wordnet, Word Sense Disambiguation, Novel Word Sense detection, Topic Models : Introduction, Latent Dirichlet Allocation : Formulation, Gibbs Sampling for LDA, Applications, LDA Variants and Applications , Entity Linking

UNIT V

INFORMATION EXTRACTION: Introduction, Relation Extraction, Text Summarization – LEXRANK, Optimization based Approaches for Summarization, Text Classification, Sentiment Analysis- Affective Lexicons, Learning Affective Lexicons , Aspect - Based Sentiment Analysis

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and ImedZitouni, PearsonPublication.
2. Natural Language Processing and Information Retrieval: TanvierSiddiqui, U.S. Tiwary.

3. “Natural Language Understanding” James Allen, -1995Benjamin/cummings Pub. Comp. Ltd
4. “Language as a cognitive process”, Terry Winograd 1983, AW
5. “Natural Language processing in prolog”, G. Gazder, 1989, Addison Wesley.
6. “ Introduction of Formal Language Theory”, MdljArbib&Kfaury, 1988, Springer

REFERENCES

1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publications.
2. https://nptel.ac.in/course.html/Natural Language Processing

CS-415	ELECTIVE -III (High-Dimensionality Data Analytics)	L-T-P	Cr
		4-0-0	4

OBJECTIVE

Dimensional analysis is commonly used to determine the relationships between several variables, i.e. to find the force as a function of other variables when an exact functional relationship is unknown. Based on understanding of the problem, we assume a certain functional form.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: Outline the classical High Dimensional problems.
CO2: Explore the Principal component analysis and canonical correlation
CO3: Use the Factors and grouping techniques.
CO4: Explore the Non Gaussian analysis.
CO5: Outline the Feature selection and principal component analysis.

UNIT I

CLASSICAL METHODS: Classical method- Multi variant and High dimensional problems – Visualization – Multi variant Random vector and data- Multi dimensional data

UNIT II

DISCRIMINANT ANALYSIS: Visualizing principal component analysis – Properties of principal component - Standardized data and high dimensional data - Asymptotic results - Number of components and regression - Canonical correlation analysis -Population - sample and properties of canonical correlation, Asymptotic consideration - Canonical correlation and regression

UNIT III

FACTORS AND GROUPING: Norms proximities, features, and dualities - Vectors and matrix norms, measure of proximity - Features and feature maps, dualities of X and X Transpose - Cluster analysis - Hierarchal agglomerative clusters - 3k means clustering, -Principal component and cluster analysis- Factor Analysis, population k factor model - Sample k factor model - Multidimensional scaling, classical scaling, metric scaling and non- metric scaling.

UNIT IV

NON-GUASSIAN ANALYSIS: Factor Analysis - Population k factor model – Sample k factor model - Multidimensional scaling - Towards non Gaussianity - Independent component Analysis -Projection pursuit -Kernal and more independent component methods.

UNIT V

FEATURE SELECTION: Introduction-Independent component and feature selection -Variable Ranking and statistical learning - Sparse principle component analysis – Consistency of principle component analysis as dimension grows.

TEXT BOOK

1. Koch, I. (2013). Analysis of multivariate and high-dimensional data (Vol. 32). Cambridge University Press.
2. Bühlmann, P., & Van De Geer, S. (2011). Statistics for high-dimensional data: methods, theory and applications. Springer Science & Business Media.

REFERENCE BOOKS

1. Fan, J., Li, R., Zhang, C. H., & Zou, H. (2020). Statistical foundations of data science. Chapman and Hall/CRC.

CS-417	ELECTIVE-III (NATURE INSPIRED COMPUTING)	L T P	Cr
		3 0 0	3

UNIT I - INTRODUCTION: From Nature to Nature Computing , Philosophy , Three Branches: A Brief Overview, Individuals, Entities and agents - Parallelism and Distributivity Interactivity, Adaptation Feedback-Self-Organization-Complexity, Emergence and ,Bottom-up Vs Top-Down- Determination, Chaos and Fractals.

UNIT II - Computing Inspired by Nature: Evolutionary Computing, Hill Climbing and Simulated Annealing, Darwin's Dangerous Idea, Genetics Principles, Standard Evolutionary Algorithm -Genetic Algorithms, Reproduction-Crossover, Mutation, Evolutionary Programming, Genetic Programming.

UNIT III - SWARM INTELLIGENCE: Introduction - Ant Colonies, Ant Foraging Behavior, Ant Colony Optimization, SACO and scope of ACO algorithms, Ant Colony Algorithm (ACA), Swarm Robotics, Foraging for food, Social Adaptation of Knowledge, Particle Swarm Optimization (PSO).

UNIT IV - IMMUNOCOMPUTING: Introduction- Immune System, Physiology and main components, Pattern Recognition and Binding, Immune Network Theory- Danger Theory, Evaluation Interaction Immune Algorithms, Introduction – Genetic algorithms, Bone Marrow Models, Forest's Algorithm, Artificial Immune Networks.

UNIT V - COMPUTING WITH NEW NATURAL MATERIALS: DNA Computing: Motivation, DNA Molecule, Adleman's experiment, Test tube programming language, Universal DNA Computers, PAM Model, Splicing Systems, Lipton's Solution to SAT Problem, Scope of DNA Computing, From Classical to DNA Computing.

TEXT BOOK

1. Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007

REFERENCE BOOK

1. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
2. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.

CS-419	ELECTIVE-III (BLOCKCHAIN TECHNOLOGY)	L T P	Cr
		3 0 0	3

Course Outcomes (COs):

After completion of course, students would be able to:

1. **CO1:** Able to design smart contracts and decentralized applications.
2. **CO2:** Able to understand Distributed Ledger Technologies and apply this concept in real world.
3. **CO3:** Able to design innovative application models using the Blockchain technology.
4. **CO4:** Able to understand core concepts of Blockchain technology that are commonly used across multiple industries to solve large scale problems.

Unit 1: Introduction to Blockchain, Structure of a Block, Types of Blockchain, Public Ledgers, Blockchain as public ledgers, Crypto currency as application of blockchain technology, **Introduction to Bitcoin**, History of Bitcoin, Bitcoin Transactions, Bitcoin Mining, Bitcoin Address. **Introduction to Ethereum** - Ethereum Virtual Machine (EVM), Wallets for Ethereum, Differences between Ethereum and Bitcoin, Block format, Mining algorithm, Solidity, Smart Contracts, Some attacks on smart contracts.

Unit 2: Basic Cryptographic Primitives used in Blockchain (6) Secure, Collision-resistant hash functions, Digital signature, Public key cryptosystems, Zero-knowledge proof systems Cryptographic Hash Function, SHA-256, Properties of a hash function, Hash pointer and Merkle tree.

Unit 3: Consensus Algorithms (10) Consensus, Distributed consensus in open environments, Consensus in a Bitcoin network Types of consensus algorithm: Proof of Work (PoW), Proof of Stake (PoS), Delegated Proof of Stake (DPoS), Ripple, Proof of Burn

Unit 4: Blockchain Technology (10) Blockchain Technology: Hyper ledger Fabric: System architecture, ledger format, chain code execution, transaction flow and ordering, private channels, membership service providers, Fabric Peer and Certificate Authority, Case studies of applications

Unit 5: Research-based Study The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of latest research published in IEEE/ACM transactions, SCI/SCIE/Web of Science/SCOPUS indexed journals and Tier-1 conference of this area.

Text-Books

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos, O'Reilly publisher
2. Blockchain Blueprint for a New Economy, by Melanie Swan, O'Reilly
3. Narayanan, Arvind, et al. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction. Princeton University Press, 2016.
4. Antonopoulos, Andreas M. Mastering Bitcoin: Programming the Open Blockchain. O'Reilly Media, Inc., 2017

Value Added-I		
S.No	**Course Code**	**Course Name**
1	VAC-101	Advance Excel

Value Added-II		
S.No	**Course Code**	**Course Name**
1	VAC-201	Investment Avenue
2	VAC-202	Trading & Investment in Stock Market

Value Added-III		
S.No	**Course Code**	**Course Name**
1	VAC-301	Introduction to Research

Value Added-IV		
S.No	**Course Code**	**Course Name**
1	VAC-401	Interview Skills
2	VAC-402	Introduction to Research – I

VAC-101	VALUE ADDED-I (ADVANCED EXCEL)	L-T-P	Cr
		0-0-2	1

OBJECTIVE

This course provides an insight into advanced functions typically used in organizations to summarize, analyze, explore, and present visualizations of data.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: Use advanced functions and productivity tools to assist in developing worksheets.
CO2: Manipulate data lists using Outline, Auto filter and PivotTables
CO3: Use Consolidation to summarize and report results from multiple worksheets.
CO4: Use Hyperlinks to move around worksheets.
CO5: Record repetitive tasks by creating Macros

LIST OF TOPICS

Session 1: Introduction
1.01 Introduction
1.02 Interface
1.03 Tabs and Ribbons
1.04 Document Windows
1.05 Navigation Tips
1.06 Office Button and Save

Session 2: Entering, Editing and Formatting Data
2.01 Introduction
2.02 Entering Data
2.03 Fonts, Fills, and Alignment
2.04 Cut, Copy, and Paste
2.05 Paste Special
2.06 Undo and Redo
2.07 Moving, Finding, and Replacing a Value
2.08 Cell Styles
2.09 Comments

Session 3: Formatting Numbers
3.01 Introduction
3.02 Currency Format
3.03 Format Painter
3.04 Formatting Dates
3.05 Custom and Special Formats

Session 4: Managing Worksheets
4.01 Introduction

4.02 Naming and Moving Worksheets
4.03 Copying Worksheets
4.04 Adding, Deleting and Hiding Worksheets
4.05 Grouping Worksheets
4.06 Moving, Copying, Deleting and Hiding Grouped Worksheets

Session 5: Modifying Rows and Columns
5.01 Introduction
5.02 Inserting and Deleting Columns and Rows
5.03 Inserting & Deleting Cells
5.04 Inserting Multiple Columns & Rows
5.05 Modifying Cell Width and Height
5.06 Hiding and Unhiding Rows and Columns

Session 6: Understanding Formulas
6.01 Introduction
6.02 Using Operations
6.03 Creating Formulas
6.04 AutoSum
6.05 Common Formulas
6.06 Searching for Formulas
6.07 Copying Formulas
6.08 Using Relative and Absolute References

Session 7: Changing Views
7.01 Introduction
7.02 Workbook Views
7.03 Show/Hide
7.04 Zoom Features
7.05 Freeze Panes
7.06 Split Windows
7.07 Viewing Multiple Windows
7.08 Minimize The Ribbon
7.09 Worksheet Backgrounds
7.1 Watermarks

Session 8: AutoFill and Custom Lists
8.01 Introduction
8.02 AutoFill a Series
8.03 AutoFill Non-Adjacent Cells
8.04 AutoFill on Multiple Sheets
8.05 Creating Custom Lists
8.06 Series Formatting
Session 9: Conditional Formatting
9.01 Introduction
9.02 Highlight Cells Rules

9.03 Top/Bottom Rules
9.04 Data Bars
9.05 Color Scales
9.06 Custom Formatting Rule and many more.

Session 10: Tables
10.01 Introduction
10.02 Insert a Table and Style Options
10.03 Add Rows and Columns
10.04 Perform a Function in a Table
10.05 Summarise With Pivot Table

Session 11: Data Tools
11.01 Introduction
11.02 Data Validation
11.03 Drop-Down Lists
11.04 Removing Duplicates
11.05 Text To Columns
11.06 Goal Seek
11.07 Scenario Manager

Session 12: Referencing Formulas
12.01 Introduction
12.02 Multiple Sheet References
12.03 Consolidating Data - With or Without Links
12.04 Trace the Precedents and Dependents
12.05 Using the Watch Window

Session 13: Ranges and Dates
13.01 Introduction
13.02 Cell Names
13.03 Named Ranges
13.04 Formulas with Cell Names
13.05 Date Formulas
Session 14: Lookups
14.01 Introduction
14.02 VLOOKUP
14.03 VLOOKUP Exact Match/Approximate Match
14.04 HLOOKUP
14.05 HLOOKUP Exact Match/Approximate Match

Session 15: Conditional Logic
15.01 Introduction
15.02 IF Statement
15.03 Nested IF
15.04 AND

15.05 OR
15.06 NOT
15.07 IFERROR
15.08 SUMIF/SUMIFS
15.09 AVERAGEIF/AVERAGEIFS
15.1 COUNTIF/COUNTIFS

Session 16: Text Formulas
16.01 Introduction
16.02 Case Formulas
16.03 Fix Number Fields
16.04 Trim Spaces
16.05 Substitute Text

Session 17: Introduction to Charts
17.01 Introduction
17.02 Chart Types
17.03 Instant Chart
17.04 Update Chart
17.05 Column Chart
17.06 Picture Fill
17.07 Adjust Chart Size
17.08 Line Chart
17.09 Scatter Chart/Clustered Bar Chart

Session 18: Formatting Charts
18.01 Introduction
18.02 Chart Styles
18.03 Chart Layouts
18.04 Add Labels
18.05 Axis Options
18.06 Chart Title
18.07 Legends
18.08 Data Labels

Session 19: Outline, Sort, Filter, and Subtotal
19.01 Introduction
19.02 Group and Ungroup
19.03 Sort Data
19.04 Sort Multiple Levels
19.05 Filter Data
19.06 Advanced Filter
19.07 Conditional Sorting and Filtering
19.08 Sorting with Custom Lists
19.09 Subtotal

Session 20: PivotTables
20.01 Introduction
20.02 Creating PivotTables
20.03 Choosing Fields
20.04 PivotTable Layout
20.05 Filtering PivotTables
20.06 Modifying PivotTable Data
20.07 Pivot Charts

Session 21: Protecting Data
21.01 Introduction
21.02 Workbook Passwords
21.03 Protecting Workbooks
21.04 Unlocking Cells

Session 22: Collaboration
22.01 Introduction
22.02 Document Properties
22.03 Inserting Hyperlinks
22.04 Sharing a Workbook
22.05 Track Changes
22.06 Accept/Reject Changes
22.07 Mark as Final

Session 23: Saving a Workbook
23.01 Introduction
23.02 Save As Previous Version
23.03 AutoRecover Save Options
23.04 Templates
23.05 Save As PDF
23.06 Save As Web Page
23.07 Macro-Enabled Workbook

Session 24: Macros
24.01 Introduction and Macro Security
24.02 Recording a Macro
24.03 Assign a Macro to a Button or Shape
24.04 Run a Macro upon Opening a Workbook
24.05 How to Inspect and Modify a Macro

Textbooks:

1. Alexander, M., Kusleika, R., & Walkenbach, J. (2018). Excel 2019 Bible. John Wiley & Sons.
2. Girvin, M. (2010). Slaying Excel Dragons: A Beginners Guide to Conquering Excel's Frustrations and Making Excel Fun. Tickling Keys, Inc..