GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND P.G. COURSES (A)

RUSHIKONDA, VISAKHAPATANAM 530045 | website: www.gvpcdpgc.edu.in

(Approved by A.I.C.T.E | Affiliated to Andhra University | An ISO 9001:2015 Certified Institute)

ENGINEERING AND TECHNOLOGY PROGRAM

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B. Tech Computer Science and Engineering (R-22 Regulation)

I Year – I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS1101	BS	Engineering Mathematics-I(Partial Differentiation, Multiple Integrals, Fourier Series and Applications)	3	0	0	30	70	100	3
CS1102	BS	Green Chemistry	3	1	0	30	70	100	3
CS1103	HSS	English	3	0	0	30	70	100	3
CS1104	ES	Computer Programming Using 'C'	3	0	0	30	70	100	3
CS1105	ES	IT Essentials	3	0	0	30	70	100	3
CS1106	HSS	Communication Skills Lab	0	0	3	50	50	100	1.5
CS1107	BS	Engineering Chemistry Lab	0	0	3	50	50	100	1.5
CS1108	ES	Computer Programming using 'C' LAB	0	0	3	50	50	100	1.5
Total Credits									**19.5**

B. Tech Computer Science and Engineering (R-22 Regulation)

I Year – II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	TotalMarks	Credits
			L	T	P				
CS1201	BS	Engineering Mathematics-II (Matrix Algebra, Ordinary Differential Equations and Laplace Transforms)	3	0	0	30	70	100	3
CS1202	BS	Engineering Physics	3	1	0	30	70	100	3
CS1203	ES	Data Structures Using 'C'	3	0	0	30	70	100	3
CS1204	ES	Engineering Graphics	1	0	4	30	70	100	3
CS1205	ES	Discrete Mathematical Structures	3	0	0	30	70	100	3
CS1206	ES	IT Workshop Lab	0	0	3	50	50	100	1.5
CS1207	BS	Engineering Physics Lab	0	0	3	50	50	100	1.5
CS1208	ES	Data Structures Lab	0	0	3	50	50	100	1.5
Total Credits									**19.5**

B. Tech Computer Science and Engineering (R-22 Regulation)

II Year – I Semester

Course code	Category	Course Title	Hours per week			Intern-al Marks	External Marks	Total Marks	Credits
			L	T	P				
CS2101	ES	Elements of Electronics Engineering	3	0	0	30	70	100	3
CS2102	PC	Digital Logic Design & Microprocessors	3	0	0	30	70	100	3
CS2103	HSS	Managerial Economics & Financial Accounting	3	0	0	30	70	100	3
CS2104	PC	Design and Analysis of Algorithms	3	0	0	30	70	100	3
CS2105	PC	Database Management Systems	3	0	0	30	70	100	3
CS2106	PC	DEMP Lab	0	0	3	30	70	100	1.5
CS2107	PC	Database Management Systems Lab	0	0	3	50	50	100	1.5
CS2108	PC	Algorithms through C++ Lab	0	0	3	50	50	100	1.5
CS2109	SC	Skill Course -1 C++ Programming	1	0	2	50	50	100	2
CS2110	MC	Environmental Science	3	0	0	30	70	100	0
Total Credits									**21.5**

B. Tech Computer Science and Engineering (R-22 Regulation)

II Year – II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS2201	ES	Computer Organization & Architecture	3	0	0	30	70	100	3
CS2202	PC	Operating Systems	3	0	0	30	70	100	3
CS2203	PC	Object Oriented Programming Through Java	3	0	0	30	70	100	3
CS2204	PC	Formal Languages &Automata Theory	3	0	0	30	70	100	3
CS2205	BS	Probability, Statistics & Queuing Theory	3	0	0	30	70	100	3
CS2206	PC	Operating Systems LAB	0	0	3	50	50	100	1.5
CS2207	PC	Object Oriented Programming Through Java Lab	0	0	3	50	50	100	1.5
CS2208	SC	Skill Course -2 Python Programming	1	0	2	50	50	100	2
CS2209	MOOCS	Massive Open Online Courses (NPTEL/COURSERA/UDEMY)	0	0	3	50	50	100	1.5
CS2210	MC	NCC/NSS	0	0	2	-	-	-	0
Total Credits									**21.5**
Summer Internship – I (Evaluation will be done in 3-1)									
Honors & Minors									**4**

B. Tech Computer Science and Engineering (R-22 Regulation)

III Year – I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS3101	PC/PCC	Data Warehousing and DataMining	3	0	0	30	70	100	3
CS3102	PC/PCC	Compiler Design	3	0	0	30	70	100	3
CS3103	PC/PCC	Computer Networks	3	0	0	30	70	100	3
CS3104	OEC/JOE	Open Elective – I: C++Programming	3	0	0	30	70	100	3
CS3105	PEC	Elective-I	3	0	0	30	70	100	3
CS3106	PC/PCC	Computer Networks Lab	0	0	3	50	50	100	1.5
CS3107	PC/PCC	Data Mining Lab	0	0	3	50	50	100	1.5
CS3108	SAC/SC	Skill Course – 3 Web Technologies	1	0	2	50	50	100	2
CS3109	MC	Technical Communication& Soft Skills	2	0	0	100	0	100	0
Summer Internship – 1, two months mandatory after 2nd year to be evaluated during 5th Semester			0	0	3	0	100	100	1.5
Total Credits									**21.5**

Title of the Program	L	T	P	Credits
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**3**	**1**	**0**	**4**

Elective-I
Introduction to Data Science
Embedded Systems
Introduction to Arduino and Raspberry Pi

Open Elective – I
Offered by Mechanical Engineering
Offered by Civil Engineering
Offered by ECE

B. Tech Computer Science and Engineering (R-22 Regulation)

III Year – II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS3201	PC/PCC	Object Oriented Software Engineering	3	0	0	30	70	100	3
CS3202	PC/PCC	Artificial Intelligence	3	0	0	30	70	100	3
CS3203	PC/PCC	Cryptography & Network Security	3	0	0	30	70	100	3
CS3204	OEC/JOE	Open Elective - II : Programming in Java	3	0	0	30	70	100	3
CS3205	PEC	Elective – II	3	0	0	30	70	100	3
CS3206	PC/PCC	OOSE Lab	0	0	3	50	50	100	1.5
CS3207	PC/PCC	Cryptography & Network Security Lab	0	0	3	50	50	100	1.5
CS3208	PEC	Elective – II Lab	0	0	3	50	50	100	1.5
CS3209	SAC/SC	Skill Course – 4 Design Thinking and Innovation	1	0	2	50	50	100	2
CS3210	MC	Essence of Indian Traditional Knowledge	3	0	0	30	70	100	0
Total Credits									**21.5**
Summer Industrial Research Internship (2 months) Mandatory									

Title of the Program	L	T	P	Credits
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**3**	**1**	**0**	**4**

Elective-II

Big Data Analytics
Internet of Things
Machine Learning

Open Elective – II

Offered by Mechanical Engineering
Offered by Civil Engineering
Offered by ECE

B. Tech Computer Science and Engineering (R-22 Regulation)

IV Year – I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS4101	PEC	Elective -III	3	0	0	30	70	100	3
CS4102	PEC	Elective -IV	3	0	0	30	70	100	3
CS4103	PEC	Elective -V	3	0	0	30	70	100	3
CS4104	OEC/JOE	Open Elective-III: Introduction to Artificial Intelligence	3	0	0	30	70	100	3
CS4105	OEC/JOE	Open Elective-IV : Introduction to Data Science	3	0	0	30	70	100	3
CS4106	HSS/HSMS	Professional Ethics and Universal Human Values (Understanding Harmony)	3	0	0	30	70	100	3
CS4107	SAC/SC	Skill Course – 5: AndroidProgramming	1	0	2	50	50	100	2
CS4108	Industrial/ Research Internship (2 months Mandatory after 6th Semester to be evaluated in 7th Semester)		0	0	0	0	100	100	3
							Total Credits		**23**

Title of the Program	L	T	P	Credits
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**3**	**1**	**0**	**4**

Elective-III

Natural Language Processing
Cloud Computing
Data Visualization & Analytics

Elective-IV

Computer Vision
Wireless Sensor Networks
Cyber Security & Digital Forensics

Elective-V

Soft Computing
Deep Learning
Introduction to Blockchain Technologies

Open Elective - III

Offered by ME
Offered by CE
Offered by ECE

Open Elective - IV

Offered by ME
Offered by CE
Offered by ECE

B. Tech Computer Science and Engineering (R-22 Regulation)
IV Year – II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
Project	Major Project	Project Work, Seminar & Internshipin Industry	0	0	0	50	50	100	12
								Total Credits	**12**

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ENGINEERING AND TECHNOLOGY PROGRAM
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B. Tech CSE (R-22 Regulation)

I Year – I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS1101	BS	Engineering Mathematics-I(Partial Differentiation, Multiple Integrals, Fourier Series and Applications)	3	0	0	30	70	100	3
CS1102	BS	Green Chemistry	3	1	0	30	70	100	3
CS1103	HSS	English	3	0	0	30	70	100	3
CS1104	ES	Computer Programming Using 'C'	3	0	0	30	70	100	3
CS1105	ES	IT Essentials	3	0	0	30	70	100	3
CS1106	HSS	Communication Skills Lab	0	0	3	50	50	100	1.5
CS1107	BS	Green Chemistry Lab	0	0	3	50	50	100	1.5
CS1108	ES	Computer Programming using 'C' LAB	0	0	3	50	50	100	1.5
Total Credits									**19.5**

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1101	**Engineering Mathematics-I** **(Partial Differentiation, Multiple Integrals, Fourier Series and Applications)**	L **3**	T **0**	P **0**	Int. **30**	Ext **70**	3

COURSE OBJECTIVES

1. To transmit the knowledge of Partial differentiation.
2. To know of getting maxima and minima of function of two variables and finding errors and approximations.
3. To evaluate double and triple integrals, volumes of solids and area of curved surfaces.
4. To expand a periodical function as Fourier series and half-range Fourier series.

COURSE OUTCOMES:

CO 1: To determine the partial derivatives of functions of two or more variables.
CO 2: Evaluate maxima and minima, errors and approximations.
CO 3: Ability to evaluate double and triple integrals.
CO 4: Ability to find volumes of solids and area of curved surfaces.
CO 5: To expand a periodical function as Fourier series and half-range Fourier series.

UNIT-I

Partial Differentiation: Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins.

UNIT-II

Applications of Partial Differentiation: Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

UNIT-III

Multiple Integrals: Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

UNIT-IV

Multiple Integrals-Applications: Area enclosed by plane curves - Volumes of solids - Area of a

curved surface - Beta Function - Gamma Function - Relation between Beta and Gamma Functions.

UNIT-V

Fourier Series: Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula.

Text Book:

Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

Reference Books:

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1102	**Green Chemistry**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES

CO 1: To apply the basic knowledge of Chemistry to the Engineering Discipline.
CO 2: To develop knowledge about water and its treatment for industrial and potable purposes.
CO 3: To develop understanding in the areas of Batteries, Fuels Mechanism of Corrosion of Metals and Corrosion Control Methods, Green Chemistry and Technology and Processes involving Green Chemistry and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

LEARNING OUTCOMES:

LO 1: The students are able to apply the basic concepts and principles studied in Chemistry to the field of Engineering.
LO 2: The students are able to apply chemistry to different branches of engineering.
LO 3: The students are able to acquire the knowledge in the areas of Water Chemistry, Mechanism of Corrosion of Metals and Corrosion Control Methods, Batteries, Fuel Cells, Green Chemistry and Technology and Processes involving Green Chemistry and suggest innovative solutions for existing challenges in these areas.

UNIT-I

Water Technology: Sources of Water – Impurities – WHO Limits – Hardness and its Determination by EDTA method– Boiler Troubles– Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water : Reverse Osmosis and Electrodialysis. Methods

UNIT-II

Batteries: Definition, types,Primary batteries: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells – . Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles: requirements of the battery – sodium-beta and redox batteries.

UNIT-III

Fuel Cells: Definition, Description, working principle, advantages, disadvantages, H_2_O_2 fuel cells: alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, methanol fuel cells- Proton Membrane fuel cells.

UNIT-IV

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Waterline,and Stress corrossion – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods: Protective Coatings: Metallic Coatings, Electroplating and Electroless Plating.

UNIT-V

Green Chemistry and Technology: Introduction and significance of Green Chemistry, goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies: atom economy, functional toxicity Vs non-functional toxicity, functional group approaches to green chemistry, Elemination of toxic functional group, optimization of frame works for the design of the dgreener synthetic pathways, applications of green chemistry – Green solvents, green fuels and propellants, biocatalysis.

Text Books:

1. Engineering Chemistry – PC Jain and M. Jain – DhanpathRai and Sons, New Delhi.
2. A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi. 3. Dell, Ronald M Rand, David A J, 'Understanding Batteries', Royal Society of Chemistry, (2001).
3. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1103	**English**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OUTCOMES

CO-1:

- Addressing explicit and implicit meanings of a text on current topics.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

CO-2:

- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, emails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.
- Participating in discussions and influencing them and communicating ideas effectively.
- Examining self-attributes and identifying areas that require improvement: self-diagnosis and self-motivation.

CO-3:

- Analyzing a topic of discussion and relating it to time management skills.
- Participating in discussions and influencing them.
  Communicating ideas effectively.
  Presenting ideas coherently within a stipulated time.

CO-4:

- Examining self-attributes and identifying areas that require improvement: self-diagnosis and self-motivation.
- Adapting to a given situation and developing a functional approach to finding solutions: adaptability and problem solving.
- Understanding the importance of helping others: community services and enthusiasm.

CO-5:

- The student will learn to avoid redundancy will learn common abbreviations useful for competitive exams and will acquire basic proficiency in English including reading, comprehension and writing skills.

- The student will be motivated with a sense of purpose throughout the course by learning life skills.

DETAILED SYLLABUS

Topics:
On the conduct of life: William Hazlitt
Life skills: Values and Ethics
If: Rudyard Kipling
The Brook: Alfred Tennyson
Life skills: Self-Improvement
How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki
Life skills: Time Management
On saving Time: Seneca

Chindu Yellama
Life skills: Innovation
Muhammad Yunus

Politics and the English Language: George Orwell
Life skills: Motivation
Dancer with a White Parasol: Ranjana Dave

Grammar:
Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement –
Misplaced Modifiers – Clichés, Redundancies, Punctuations.

Vocabulary:
Introduction to Word Formation – Root Words from other Languages – Prefixes and
Suffixes – Synonyms, Antonyms – Common Abbreviations

Writing:
E-mail writing– Principles of Good Writing – Essay Writing –Paragraph Writing (with hints)
Writing a Summary.

Textbook:

Language and Life: A Skills Approach Board of Editors, Orient Black swan Publishers, India. 2018.

Reference Books:

Practical English Usage. Michael Swan. OUP. 1995.
Remedial English Grammar. F.T. Wood. Macmillan.2007
On Writing Well. William Zinsser. Harper Resource Book. 2001

1. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
2. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford UniversityPress.
4. University Physics by Young & Freedman
5. Nonconventional Energy by Ashoke V. Desai

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1104	**Computer Programming using 'C'**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES

1. The course is designed to provide complete knowledge of C language.
2. To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
3. To provide knowledge to the students to develop logics which will help them to create programs, applications in C.
4. This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
5. This course provides the fundamental knowledge which is useful in understanding the other programming languages.

COURSE OUTCOMES

At the end of the course students will be able to:
CO1. Identify basic elements of C programming structures like data types, operators, constants, input- output statements and decision-making statements.
CO2. Apply Various Operations on derived data types like arrays & strings.
CO3. Design and Implementation of Modular Programming using functions.
CO4. Design and Implementation of Modular Programming using Pointers.
CO5. Develop C programs using user defined data types like structures and unions.

UNIT-I

Introduction to C and Decision Making,: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output, Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement.

UNIT-II

Branching, Looping, Arrays & Strings:, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops, One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

UNIT-III

Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

UNIT-IV

Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications.

UNIT-V

Structure, Unions and File handling: : Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Defining and opening a file, closinga file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments-Program Applications.

Text Books

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India)Private Limited.

Reference Books

1. Let Us C ,Yashwant Kanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.
4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M.Barone (Author), EnzoMarinari (Author), Giovanni Organtini, World Scientific.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1105	**IT Essentials**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES

1. Select the appropriate computer components to build, repair, or upgrade personalcomputers.
2. Explain how to correctly use tools and safely work in a lab.
3. Install components to build, repair, or upgrade personal computers.
4. Configure computers to communicate on a network
5. Configure devices to connect to the Internet and Cloud services
6. Explain how to use, configure, and manage laptops and mobile devices

COURSE OUTCOMES

At the end of the course student will be able to

CO1: Understands the roles and responsibilities of the IT professional
CO2: Troubleshoot advanced hardware and software problems
CO3: Understand the basics of Operating Systems
CO4: Learn the Safe Lab Procedures and Tools
CO5: Understand Networks and Security Concepts.
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UNIT- I

Introduction to the Personal Computer Describe a Computer System, Identify the Names, Purposes, and Characteristics of Cases and Power Supplies, Identify the Names, Purposes, and Characteristics of Internal Components, Identify the Names, Purposes, and Characteristics of Ports and Cables, Identify the Names, Purposes, and Characteristics of Input Devices, Identify the Names, Purposes, and Characteristics of Output Devices, Explain System Resources and Their Purposes.

UNIT- II

Computer Assembly Attach the Components to the Motherboard and Install the Motherboard, Install Internal Drives, Install Drives in External Bays, Install Adapter Cards, Connect the Power Cables Reattach the Side Panels to the Case, Boot the Computer for the First Time. **Basics of Preventive Maintenance and Troubleshooting** Explain the Purpose of Preventive Maintenance, Identify the Steps of the Troubleshooting Process.

UNIT- III

Fundamental Operating Systems Explain the Purpose of an Operating System, Describe and Compare Operating Systems to Include Purpose, Limitations, and Compatibilities, Determine Operating System Based on Customer Needs, Install an Operating System, Identify and Apply Common Preventive Maintenance Techniques for Operating Systems, Troubleshoot Operating Systems.

UNIT- IV

Safe Lab Procedures and Tool Use Explain the Purpose of Safe Working Conditions and Procedures, Identify Tools and Software Used with Personal Computer Components and Their Purposes, Implement Proper Tool Use. **Fundamental Laptops and Portable Devices** Identify Common Preventive Maintenance Techniques for Laptops and Portable Devices, Describe How to Troubleshoot Laptops and Portable Devices.

UNIT-V

Fundamental Networks Explain the Principles of Networking, Describe Types of Networks, Describe Basic Networking Concepts and Technologies, Describe the Physical Components of a Network, Describe LAN Topologies and Architectures. **Fundamental Security:** Explain Why Security Is Important, Describe Security Threats, Identify Security Procedures, Identify Common Preventive Maintenance Techniques for Security, Troubleshoot Security.

Text Books:

1. IT Essentials: PC Hardware and Software Companion Guide Fourth Edition, CiscoNetworking Academy.

Reference Books:

1. Network security essentials application and standrads, by William stallings, 4th edition,prentice hall.
2. Mike Meyers' CompTIA A+ Guide to Managing and Troubleshooting PCs, SixthEdition 6th Edition

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1106	**Communication Skills LAB**	L	T	P	Int.	Ext	1.5
		0	**0**	**3**	**50**	**50**	

COURSE OBJECTIVES

1. To make students recognize the sounds of English through Audio-Visual aids;
2. To help students build their confidence and help them to overcome their inhibitions and self-consciousness while speaking in English;
3. To familiarize the students with stress and intonation and enable them to speak English effectively; and
4. To give learners exposure to and practice in speaking in both formal and informal contexts.

COURSE OUTCOMES

CO1: Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
CO2: Students will be able to participate in group activities like roleplays, group discussions and debates; and
CO3: Students will be able to express themselves fluently and accurately in social as well professional context.

Topics:

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation.

DISTRIBUTION AND WEIGHTAGE OF MARKS

- The practical examinations for the English Language Lab shall be conducted as per the University norms prescribed for the core Engineering practical sessions.
- For the Language lab sessions, there shall be a continuous evaluation during the semester for 50 sessional marks and 50 semester-end Examination marks.
- For the 50 sessional (Internal) marks, 30 marks shall be awarded for day-to-day performance and for completing activities in the lab manual, 20 marks to be awarded by conducting Internal Lab Test(s).
- For the 50 Semester- end (External) marks, 30 marks shall be awarded for written examination (dialogues, the sounds of English and stress) and 20 marks for External Examiner viva-voce.

Reference Books:

- Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
- Speak Well. Orient Blackswan Publishers, Hyderabad.
- Allan Pease. Body Language. Manjul Publishing House, New Delhi.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1107	**Green Chemistry LAB**	L	T	P	Int.	Ext	1.5
		0	**0**	**3**	**50**	**50**	

COURSE OUTCOMES

At the end of the course student will be able to:

Course outcomes: At the end of the course the student shall be able to
CO 1: Determine the quality of the ground water sample.
CO 2: Determine the metal ions using titrimetry.
CO 3: Explain the functioning of the instruments like pH metry, Conductometry and Potentiometry .
CO 4: Use spectrophotometry to determine the metal ions.

List of Laboratory Experiments
(Any 10 experiments to be performed during the semester)

1. Determination of sodium hydroxide with HCl .
2. Determination of Fe (II) by potassium dichromate.
3. Determination of Fe(II) by permanganometry.
4. Determination of chromium (VI) by hypo.
5. Determination of Zinc by EDTA method.
6. Determination of hardness of water sample by EDTA method.
7. Determination of available chlorine in water .
8. Determination of sulphuric acid in lead-acid storage cell.
9. Determination of carbonate and bicarbonate in a mixer.
10. Determination of strength of an acid by pH metric method.
11. Determination of citric acid in a citrus fruit by conductometric method.
12. Determination of Fe(II) in Mohr's salt by potentiometric method.
13. Construction of Galvanic cell.
14. Determination of Fe(III) by spectrophotometry.
15. Optimization of structure of the compound using Gaussian software.
16. Preparation of Biodiesel from vegetable oils.

Reference Books:

1. Vogel's Quantitative Chemical Analysis – V Edition – Longman

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1108	**Computer Programming using 'C' LAB**	L	T	P	Int.	Ext	1.5
		0	**0**	**3**	**50**	**50**	

COURSE OBJECTIVES

1. To provide complete knowledge of C language.
2. To develop logics which will help them to create programs, applications in C.
3. To learn the basic programming constructs they can easily switch over to any other language in future.

COURSE Outcomes

CO1: Ability to implement the programs using control structures & arrays.
CO2: Ability to implement the programs using strings & functions.
CO3: Ability to implement the programs using user defined datat ypes.
CO4: Ability to implement the programs using pointers and operations on files.

LIST OF EXPERIMENTS

1. Basic Programs

A. C program to scan all data type variables as input and print it as output.
B. C program to perform arithmetic operations like +,-,*,/,% on two input variables.
C. C program to perform temperature conversions from Centigrade to Fahrenheit and vice versa.

2. Programs on Operators

A. C program to perform all bit wise operations.
B. C program to extract the last two digits of a given integer n, where the number of digits shouldbe greater than 2.
C. C program to display the greatest of three numbers using a conditional operator.
D. C program to swap two numbers without using a third variable.

3. Programs on Conditional Statements

A. C program to check whether a given input integer is in between two values x and y.
B. C program to check whether a given character is a vowel or a consonant or a digit or a specialsymbol.
C. C program to display the nature of roots of a quadratic equation.
D. C program to perform arithmetic operations using switch statement.
E. C program to convert upper case character to lowercase and vice versa.

4. Programs on Loop Statements

A. C program to print odd numbers between specified ranges.

B. C program to display the factors of a given number and check whether it is a prime or not.

C. C program to display the sum of individual digits of a given integer raised to the power of n. Alsocheck whether the given integer is Armstrong or not.

D. C Program to demonstrate the usage of unconditional control tatements

E. C Program to display fibnocii series.

F. C Program to generates 100 random real numbers in the range of 10.0 to 20.0 and sort them in descending order.

G. C program to display the following pattern.

```
5 4 3 2 1
4 3 2 1
3 2 1
2 1
1
```

5. Programs on Functions

A. C program to demonstrate the various categories of functions with respect to return type andnumber of arguments.

B. C program to find the LCM of two numbers using functions.

C. Create a header file which contains the following prototype:

i. int factorial(int) ; // non-recursive function

ii. int factorial_rec(int); //Recursive function

iii. int prime(int);

Use the above functions in a C program by including the above header file.

D. C program to display Pascal's triangle using functions.

6. Programs on Arrays

A. C program to read n integer values into an array and display them

B. C program to count and display the number of positive, negative, even and odd numbers in a given array of integers and also display their sum.

C. C program to find the smallest and largest numbers in an array of integers.

D. C program to perform addition, multiplication, transpose of given matrices using functions.

E. C program to check whether a given integer exists in a list of numbers and print its index value if it is present, otherwise print "No".

7. Programs on Character Array

A. C program to convert upper case character to lowercase and vice versa in a given string.

B. C program to delete all vowels in a given string and display the remaining string.

C. C program to check whether a given string is palindrome or not.

8. Programs using String handling functions

A. C program to demonstrate the usage of at least 10 predefined string handling functions.
B. C Program to Sort the given n strings in ascending order.
C. C program that implements the following user defined string handling functions
    i. To find the length of the given string
    ii. To copy the contents of one string to another
    iii. To reverse the contents of a string
    iv. To compare two strings
    v. To concatenate two strings

9. Programs on Pointers and Dynamic Memory Allocation

A. C program to demonstrate the usage of pointers.
B. C program that uses dynamic memory allocation functions to add n elements and display their average.
C. C program that performs pointer arithmetic.
D. C program that implements call by reference.
E. C program to demonstrate the following
    i. Pointers to Pointers
    ii. Array of Pointers
    iii. Pointer to Array
    iv. Pointers to Functions

10. Programs on Structures

A. C program to read the data of four students, each students has a name (string), roll number (string), age (integer), use an array of structure. Later find the average age of the students.
B. C program using nested structures.
C. C program that demonstrates different ways to access the structure elements using pointers.

11. Programs on Files

A. C program to read the contents of a file and display on the output screen.
B. C program to copy the contents of one file to another.
C. C program to count and display the number of characters, words and lines in a file.

12. Programs on Command Line Arguments

A. C program to perform arithmetic operations using command line arguments.
B. C program to pass file name as argument and display the contents of file on screen.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND P.G. COURSES (A)
RUSHIKONDA, VISAKHAPATANAM 530045 | website: www.gvpcdpgc.edu.in
(Approved by A.I.C.T.E | Affiliated to Andhra University | An ISO 9001:2015 Certified Institute)
ENGINEERING AND TECHNOLOGY PROGRAM
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B. Tech CSE (R-22 Regulation)

I Year – II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	TotalMarks	Credits
			L	T	P				
CS1201	BS	Engineering Mathematics-II (Matrix Algebra, Ordinary Differential Equations and Laplace Transforms)	3	0	0	30	70	100	3
CS1202	BS	Engineering Physics	3	1	0	30	70	100	3
CS1203	ES	Data Structures Using 'C'	3	0	0	30	70	100	3
CS1204	ES	Engineering Graphics	1	0	4	30	70	100	3
CS1205	ES	Discrete Mathematical Structures	3	0	0	30	70	100	3
CS1206	ES	IT Workshop Lab	0	0	3	50	50	100	1.5
CS1207	BS	Engineering Physics Lab	0	0	3	50	50	100	1.5
CS1208	ES	Data StructuresLab	0	0	3	50	50	100	1.5
Total Credits									**19.5**

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS1201	**Engineering Mathematics-II (Matrix Algebra, Ordinary Differential Equations and Laplace Transforms)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES

- The way of obtaining rank, Eigen values and Eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form from a given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

COURSE OUTCOMES

CO1: Find rank, Eigen values and Eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.

CO2: Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.

CO3: Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling

CO4: Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.

CO5: Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

UNIT-I

Matrix Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Gauss elimination method, LU Factorization method, Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

UNIT-II

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications.

Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

UNIT-III

Ordinary Differential Equations of First Order and its Applications: Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

UNIT-IV

Differential Equations of Higher Order: Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

UNIT-V

Laplace Transforms: Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by t^n - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

Text Book:

Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

Reference Books:

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1202	**Engineering Physics**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES

The fundamentals of sciences are essential to learn as the application of science in solving problems is technology. The engineering physics curriculum is designed in such a way that all branches of engineering will study the basic fundamentals of technology from where it is originated. The course objectives are

1. To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.
2. To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.
3. To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
4. To learn basics of lasers and optical fibers and their use in some applications.
5. To understand concepts and principles in quantum mechanics and Nanopahse Materials. Relate them to some applications.

COURSE OUTCOMES

By the end of this course, student would have

CO.1: Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.

CO.2: Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.

CO.3: Understand the Theory of Superposition of waves. Understand the formation of Newton'srings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a single slit.

CO.4: Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fiber. Realize their role in optical fiber communication.

CO.5: Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

UNIT-I

THERMODYNAMICS (CO1)

Part-I

Introduction, Heat and Work, First law of thermodynamics and its applications, Reversible and Irreversible process, Carnot cycle and Efficiency (Problems based on efficiency), Carnot's Theorem.

Part-II

Second law of thermodynamics (Kelvins and Clausius statement only) , Entropy - Physical Significance, Change of entropy in reversible and irreversible process, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

UNIT - II

ELECTROMAGNETISM (CO2)

Gauss's law (Statement and Proof, without applications), Ampere's law (Statement and Proof, without applications), Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), propagation of electromagnetic waves in free space (Theory only). Ultrasonics: Properties of ultrasonic waves, production of ultrasonic waves by magnetostriction and piezoelectric methods, acoustic grating, applications of ultrasonics, acoustic grating.

UNIT - III

OPTICS (CO3)

Interference: Principle of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings (Problems based on finding radius of curvature or wavelength), Michelson Interferometer and its applications (Theory only).

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit **(**Qualitative and quantitative treatment**)**(Theory only).

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate (problems based on thickness), production and detection of plane, circular and elliptical polarization (Theory only).

UNIT - IV

LASERS AND FIBRE OPTICS (CO 4)

Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers (Theory only). Introduction to optical fibers, principle of propagation of light in optical fibers, Acceptance Angle and cone of a fibre, Numerical aperture (Problems based on acceptance angle and numerical aperture), Modes of propagations**,** classification of fibers,Fibre optics in communications, Application of optical fibers, fiber optic sensors.

UNIT - V

MODERN PHYSICS (CO. 5)

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time dependent and independent wave equations, physical significance of wave function and its properties, application for particle in a one dimensional well – energy eigen values and eigen functions of the particles (No problems).Energy band theory of crystals, classification of conductors, semiconductors and insulators. (Theory only). **Nanophase Materials :**Introduction, properties, Top-down and bottom up approaches, Synthesis - Ball milling, Chemical vapour deposition method, sol-gel methods, Applications of nanomaterials. (Theory only).

Text Books:

1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand
3. Engineering Physics by R.K. Gaur and S.L. Gupta –DhanpatRai

Reference Books:

1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1203	**Data Structures using 'C'**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. To understand recursive algorithms and basic concepts of data structures.
2. To learn linear data structures such as Stacks, Queues and Linked lists.
3. To learn Nonlinear data structures such as Trees and Graphs.
4. To understand and solve searching and sorting techniques.
5. To solve problems using data structures such as stacks, queues, linear lists, trees and graphs.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Understand the implementation of Stacks and Queues using Arrays and their applications.
2. Describe various types of linked lists and their implementation.
3. Construct various types of trees and their traversal techniques.
4. Discuss the computational efficiency of the principal algorithms for sorting and searching.
5. Describe how graphs are represented in memory and solve real time application problems using concepts of graphs.

UNIT – I

Introduction to Data Structures: Abstract Data Types, Meaning and Definition of Data Structures. **Stacks:** Stack as an Abstract Data Type, Primitive Operations, Implementing Stack Operations using Arrays. Infix to Postfix, Infix to Prefix Conversions, Postfix Evaluation and Recursion. **Queues:** Queue as an Abstract Data Type, Sequential Representation, Types of Queues, Operations, Implementation using Arrays.

UNIT – II

Linked List: Operations, Implementation of Stacks, Queues and priority Queues using Linked Lists, Circular Lists: Insertion, Deletion and Concatenation Operations, Stacks and Queues as Circular Lists, Doubly Linked Lists.

UNIT- III

Trees: Binary Trees - Definitions and Operations, Binary Tree Representation: Node Representation, Implicit array Representation, Binary Tree Traversal, Threaded Binary Trees and

their Traversal, Trees and their Applications; Heterogeneous binary trees, Tree Searching Insertion and Deletion of a node from a Binary Search Tree, Efficiency of Binary Search Tree operations.

UNIT –IV

Searching: Basic Searching Techniques: Dictionary as an Abstract Data Type, Algorithmic Notation, Sequential Searching and its Efficiency, Binary Search, Interpolation Search.
Sorting: General Background: Efficiency, Asymptotic Notations, Efficiency of Sorting, Bubble Sort and Quick Sort and their Efficiency, Selection Sorting, Binary Tree Sort, Heap Sort, Insertion Sorts, Shell Sort, Address calculation Sort, Merge and Radix Sorts.

UNIT – V

Graphs and Their Application: Definition of Graphs, Representation of Graphs, Transitive closure, Linked Representation of Graphs, Topological Ordering of nodes, Graph Traversal and Spanning Forests, Undirected Graphs and their Traversals Applications of Graphs, Minimal Spanning Trees.

Text Books:

1. Data Structures Using C and C++ Yaddish Langsam, Moshe J .Augenstein and Aaron M. Tanenbaum,Prentice Hall Of India(2ndEdition)
2. Data Structure and Algorithm, Prof. Maria Rukadikar S

Reference Book:

1. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1204	**Engineering Graphics**	L	T	P	Int.	Ext	3
		1	**0**	**4**	**30**	**70**	

COURSE OBJECTIVES

1. The course is aimed at developing Basic Graphic skills.2:
2. Develop Skills in Preparation of Basic Drawings
3. Skills in Reading and Interpretation of Engineering Drawings

COURSE OUTCOMES

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

CO 1: Graphically construct and understand, the importance of mathematical curves in Engineering applications

CO 2: Graphically visualize and construct orthographic projection of points and lines

CO 3: Visualize and construct different views of planes and solids in different orientations

CO 4: Construct and develop the sectioned surfaces of geometrical solids

CO 5: Interpret and draw the Orthographic and Isometric views of different solids.

UNIT-I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions.

Curves: Construction of Conic sections by using general method - Normal and tangent to the curves.

UNIT – II

Projections of Points and Straight Lines: Principal or Reference Planes - Projections of a point lying in any one of the four quadrants. Projections of straight lines parallel to both reference planes - perpendicular to one reference plane and parallel to other reference plane - inclined to one planeand parallel to the other.

UNIT – III

Projections of Planes: Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other - perpendicular to one reference plane and inclined to other plane.

UNIT – IV

Projections of Solids: Types of solids: Polyhedral and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane - vertical plane -parallel to both the reference planes - Projection of Solids with axis inclined to one reference plane and parallel to other.

UNIT – V

Isometric Views: Isometric projection - Isometric scale and Isometric view. Isometric view of Prisms, Pyramids, cylinder, cone, sphere .

Text Books:

Elementary Engineering Drawing by N.D. Bhatt, Charotar Publishing House.

Reference Books:

Engineering Graphics by K.L. Narayana and P. Kannaiah, Tata Mc-Graw Hill.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1205	**Discrete Mathematical Structures**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. To understand mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic and truth tables.
2. To understand about permutations and combinations.
3. To understand various types of relations and discuss various properties of the relations.
4. To study the graphs, graph isomorphism and spanning trees.

COURSE OUTCOMES:

At the end of the course student will be able to:

CO1: Solve the basic principles of Logics and proofs.
CO2: Solve different kinds of problems related to Relations and set theory.
CO3: Analyze the fundamental algorithms and construct simple mathematical proofs.
CO4: Acquire knowledge to solve network problems using graph theory.
CO5: Solve problems related to counting and advanced counting techniques.

UNIT-I

The Foundations-Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers Rules of Inference, Introduction to Proofs, Proof Methods andStrategy.

UNIT-II

Basic Structures-Sets, Functions, Sequences and Sums: Sets, Set Operations, Functions, Sequences and Summations. Relations: Relations and their properties, n-ary relations, applications,Representation, closure equivalence relations, Partial orderings.

UNIT-III

The Fundamentals-Algorithms, the Integers and Matrices: Algorithms, The Growth of Functions, Complexity of Algorithms, The Integers and Division, Primes and Greatest Common Devisors, Integers and Algorithms, Applications of Number Theory, Matrices. Induction And

Recursion: Mathematical Induction, Strong Induction and Well- Ordering, Recursive Definitions and

Structural Induction, Recursive Algorithms, Program Correctness.

UNIT-IV

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

UNIT-V

Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations. Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recursion Relations, Generating Functions, Inclusion- Exclusion, and Applications of Inclusion-Exclusion.

Text Book:

1. Discrete Mathematics & Its Applications with Combinatorics and Graph Theory byKenneth HRosen, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Reference Books:

1. Discrete Mathematics for Computer Scientists & Mathematicians by Joe L. Mott,Abraham Kandel, Theodore P. Baker, Prentice-Hall, India
2. Discrete Mathematics by Richard Johnson Baug, Pearson Education, New Delhi.
3. Discrete and Combinatorial Mathematics by Ralph. G. Grimaldi, Pearson Education, NewDelhi.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1206	**IT Workshop LAB**	L	T	P	Int.	Ext	1.5
		0	**0**	**3**	**50**	**50**	

COURSE OBJECTIVES

1. Explain the internal parts of a computer, peripherals, I/O ports, connecting cables.
2. Demonstrate basic command line interface commands on LINUX.
3. Teach the usage of Internet for productivity and self-paced lifelong learning.
4. Describe about Compression, Multimedia and Antivirus tools.
5. Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools.

COURSE OUTCOMES

CO1: Assemble and disassemble components of a PC
CO2: Construct a fully functional virtual machine, Summarize various LINUX operating system commands.
CO3: Able to Troubleshoot hardware and software problems.

Module I – Hardware Concepts

1. Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

Module II – Software Installations

1. Every student should individually install operating system like LINUX or MS windows on the personal computer. The system should be configured as dual boot with both windows and LINUX.
2. Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.
3. Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.
4. Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.
5. Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers.

Module III – MS-Office

1. MS Word - Features to be covered: Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colours, Inserting Header and Footer, Using Date.
2. Creating project abstract Features to be covered: Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3. Creating a Newsletter: Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.
4. Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files,Using help and resources. Creating a Scheduler: Gridlines, Format Cells, Summation, auto fill, Formatting Text.
5. Calculating GPA - Features to be covered: Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.
6. Creating Power Point: Student should work on basic power point utilities and tools in Latex and MS-Office/equivalent (FOSS) which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1207	**Engineering Physics Lab**	L	T	P	Int.	Ext	1.5
		0	**0**	**3**	**50**	**50**	

COURSE OBJECTIVES

To train the student in acquiring skills, techniques of using instruments to observe the physical phenomena, to measure certain physical quantities and constants.

COURSE OUTCOMES

By the end of the course

CO1:Experiment and evaluate basic principles of physics by observing and analyzing the data, plotting graphs and interpreting the results.

List of Laboratory Experiments:

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton‘s Rings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current Carrying Circular Coil.
4. Determination of Cauchy‘s Constants of a Given Material of the Prism using Spectrometer.
5. Determination of Refractive Index of Ordinary ray μo and Extraordinaryμe ray.
6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth‘s Magnetic Field.
10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.
11. Carey Foster‘s Bridge – Verification of laws of Resistance and Determination of Specific Resistance.
12. Melde‘s Apparatus – Frequency of electrically maintained Tuning Fork.
13. Photoelectric cell-Characteristics.
14. Planks Constants.
15. Determination of energy band gap of a given semiconductor.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS1208	**Data Structures LAB**	L	T	P	Int.	Ext	1.5
		0	**0**	**3**	**50**	**50**	

COURSE OBJECTIVES:

1. To implement stacks and queues using arrays and linked lists.
2. To develop programs for searching and sorting algorithms.
3. To write programs using concepts of various trees.
4. To implement programs using graphs.

COURSE OUTCOMES:

At the end of the course student will be able to:

Implement programs on stacks, queues and various types of linked list.

1. Develop programs using various graph algorithms
2. Implement program on Binary search tree traversals
3. Write programs using various searching and sorting techniques.

List of Programs:

1. Write a C program to implement the operations on stacks.
2. Write a C program to implement the operations on circular queues.
3. Write a C program for evaluating a given postfix expression using stack.
4. Write a C program for converting a given infix expression to postfix form using stack.
5. Write a C program for implementing the operations of a dequeue.
6. Write a C program for the representation of polynomials using circular linked list andfor the addition of two such polynomials.
7. Write a C program to create a binary search tree and for implementing the in order,preorder, post order traversal using recursion
8. a) Write a C program for finding the transitive closure of a digraph
   b) Write a C program for finding the shortest path from a given source to any vertex ina digraph using Dijkstra's algorithm
9. a) Write a C program for finding the Depth First Search of a graph.
   b) Write a C program for finding the Breadth First Search of a graph.
10. Write a C program for sorting a list using Bubble sort and then apply binary search.
11. Write a C program for quick sort
12. Write a C program for Merge sort.
13. Write a C program for Heap sort.

Reference Books:

1. Data Structures Using C and C++ Yaddish Langsam, Moshe J .Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India(2ndEdition)
2. Data Structure and Algorithm, Prof. Maria RukadikarS
3. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

B. Tech Computer Science and Engineering (R-22 Regulation)
II Year – I Semester

Course code	Category	Course Title	Hours per week			Intern-al Marks	External Marks	Total Marks	Credits
			L	T	P				
CS2101	ES	Elements of Electronics Engineering	3	0	0	30	70	100	3
CS2102	PC	Digital Logic Design & Microprocessors	3	0	0	30	70	100	3
CS2103	HSS	Managerial Economics & Financial Accounting	3	0	0	30	70	100	3
CS2104	PC	Design and Analysis of Algorithms	3	0	0	30	70	100	3
CS2105	PC	Database Management Systems	3	0	0	30	70	100	3
CS2106	PC	DEMP Lab	0	0	3	30	70	100	1.5
CS2107	PC	Database Management Systems Lab	0	0	3	50	50	100	1.5
CS2108	PC	Algorithms through C++ Lab	0	0	3	50	50	100	1.5
CS2109	SC	Skill Course -1 C++ Programming	1	0	2	50	50	100	2
CS2110	MC	Environmental Science	3	0	0	30	70	100	0
Total Credits									**21.5**

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS2101	**Elements of Electronics Engineering**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES

1. To introduce Electronics and Communication Engineering in a nutshell.
2. To explain the role of Electronics and Communication Engineering in all other engineering disciplines.
3. To explain the basic building blocks of digital and analog electronic circuits.

COURSE OUTCOMES

At the end of the course, the student must be able to

CO1: Design simple combinational and sequential circuits.
CO2: Analyze the given RC and RL circuits.
CO3: Design simple Diode circuits like rectifiers and clipping circuits.
CO4: Design circuits using ideal opamp to perform mathematical operations on analog signals.
CO5: Appreciate the importance of some of the analog systems such as ADC, DAC.

UNIT-I

Introduction to Electronics and Semiconductors: Energy band theory, Conduction in Insulators, Semiconductors and metals, Electron emission from metals, Classification of semiconductors, Carrier concentration in an intrinsic semiconductor, Properties of intrinsic semiconductor, Drift and diffusion currents.

UNIT-II

Semi-Conductor Diode: Theory of PN junction diode, Open circuited PN junction, V-I characteristics of a PN diode, Diode current equation, Transition and diffusion capacitances, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.

UNIT-III

Rectifying circuits: Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple and regulation of each rectifier, Capacitor filters. **Bipolar Junction Transistor: –** Introduction,

construction, Operation of PNP and NPN Transistors – Transistor Circuit configurations-Characteristics of a CE configurations – h parameters, low frequency small signal equivalent circuit of a Transistor.

UNIT-IV

Transistor Biasing and thermal stabilization: Transistor Biasing, Stabilization, Different methods of transistor biasing – Fixed bias, Collector feedback bias – self bias – Bias compensation.Transistor Amplifiers: CE, CB, CC amplifier configurations –Multistage amplifier – A Two Stage RC coupled amplifier – frequency response curve and bandwidth.

UNIT-V

Field Effect Transistors: Junction Field Effect Transistors (JFET) – JFET characteristics, JFET Parameters, Small signal equivalent circuit – MOSFETS – Depletion and Enhancement MOSFETS.

TEXT BOOKS:

1. Electronic Device and Circuits by Sanjeev Guptha.

REFERENCE BOOKS:

1. Electronic Device and Circuits Theory by Robert L. Boylested Electronic Device andCircuits by David. A. Bell

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
CS2102	**Digital Logic Design and Microprocessor**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. To learn the basic principles for design of combinational circuit and sequential circuits.
2. Learn about the architecture of 8086 Microprocessor
3. Able to write programs in 8086

COURSE OUTCOMES:

At the end of the course student will be able to:
CO1: Understand Digital Circuits and Boolean Algebra and Minimize the Boolean expression using Boolean algebra and design it using logic gates.
CO2: Realize and simplify Boolean Algebraic functions using K-Maps and design combinational circuits.
CO3: Design and develop sequential circuits
CO4: Learn 8086 Microprocessors architecture and storage & memory structures
CO5: Understand the instruction set and programming of 8086 and able to write Assembly language programs.

UNIT-I

Introduction : Digital Signals, Digital Circuits, AND, OR , NAND, NOT, NOR and Exclusive-OR Operations, Boolean Algebra and Examples of IC Gates, Number Systems: Binary, Signed Binary, Octal, Hexa decimal Number, Binary Arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

UNIT-II

Combinational Digital Circuits: Standard Representation for logic functions, K-Map Representation, simplification of logic functions using K-Map, Minimization of Logical Functions, Don't Care Conditions, Multiplexer, Demultiplexer/Decoders, Adders, Subtractors, BCD Arithmetic, Carry look ahead adder, serial adder, ALU, elementary ALU design, parity checker/generator.

UNIT-III

Sequential Circuits and Systems: 1-bit memory, the circuit properties of Bistable latch, Clocked S-R Flip- flop, J-K, T and D-types Flip Flops, applications of flip flops, shift registers, applications of shift registers, ripple (Asynchronous) counters, synchronous counters, Counters design using Flip Flops.

UNIT-IV

Fundamentals of Microprocessors: Fundamentals of Microprocessor, Comparison of 8-bit (8085), 16-bit (8086) and 32-bit (80386) Microprocessors. The 8086 Architecture, Internal Block Diagram, CPU, ALU, Address, data and control bus, working registers, SFRs, Clock and RESET Circuits, STACK and STACK Pointer, Program Counter, Interrupts in 8086, I/O Ports, Memory Structures, Data and Program Memory.

UNIT-V

8086 Instruction Set and Programming: 8086 Instruction set and Programming, Addressing Modes: Introduction, Instruction Syntax, Data Types, Subroutines Immediate Addressing, Register Addressing, Direct Addressing, Indirect Addressing, Relative Addressing, Indexed Addressing, Data Transfer Instructions, Arithmetic Instructions, Logical Instructions, Branch Instructions, Bit Manipulation Instructions, Assembly Language Programs.

TEXT BOOKS:

1. Digital Logic Design and Microprocessors, Dr. Narendra S. Jadhav, Dr. (Mrs.) Alpana P. Adsul, ISBN: 9789354517242.
2. Digital Logic and Microprocessor Design with VHDL, by Enoch Hwang
3. Digital Design, 3rdEdition, M.Morris Mano, Pearson Education

REFERENCE BOOKS:

1. Digital Logic Design Principles, Norman Balabanian & Bradley Carlson, John Wiley & Sons (Asia) Pvt.Ltd.,2002
2. The 80x86 Family, Design, Programming and Interfacing, John E. Uffenbeck, 3rdEdition, Pearson Education Inc., 2002
3. BARRY B. BREY, The Intel Microprocessors 8086/8088,80186/80188,80286,80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and Interfacing, 8th Edition, Pearson Education Inc., 2009.

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS2103	**Managerial Economics & Financial Accounting**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

The objective of this course is to:

1. To understand the concepts of managerial economics and familiar with demand concepts, types of methods or techniques of demand those are used by the entrepreneur or producer.
2. To have a thorough knowledge on the production theories and cost while dealing with the production and factors of production. To introduce the concepts of cost and significance, limitation of Break-even analysis.
3. To understand how to start a business by using different forms of business organizations.
4. To have a knowledge about how to record business transactions and books by using Accounting concepts and conventions, journal, ledger and other accounting records.
5. To assess the sources of funds and the financial position of the business by using common and comparative balance sheets.

COURSE OUTCOMES:

At the end of this course student will be able to:

CO1: Adopt the Managerial Economic concepts for decision making and forward planning. Also know law of demand and its exceptions, to use different forecasting methods for predicting demand for various products and services.

CO2: To assess the functional relationship between Production and factors of production and list out various costs associated with production and able to compute breakeven point to illustrate the various uses of breakeven analysis.

CO3: To outline the different types of business organizations and their registration process.

CO4: To adopt the principles of accounting to record, classify and summarize the accounts.

CO5: To plan about the sources of funds for business and the implementation of common size and comparative balance sheets for assessing the financial position of the business.

UNIT-I

INTRODUCTION TO MANAGERIAL ECONOMICS & DEMAND: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Definition-types of demand – Demand

Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Significance of Elasticity of Demand. Demand Forecasting: definition, methods of demand forecasting(survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

UNIT-II

THEORY OF PRODUCTION AND COST ANALYSIS: Production Function – Law of Variable Proportion, Isoquants and Iso costs, MRTS, Cobb-Douglas Production function, Laws of Returns. Cost Analysis: Types of Cost, Break-even Analysis (BEA), Determination of Break-Even Point (Simple numerical problems) - Managerial Significance and limitations of BEA.

UNIT-III

BUSINESS ENVIRONMENT: Features of Business Organization, Sole Proprietorship, Partnership and Joint Stock Company, Steps for formation and Registration of the company.

UNIT-IV

INTRODUCTION TO FINANCIAL ACCOUNTING: Introduction to Accounting: Accounting Principles, Concepts & conventions, Double-Entry Book Keeping, Journal, Ledger and Trial Balance.

UNIT-V

PREPARATION AND ANALYSIS OF FINANCIAL STATEMENTS: Introduction to Sources ofFinance: Equity shares, Preference shares, debentures, long term loans and Retained Earnings: Financial statement Analysis: advantages, Comparative and Common Size Balance Sheets Statements

TEXT BOOKS:

1. A R Aryasri, “Managerial Economics and Financial Analysis”, 4th Edition, TMH Publication,2012.
2. S A Siddiqui & A. S. Siddiqui “Managerial Economics and Financial Analysis”,1stEdition, New AgePublishers, 2012.

REFERENCE BOOKS:

1. Dominick Salvatore, “Managerial Economics: Principles and Worldwide Applications”, 7th edition, OxfordUniversity Press, 2012.
2. N Ramachandran, Ram Kumar Kakani, “Financial Accounting for Management”, 2ndEdition, PearsonEducation, 2007.
3. D N Dwivedi, “Managerial Economics”, 8th Edition, PHI Publication, 2010.

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS2104	**Design and Analysis of Algorithms**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. To learn techniques for effective problem solving in computing.
2. To analyze the asymptotic performance of algorithms.
3. To explain familiarity with major algorithms and data structures.
4. To apply algorithm designing techniques such as greedy algorithms, dynamic programming, divideand conquer, backtracking, branch and bound etc. for common engineering design situations.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1.Analyze the efficiency of algorithms using mathematical analysis and asymptotic notations.

CO2.Employ divide-and-conquer and decrease-and-conquer strategies for problem solving.

CO3:Apply transform-and-conquer and string-matching techniques appropriately when an algorithmic design situation calls for it.

CO4:Solve problems using algorithm design methods such as the greedy method, dynamic programming.

CO5:Understand P and NP, NP-complete and NP-hard problems.

UNIT-I

Introduction Fundamentals of algorithmic problem solving, important problem type. Fundamentals of analysis of algorithms and efficiency, Analysis framework, Asymptotic Notations and Basic Efficiency classes, Mathematical Analysis of Non-recursive Algorithms, Mathematical Analysis of recursive Algorithms. **Brute Force:** Selection Sort and Bubble sort, Sequential Search and Brute Force String Matching, Closest Pair and Convex Hull Problems by Brute Force–Exhaustive Search.

UNIT-II

Divide-and-Conquer – Merge sort, Quick sort, Binary Search, Binary Tree Traversals and Related Properties, Multiplication of large integers and Strassen's Matrix Multiplication, Closest- Pair Convex-Hull Problems by Divide-and-Conquer. Decrease–and–Conquer: Insertion Sort, Depth-First Search and Breadth-First Search, Topological Sorting, Algorithms for Generating Combinatorial Objects, Decrease-by-a-Constant-Factor Algorithms, Variable-Size-Decrease Algorithms.

UNIT-III

Transform-and-Conquer – Pre-sorting, Gaussian Elimination, Balanced Search Trees, Heaps and Heapsort, Horner's Rule and Binary Exponentiation, Problem Reduction. Space and Time Tradeoffs: Sorting by Counting, Input Enhancement in string Matching, Hashing, B-Trees.

UNIT-IV

Dynamic Programming–Computing a Binomial Coefficient, Warshall's and Floyd's Algorithm, Optimal Binary Search Trees, The Knapsack Problem and Memory Functions. Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.

UNIT-V

Limitations of Algorithm Power - Lower-Bound Arguments, Decision Trees, P, NP and NP – complete problems, Challenges of Numerical Algorithms. Coping with the Limitations of Algorithms Power: Backtracking, Branch-and-Bound.

TEXT BOOKS:

1. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education,NewDelhi,3rd Edition, 2017.
2. Fundamentals of Computer Algorithms, Horowitz and Sahni, Galgothia publications.

REFERENCE BOOKS:

1. Introduction to Algorithms by Thomas H.Corman, Charles E.Leiserson, Ronald R. Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhis

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
CS2105	**Database Management Systems**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. Focus the role of a database management system in an organization and construct ER
2. Diagrams Demonstrate basic database concepts, including the structure and operation of the relational data model and basic database queries using SQL.
3. Applying advanced database queries using Structured Query Language (SQL)
4. Evaluating logical database design principles and database normalization.
5. Demonstrate the concept of a database transaction, concurrency control, and data object locking and protocols.

COURSE OUTCOMES:

After successful completion of the course, the student will be able to:
CO1: Understand database design principles.
CO2: Apply data Modelling using E-R diagrams.
CO3: Create refined data models using normalization.
CO4: Build database queries using Structured Query Language.
CO5: Understand the transaction management and concurrency control.

UNIT-I

Introduction to DBMS and Database Design: File system vs DBMS, advantages of DBMS, storage data, queries, DBMS structure, Types of Databases – Hierarchical, Network, Relational, Key-Value, Object Oriented, XML DB Overview of File Structures in database, **Data base Design**: data models, the importance of data models. **E-R model:** Entities, attributes and entity sets, relationship and relationship set, mapping cardinalities, keys, features of ER model, conceptual database design with ER model.

UNIT-II

Relational Model and Basic SQL Relational model: Integrity constraints over relations and enforcement, querying relation data, logical database design, views, destroying/altering tables and views. **Basic SQL:** Introduction to SQL, Basic SQL Queries: DML, DDL, DCL, TCL.

UNIT - III

Structured Query Language (SQL): Select Commands, Union, Intersection, Except, Nested Queries, Aggregate Operators, Null values, Relational set operators, SQL join operators. **Relational Algebra(RA):** Selection, Projection, Set operations, Joins Relational Calculus (TRC, DRC): Tuple Relational Calculus, Domain Relational Calculus PL/SQL, Assertions, Triggers.

UNIT - IV

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Reasoning about Functional Dependencies. Normal Forms, Properties of Decomposition, Normalization, different types of dependencies.

UNIT - V

Introduction to Transaction Management: ACID properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control. **Concurrency Control:** 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Concurrency control without locking. **Crash Recovery:** Aries, Recovering from a System Crash.

TEXT BOOKS:

1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw-Hill, 3e, 2014 .

2. H.F.Korth and A.silberschatz, Database System Concepts, McGraw-Hill, 6e, 2011.

REFERENCE BOOKS:

1. D. Ullman, Principles of Database and Knowledge – Base Systems, Vol 1,1/e, Computer Science Press,1990.

2. RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education, 7e, 2016.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS2106	**Digital Electronics and Microprocessor Lab (DEMP Lab)**	L	T	P	Int	Ext	1.5
		0	**0**	**3**	**50**	**50**	

COURSE OBJECTIVES:

1. To learn about experiments related to Digital Electronics Components and ICs.
2. To learn about the microprocessor programming.

COURSE OUTCOMES:

- **CO1:** Design and Analyze Combinational and Sequential Circuits
- **CO2:** Understand Assembly Language Programs of 8086 Assembler and Write Programs

CYCLE 1- BASIC LOGIC GATES, COMBINATIONAL AND SEQUENTIAL CIRCUITS

1. Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR gates (By using 7400-series)
2. Construction of gates using NAND, NOR gates.
3. Construction of Half and Full adders and verifying their truth tables.
4. Operation and verifying truth tables of flip- flops- RS, D, and JK using ICs.
5. Construction of Decade counters (7490).
6. Decade counter using JK flip flops.
7. Up/Down counter using JK flip flop.

CYCLE 2- 8086 PROGRAMMING

8. Write a program to add two 16 bit numbers stored in two memory Locations 2000h and 2002h and store the result in another memory location 2004h

9. Write a program to divide two 16 bit numbers stored in two memory Locations 2000h and 2002h and store the result in another memory location 2004h

10. Write a program to multiply two 16 bit numbers stored in two memory Locations 2000h and 2002h and store the result in another memory location 2004H

11. Write a program to add two 32 bit numbers stored in two memory Locations 2000h and 2004h and store the result in another memory location 2008h

12. Write a program to find Fibonacci series of a given number

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS2107	**Database Management Systems Lab**	**0**	**0**	**3**	**50**	**50**	1.5

COURSE BJECTIVES:

1. To introduce to a commercial DBMS such as ORACLE.
2. To learn and practice SQL commands for schema creation, data manipulation.
3. To learn conceptual and physical database design based on a case study.
4. To apply database design stages by studying a case study.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Understand and effectively explain the underlying concepts of database technologies
2. Explore to a commercial RDBMS environment to write SQL queries.
3. Normalize a database
4. Develop mini project using DBMS Concepts.

CYCLE-I

Laboratory Exercises Should Include:

1. Developing a sample ER model for the specified database.

2. Create a database and learn to set various constraints (can use Sailors example from textbook1, University example from textbook2).

3. Familiarization of SQL DDL commands-create, alter, drop, rename and truncate.

4. Use of DML commands-select, insert, update and delete.

5. Use of different of operators for nested sub-queries.

6. Use of Joins.

7. Use of grouping functions.

8. Creating Views.

9. PL/SQL programming environment.

10. Declaring triggers and use of cursors.

CYCLE II

MINI PROJECT:

Mini Project in oracle that includes i)System Requirements, E-R diagrams, ii) Database design along with Key Constraints and Normalization, iii)Execution of SQL Commands (DDL,DML, JOINS, GROUPING, AGGREGATE FUNCTIONS & PL/SQL) on the database. Some sample applications are given below:

1. Accounting Package for Shops,
2. Database Manager for Magazine Agency or Newspaper Agency,
3. Ticket Booking for Performances,
4. Preparing Greeting Cards & Birthday Cards
5. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc.,
6. Doctor's Diary & Billing System
7. Personal Bank Account
8. Class Marks Management
9. Hostel Accounting
10. Video Tape Library,
11. History of Cricket Scores,
12. Cable TV Transmission Program Manager,
13. Personal Library.
14. Sailors Database
15. Suppliers and Parts Database

REFERENCE BOOKS:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition,McGraw- Hill.
2. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill.

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS2108	**Algorithms Lab through C++**	L	T	P	Int.	Ext	1.5
		0	**0**	**3**	**50**	**50**	

COURSE OBJECTIVES:

1. To learn the importance of designing an algorithm in an effective way by considering space and time complexity.
2. To study optimization algorithms for specific applications.

COURSE OUTCOMES:

At the end of the course student will be able to
1. Design an algorithm in an effective manner
2. Apply iterative and recursive algorithms.
3. Implement optimization algorithms for specific applications.
4. Analyze and Implement algorithms to solve world problems.

List of Programs:

1. Implement and Analysis factorial of a number program using iterative and recursive methods and compare the time complexities.
2. Write a program to find the Greatest Common Divisor of two numbers using recursion and calculate the time complexity.
3. Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
4. Implement Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
5. Obtain the Topological ordering of vertices in a given digraph.
6. Implement string matching using brute-force.
7. Compare the time complexities of linear search and Binary search.
8. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
9. a. Print all the nodes reachable from a given starting node in a graph using BFS method.

b. Print all the nodes reachable from a given starting node in a graph using DFS method.
c. Compare their time complexities.

10. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
11. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
12. Implement 0/1 Knapsack problem using dynamic programming.
13. Write a program to implement all pair shortest path problem using Dynamic Programming.
14. Implementation of 'Hashing' with any collision resolution technique.
15. Implement N-Queens problem using backtracking.

REFERENCES:

1. Data Structures & Algorithm Analysis in C++ 4th Edition, MARK ALLEN WEISS, Pearson.
2. Fundamentals of Computer Algorithms, Horowitz and Sahni, Galgothia publications.
3. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest &Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.

Course Code	Title of the Course	Contact Hours/ week			Allotmentof Marks		Credits
		L	T	P	Int.	Ext	
CS2109	**C++ Programming (SKILL COURSE-1)**	**1**	**0**	**2**	**50**	**50**	2

COURSE OBJECTIVES:

1. Learn Object – oriented programming in C++.
2. To develop programs using templates and Exception Handling in C++.

COURSE OUTCOMES:

At the end of the course student will be able to:

CO1**:** Implement programs using classes and objects.
CO2**:** Develop solutions using inheritance and polymorphism
CO3**:** Utilize tryand catch blocks to handle exceptions.
CO4: Make use of generic templates in solving problems.
CO5: Apply standard template libraries to linear data structures.

LIST OF PROGRAMS:

(Any 12 experiments of the following to be performed)

1. a) Write a program Illustrating Class Declarations, Definition, and Accessing Classmembers.
b) Write a program to illustrate default constructor, parameterized constructor and copy Constructor, Destructors for a class.

2. a) Write a program that illustrates the following forms of inheritancesSingle, Multiple, Multilevel, Hierarchical.
b) Create multiple objects for the class and observe the order in whichConstructors and Destructors are called.

3. a) Write a program to use pointers for both base and derived classes and call theMember functions.
b) Write a program that demonstrates function overloading, operator overloading, overriding.

4. a) Write a program that demonstrates friend functions, inline functions,
b) Write a program that demonstrates virtual, static functions.

5. a) Write a program which uses the concept of pass and return objects to functions.
b) Write a program to create an array of objects.

6. a) Write a program that handles Exceptions. Use a Try Block to throw it and a Catch Block to handle it properly.
b) Write a Program to Demonstrate the Catching of All Exceptions.

7. Write a Program to demonstrate user defined exceptions.

8. Write a program to create a generic template for adding two integers and two float values and makeuse of the template to perform addition.

9. Write a program to implement the matrix ADT using a class. The operations supported by thisADT are:
a) Addition of two matrices.
b) Subtraction of two matrices.
c) Multiplication of two matrices.

10. Accept two stacks as input from the user and perform operations on it using stack class availablein Standard Template Library (STL).

11. Write a program implementing a queue class with required operations using STL.

12. Write a program implementing a circular queue class with required operations using STL.

13. Write a program to convert an infix expression to a postfix expression using stacks in STL.

14. Write a program to perform all operations of a single linked list using forward list in STL.

15. Write a program to implement binary search tree using traverse the tree using any traversalschema.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc19_cs38/preview
2. oursera.org/learn/cs-fundamentals-1#syllabus
3. https://www.geeksforgeeks.org/c-plus-plus/

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS2110	**Environmental Science**	**3**	**0**	**0**	**30**	**70**	0

COURSE OBJECTIVES:

The objectives of the Environmental Science course are to

1. Familiarize the fundamental aspects of environment and the environmental management'
2. Make realize the importance of natural resources management for the sustenance of the life and thesociety.
3. Apprise the impact of pollution getting generated through the anthropogenic activities on theenvironment
4. Provide the concept of Sustainable Development, energy and environment.
5. Impart knowledge on the new generation waste like e-waste and plastic waste

COURSE OUTCOMES:

CO1: In this unit the students learn about the scope and importance of Environmental studies. The studentsunderstand about different kinds of ecosystems.
CO2: The students learn about biodiversity and its conservation. They also learn about types of biodiversity,values of biodiversity and threats to biodiversity.
CO3: The students understand about the types of natural resources and problems associated with them.
CO4: In this unit the students gain knowledge about different types of environmental pollution- causes, effectsand control measures.
CO5: In this unit the students gain knowledge about characteristics of human population growth and its impacton environment. The students develop deep understanding about the environmental legislation.

UNIT-I

Introduction to Environmental studies and Ecosystems: Definition, Scope and importance of environmental studies. Concept of an Eco system, Biotic and Abiotic components of ecosystem, structure and function of an ecosystem. Food Chains, Food web and Ecological Pyramids. Forest ecosystem, Grassland ecosystem, Desert ecosystem, Pond ecosystem and Marine ecosystem.

UNIT-II

Bio-Diversity and its Conservation: Introduction – Definition and types of biodiversity – value of biodiversity - India as mega diversity nation – Hot spots of biodiversity – Threats to biodiversity – Conservation methods of biodiversity – In-situ & Ex – situ methods of conservation - Concept of sustainable development.

UNIT-III

Environment and Natural Resources Management: Soil erosion and desertification, Effects of modern agriculture, fertilizer-pesticide problems, Forest Resources: Use and over-exploitation, Miningand dams – their effects on forest and tribal people, Water resources: Use and over-utilization of surface and ground water, Floods, droughts, Water logging and salinity, Dams – benefits and costs, Conflicts over water, Energy Resources: Energy needs, Renewable and non-renewable energy sources.

UNIT-IV

Environmental Pollution – climate change and environmental problems: Definition, causes, effects and control measures of (a) air pollution (b) water pollution (c) soil pollution (d) noise pollution. Global Warming – Acid Rain – Ozone depletion – Photochemical smog. Drinking water, Sanitation and public health, Effect of Human activities of the quality of environment- Urbanization, transportation, Industrialization. Water scarcity and ground water depletion, Controversies on major dams – resettlement and rehabilitation of people problems and concerns. concept of plastic waste and e-waste.

UNIT-V

Human Population and Environmental legislations: Population Explosion – characteristics of population explosion. Impact of population growth on Environment – Role of Information technology in Environment and Human Health. Environmental Ethics. Environmental acts: Water (Prevention andcontrol of pollution) act, air (Prevention and control of pollution) act, Environmental Protection Act, Wild life protection act, Forest conservation act.

TEXT BOOKS:

1. Bharucha, Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of allBranches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press,India
3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science.Englewood Cliffs, NJ: Prentice Hall.
4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher:McGraw-Hill Higher Education; 12th edition, 2010.
5. Anubha Kaushik and C.P.Kaushik.Environmental Science by New age International Publishers.

B. Tech Computer Science and Engineering (R-22 Regulation)

II Year – II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS2201	ES	Computer Organization & Architecture	3	0	0	30	70	100	3
CS2202	PC	Operating Systems	3	0	0	30	70	100	3
CS2203	PC	Object Oriented Programming Through Java	3	0	0	30	70	100	3
CS2204	PC	Formal Languages &Automata Theory	3	0	0	30	70	100	3
CS2205	BS	Probability, Statistics & Queuing Theory	3	0	0	30	70	100	3
CS2206	PC	Operating Systems LAB	0	0	3	50	50	100	1.5
CS2207	PC	Object Oriented Programming Through Java Lab	0	0	3	50	50	100	1.5
CS2208	SC	Skill Course -2 Python Programming	1	0	2	50	50	100	2
CS2209	MOOCS	Massive Open Online Courses (NPTEL/COURSERA/UDEMY)	0	0	3	50	50	100	1.5
CS2210	MC	NCC/NSS	0	0	2	-	-	-	0
Total Credits									**21.5**
Summer Internship – I (Evaluation will be done in 3-1)									
Honors & Minors									**4**

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS2201	**Computer Organization & Architecture**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. To study about structure and functional components of a computer.
2. Understanding the hierarchical organization of a computer system which consists of instruction set of commands.
3. Learn about the architecture of a computer from a programming view.
4. To design a balance system that minimizes performance and utilization of all elements.

COURSE OUTCOMES:

At the end of the course student will be able to
CO1: Understand the Concepts of Register Transfer and Micro-operations and detailed idea aboutComputer Organization and Design.
CO2: Describe Micro-programmed Control & Organization of the CPU.
CO3: Discuss the design concepts of pipeline and vector processing
CO4: Classify various I/O devices and the I/O interface.
CO5: Distinguish the organization of various parts of a system memory hierarchy.

UNIT-I

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit. **Basic Computer Organization and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

UNIT-II

Micro programmed Control: Control Memory, Address Sequencing, Microprogram Example, Design of Control Unit. **Central Processing Unit**: Introduction, General Register Organization,

Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Architecture and Programming of 8085Microprocessor.

UNIT-III

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

UNIT-IV

Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

UNIT-V

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

TEXT BOOKS:

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd. Third Edition Sept. 2008.
2. Computer Architecture and Organization, P. Chakraborty, JaiN Publishing House; First Edition (9 January 2006)
3. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S Gaonkar, Penram International Publishing, 6th edition,2013

REFERENCE BOOKS:

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa Publications ISBN81-7319-609-5
3. Computer System Architecture‖, John. P.Hayes, McGraw Hill Education; 3rd edition,2017

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
CS2202	**Operating Systems**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. To learn about operating system structure, services, operations and design principles.
2. To understand how processes are scheduled and synchronized by Operating System.
3. To learn different OS approaches to memory management and deadlocks.
4. To learn design and implementation of OS subsystems such as File Systems, I/O Systems.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Understand Operating System structure, classify OS services and analyze scheduling algorithms.
CO2: Identify solutions to overcome synchronization problems and deadlocks in modern operating system design.
CO3: Explain about memory management functions and compare various page replacement algorithms.
CO4: Understand how File Systems and I/O Systems are organized, implemented and managedby operating system.
CO5: Understand how OS recognize and protects system from unauthorized access.

UNIT-I

Introduction to Operating Systems: Over View of Operating Systems, Types of Operating Systems, Operating System Structures, Operating System Services, System Calls, Virtual Machines, Operating System Design and Implementation. **Process Management**: Process, Process Control Block, Process States, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms.

UNIT-II

Process Synchronization: The Critical Section Problem, Peterson ‘s Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors. **Deadlocks**: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlocks.

UNIT-III

Memory Management: Logical versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table, segmentation. **Virtual Memory**: Demand Paging, Page Replacement, Allocation of Frames, Thrashing.

UNIT-IV

File Systems: Implementation and Secondary-Storage Structure: Concept of a file, Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management.

UNIT-V

I/O systems: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling. **System Protection:** Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights.

TEXT BOOKS:

1. Operating Systems, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne,JohnWiley Publ., 9th Edition.

REFERENCE BOOKS:

1. Modern Operating Systems, Andrew S. Tanenbaum, 4th edition, 2016, Pearson.
2. Operating Systems, William Stallings 5th Edition –PHI.
   Operating Systems: A Design-Oriented Approach ‘, Charles Crowley, Tata Hill Co.,1998 Edition.

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS2203	**Object-Orientated Programming through Java**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. To learn the basics of object oriented programming concepts and Java programming.
2. To learn different types of Constructors and inheritance, Super Keyword, Method overriding and dynamic method dispatch.
3. To understand the concepts of packages and Interfaces.
4. To understand the concepts of Exception Handling and Multithreading.
5. To design concepts of real time problems using Graphical User Interface.

COURSE OUTCOMES:

At the end of the Course the student shall be able to

CO1: Implement object orientated programming strategies and Contrast classes and objects.
CO2: Analyze Constructors, Inheritance and Dynamic Method Dispatch.
CO3: Demonstrate various classes in different packages, design own packages and implementing interfaces.
CO4: Manage Exceptions and Apply Threads.
CO5: Create GUI screens along with event handling and write network programs.

UNIT-I

Introduction to Objects & Classes: OOP Principles, Java Buzz Words, The Byte Code, A First Simple Program. Class Fundamentals with Variables and Methods, Declaring objects for accessing variables and methods. Data Types and Variables, Operators and Expressions, Control Statements, Type Conversion and casting, Arrays: Single Dimension, Multi Dimension, command line arguments.
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UNIT-II

Constructors: Default and Parameterized, this keyword and Garbage Collection, Overloading Methods, Overloading Constructors, Using objects as Parameters, Returning objects, String Handling.

Inheritance: Inheritance Basics, Types of Inheritance, Using Super keyword for constructors, Super to call variables and methods, Method Overriding, Dynamic Method Dispatch.

UNIT-III

Packages and Interfaces: Defining a Package, importing a package, Package Example, Access Modifiers, Abstract class. **Interfaces:** Defining and Implementing Interfaces. **Exploring java.lang**: Wrapper classes, Object, Math, **Exploring java.util**: The collection framework: Array List, HashSet and HashMap, StringTokenizer, Calendar, Random, Scanner. **Exploring java.io**: File class, Byte Streams, Character Streams, File Input Stream, FileOutputStream, FileReader and FileWriter classes.

UNIT-IV

Exception Handling: Exception Handling Fundamentals, Exception Types, throw,throws and finally, Creating your own exceptions. **Multithreaded Programming**: Two ways of Creating a Thread, Creating Multiple Threads, isAlive(), join(), Synchronization.

UNIT-V

Introducing GUI Programming With Swings: Swing Features, MVC Connection, Components and Containers, Panes, Simple Swing Application, Simple Swing Applet, Layout Managers: Flow, Border, Card, Grid, Grid Bag, Working with Color, Working with Fonts, Painting inSwing, Exploring Swing Components. **Delegation Event Mode**l: Event Classes, Sources and Listeners.

TEXT BOOKS:

1. Herbert Schildt, Java The complete reference, 11th Edition, McGrawHill, 2019
2. Timothy budd, An introduction to object-oriented programming, 3rd Edition,Pearson, 2009.

REFERENCE BOOKS:

1. Cay S. Horstmann, Core Java Volume I–Fundamentals, 11th Edition, Pearson 2019
2. Y. Daniel Liang Introduction to Java Programming Comprehensive Version, 10thEdition, Pearson, 2015.
3. Bruce Eckel, Thinking in Java, 4th Edition, Prentice Hall, 2006

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS2204	**Formal Languages & Automata Theory**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. Learn about different types of Finite State Machine and its representations.
2. Learn about different representations for a given Finite State Machine.
3. Learn how to construct a regular expression for a given Finite State Machine and a Finite State Machine for a given regular expression.
4. Learn about context free grammar and Push down Automata.
5. Learn working of Turing Machine.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Identify the type of Finite State Machine, represent them in its mathematical notations.
2. Analyze the given finite state machine, represent it in its minimal form and equivalent grammar.
3. Construct Finite State Machine for a given regular expression and Vice-Versa.
4. Convert a given context free grammar into its equivalent norms and Push down Automata.
5. Construct Push down Automata and Turing Machine for a given grammar.

UNIT-I

Definitions of alphabet, strings, language, grammar, types of grammar, types of machines, generation of languages from grammar, construction of grammar from the given description of languages, Definition of finite state machine, Definite state machine, indefinite state machine, representations in mathematical diagram, tabular etc., id of finite state machines.

UNIT-II

Design of finite state machine from the given description, elimination of e-transitions, indefinite state machine to definite state machine, optimization of finite state machine, Conversion of regular grammar to finite state machine, finite state machine to regular grammar, discussion of pumping lemma, systematic way of construction of finite state machine.

UNIT-III

Definition of regular expression, regular algebra, minimization of regular expressions, closure properties, construction of regular expression from the given description, regular expression to finite state machine, finite state machine to regular expression, construction of regular expression for the given finite state machine- a systematic way using Arden's theorem.

UNIT-IV

Parsing tree, bottom-up parsing, top-down parsing, types of context free grammar's, left-most and right most derivations, productions, reductions, optimization of context free grammar's, elimination of e productions, unit productions, normal forms- cnf, gnf, Definition of push down machine, push down machine, types of push down machine's, push down machine to context free grammar, context free grammar to push down machine.

UNIT-V

Design methodology of various push down machine's, push down machine by empty stack, push down machine by final states, conversion from one type to other type, applications of push down machine's, Definition of Turing machine, ways of representing Turing machine's- tabular form,diagram, mathematical form, quintuples etc., design of Turing machine, id of Turing machine, types ofTuring machine, universal Turing machine.

NOTE: Theorem proofs are eliminated

TEXT BOOKS:

1. Introduction to automata theory, languages and computation, John. E.H.P croft, Rajeev Motwani & JD Ullman—Pearson education- III edition

.

REFERENCE BOOKS:

1. Theory of computation, K.L.P. Mishra and Chandrasekhar, PHI
2. Theory of computation, formal languages and automata theory, G P Saradhi Varma, B.Thirupathi Rao –Sci Tech publications.

GAYATRI VIDYA PARISHAD COLLEGE FOR
DEGREE AND P.G. COURSES (A)
RUSHIKONDA, VISAKHAPATNAM 530045 | website: www.gvpcdpgc.edu.in
(Approved by A.I.C.T.E | Affiliated to Andhra University | An ISO 9001:2015 Certified Institute)
ENGINEERING AND TECHNOLOGY PROGRAM
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS2205	Probability, Statistics & Queuing Theory	3	0	0	30	70	3

COURSE OBJECTIVES

- To discuss basics of probability and related theorems, Problems. To study about conditional probability and Bayes theorem.
- To study about random variables and their properties. To examine, analyze and compare Probability distributions.
- To discuss regression and estimation techniques.
- To discuss various types of tests such as F-test, Chi-square test. To study the various Queuing models.

COURSE OUTCOMES:
At the end of course, Student will be able to:

CO 1: Ability to solve various problems regarding probability and conditional probability.
CO 2: Examine, analyze and compare probability distributions.
CO 3: Prepare null and alternative hypotheses and test its validity based on random samples.
CO 4: Solve various types of regression problems.
CO 5: Understand various queuing models.

Unit-I

Probability
Definitions of Probability, Addition Theorem, Conditional Probability, Multiplication Theorem, Bayes Theorem of Probability and Geometric Probability. Random Variables and their Properties: Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions Their Properties, Transformation Variables, Mathematical Expectations, Probability Generating Functions.

Unit-II

Probability Distributions
Discrete Distributions: Binomial, Poisson Negative Binominal Distributions and their Properties; Continuous Distributions: Uniform, Normal, Exponential Distributions and their Properties.

Unit-III

Multivariate Analysis and Curve Fitting:
Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Multiple Regression, Principles of Least Squares and Curve Fitting

Unit-IV

Estimation and testing of hypothesis
Types of Errors, Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Unbiasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation. Sample Tests: Large Sample Tests Based on Normal Distribution Small Sample Tests: Testing Equality of Means, Testing Equality of Variances, Test of Correlation Coefficient, Test for Regression Coefficient; Coefficient of Association, 2- Test for Goodness of Fit, Test for Independence;

Unit-V

Queuing Theory
Queue Description, Characteristics of a Queuing Model, Study State Solutions of M/M/1: Model, M/M/1; N Model, MM/C: Model, Case Studies

Text Books:

1. Probability & Statistics for Engineers and Scientists, Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Pearson Education.
2. Probability, Statistics and Random Processes T. Veerarajan, Tata McGraw Hill
3. Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor Sultan, Chand & son.

Reference Books:

1. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India, 1999.

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS2206	**Operating Systems Lab**	**0**	**0**	**3**	**50**	**50**	1.5

COURSE OBJECTIVES:

1. To learn about UNIX/LINUX operating system and system calls.
2. To understand and simulate the principles of resource management.
3. To understand UNIX/LINUX shell and its programming and vi editor.
4. To identify the data structures used for solving the problems related tosynchronization, deadlocks and file allocation methods.

COURSE OUTCOMES:

At the end of the course student will be able to:

CO1: Examine different Unix commands and Experiment programs using system calls.CO2: Develop shell programs using vi editor

CO3: Employ various data structures to implement OS functions.

LIST OF

EXPERIMENTS

MODULE-I

1. OS lab familiarization, Home Assignment on Unix commands, vi editor.
2. Simple C programs using command line arguments, system calls, library function calls.
3. C programs using fork system call to create processes and study parent, childprocess mechanism.
4. C programs to create process chaining, spawning.
5. C programs to handle errors using errno, perror() function.
6. C programs to use pipe system call for inter process communication.

MODULE-II

1. Familiarization of UNIX shell programming.
2. Simple shell programming exercises.
3. Shell programming using decision making constructs.
4. Shell programming using loop constructs.
5. Shell programming for file and directory manipulation.

MODULE-III

1.C programs to study process scheduling implementing FCFS, Shortest Job First, and RoundRobin algorithms.

2. C programs to study page replacement implementing FIFO, Optimal, and LRU pagereplacement algorithms.

3. C programs to study deadlock avoidance and detection.

4. Implement the Producer – Consumer problem using Semaphores.

REFERENCE BOOKS:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Unix programming by Stevens, Pearson Education.
3. Shell programming by Yashwanth Kanetkar.
4. Operating System, Concepts by Silberschatz, and Peter Galvin.

Course Code	Title of the Course	Contact Hours/ week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS2207	**Object - Oriented Programming through Java lab**	**0**	**0**	**3**	**50**	**50**	1.5

COURSE OUTCOMES:

At the end of the Course the student shall be able to

CO1**:** Write basic Java applications and use arrays
CO2**:** Demonstrate classes, objects and apply Inheritance
CO3**:** Implement Packages and build applications using default packages
CO4**:** Illustrate Exceptions and develop multithreaded applications
CO5**:** Outline GUI applications which are event based and write network programs

LIST OF PROGRAMS:

(Any 12 programs from the following to be performed)

1) a) Implement the following programs using command line arguments and Scanner class
b) Accept two strings from the user and print it on console with concatenation of "and"in the middle of the strings.
c) To find the perimeter and area of a circle given a value of radius.
b) Write a program using classes and objects in java?

2) a) Write a program to call default constructor first and then any other constructor in theclass?
b) Write a program that accepts an array of integers and print those which are both oddand prime. If no such element in that array print "Not found".
c) Write a program to accept contents into an Integer Array and print the frequency ofeach number in the order of their number of occurrences.
d) Write a program that accepts an „m x n" double dimension array, where „m" represents financial years and „n" represents Ids of the items sold. Each element in the array representsnumber of items sold in a particular year. Identify the year and id of the item which has more demand.

3) a) Create a class Box that uses a parameterized constructor to initialize the dimensions of a box. The dimensions of the Box are width, height, depth. The class should have a method that can return the volume of the box. Create an object of the Box class and test the functionalities.

b) Create a new class called Calculator with the following methods:
A static method called powerInt(int num1,int num2) This method should return num1 to the power num2.A static method called powerDouble(double num1,double num2). This method should return num1 to the power num2. Invoke both the methods and test the functionality. Also count the number of objects created.

4) a) Accept a String and a number „n“ from user. Divide the given string into substringseach of size „n“ and sort them lexicographically.
b) Accept an array of strings and display the number of vowels and consonants occurredin each string.
c) Accept two strings from the user and determine if the strings are anagrams or not.

5) a) Create a multilevel inheritance for classes vehicle, brand and cost. The vehicle class determines the type of vehicle which is inherited by the class brand which determines the brand of the vehicle. Brand class is inherited by cost class, which tells about the cost of the vehicle. Create another class which calls the constructor of cost class and method that displays the total vehicle information from the attributes available in the super classes.
b) Create an inheritance hierarchy of Figure_3D, Cylinder, Cone, Sphere etc. In the base class provides methods that are common to all Figure_3Ds and override these in the derived classes to perform different behaviors, depending on the specific type of Figure_3D. Create an array of Figure_3D, fill it with different specific types of Figure_3Ds and call your base class methods.

6) a) Design a package to contain the class Student that contains data members such asname, roll number and another package contains the interface Sports which contains somesports information. Import these two packages in a package called Report which process both Student and Sport and give the report.
b) Write a program that accepts values of different data types and convert them tocorresponding wrapper classes and display using the vector

7) a) Write a program to generate a set of random numbers between two numbers x1 and x2, and x1>0.
b) Write a program to implement a new ArrayList class. It should contain add(), get(), remove(), size() methods. Use dynamic array logic.
c) Create an employee class containing at least 3 details along with Id, setters, and getters.Insert the employee objects dynamically key as employee id and value as it“s corresponding object into a HashMap. Perform Id based search operation on the HashMap.

8) a) Write a program that reads file name from the user then displays information about that file, also read the contents from the file in byte stream to count the number of alphabets, numeric values, and special symbols. Write these statistics into another file using bytestreams.Write a program that reads a CSV file containing a super market data containing product ID, Name, Cost and Quantity of sales and calculate the total revenue of the supermarket also sort the products in the order of their demand.
b) Write a program that reads a text file containing some technical content and identify the technical terms and sort them alphabetically.
Note: use a file containing stop words (general English and Grammar terms as many as possible)

9) a) Write a program that reads two numbers from the user to perform integer division into Num1 and Num2 variables. The division of Num1 and Num2 is displayed if they are integers. If Num1 or Num2 were not an integer, the program would throwa Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception.

b) Create a user defined exception.

10) a) Write a program that creates 3 threads by extending the Thread class. First thread displays "Good Morning" every 1 sec, the second thread displays "Hello"every 2 seconds and the third displays Welcome" every 3 seconds. (Repeat the same by implementing Runnable).
b) Write a program to illustrate Thread synchronization.

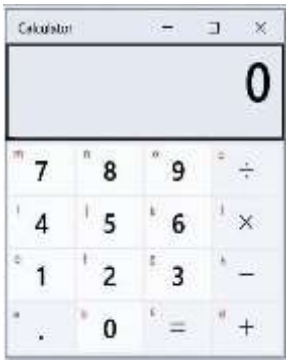
11) a) Create a JApplet that displays a message which is scrolling from left to right. b) Write a program that displays a sample registration page using Swing ontrols useappropriate layout managers.
b) Write a program for handling mouse events with adapter classes.

12) a) Create an interface containing 3 radio buttons named line, rectangle, and oval. Based on the radio button selected, allow user to draw lines, rectangles, or ovalsas per the locations selected by the user.
b) Write a program to create a Table inside a JFrame.
c) Create an interface that illustrates JFileChooser class and read CSV filecontaining employee data of various departments and display the records department wise on the interface.

13) a)Check all the fields filled or not, display success dialogue if all fields are filled withthe help of ActionListener for program.
b). Display respective error dialogue if afield is empty.

14) Write a program to create three JSliders where each represents colors RED, GREEN and BLUE. Each slider has a value from 0 to 255. The background color of the applet is set based on the values retrieved from each slider to form a color using the color class constructor. On sliding any slider, the background color of the applet changes.

15) Complete the code to develop an ADVANCED CALCULATOR that emulates all the functions of the GUI Calculator as shown in the image.



TEXT BOOKS:

1. Herbert Schildt, *Java The complete reference*, 11th Edition, McGrawHill, 2019
2. Timothy budd, *An introduction to object-oriented programming*, 3rdEdition, Pearson Education, 2009.

REFERENCE BOOKS:

1. Cay S. Horstmann, Core Java Volume I–Fundamentals, 11th Edition, Pearson 2019.
2. Y. Daniel Liang Introduction to Java Programming Comprehensive Version, 10th Edition, Pearson, 2015.
3. Bruce Eckel, Thinking in Java, 4th Edition, Prentice Hall, 2006.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS2208	**Python Programming (Skill Course-2)**	L	T	P	Int.	Ext	**3**
		1	**0**	**2**	**50**	**50**	

COURSE OBJECTIVES:

1. Learn basic programming of Python.
2. To develop programs using Python packages.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Develop the Python programs using operators, conditional and looping statements andstrings.
CO2: Implement programs using functions and different types of Data structures.3: Develop the programs using Python Packages, OOP concepts.

MODULE-I

Week 1: Introduction:

History of Python, Need of Python Programming, Python Installation, Python basics.

Week 2: Operators in python, conditional statements

1. Accept two numbers from the user and calculate Addition, Subtraction, multiplication and Division.
2. Write a Program for checking whether the given number is an even number or not.
3. Given a two integer numbers return their product and if the product is greater than 1000, then return their sum.
4. A student will not be allowed to sit in exam if his/her attendance is less than 75%. Take following input from user - Number of classes held, Number of classes attended, and print percentage of class attended Is student is allowed to sit in examor not.

Week 3: Iterations, continue and break statements.

1. Print the following pattern

```
1
1 2
1 2 3
1 2 3 4
```

2. Accept number from user and calculate the sum of all number between 1 and given number
3. Given a number count the total number of digits in a number

Week 4: Strings, string functions, string slicing

1. Given 2 strings, s1 and s2, create a new string by appending s2 in the middle of s1.
2. Given a string input Count all lower case, upper case, digits, and special symbols.
3. Given an input string, count occurrences of all characters within a string.

MODULE-II

Week 5: Lists and Tuples

1. Write a Python program to get the largest number and smallest number from a list.
2. Write a Python program to remove duplicates from a list.
3. Write a Python program to find the length of a tuple.
4. Write a Python program to convert a list to a tuple.

Week 6: Sets and Dictionaries

1. Dictionaries and dictionary methods, Sets and set methods.
2. Write a Python script to merge two Python dictionaries
3. Write a Python program to sort a dictionary bykey
4. Return a set of identical items from a given two Python set

Week 7: Functions:

(Defining Functions, Calling Functions, Passing Arguments, Anonymous Functions, Fruitful Functions (Function Returning Values)

1. Write a Python program to reverse a string using functions
2. Write a Python function to check whether a number is perfect or not
3. Write a function unique to find all the unique elements of a list.

Week 8: Recursion

1. Write a Python program to get the factorial of a non-negative integer using Recursion
2. Write a Python program to solve the Fibonacci sequence using recursion.

Week 9: Regular expressions: Metacharacters, Special Sequences, Sets, RegEx Function. File handling: modes, reading files, writing and closing files, Iterators, Generators, Filters and Lambda.

1. Write a Python program to find the substrings within a string
2. Write a Python program to Email id validation
3. Write a Python program to write a list to a file
4. Write a Python program to copy the contents of a file to another file

MODULE-III

Week 10: Modules:

Creating modules, import statement, from. Import statement, name spacing.

Python packages: Introduction to PIP, Installing Packages via PIP, Using Python Packages.

1. Install packages requests, flask and explore them. using (pip)
2. Write a script that imports requests and fetch content from the page. Eg. (Wiki)
3. Write a simple script that serves a simple HTTP Response and a simple HTML Page

Week 11: Basics of NumPy and Pandas packages, Basics of Matplotlib library.

1. Add the following two NumPy arrays and modify a result array by calculating the square of each element.
2. Write a Python program to convert a dictionary to a Pandas series

Week 12: OOP

a) Class variables and instance variable
i) Robot
ii) ATM Machine.

REFERENCE BOOKS:

1. Head-First Python: A Brain-Friendly Guide (2nd Edition).
2. Python Programming: An Introduction to Computer Science (3rd Edition)
3. Fluent Python: Clear, Concise, and Effective Programming (1st Edition)
4. Programming Python: Powerful Object-Oriented Programming (4th Edition)

Course Code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS2210	**NCC/NSS**	L	T	P	Int	Ext	0
		0	**0**	**2**	**0**	**0**	

NCC: NCC facility is provided for students to develop their leadership, character, comradeship,discipline, a secular outlook and spirit. The main function of NCC is to stand for the country in tough times or when in need to provide a suitable environment to motivate the youth to take up a career in the Armed forces. Students have to apply within the due date as soon as the academic session starts. They have to do at least 2 hours of service in a Week.

NSS : The core objective of N.S.S. (National Service Scheme) is to contribute towards national development and for the student's creative development. Various camps are organized from timeto time where students learn life skills, leadership and teamwork along with serving society. Students have to apply within the due date as soon as the academic session starts. They have to at least 2 hours of service in a Week.

B. Tech Computer Science and Engineering (R-22 Regulation)
III Year – I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS3101	PC/PCC	Data Warehousing and Data Mining	3	0	0	30	70	100	3
CS3102	PC/PCC	Compiler Design	3	0	0	30	70	100	3
CS3103	PC/PCC	Computer Networks	3	0	0	30	70	100	3
CS3104	OEC/JOE	Open Elective – I:	3	0	0	30	70	100	3
CS3105	PEC	Elective-I	3	0	0	30	70	100	3
CS3106	PC/PCC	Computer Networks Lab	0	0	3	50	50	100	1.5
CS3107	PC/PCC	Data Mining Lab	0	0	3	50	50	100	1.5
CS3108	SAC/SC	Skill Course – 3 Web Technologies	1	0	2	50	50	100	2
CS3109	MC	Technical Communication & Soft Skills	2	0	0	100	0	100	0
Summer Internship – 1, Two months mandatory after 2nd year to be evaluated during 5th Semester			0	0	3	0	100	100	1.5
Total Credits									**21.5**

Title of the Program	L	T	P	Credits
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**3**	**1**	**0**	**4**

Elective-I Introduction to Data Science
Embedded Systems
Introduction to Internet of Things

Open Elective – I
Offered by Mechanical Engineering
Offered by Civil Engineering
Offered by ECE
Offered by CSE: **C++ Programming**
Offered by CSE(AI&ML)

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3101	Data warehousing and Data Mining	3	0	0	30	70	3

COURSE OBJECTIVES:

1: Illustrate the evolution and importance of Data Mining and its applications various types of data.
2: Explain the evolution of data warehouses and data mining systems, pre-processing techniques, OLAP operations and concepts of data cube.
3: Experiment with various data mining algorithms with association and correlations of frequent Patterns mining.
4: Experiment the principles of statistics with classification and clustering methods for mining patterns.
5: Illustrate the basic concepts of Clustering, types of clustering and graph mining approaches.

COURSE OUTCOMES:

At the end of the course student will be able to:

CO1: **Explain** the functionality of various data mining components and concepts of Data Pre-Processing.
CO2: **Explain** data ware house design and data cube technology for summarization and querying high dimensional data.
CO3: **Compare** and **contrast** the strengths and limitations of various data mining models.
CO4: **Apply** knowledge for various classification and prediction techniques for developing new Data Mining algorithms.
CO5: **Evaluate** various clustering analysis algorithms for designing new Data Mining algorithms.

UNIT-I

Introduction to Data Mining, Data pre-processing: Evolution of IT into DBMS, Motivation and importance of Data Warehousing and Data Mining, Kinds of Patterns, Technologies, Applications, Major Issues in Data Mining, Data Objects and Attributes Types, Statistical Descriptions of Data, Data Visualization, Estimating Data Similarity and Dissimilarity, Quality data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation.

UNIT-II

Data Warehouse, OLAP Technology and Data Cube Technology: Basic Concepts of Data warehouse, Data Modeling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI, Preliminary Concepts of Data Cube Computation, Data Cube Computation Methods: Multi-way Array Aggregation for Full Cube, Multi-dimensional Data Analysis in cube space.

UNIT-III

Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Item set Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP- Growth Approach, Mining Closed and Max Patterns, Pattern Evaluation Methods, Association mining in multi-level, multi-dimensional space.

UNIT-IV

Classification & Prediction: Basic Concepts, Decision Tree Induction, Bayes Classification, Rule- Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Classification by Back Propagation, Associative Classification, K-nearest neighbor classifier.

UNIT-V

Cluster Analysis: Basic Concepts and issues in clustering, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Evaluation of Clustering Solutions, Graph Mining Approaches.

TEXT BOOKS

1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei – Morgan Kaufmann publishers --3rd edition

REFERENCE BOOKS:

1. Introduction to Data Mining, Adriaan, Addison Wesley Publication
2. Data Mining Techniques, A.K.Pujari, University Press Data mining concepts by Tan, Steinbech, and Vipin Kumar - Pearson Edu publishers

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course Code	Title of the Course	Contact hours/week			Allotment of Marks		Credits
CS3102	**Compiler Design**	L	T	P	Internal	External	**3**
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. Learn about language processors, phases of compiler and Lexical Analyzer.
2. Learn about Syntax Analyzer and various types of parsers.
3. Learn about intermediate code generation.
4. Learn different code optimization techniques.
5. Learn symbol tables, run time environment, error handling, code generation and code scheduling.

COURSE OUTCOMES:

At the end of the Course student will be able to

CO 1: **Describe** the various phases of Compiler and generate tokens for the given program.
CO 2: **Explain** the working of syntax analyzer and generate a parsing table to parse a string.
CO 3: **Construct** intermediate code for the given parse tree.
CO 4: **Construct** an Optimized Code for the given intermediate code using different techniques.
CO 5: **Understand** the working of Code Generation, Code Scheduling, Symbol Tables, Run time Environment and Error Handling.

Unit I

Introduction Finite Automata & Lexical Analysis: Introduction to Compilers and Language processors, , Programming Language basics, Structure & Different Phases of a Compiler, Review of Compiler Structure, Structure of Optimizing Compilation, Compiler construction tools, Boot strapping, Cross compilers, Introduction to Lexical Analysis, Lexical Analyzers, Approaches to design Lexical Analyzers, Language for specifying lexical analyzers, Introduction to Finite automata, Regular Expressions & Languages, Recognition of Tokens, Transition Diagrams, Implementation of lexical analyzers, Lexical Analyzer Generator LEX.

Unit II

Syntax Analysis and Semantic Analysis: Syntactic Specification of Programming Languages, Context Free Grammars & Languages, Introduction to Parsers. Top-down parsing techniques: Brute force parsing, Recursive Descent Parsing, Predictive Parsing, Bottom up Parsing: Shift reduce parsing, Operator parsing, LR (k) parsing, Semantic Actions, Sy–ntax Directed Translations, Translation on the parse Tree, Implementation of Syntax Directed Translator.

Unit III

Intermediate Code Generation: Intermediate Codes, Syntax Directed translation to Postfix code, Syntax Trees, Intermediate Code Generation, Three Address Code-Translation of Expressions, Type Checking& Type Conversions.

Unit IV

Code Optimization: Principal sources of Code Optimization, Loop Optimization, Basic Blocks & Flow Graphs, DAG Representation of Basic Blocks, Applications of DAG, Local Optimization, Unreachable Code Elimination, Dead Code Elimination, Data Flow Analysis, Data Flow Equations & Computations, and Peep-Hole Optimization. Machine Dependent Optimizations, Overview of Informal Compiler Algorithm Notation (ICAN), If Simplification, Loop Simplification, Loop Inversion, Branch Optimization and Prediction.

Unit V

Code Generation, Code Scheduling, Symbol Tables, Run time Environment and Error Handling: Issues in Code Generation, Input to Code Generator, Instruction Selection, Register Allocation, Simple Target Machine Model, Program and Instruction Costs, Register allocation & Assignments, Code Generation Algorithm, Code Generators, Optimal Code Generation for Expressions, Code Generation From DAG, Contents of a Symbol Table, Data Structures forSymbol Tables, Run time Environments, Implementation of a simple Stack allocation, Heap Management, Block Structured Languages; Error Detection & Recovery, Lexical Phase Errors, Syntactic & Semantic Errors, Error Handling Routines.

Text Book:

1. Principles of Compiler Design by Aho,D. Ullman, Lam and Ravi Sethi, Pearson Education Second Edition.
2. Advanced Compiler Design and Implementation, Steven Muchnic, Elsevier Publications.

Reference Books:

1. Compiler Construction by Kenneth. C. Louden, Vikas Pub.House.
2. Compiler Design, A.A. Pentambekar, Technical Publications
3. Modern Compiler Design, Grune.D, Van Reeuwijk K, Bal H.E, Jacobs C J H, Langendoen K, Springer

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course Code	Title of the Course	Contact hours/week			Allotment of Marks		Credits
CS3103	**Computer Networks**	L	T	P	Internal	External	**3**
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. Provide a comprehensive understanding of data communication and networking principles.
2. Cover network components, topologies, and layered models, including the OSI and TCP/IP protocols.
3. Explore key topics like transmission media, routing algorithms, transport services, and congestion control.
4. Examine modern networking trends such as delay-tolerant networking and content delivery networks.
5. Equip students with the knowledge needed to design and manage efficient network systems.

COURSE OUTCOMES:

CO 1: Illustrate the fundamental concepts of data communication and networking principles.

CO 2: Identify and explain the components, topologies, and layered models including OSI and TCP/IP protocols.

CO 3: Demonstrate knowledge of transmission media, routing algorithms, transport services, and congestion control techniques.

CO 4: Understand and analyze modern networking trends such as delay-tolerant networking and content delivery networks.

CO 5: Apply networking principles to design and manage efficient network systems.

UNIT I

DATA COMMUNICATION: Characteristics, Components, Data flow, Network criteria, Topologies, Network model, Layered tasks, ARPANET, OSI model, TCP/IP protocol suite, Addressing.
PHYSICAL LAYER: Transmission Media: Guided and unguided, Connecting devices: Hub, switch, bridge, router, Gateway.

UNIT II

DATA LINK LAYER: Design issues, Error detection and correction, Elementary data link protocols, Sliding window protocols.
RANDOM ACCESS: ALOHA, CSMA/CD, CSMA/CA, Controlled access, Channelization, Wired LAN: IEEE Standards, Standard Ethernet, Wireless LAN:IEEE802.11, ATM: architecture, Layers.

UNIT III

NETWORK LAYER: Design issues, Routing algorithms, Internetworking, Network layer in the Internet**.**
CONGESTION CONTROL: Approaches to Congestion Control, Traffic-Aware Routing, Traffic Throttling, Load shedding, traffic shaping.
IP Addressing: IPv4 Addressing, Subnetting, IPv6 Addressing, Transition from IPv4 to IPv6.

UNIT IV

TRANSPORT LAYER: Transport services, Elements of transport Protocols, TCP and UDP.
DELAY-TOLERANT NETWORKING: DTN Architecture, the Bundle Protocol.

UNIT V

APPLICATION LAYER: Domain Name Space (DNS), SNMP, Electronic mail: MIME, SMTP, IMAP.
CONTENT DELIVERY: Content Delivery Networks, Peer-to-Peer Networks.

TEXTBOOK:

1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 5th Edition, Pearson New International Edition, 2016.
2. Behrouz A. Forouzan, Data Communication and Networking, 4th Edition, McGraw- Hill, 2017.

REFERENCE BOOKS:

1. William Stallings, Data and Computer Communication, 8th Edition, Pearson, PHI, 2013.

2. Douglas Comer, Internetworking with TCP/IP, 6th Edition, PHI, 2015.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106105183/

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotmentof Marks		Credits
		L	T	P	Int	Ext	
CS3104	C++ Programming (Open Elective-I)	3	0	0	30	70	3

COURSE OBJECTIVES

1. Describe the procedural and object oriented paradigm with concepts of classes, functions, data and objects.
2. Understand dynamic memory management techniques using constructors, destructors.
3. Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.
4. Classify inheritance with the understanding of early and late binding, usage of exception handling.
5. Demonstrate the use of various OOPs concepts with the help of programs.

COURSE OUTCOMES:

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

CO1: Describe how object-oriented programming differs from procedural programming and explain how data abstraction, encapsulation, inheritance, and polymorphism contribute to more effective software design.
CO2: Develop C++ programs that include class definitions with constructors, destructors, overloaded operators, overridden functions, friend functions, and inline functions to perform specific tasks.
CO3: Design and implement complex inheritance structures in C++, utilizing single, multilevel, multiple, hierarchical, and hybrid inheritance to solve advanced programming problems while managing private member access appropriately.
CO4: Analyze and debug C++ code to identify issues related to pointers, virtual functions, and polymorphism, including the correct use of the ‘`this`’ pointer, pointers to derived classes, and virtual function behavior.
CO5: Evaluate the design and effectiveness of exception handling in C++ programs, assessing the proper use of exception handling mechanisms, including the appropriateness of user-defined exceptions and multi-catch blocks.

UNIT-I

Introduction to OOPs: Procedural Paradigms, Object Oriented Paradigm, Concept of Data Abstraction Encapsulation, Inheritance and Polymorphism, Basics of Object Oriented Programming: benefits of OOP, Introduction to C++: data types, declarations, expressions and operator precedence, functions, scope of variables.

UNIT-II

Introduction to OOPs in C++: Classes and objects, Constructors & Destructors, Operator Overloading & function overriding, friend functions, inline functions

UNIT-III

Inheritance in C++: Derived classes, syntax of derived classes, making private members inheritable, single, multilevel, multiple, hierarchical, hybrid inheritance.

UNIT-IV

Polymorphism in C++: Pointers, virtual functions and polymorphism- pointers to objects, this pointer, pointers to derived classes, virtual and pure virtual functions, static functions.

UNIT-V

Exception handling in C++: Basics of Exception handling, Exception handling Mechanism, Throwing Mechanism, and Catching Mechanism, Multi Catch Block Mechanism, user defined exception.

TEXT BOOKS:

1. Object oriented Programming using C++: E. Balagurusamy, PHI.
2. Object Oriented Programming in C++: N. Barkakati, PHI.

REFERENCE BOOKS:

1. Object Oriented Programming through C++ by Robat Laphore.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045

Course code	Title of the Course	Contact Hours/week			Allotmentof Marks		Credits
		L	T	P	Int	Ext	
CS3105	Introduction to Internet of Things	3	0	0	30	70	3

Course objectives:

1. To learn the basics concept Internet of Things.
2. To study design principles.
3. To understand different sensors in IoT environment
4. To study basic building blocks of IoT devices.

Course Outcomes:

At the end of the Course, the Student will be able to:

CO1: Define the concepts of IoT along with its applications.

CO2: Build a prototype using Arduino Uno.

CO3: Identify different types of sensors, actuators and communicationProtocols.

CO4: Build a prototype using Raspberry pi.

CO5: Plan an IoT application to interact with Django.

UNIT-I

INTRODUCTION TO IoT: Microprocessor, Microcontroller, Embedded System, Definition of IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, IoT Enabling Technologies, IoT levels & Deployment Templates, IoT Applications. (Text Book 1,3)

UNIT-II

IOT WITH ARDUINO: Introduction to the Arduino, Creating an Arduino programming Environment, Using the Arduino IDE, Creating an Arduino program, Using Libraries, Working with Digital Interfaces, Interfacing with Analog devices, Adding Interrupts, Communicating with devices, Using sensors, Working with Motors, Using an LCD. (Text Book -2)

UNIT-III

SENSORS AND ACTUATORS: Introduction, Sensor, Types of Sensors, Actuators, classification of Actuators. **TECHNOLOGIES USED IN IoT:** Bluetooth, Bluetooth Low Energy (BLE), WiFi, LiFi, Cellular Networks, Z-Wave,X-10,Sig fox, ZigBee, LoRa WAN, 6LowPAN, 5-G, LPWAN, RFID and NFC,WSN. **COMMUNICATION PROTOCOLS:** CoAP, MQTT, XMPP, DDS, AMQP, REST,HTTP (Text Book- 3)

UNIT-IV

IoT WITH RASPBERRY PI : IoT PHYSICAL DEVICES & ENDPOINTS: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Controlling LED with Raspberry Pi, Interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi. (Text Book -1)

UNIT-V

IoT PHYSICAL SERVERS & CLOUD OFFERINGS: Python Packages for IoT, WAMP - AutoBahn for IoT, Python Web Application Framework – Django, Amazon Web Services for IoT,SkyNet IoT messaging platform (Text book- 1)

TEXT BOOKS:

1. Vijay Madisetti and Arshdeep Bahga, *Internet of Things (A Hands-on-Approach)*, 1st Edition, VPT, 2016.
2. Richard Blum,*Arduino Programming in 24 Hours*, Sams Teach Yourself, Pearson Education,2017.
3. Jain, Prof. Satish, Singh, Shashi, *Internet of Things and its Applications*, 1st Edition, BPB, 2020.

REFERENCES:

1. Donald Norris, *Internet of things_ do-it-yourself projects with Arduino, Raspberry Pi, and Beagle BoneBlack*,1st Edition, McGraw-Hill, 2015.
2. Adeal Javed Lake Zurich, Illinois, *Building Arduino Projects for the Internet: Experiments with Real-World Applications*, 1st Edition,USA, A press, 2016.
3. Yashavant Kanetkar, Shrirang Korde, *21 IOT Experiments*, 1st Edition, BPB Publications, 2018.
4. Dr. Rajesh Singh, Dr. Anita Gehlot, Dr. Lovi Raj Gupta, Navjot Rathour, Mahendra Swain, BhupendraSingh, *IoT based Projects Realization with Raspberry Pi, NodeMCU and Arduino*, 1st Edition, BPB Publications, 2020.

WEB REFERENCES:

1. https://www.arduino.cc/reference/en
2. https://create.arduino.cc/projecthub
3. https://maker.pro/raspberry-pi/tutorial
4. https://projects.raspberrypi.org/en/projects
5. https://www.digikey.com/en/maker/blogs/2019/how-to-use-mqtt-with-the-raspberry-pi

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3105	Embedded Systems	3	0	0	30	70	3

Course Objectives:

1. Understand the fundamental principles of embedded systems.
2. Identify and describe core components of embedded systems.
3. Develop skills in embedded firmware programming.
4. Implement real-time operating systems (RTOS) for embedded applications.
5. Integrate and test embedded systems.

Course Outcomes:

At the end of the course student will be able to

1. Define embedded systems and differentiate them from general computing systems.
2. Explain the core components of embedded systems, including microcontrollers, memory, sensors, and actuators.
3. Develop embedded firmware using programming languages such as C and C++.
4. Analyse the requirements for designing and implementing real-time operating systems (RTOS) for embedded applications.
5. Integrate hardware and software components and conduct testing and debugging of embedded systems.

UNIT 1: INTRODUCTION TO EMBEDDED SYSTEMS (10 HOURS)

Definitions and Characteristics: Definition of embedded systems, **Key characteristics**: real-time operation, resource constraints, and specific functionality, **Comparisons with General Computing Systems:** Differences in architecture, performance, and application Examples of embedded vs. general-purpose systems, **Historical Development:** Evolution of embedded systems from early applications to modern IoT devices Key milestones in embedded technology, **Classification:** Types of embedded systems (e.g., standalone, networked, mobile), Application-specific classifications (automotive, consumer electronics, industrial).

UNIT 2: CORE COMPONENTS OF EMBEDDED SYSTEMS (15 HOURS)

Microcontrollers and Microprocessors: Differences between microcontrollers and microprocessors, popular architectures (ARM, AVR, and PIC) **Memory Types:** RAM, ROM, Flash Memory, EEPROM, and their applications, **Sensors:** Types of sensors (temperature, pressure, motion, etc.), Sensor interfacing and calibration techniques, **Actuators:** Types of actuators (motors, relays, and solenoids), Control mechanisms for actuators, **Communication Interfaces:** Overview of I2C, SPI, UART, and CAN protocols

UNIT 3: EMBEDDED FIRMWARE DEVELOPMENT (10 HOURS)

Overview of Design and Development Processes: Software development lifecycle in embedded systems, **Programming Languages:** Introduction to assembly language and its

applications, **Development Environments:** Integrated Development Environments (IDEs) and tool chains (e.g., Kiel, MPLAB, Arduino IDE), Debugging tools and techniques (JTAG, SWD), **Case Studies of Firmware Implementations:** Real-world examples of firmware in consumer and industrial applications

UNIT 4: REAL-TIME OPERATING SYSTEMS (RTOS) (15 HOURS)

Basics of Operating Systems Relevant to Embedded Systems: Difference between general-purpose OS and RTOS, Examples of popular RTOS (FreeRTOS, VxWorks, RTEMS) **Concepts of Tasks and Threads:** Definition and differences between tasks and threads Task states and lifecycle management. **Task Scheduling:** Scheduling algorithms (pre-emptive, cooperative, and rate-monotonic), Real-time scheduling challenges, **Inter-Process Communication:** Mechanisms for IPC (semaphores, message queues, shared memory), Synchronization techniques in multitasking environments, **Case Studies of RTOS Applications:** Examples of RTOS in automotive, robotics, and telecommunications

UNIT 5: INTEGRATION AND TESTING OF EMBEDDED SYSTEMS (10 HOURS)

Techniques for Hardware and Firmware Integration: Strategies for integrating hardware components with firmware, Importance of hardware abstraction layers (HAL) **Various Testing Methodologies:** Unit testing, integration testing, system testing Automated testing frameworks and tools **Debugging Techniques:** Troubleshooting common issues in embedded systems **Case Studies:** Analysis of integration and testing in successful embedded projects.

TEXTBOOKS:

1. “Introduction to Embedded Systems" by Shibu K V, 2nd Edition
2. "Embedded Systems: Architecture, Programming, and Design" by Rajkamal, 3rd Edition
3. "Embedded Systems Design: A Unified Hardware/Software Introduction" by Frank Vahid and Tony Givargis, 1st Edition
4. "Embedded Systems" by Lyla B. Das, 1st Edition
5. "An Embedded Software Primer" by David E. Simon, 1st Edition

REFERENCE BOOKS:

1. "Programming Embedded Systems in C and C++" by Michael Barr, 2nd Edition
2. "Embedded Systems: Real-Time Interfacing to Arm Cortex-M Microcontrollers" by Jonathan Valvano, 5th Edition
3. "Computers as Components: Principles of Embedded Computing System Design" by Wayne Wolf, 4th Edition

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course Code	Title of the Course	Contact hours/week			Allotment of Marks		Credits
CS3105	Introduction to Data Science	L	T	P	Internal	External	3
		3	0	0	30	70	

Course Objectives:

The objective of this course is to provide a comprehensive understanding of data science, its significance, applications, and relationship with other fields. The course will cover data analysis methods, including descriptive, diagnostic, predictive, prescriptive, and regression, and introduce supervised and unsupervised learning techniques. The course will equip students with the necessary skills to approach data problems systematically and ethically, using appropriate tools and methodologies.

Course Outcomes:

CO 1: Illustrate the Data Science Methodology.
CO 2: Identify different sources of Data and Demonstrate different computing tools involved in data handling.
CO 3: Demonstrate various Techniques involved in Data analysis and Analytics
CO4: Understanding of when to use supervised and unsupervised statistical learning methods on labeled and unlabeled datasets
CO 5: Apply domain expertise to solve real world problems using data science

UNIT I

Introduction: What Is Data Science, Where Do We See Data Science, How Does Data Science Relate to Other Fields, The Relationship between Data Science and Information Science, Computational Thinking, Skills for Data Science, Tools for Data Science, Issues of Ethics, Bias, and Privacy in Data Science .

UNIT II

Data: Introduction, Data Types, Structured Data, Unstructured Data, Challenges with Unstructured Data, Data Collection, Open Data, Social Media Data, Multimodal Data, Data Storage and Presentation, Data Pre-processing, Data Cleaning, Data Integration, Data Transformation, Data Reduction, Data Discretization.

UNIT III

Techniques: Introduction , Data Analysis and Data Analytics, Descriptive Analysis, Variables, Frequency Distribution, Measures of Centrality, Dispersion of a Distribution, Diagnostic Analytics, Correlation, Predictive Analytics, Prescriptive Analytics, Exploratory Analysis, Mechanistic Analysis, Regression.

UNIT IV

Supervised Learning: Introduction, Logistic Regression, Softmax Regression, Classification with kNN, Decision Tree, Decision Rule, Classification Rule, Association Rule, Random Forest, Naïve Bayes, Support Vector Machine (SVM)
Unsupervised Learning: Introduction, Agglomerative Clustering, Divisive Clustering, Expectation Maximization (EM)

UNIT V

Applications, Evaluations, and Methods: Hands-On with Solving Data Problems: Introduction, Collecting and Analyzing Twitter Data, Collecting and Analyzing YouTube Data , Data Collection, Experimentation, and **Evaluation:** Introduction, Data Collection Methods, Surveys, Survey Question Types, Survey Audience, Survey Services, Analyzing Survey Data, Pros and Cons of Surveys, Interviews and Focus Groups, Why Do an Interview?, Why Focus Groups?, Interview or Focus Group Procedure, Analyzing Interview Data, Pros and Cons of Interviews and Focus Groups, Log and Diary Data, User Studies in Lab and Field, Picking Data Collection and **Analysis Methods:** Introduction to Qualitative Methods, Mixed Method Studies, Evaluation, Comparing Models, Training–Testing and A/B Testing, Cross-Validation

Text Book:

1. Chirag Shah, 2020, A Hands-On Introduction to Data Science, Cambridge University Press

Reference Books:

1 .Jeffrey S. Saltz, Jeffrey M. Stanton, 2018, An Introduction to Data Science, SAGE Publications
2. Joel Grus, 2015, “Data Science from Scratch”.
3. Lillian Pierson, Jake Porway, “Data Science for Dummies”, 2nd Edition, For Dummies, 2017

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course Code	Title of the Course	Contact hours/week			Allotment of Marks		Credits
CS3106	Computer Networks Lab	L	T	P	Internal	External	1.5
		0	0	3	50	50	

COURSE OBJECTIVES:

1. Provide hands-on experience with various networking tools, devices, and protocols.
2. Teach students to create network cables and analyze network packets using tools like Wireshark.
3. Explore network simulators such as NS2 and CISCO Packet Tracer.
4. Cover different network topologies, error detection and correction techniques.
5. Develop practical skills in socket programming for TCP and UDP protocols, as well as Configuring, analyzing, and troubleshooting network systems.

COURSE OUTCOMES:

At the end of the course student will be able to

CO 1: Demonstrate the ability to create and implement different types of network cables, and connect computers in a Local Area Network.
CO 2: Illustrate the use of Wire Shark Packet Analyzer Tool to capture and analyze network packets in peer-to-peer mode.
CO 3: Utilize network simulators like NS2 and CISCO Packet Tracer to study and configure various network topologies and protocols.

CYCLE-1

1. Study of different types of network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of network devices in detail
3. Connect the computer in Local Area Networks
4. Studyof Network Simulator (NS 2) and CISCO Packet Tracer.
5. Demonstrate the packets captured traces using Wire shark Packet Analyzer Tool for peer to peer mode.
6. Network Topology: Bus Topology, RING Topology, and STAR Topology.
7. Write a Program with following four options to transfer
   a) Characters separated by space
   b) One Strings at a time
   c) One Sentence at a time
   (To demonstrate Framing, Flow control, Error control).

CYCLE-2

8. Write a program for error detection and correction for 7/8 bits ASCII codes using Hamming Codes or CRC.
9. Write a program to simulate Go Back N and Selective Repeat Modes of Sliding Window Protocol in peer to peer mode
10. Write a program using TCP socket for wired network for following
    a) Say Hello to Each other
    b) File transfer
11. Write a program using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines.
12. Development of applications such as E – mail/ Multi – user Chat.

REFERENCE BOOKS:

1. Internet and Web Technologies by Raj Kamal, TataMcGraw-Hill
2. Programming the World Wide Web by Robert W. Sebesta, PearsonEducation.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS3107	Data Mining Lab	L	T	P	Int.	Ext	1.5
		0	0	3	50	50	

COURSE DESCRIPTION:

The purpose of this course is to impart knowledge on the basic principles of object oriented software engineering and enabling the learner to understand software lifecycle stages by using UML diagrams. Systematic development of software products or solutions is emphasized throughout the course to enable the student ensure quality of development activities.

COURSE OBJECTIVES:

1. Apply the various data analysis techniques in R Programming language.
2. Construct and demontrate various data mining techniques available in WEKA for generating knowledge such as Association Analysis, Classification and Clustering to various standard datasets and own datasets.

COURSE OUTCOMES:

CO1: Apply R programs to perform several data analytics operations on datasets.
CO2: Ability to extract patterns by applying appropriate data mining techniques from different types of datasets using WEKA.

Module 1: Exploratory data analysis using R:

1. Study of R commands homogeneous and heterogeneous data structures such as vector, matrix, array, list, data frame in R.
2. Load the 'iris. CSV' file and display the names and type of each column. Find statistics such as min, max, range, mean, median, variance, standard deviation for each column of data.
3. Run R scripts using conditional statements, and loop constructs.
4. Write R program to normalize the numerical attributes of iris data ((sepal length/ sepal width/ petal length/ petal width etc.) into 0 to 1 scale using min-max normalization and z-score normalization.
5. Use R to apply linear regression to predict evaporation coefficient in terms of air velocity using the data given below: Air Velocity (cm/sec) 20,60,100,140,180,220,260,300,340,380 Evaporation Coefficient (sqmm/sec) 0.18, 0.37, 0.35, 0.78, 0.56, 0.75, 1.18, 1.36, 1.17, 1.65.
6. Generate histograms and boxplots for any one variable (sepal length/ sepal width/ petal length/ petal width etc.) for each class of iris database.

Module 2: WEKA Knowledge Extraction toolkit

7. Create an ARFF (Attribute-Relation File Format) file and read it in WEKA. Convert. ARFF file into .CSV and vice versa.

8. Performing data pre-processing in Weka Study Unsupervised Attribute Filters such as Replace Missing Values to replace missing values in the given dataset, Add to add the new attribute Average, Discretize to discretize the attributes into bins.
9. Classification using the WEKA toolkit Demonstration of classification process using id3 algorithm on categorical dataset (weather). Demonstration of classification process using naïve Bayes algorithm on categorical dataset ('vote'). Demonstration of classification process using Random Forest algorithm on datasets containing large number of attributes.
10. Classification using the WEKA toolkit - Demonstration of classification process using J48 algorithm on mixed type of dataset after discretizing numeric attributes. Perform cross-validation strategy with various fold levels. Compare the accuracy of the results.
11. Performing clustering in WEKA Apply hierarchical clustering algorithm on numeric dataset and estimate cluster quality. Apply DBSCAN algorithm on numeric dataset and estimate cluster quality.
12. Association rule analysis in WEKA Demonstration of Association Rule Mining on supermarket dataset using Apriori Algorithm with different support and confidence thresholds. Demonstration of Association Rule Mining on supermarket dataset using FP-Growth Algorithm with different support and confidence thresholds.

REFERENCE BOOKS:

1. Beginner's Guide for Data analysis using R Programming by Dr Jeeva Jose, Khanna book Publishing.
2. The art of R Programming, A Tour of Satistical Software Design by Norman Maltoff, No starch Press.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
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Course Code	Title of the Course	Contact hours/week			Allotment of Marks			Credits
CS3108	Web Technologies	L	T	P	Internal	External	Total	2
		1	0	2	50	50	100	

Course Objectives:

1. Understand client-server architecture and its role in web application development.
2. Develop web applications using HTML and PHP technologies.
3. Gain project-based experience to prepare for a career in web application development.

Course Outcomes:

At the end of the Course student will be able to
CO 1: Design static and dynamic web pages using HTML, CSS and JavaScript.
CO 2: Develop Server Side Scripts for insert, update, modify, and retrieve data from the server using PHP for an Application.

LIST OF EXPERIMENTS

Week 1 & Week 2:
HTML Tags:

1. Design static web pages for home page that comprises of 3 frames. Top frame consists of Logo and title of the web page. Left frame comprises of links to different web pages and Right frame is used to display the content of web pages.
2. Left frame has links to Registration page, Login page, Contact us etc..
3. Login page has username and password fields along with submit button, forgot password and sign up hyperlinks.
4. Registration page has username, password, confirm password, email-id, Mobile Number, Date of birth, Address, Gender fields, submit button etc.

Week 3:
CSS:

5. Apply styles to web pages using inline.
6. Apply styles to web pages using embedded.
7. Apply styles to web pages using external style sheets.

Week 4 and Week 5:
JAVA SCRIPT:

8. Create a form similar to the one in previous experiment. Put validation checks on values entered by the user using JavaScript (such as age should be a value between 1 and 150).
9. Write a JavaScript program to display information box as soon as page loads.

10. Write a JavaScript program to change background color after 5 seconds of page load.
11. Write a JavaScript program to dynamically bold, italic and underline words and phrases based on user actions.
12. Write a JavaScript program to display a hidden div (e.g. showing stats of a player when user clicks on his name).
13. MySql Queries.

Week 6 and Week 7:
PHP:

14. Basic PHP Programs.

Week 8 and Week 9:
PHP and MySQL:

15. Perform insert, update, and retrieval and delete a record from database using Php and HTML.

Week 10:

16. Application

Text Book:

1. Programming the World Wide Web, 8th Edition, Robert W. Sebesta, Pearson.
2. Introduction to JavaScript Object Notation by Lindsay Bassett, O'Reilly Media, 2015.
3. Learning PHP, MySql, Robin Nixon.

Reference Books:

1. Web Programming, building internet applications, 2nd Ed., Chris Bates, Wiley Dreamtech.
2. Programming PHP, Kevin Tatroe, Peter MacIntyre & Rasmus Lerdorf foreword by Michael Bourque.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course Code	Title of the Course	Contact hours/week			Allotment of Marks		Credits
		L	T	P	Internal	External	
CS3109	Technical Communication & Soft Skills	2	0	0	100	0	0

Prerequisite (s)	Knowledge of communication skills, work ethic, leadership, personal responsibility, empathy, leadership, sense of responsibility, integrity, self-esteem, self- management, motivation, flexibility, sociability, time management and making decisions.	**Ext. Exam Time 3 Hrs.**

Course Objectives:

- By the end of the soft skills training program, the students should be able to:
- Develop effective communication skills (spoken and written).
- Develop effective presentation skills.
- Conduct effective business correspondence and prepare business reports which produce results

Course Outcomes:

CO 1: **Develop** effective communication skills (spoken and written)..
CO 2: **Develop** effective presentation skills.
CO 3: **Conduct** effective business correspondence and prepare business reports which produce results

UNIT I

Introduction to Soft Skills: Communication – Verbal and Non-Verbal Communication - Personal grooming (Etiquette, Attitude, Body Language), Posture, Gestures, Facial Expressions, Eye Contact, Space Distancing, Presentation Skills, Public Speaking, Just a Minute (JAM) sessions, Adaptability

UNIT II

Goal Setting and Time Management: Immediate, Short term, Long term, Smart Goals, Strategies to Achieve goals, Types of Time, Identifying Time Wasters, Time Management Skills, Stress Busters.

UNIT III

Leadership and Team Management: Qualities of a Good Leader, Team Dynamics, Leadership Styles, Decision Making, Problem Solving, Negotiation Skills.

UNIT IV

Group Discussions: Purpose (Intellectual ability, Creativity, Approach to a problem, Tolerance), Group Behavior, Analyzing Performance.

UNIT V

Job Interviews: Identifying job openings, Covering Letter and CVs / Resumes, Interview (Opening, Body-Answer Q, Close-Ask Q), Telephone Interviews, Types of Questions.

Text Books:

1. English for Careers (ISBN: 9788131768846)
2. Communication Skills and Soft Skills (ISBN: 9788131734537)
3. Communicative English for Engineers and Professionals (ISBN: 9788131732045)
4. Effective Communication and Soft Skills (ISBN: 9788131760345)

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
Honors 3-1	Advanced Data Structures	4	0	0	30	70	4

COURSE OBJECTIVES:

The objective of this course is to teach advanced concepts of data structures and their implementation. It covers essential topics for a computer science graduate, including AVL Trees, Red Black Trees, B-Trees, Suffix Trees, Tries, dictionaries, skip lists, hashing techniques, priority queues, heaps, Disjoint Set ADT, smart union algorithms, path compression, external sorting techniques, and recurrence equations. This course ensures a deep understanding of advanced data structures and their use in solving real time problems.

COURSE OUTCOMES:

At the end of the course student will be able to:

CO 1: Develop and **analyze** algorithms for implementing AVL Trees red-black trees, B-trees etc
CO 2: Understand the implementation of Hashing and dictionaries
CO 3: Apply concepts of Priority queues.
CO 4: Apply the concepts of Disjoint Set ADT
CO 5: Apply External Sorting for External memory devices.

UNIT-I

Trees: AVL Trees, Red Black Trees, Splay Trees, B-Trees. **Tree data structures for Strings**: Suffix trees, Tries.

UNIT-II

Dictionaries, Skip Lists and Hashing: Dictionary ADT and implementation. **Skip Lists**: Insertion and Deletion in skip Lists, Time complexity. **Hashing Functions**: Idea of Hashing, Multiplication, Middle of Square, Folding, Hash Tables, Linear Probing, Random Probing, Double Hashing, Quadratic Probing, Rehashing and Hashing with Chains.

UNIT-III

Priority Queues: Definition, Heaps, Insertion into Max Heap, Deletion from a Max Heap, Leftist Trees. **Applications of Priority Queues**: Heap sort, Machine Scheduling, Huffman codes.

UNIT-IV

Disjoint Set ADT: Equivalence relations, Dynamic Equivalence problem, Basic data structures, smart union algorithms, path compression, Analysis of union/find algorithm, applications of ADT Disjoint set.

UNIT-V

External Sorting: Model for external sorting, The simple algorithm, Multi-way Merge, Poly-phase Merge, Replacement Selection. **Recurrence Equations**: Introduction, Substitution, Induction, Characteristic Roots, generating Functions.

TEXT BOOKS:

1. Data Structures and Algorithm Analysis in C – Mark Allen Weiss, Pearson
2. Data Structures, algorithms and Applications in C++, Sartaj Sahani, 2nd Edition.

REFERENCE BOOKS:

1. Advanced Data Structures by Ikvinderpal Singh.

2. Data Structures and Algorithms: Concepts, Techniques and Applications – G.A.V.Pai, Tata Mc. Graw Hill Publishers.

3. Advanced Data Structures – Peter Brass, Cambridge University Press, 2008.

4. Data Structures, R Venkatesan, S Lovelyn Rose, WILEY Publishers.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
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Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
Minors 3-1	Operating Systems (Minor)	L	T	P	Int.	Ext	3
		3	0	0	30	70	

COURSE OBJECTIVES:

Analyze the structure of operating systems and to understand the role in managing services, system calls, and virtual machines and the concepts of process management, inter-process communication, classifying scheduling, and synchronization techniques. Evaluate the system model and deadlock characterization and compare the methods for handling deadlocks and memory management techniques. Design File System and Directory Structure and assess different allocation methods.

COURSE OUTCOMES:

At the end of the course student will be able to:

CO1: Assess the Operating System structure; classify OS services, and Virtual operating systems.
CO2: Solve solutions to overcome synchronization problems and analyze scheduling algorithms.
CO3: Understand the role of deadlocks and application of different strategies in handling deadlocks.
CO4: Compare various memory management techniques and different page replacement algorithms.
CO5: Evaluate how File System and Directory are organized, implemented and managed by OS.

UNIT-I

Introduction to Operating Systems: What Operating Systems do, Operating System Structure, Operations, Services, Types of perating Systems, System Calls, Types of System Calls and Virtual Machines.

UNIT-II

Process Management and Synchronization: Process Concepts, Operations on Processes, Inter Process Communication, Process Scheduling, Scheduling criteria, Scheduling Algorithms, Process Synchronization: The Critical Section Problem, Semaphores.

UNIT III

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Deadlock Detection, Recovery from Deadlocks.

UNIT IV

Logical versus Physical Address, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory, Demand Paging, Page Replacement.

UNIT V

Storage management: File Systems: File concepts, Access Methods, File System Structure and Implementation, Directory Implementation Allocation Methods.

Text Book:

1. Operating System Concepts: Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, John Wiley Publ., 8th Edition.
2. Modern Operating Systems, Andrew S. Tanenbaum, 2nd edition, 1995, PHI.

Reference Books:

1. Operating Systems, William Stallings 5th Edition -PHI
2. Operating Systems: A Practical Approach, Rajiv Chopra.

B. Tech Computer Science and Engineering (R-22 Regulation)

III Year – II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS3201	PC/PCC	Object Oriented Software Engineering	3	0	0	30	70	100	3
CS3202	PC/PCC	Artificial Intelligence	3	0	0	30	70	100	3
CS3203	PC/PCC	Cryptography & Network Security	3	0	0	30	70	100	3
CS3204	OEC/JOE	Open Elective - II : Programming in Java	3	0	0	30	70	100	3
CS3205	PEC	Elective – II	3	0	0	30	70	100	3
CS3206	PC/PCC	Software Engineering and Mini Project Lab (SEMP Lab)	0	0	3	50	50	100	1.5
CS3207	PC/PCC	Cryptography & Network Security Lab	0	0	3	50	50	100	1.5
CS3208	PEC	Elective – II Lab	0	0	3	50	50	100	1.5
CS3209	SAC/SC	Skill Course – 4 Design Thinking and Innovation	1	0	2	50	50	100	2
CS3210	MC	Essence of Indian Traditional Knowledge	3	0	0	30	70	100	0
Total Credits									**21.5**
Summer Industrial Research Internship (2 months) Mandatory									

Title of the Program	L	T	P	Credits
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**3**	**1**	**0**	**4**

Elective-II

Big Data Analytics
Introduction to Arduino and Raspberry Pi.
Machine Learning

Open Elective – II

Offered by Mechanical Engineering
Offered by Civil Engineering
Offered by ECE
Offered by CSE: Programming in Java
Offered by CSE (AI&ML)

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
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Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3201	Object-Oriented Software Engineering	3	0	0	30	70	3

COURSE OBJECTIVES:

1. Understand the importance of Object-Oriented Software Engineering in Software Development.
2. Elicit, analyze, and specify security requirements to develop problem statement and requirements.
3. Design UML Diagrams.
4. Acquaint with various architectural models and design patterns.
5. Develop and apply testing strategies.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Understand the concepts related to development of Software Engineering.
CO2: Apply the knowledge of requirements elicitation process.
CO3: Design the UML Diagrams for improving communication between client and developer.
CO4: Analyze architecture models and design patterns.
CO5: Apply anddevelops various testing strategies on the developed products.

UNIT-I

Introduction to Object Oriented Software Engineering: Nature of the Software, Types of Software, Software Engineering Projects, Software Engineering Activities, Software Quality, and Introduction to Object Orientation, Software Process Models-Waterfall Model, and Opportunistic Model, Phased Released Model, Spiral Model, Evolutionary Model, Concurrent Engineering Model.

UNIT-II

Requirements Engineering: Domain Analysis, Problem Definition and Scope, Requirements Definition, Types of Requirements, Techniques for Gathering and Analyzing Requirements, Requirement Documents, Reviewing, Managing Change in Requirements.

UNIT-III

Unified Modeling Language: Introduction to UML, Modeling Concepts: Systems, Models and Views Data Types, Abstract Data Types, Instances Classes, Abstract Classes, Objects, Event Classes, Events, and Messages Object-Oriented Modeling, Falsification and Prototyping. Types of UML Diagrams- **Structural diagrams**: Class Diagrams, Associations and Multiplicity, Labelling Associations, Validating associations, Reflexive Associations, Generalization, Component Diagrams, Deployment Diagrams, and Object Diagrams.

Behavioral Diagrams: Use Case Diagrams, Activity Diagrams, State Machine Diagrams, Sequence Diagrams.

UNIT-IV

Software Design and Architecture: Process of Design, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document; Pattern Introduction, Design Patterns: Abstraction-Occurrence Pattern, General Hierarchical Pattern, Play-Role Pattern, Singleton Pattern, Observer Pattern, Delegation Pattern, Adaptor Pattern, Façade Pattern, Immutable Pattern, Read-Only Interface Pattern and The Proxy Pattern; Software Architecture Contents of Architecture Model, Architectural Patterns: Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter and MVC Architectural Patterns.

UNIT-V

Software Testing: Overview, Testing Conventional Applications: **White-Box Testing**: Basis Path Testing: Flow Graph Notation, Independent Program Paths, Deriving Test Cases, Graph Matrices, Control Structure Testing: Condition Testing, Data Flow Testing, Loop Testing, **Black Box Testing**: Graph-Based Testing Methods, Equivalence Partitioning, Boundary Value Analysis, Orthogonal Array Testing. **Testing Activities**: Component Inspection, Usability Testing, Unit Testing, Integration Testing, System Testing. **Managing Testing**: Planning Testing, Documenting Testing, Assigning Responsibilities, Regression Testing, Automating Testing, Model based testing. Software Quality, Quality Attributes and Criteria, Introduction to Software Project Management.

CASE STUDY:

1. Simple Chat Instant Messaging System
2. GPS Based Automobile Navigation System
3. Waste Management Inspection Tracking System (WMITS)
4. Geographical Information System

TEXT BOOKS:

1. Object-Oriented Software Engineering Practical software development usingUML and Java by Timothy C. Lethbridge & Robert, Langaniere Mcgraw-Hill.
2. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia.

REFERENCE BOOKS:

1. Software Engineering: A Practitioner's Approach, Roger S Pressman.
2. A Practical Guide to Testing Object-Oriented Software, John D. McGregor; David A. Sykes, Addison-Wesley Professional.
3. Software Engineering, K.K. Agarwal, New Age Publications 2008.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
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Course Code	Title of the Course	Contact hours/week			Allotment of Marks		Credits
CS3202	Artificial Intelligence	L	T	P	Internal	External	3
		3	0	0	30	70	

COURSE OBJECTIVES:

The objective of this course is to learn about AI problems, production systems, and their characteristics. Students will understand the importance of search and the corresponding search strategies for solving AI problems. Additionally, the course will introduce students to planning, natural language processing, and expert systems.

COURSE OUTCOMES:

At the end of the course student will be able to

CO 1: Solve AI problems using the knowledge of state space search.
CO 2: Apply several optimal search strategies and heuristic techniques to solve AI problems.
CO 3: Learn relational, inferential, inheritable, and procedural knowledge and the corresponding knowledge representation approaches.
CO 4: Apply the concepts of reasoning under uncertainty to solve complex AI problems.
CO 5: Implement AI problem-solving approaches to develop natural language processing, planning, and expert systems.

UNIT I

Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, Problem Characteristics, Production Systems.

UNIT II

Search Techniques: Issues in The Design of Search Programs, Un-Informed Search, BFS, DFS; Heuristic Search Techniques: Generate-And- Test, Hill Climbing, Best- First Search, A* Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis.

UNIT III

Knowledge Representation using Rules: Procedural Vs Declarative Knowledge, Logic programming, Forward Vs Backward Reasoning, Matching Techniques, Partial Matching, RETE Matching Algorithm AI Programming languages: Overview of LISP and PROLOG, Production System in Prolog.

Symbolic Logic: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Unification & Resolution, Natural deduction.

Structured Representations of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts.

UNIT IV

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non-Monotonic Reasoning, **Statistical Reasoning**: Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster- Shafer Theory, Fuzzy Logic: Crisp Sets, Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences &Fuzzy Systems.

UNIT V

Natural Language Processing: Steps in the Natural Language Processing, Syntactic processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems

Planning: Componentsof a Planning System, Goal Stack Planning, Non- linear Planning using Constrait Posting, Hierarchical Planning, Reactive Systems.

Experts Systems: Overview of an Expert System, Architecture of an Expert Systems, Different Types of Expert Systems- Rule Based, Frame Based, Decision Tree based, Case Based, Neural Network based, Black Board Architectures, Knowledge Acquisition and Validation Techniques, Knowledge System Building Tools, Expert System Shells.

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TEXT BOOKS:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mcgraw-Hill Publications

REFERENCE BOOKS:

1. Artificial Intelligence, George F Luger, Pearson Education Publications
2. Artificial Intelligence: Amodern Approach, Russell and Norvig, Prentice Hall
3. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3203	Cryptography & Network Security	3	0	0	30	70	3

COURSE OBJECTIVES:

1. To introduce several issues in network security- its need and importance, taxonomy and terminology.
2. To learn various cryptographic techniques.
3. To understand Internet security protocols and standards.
4. To design security applications in the field of Information technology.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Classify network security attacks, services, mechanisms and classical encryption techniques.
CO2: Apply symmetric/asymmetric key cryptographic techniques to ensure privacy of data in transit.
CO3: Describe symmetric keys distribution techniques and public key Infrastructure (PKI).
CO4: Design new cryptographic protocols for different security applications.
CO5: Discuss intrusion detection techniques, Firewalls and malicious software.

UNIT-I

Overview: Computer Security Concepts, the OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, a Model for Network Security, Basics of Buffer Overflow**,** Software Security Issues**. Classical Encryption Techniques**: Symmetric Cipher Models, Substitution Techniques, Transposition techniques, Introduction to Steganography.

UNIT-II

Block Ciphers and the Data Encryption Standard: Stream Ciphers and Block Ciphers, the Data Encryption Standard (DES), A DES Example, the Strength of DES. **Advanced Encryption Standard**: AES Structure, AES Transformation Functions, AES Key Expansion. **Block Cipher Operations**: Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode. **Public-Key Cryptography and RSA**: Principles of Public Key Cryptosystems, the RSA Algorithm. **Other Public-Key Cryptosystems:** Diffie-Hellman Key Exchange, Elliptic curve Cryptography.

UNIT-III

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA-512). **Digital Signatures:** Digital Signatures, NIST Digital Signature Algorithm. **Key Management and Distribution:** Symmetric Key Distribution using Symmetric Key Encryption, Symmetric Key Distribution using Asymmetric Key Encryption, Distribution of public Keys, X.509 Certificates, Public-Key Infrastructure.

UNIT-IV

Transport-Level Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security, Transport Layer Security. **Electronic Mail Security**: Pretty Good Privacy, S/MIME. **IP Security**: Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations.

UNIT-V

Malicious Software: Types of Viruses, Virus Countermeasures, Worms, Distributed Denial Of Service Attacks. **Intruders:** Intruders, Intrusion Detection, Password Management. **Firewalls:** Need of Firewalls, Firewall Characteristics, Types of Firewalls, Configurations.

TEXT BOOKS:

Cryptography and Network Security Principles and Practice, William Stallings, Seventh Edition, Pearson Education.

REFERENCE BOOKS:

1. Computer Security - Principles and Practice, 4th Edition by William Stallings, Pearson Education.
2. Cryptography and Network Security, Atul Kahate, 4th Edition, Tata McGraw Hill Publications.
3. Cryptography and Network Security Behrouz A Frorouzan, Second Edition, Tata McGraw Hill Pub Company Ltd, New Delhi.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3204	Programming in Java (Open elective-II)	3	0	0	30	70	3

COURSE OBJECTIVES:

To familiarize students with Object Oriented Programming fundamental concepts and Java constructs such as syntax, data types, operators and create applications using Java classes and Libraries. Analyze the use of program control structures and functionality of constructors and overloading. Implementing inheritance mechanisms and multi-threading constructs and focusing on applet programming to create interactive Java applications.

COURSE OUTCOMES:

At the end of the course student will be able to:

CO1: Implement Object Oriented Programming strategies with Class libraries and interpret datatypes, operators, arrays, strings.

CO2: Analyze different control structures with the use of classes and objects, and implementation of constructors and overloading.

CO3: Design applications using concepts of inheritance and interfaces.

CO4: Evaluate the implementation of multithreading and exception handling in Java applications.

CO5: Design an interactive Java application interface using Applets.

UNIT-I

Java Programming Fundamentals: Java Language, Key Attributes of Object-Oriented Programming, Java Development Kit, Byte Code, Simple Program, Keywords, Identifiers, Data Types and Operators, Java Class Libraries, Arrays, Strings, Type Conversion.

UNIT-II

Program Control Structures: if, switch, for, enhanced for, while, do-while, break, continue. **Introduction to Classes, Objects and Methods**: Class Fundamentals, Objects creation, Methods, Returning a Value, Using Parameters, Constructors, Parameterized Constructors, new Operator, this Keyword, Passing Objects to Methods, Returning Objects, Method Overloading, Overloading Constructors.

UNIT-III

Inheritance: Basics, Member Access and Inheritance, Constructors and Inheritance, Using Super, Multilevel Hierarchy, Super class References and Subclass Objects, Method Overriding, Abstract Classes. **Interfaces:** Fundamentals, Creating and Implementing an Interface, Implementing Multiple Interfaces.

UNIT-IV

Packages: Package Fundamentals, Member Access, Importing Packages.
Exception Handling: Exception Hierarchy, Fundamentals, Handling errors, Multiple Catch, Throwing an exception, Using finally.

UNIT-V

Multi - Threading: Introduction to Threads, Creating a Thread, Life cycle of a Thread, Extending the Thread class, Implementing Runnable Interface.
Applet Programming: Introduction, building applet code, applet life cycle, about HTML, designing a web page.

Text Books:

1. Herbert Schildt, Dale Skrien, Java Fundamentals A Comprehensive Introduction, 1/e, Tata McGraw Hill, 2017.
2. Balagurusamy, Programming with JAVA, 2/e, Tata McGraw Hill, 2014.

Reference Books:

1. Herbert Schildt, The Java complete References, 9/e, Tata McGraw Hill, 2014.
2. Y. Daniel Liang, An Introduction to JAVA Programming, 10/e, Tata McGraw Hill.
3. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3205	Machine Learning	3	0	0	30	70	3

Course Objectives: The objective of this courses is to This course provide a comprehensive introduction to machine learning, covering fundamental concepts such as human learning, machine learning types, and key applications. It explores the process of preparing data, selecting and evaluating models, and improving model performance. The course delves into supervised and unsupervised learning techniques, including classification, regression, and clustering methods. Additionally, it introduces the basics of neural networks, discussing their architecture, learning processes, and deep learning techniques

Course Outcomes: At the end of the course the student is able to
CO1: Understand the concepts of Machine Learning and its types
CO2: Develop Machine Learning Models
CO3: Apply Classification Algorithms
CO4: Analyze Clustering Techniques
CO5: Create Neural Networks

UNIT – I

Introduction to Machine Learning: What is Human Learning? – Types of Human Learning – What is Machine Learning? – Types of Machine Learning – Problems not to be solved using Machine Learning – Applications of Machine Learning – Tools in Machine Learning – Issues in Machine Learning.

UNIT – II

Preparing to Model & Modelling and Evaluation

Introduction - Machine Learning Activities – Basic Types of data in Machine Learning – Exploring Structure of Data – Data Quality and Remediation – Data Pre-Processing.
Selecting a Model – Training a Model (for Supervised Learning) – Model Representation and Interpretability – Evaluating Performance of a Model – Improving performance of a model.

UNIT – III

Supervised Learning: Classification & Regression

Introduction – Example of Supervised Learning – Classification Model – Classification Learning steps – Common Classification Algorithms - Example of Regression – Common Regression Algorithms

UNIT – IV

Unsupervised Learning

Introduction – Unsupervised vs Supervised Learning – Applications of Unsupervised Learning – Clustering – Types of Clustering - Finding Pattern using Association Rule.

UNIT – V

Basics of Neural Network

Introduction – Understanding the Biological Neuron – Exploring the Artificial Neuron – Types of Activation Functions – Early Implementation of ANN – Architectures of Neural Network – Learning Process in ANN – Gradient Descent - Back Propagation – Deep Learning.

TEXT BOOKS:

1) Machine Learning by Saikat Dutt, Subramanian Chandramouli & Amit Kumar Das, Pearson.

REFERENCE BOOKS :

1. Introduction to Machine Learning - Alex Smola and S.V.N. Vishwanathan, Cambridge University Press.
2. Introduction to Machine Learning , 3rd Edition by Ethem Alpaydin, PHI
3. Machine Learning – Tom M Mitechell, Tata Mc Graw hill

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE
AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course Code	Title of the Course	Contact hours/week			Allotment of Marks		Credits
		L	T	P	Internal	External	
CS3205	Introduction to Arduino and Raspberry PI	3	0	0	30	70	3

COURSE OBJECTIVES:

1. To train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi and Arduino.
2. To focus on higher-level operating systems, advanced networking, user interfaces, multimedia and uses more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice.
3. To expose the student to other comparable platforms like Arduino.
4. To design and deploy multiple IoT devices that could connect to the gateway.

COURSE OBJECTIVES:

CO1: Understanding basic concepts of Arduino and Arduino IDE.
CO2: Familiar with Arduino libraries and Arduino programming.
CO3: Examine Raspberry Pi board features and familiar with basic concepts of Raspbian Linux.
CO4: Acquiring basic foundations of Python Programming and libraries for Raspberry Pi.
CO5: Develop IoT applications using Raspberry Pi board.

UNIT- I

The Arduino Environment: Introduction to the Arduino environment, the Arduino board, the Arduino IDE, and the Arduino- compatible shields together with their libraries. Arduino board main components, inputs, and outputs. Arduino Integrated Development Environment (IDE), Compiling Code, Arduino Shields and Libraries.

UNIT-II

Basics of C programming, composition of an Arduino programs, Arduino tool chain, Arduino IDE, basic structure of a sketch, including the use of the setup() and loop() functions. Accessing the pins from a sketch for input and output, introduction on debugging embedded software on an Arduino, UART communication protocol, Synchronization, parity and stop, the use of the Serial library to communicate with the Arduino through the serial monitor.

UNIT-III

Getting Started with Raspberry Pi Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behaviour of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and 15 booting the OS Basics of Linux and its use, main features including navigating the file system and managing processes, text-based user interface through the shell

UNIT- IV

Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operate the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface, Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow.

UNIT-V

Communication with devices through the pins of the Raspberry Pi, RPi.GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphic user interface.

TEXT BOOKS:

1. McGraw Hill Professional Massimo Banzi, "Getting Started with Arduino", First Edition, February 2009, O'Reilly Media, Inc.
2. Simon Monk, "Programming the Raspberry Pi: Getting Started with Python", January 2012.

REFERENCE BOOKS:

1. Eben Upton and Gareth Halfacree, "Raspberry Pi User Guide", August 2016, 4th edition, JohnWiley & Sons.
2. Alex Bradbury and Ben Everard, "Learning Python with Raspberry Pi", Feb 2014, John Wiley & Sons.
3. Michael Margolis, "Arduino Cookbook", First Edition, March 2011, O'Reilly Media, Inc

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course Code	Title of the Course	Contact hours/week			Allotment of Marks		Credits
CS3205	BIG DATA ANALYTICS	L	T	P	Internal	External	3
		3	0	0	30	70	

COURSE OBJECTIVES:

1. Understand the Big Data Platform and its Use cases
2. Provide an overview of Apache Hadoop
3. Provide HDFS Concepts and Interfacing with HDFS
4. Understand Map Reduce Jobs

COURSE OUTCOMES:

At the end of the course student will be able to
CO1: Understand concept of Big Data and Hadoop Eco System
CO2: Configure various Hadoop services in distributed environment
CO3: Analyze unstructured data using Map Reduce
CO4: Understand various advanced Map Reduce tasks for analyzing the data
CO5: Solve various real times problems using Hadoop and HBase

UNIT-I

Introduction to Big Data: Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data, Data in the Warehouse and Data in Hadoop, Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce. Introduction to Hadoop: Hadoop- definition, understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop

UNIT-II

Hadoop Architecture: History of Hadoop, building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker, YARN. Understanding MapReduce, Word count program using traditional method and conventional methods Components of Hadoop -Working with files in HDFS, Reading and writing the Hadoop Distributed File system –The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop commands , Hadoop Filesystem

UNIT-III

MapReduce: Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce . Anatomy of a MapReduce program, A Weather Dataset, Analyzing the Data with UnixTools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes, Hadoop Archives, Getting the patent data set, constructing the basic template of a Map Reduce program

UNIT-IV

MapReduce Advanced Programming: Advanced MapReduce - Chaining Map Reduce jobs, joining data from different sources, creating a Bloom filter, passing job-specific parameters to your tasks, probing for task-specific information, partitioning into multiple output files, inputting from and outputting to a database, keeping all output in sorted order.

UNIT-V

Graph Representation in Map Reduce: Modeling data and solving problems with graphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, Bloom Filter, Zookeeper – how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

TEXT BOOKS:

1. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch "Understanding Big
Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st Edition, TMH,2012.
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly

REFERENCE BOOKS:

1. Hadoop in Action by Chuck Lam, MANNING Publ.
2. Hadoop in Practice by Alex Holmes, MANNING Publishers
3. Mining of massive datasets, AnandRajaraman, Jeffrey D Ullman, Wiley Publications.
4. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions",Wiley,ISBN:9788126551071,2015.
5. Big Data Black Book (Covers Hadoop 2, Map Reduce, Hive, Yarn, Pig & amp; Data Visualization) - Dream Tech Publications
6. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
7. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.
8. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
9. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.
10. Jy Liebowitz, "Big Data and Business analytics", CRC press, 2013.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS,VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3206	Software Engineering & Mini Project LAB (SEMP Lab)	0	0	3	50	50	1.5

Course Description:

The purpose of this course is to impart knowledge on the basic principles of software engineering and enabling the learner to understand software lifecycle stages. Systematic development of software products or solutions is emphasized throughout the course to enable the student ensure quality of development activities. The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, **Rational Products/Visual Paradigm**. The course is realized as a project-like assignment that can, in principle, by a team of three/four students working full time. Typically the assignments have been completed during the semester by each project team. The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Term projects are projects that a group student might take through from initial specification to implementation by giving equal importance to both design and implementation

COURSE OBJECTIVES:

1. Provide Introduction to Software Engineering and process of Software production along with UML diagrams.
2. Facilitate Analysis of requirements for software solution development Learn to develop a Mini-Project.
3. Summarize architecture, design, and implementation considerations of software solution.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Design different Structural UML Diagrams for a project using Rationale Architect Software Designer.
CO2: To test the software system thoroughly for all scenarios.
CO3: Develop the contents of Mini-Project for a given problem.

Cycle I: Practicing UML diagrams using IBM Rational Rose/Visual Paradigm

Before developing a mini-project, in this cycle, the student is acquainted with different UML diagrams using Rational Rose. The experiments should include drawing UML diagrams listed below for two demo/example applications assigned by the lab Instructor. The input for the following experiments is problem statement for any two demo projects supplied by the instructor.

1. Introduction to Rational Rose and practicing the following diagrams
   a. Activity diagrams for the overall business process of the projects
   b. Use-case diagram for the demo projects along with Use-case descriptions and sub-diagrams for Use-cases.

2. Class diagram- Class diagrams including the features like classes, relationships, attributes and methods along with their visibilities.
3. Interaction diagrams- Sequence diagrams and Collaboration diagrams for different scenarios of the systems with all features like actors, objects and interactions.
4. Activity diagrams, State chart and other diagrams - Activity diagrams including the features like fork join and swim lanes. State diagrams including composite states and transitions. Component diagrams, Package diagrams and Deployment diagrams.
5. Forward and Reverser Engineering- Forward Engineering Class diagrams to classes in C++ and java and persistent classes to a database. Reverse Engineering C++ code, java code and a database.
6. Documentation using Rational Rose clear quest.

Cycle II: Mini-Project

The project deliverables include

- Problem statement
- Requirements Analysis
- Design
- A Software Design Description and a System Design.
- A test specification.
- Implementation
- Implement the assigned project with one of the following web technologies

Front end: Java technologies/PHP/MS.NET Technologies
Backend: Oracle/My-SQL/SQL-ServerTesting

REFERENCE BOOKS:

1. Project-based software engineering: An Object-oriented approach, EvelynStiller, Cathie LeBlanc, Pearson Education
2. Visual Modeling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Education.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
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RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

COURSE CODE	TITLE OF THE COURSE	CONTACT HOURS/ WEEK			ALLOTMENT OF MARKS		CREDITS
		L	T	P	Int.	Ext	
CS3207	Cryptography And Network Security Lab	0	0	3	50	50	1.5

COURSE OBJECTIVES:

1. To implement the essential cipher techniques.
2. To develop various symmetric/asymmetric and key exchange algorithms.

COURSE OUTCOMES:

At the end of the course student will be able to:

1: **Construct** new security applications by experimenting the cipher techniques.
2: **Apply** various cryptographic authentication techniques.
3. Design symmetric and asymmetric cryptographic protocols for secure data transmission.

MODULE-I

1. Write a C program to XOR the string "Hello World" with zero and print the result.
2. Write a C program to AND and XOR the string "Hello World" with 127 and print the result.
3. Write Java Program to Implement Hill cipher.
4. Java Program to Implement Caesar cipher.
5. Java Program to Implement Substitution cipher.
6. Java Program to implement play fair cipher.
7. Write a C/JAVA program to encrypt a text using Cipher Block Chaining using any of the above ciphers.
8. a) Implement the Euclid Algorithm to generate the GCD of 2 numbers.
   b) Write a program for primality testing.

MODULE-II

1. Java Program to implement the encryption and decryption of 8-bit data using Simplified DES Algorithm.
2. Implement RSA algorithm for encryption and decryption in Java.
3. Write a Java Program to generate the points on Elliptic curve cryptography for given parameters.
4. Implement Diffie Hellman Key exchange.
5. Calculate the message digest of SHA-1 in Java.
6. Implement Blowfish algorithm.
7. Implement Rijendal Algorithm.

REFERENCE BOOKS:

1. Cryptography and Network Security Principles and Practice, William Stallings, Seventh Edition, Pearson Education.
2. Computer Security - Principles and Practice, 4th Edition by William Stallings, Pearson Education.
3. Cryptography and Network Security, Atul Kahate, 4th Edition, Tata McGraw Hill Publications.
4. Cryptography and Network Security Behrouz A Frorouzan, Second Edition, Tata McGraw Hill Pub Company Ltd, New Delhi.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
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COURSE CODE	TITLE OF THE COURSE	CONTACT HOURS/ WEEK			ALLOTMENT OF MARKS		CREDITS
		L	T	P	Int.	Ext	
CS3208	MACHINE LEARNING LAB	0	0	3	50	50	1.5

COURSE OBJECTIVES:

This LAB course will enable students to

1. Make use of Data sets in implementing the machine learning algorithms.
2. Implement the machine learning concepts and algorithms in any suitable language of choice.

COURSE OUTCOMES:

At the end of the course student will be able to:

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

Implement the experiments using Python

List of Lab Experiments:

1. Write a program to demonstrate the working of the decision tree based **ID3 algorithm**. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
2. Build an Artificial Neural Network by implementing the **Back propagation algorithm** and test the same using appropriate data sets.
3. Write a program to implement the **naïve Bayesian classifier** for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
4. Assuming a set of documents that need to be classified, use the **naïve Bayesian Classifier** model to perform this task. Built-in classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
5. Write a program to construct a **Bayesian network** considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Python ML library classes/API.

6. Apply **EM algorithm** to cluster a set of data stored in a .CSV file. Use the same data set for clustering using ***k*-Means algorithm**. Compare the results of these two algorithms and comment on the quality of clustering. You can add Python ML library classes/API in the program.
7. Write a program to implement ***k*-Nearest Neighbor algorithm** to classify the iris data set. Print both correct and wrong predictions. Python ML library classes can be used for this problem.
8. Implement the non-parametric **Locally Weighted Regression algorithm** in order to fit data points. Select appropriate data set for your experiment and draw graphs.

TEXT BOOKS:

1) Machine Learning by Saikat Dutt, Subramanian Chandramouli & Amit Kumar Das, Pearson.

REFERENCE BOOKS :

1. Introduction to Machine Learning - Alex Smola and S.V.N. Vishwanathan, Cambridge University Press.
2. Introduction to Machine Learning , 3rd Edition by Ethem Alpaydin, PHI
3. Machine Learning – Tom M Mitechell, Tata Mc Graw hill

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

COURSE CODE	TITLE OF THE COURSE	CONTACT HOURS/ WEEK			ALLOTMENT OF MARKS		CREDITS
		L	T	P	Int.	Ext	
CS3208	Introduction to Arduino and Raspberry PI Lab	0	0	3	50	50	1.5

COURSE OBJECTIVES:

1. To learn the basics concept Internet of Things.
2. To study design principles.
3. To understand different sensors in IoT environment
4. To study basic building blocks of IoT devices.

COURSE OUTCOMES:

At the end of the Course, the Student will be able to:

CO1: Build basic prototypes using Arduino Uno.

CO2: Use different types of sensors, actuators for Arduino Uno.

CO3: Demonstrate the setup and Installation procedure of Raspberry Pi.

CO4: Build prototypes using Raspberry pi with different communicationprotocols.

CO5: Design an interface using Tkinter to control the IoT devices.

LIST OF EXPERIMENTS: (Any 12 Experiments from the following to be performed)

1. Install the Arduino and write a program using the Arduino IDE to blink LED.
2. Interface LED and buzzer with Arduino to buzz for a period of time.
3. Interface RGB LED with Aurdino to obtain different colours and brightness using PWM.
4. a) Control a servo motor using Arduino with an input given through a push button (e.g: When the push button is pressed the servo motor has to rotate by 15 degrees).
   b) Rotate Stepper motor either clockwise or anti clockwise at 'n' number of steps using Arduino.
5. Write a program to read the data from the RFID tag and display the information on the display board using Arduino and control LED (e.g: if it is a valid card then the LED should be ON otherwise OFF).
6. Control any two actuators connected to the Arduino using Bluetooth/Wifi.
7. Interface analog/digital sensors with Arduino and analyze the corresponding readings. (Sensors like temperature, alcohol, humidity, pressure, gas, sound pollution, level, weight, flow, proximity, LDR, PIR, pulse, vibration, sound etc..)
8. Demonstration of setup & working of Raspberry Pi. (Students have to prepare the report for the same).

9. Interface RGB LED with Raspberry Pi to obtain different colors and brightness using PWM.
10. a) Interface an ultrasonic sensor with Raspberry pi to print distance readings on the monitor when the sensor changes its position.
    b) Reading the data from an analog sensor with Raspberry using Arduino serial port or ADC CP3208 using SPI.
11. Post/read the data to/from the cloud via MQTT broker with a Raspberry Pi.
12. Send real-time sensor data to a smartphone using Raspberry Pi onboard Bluetooth.
13. Interface Picamera module using Raspberry Pi to perform operations of PiCamera- API or OpenCV library.
14. Implement an intruder alert system that alerts through email
15. Implement remote monitoring of smoke alarm systems using Raspberry Pi.
16. Create a user interface using Tkinter to control the API's in Raspberry Pi.

TEXT BOOKS:

1. McGraw Hill Professional Massimo Banzi, "Getting Started with Arduino", First Edition, February 2009, O'Reilly Media, Inc.
2. Simon Monk, "Programming the Raspberry Pi: Getting Started with Python", January 2012.

REFERENCE BOOKS:

1. Eben Upton and Gareth Halfacree, "Raspberry Pi User Guide", August 2016, 4th edition, JohnWiley & Sons.
2. Alex Bradbury and Ben Everard, "Learning Python with Raspberry Pi", Feb 2014, John Wiley & Sons.
3. Michael Margolis, "Arduino Cookbook", First Edition, March 2011, O'Reilly Media, Inc

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

COURSE CODE	TITLE OF THE COURSE	CONTACT HOURS/ WEEK			ALLOTMENT OF MARKS		CREDITS
		L	T	P	Int.	Ext	
CS3208	Big Data Analytics Lab	0	0	3	50	50	1.5

COURSE OBJECTIVES:

To enable students to have skills that will help them to solve complex real-world problems using Hadoop for decision support.

COURSE OUTCOMES:

At the end of the course student will be able to
CO1: Configure single, pseudo and fully distribution node Hadoop Cluster.
CO2: Apply Map Reduce algorithms for various real time problems.
CO3: Perform various Analytic operations in Hadoop.

CYCLE 1. Getting Hadoop Up and Running in a Pseudo distribution cluster

1. Setting up Hadoop on standalone machine.
2. Wordcount Map Reduce program using standalone Hadoop.
3. HDFS basic command-line file operations.
4. Setting Hadoop in a Pseudo-distributed environment.
5. Running the Wordcount program in a distributed cluster environment.
6. Adding the combiner step to the Wordcount Map Reduce program.
7. Hadoop Services monitoring using UI.

CYCLE 2. Hadoop Map Reduce Applications

8. Implementing Custom Hadoop Writable data type.
9. Implementing Generic Hadoop Writable data type.
10. Emitting data of different value types from a mapper.
11. Choosing a suitable Hadoop Input Format for your input data format.

CYCLE 3. Analytics

12. Performing Group-By using Map Reduce.
13. Calculating frequency distributions and sorting using Map Reduce.
14. Plotting the Hadoop results using GNU plot.

TEXT BOOK:

1. Hadoop Map Reduce Cookbook, Srinath Perera &Thilina Gunarathne, 2013, PACKT PUBLISHING.

Course Code	Title of the Course	Contact Hours/ week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3209	**Design Thinking and Innovation (Skill Course– 4)**	**1**	**0**	**2**	**50**	**50**	2

Course Outcomes:

After successful completion of this activity the student will be able to:

C01: Outline a problem, apply methods of Empathy on user groups
CO2: Describe and Define the problem specific to the user group
CO3: Apply Ideation tools to generate Ideas to solve the problem
C04: Develop prototype
CO5: Test the ideas and demonstrate Storytelling ability to present the Ideas

Students shall form into groups and Identify a problem (preferably, societal problem with engineering orientation to solve) suitable for the design thinking and go through the process week-wise. At the end of each phase, brief documentation shall be submitted and a final report covering all phases has to be submitted at the end of the semester.

Weeks 1-3: Introduction to Design Thinking: A primer on design_ thinking - Traditional approach, The new design thinking approach. Stages in Design Thinking: Empathize, Define, Ideate, Prototype, Test. Mindset for design thinking, Design thinking for product and process innovation, Difference between engineering design and design thinking.

Case Studies: General, Engineering and Service applications.
Activities: Identify an Opportunity and Scope of the Project
Explore the possibilities and Prepare design brief

Weeks 4-6: Methods and Tools for Empathize and Define phases:

Empathize - Methods of Empathize Phase: Ask 5 Why / 5W+H questions, Stakeholder map, Empathy Map, Peer observation, Trend analysis
Define - Methods of Define Phase: Storytelling, Critical items diagram, Define success
Activities: Apply the methods of empathize and Define Phases, Finalize the problem statement

Weeks 7-8:_ Methods and Tools for Ideate phase:
Ideate - Brainstorming, 2X2 matrix, 6-3-5 method, NABC method;
Activities: Apply the methods of Ideate Phase: Generate lots of Ideas

Weeks 9-11: Methods and Tools for Prototype Phase:
Prototype - Types of prototypes - Methods of prototyping - Focused experiments, Exploration map, Minimum Viable Product;
Activities: Apply the methods of Prototype Phase: Create prototypes for selected ideas

Weeks 12-13: Methods and Tools for Test Phase:
Test - Methods of Testing: Feedback capture grid, A/B testing
Activities: Collect feedback; iterate and improve the ideas

Weeks 14-15:
Solution Overview - Create a Pitch - Plan for scaling rip - Road map for implementation
Activities: Present your solution using Storytelling method

Week 16:
Project Submission: Fine tuning and submission of project report.

Reference books:
1. Tim Brown, *Change* by *Design: How Design Thinking Transforms Organizations and inspires Innovation,* HarperCollins e-books, 2009.
2. Michael Lewrick, Patrick Link, Larry Leifer, *The Design Thinking Toolbox,* John Wiley &. Sons, 2020.
3. Michael Lewrick, Patrick Link, Larry Leifer, *The Design Thinking Playbook,* John. Wiley & Sons, 2018.
4. Kristin Fontichiaro, *Design Thinking,* Cherry Lake Publishing, USA, 2015.
5. Walter Brenner, Falk Uebernickel, *Design Thinking for Innovation - Research and Practice,* Springer Series, 2016.
6. Gavin Ambrose. Paul Harris, *Design Thinking,* AVA Publishing, 2010.
7. Muhammad Mashhood Alain, *Transforming an Idea into Business with Design Thinking,* First Edition, Taylor and Francis Group, 2019.
8. S. Balaram, *Thinking Design,* Sage Publications. 2011.

Web References:
1. https://designthinking.ideo.com/
2. https://thinkibility.com/2018/12/01/engineering-vs-design-thinking/
3. https://www.coursera.org/learn/design-thinking-innovation
4. https://swayam.gov.in/nd1_noc20_mg38/preview

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3210	Essence of Indian Traditional Knowledge	3	0	0	30	70	0

COURSE OBJECTIVES:

1. To know the contributions of scientists for the development of society over a period of time.
2. To understand the Science and Technological developments that lead to human welfare.
3. To appreciate the Science and Technological contributions for the development of various sectors of the economy.
4. To identify the technological transfer versus economic progress of the countries.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1 - Demonstrate knowledge of broad concepts in the history of science, technology ranging over time, space and cultures and appreciate the science and technological contributions for the development of various sectors of the economy.
CO2 - Recognize the values of a wide range of methodologies, conceptual approaches and policies for the development of science and technology.
CO3 - Think independently and critically, using appropriate methodologies and technological developments in the critical areas of science and technology that lead to human welfare.
CO4 - Proficiently use contemporary technologies.
CO5- Understand Development and Transfer of Technology

UNIT-I

Historical Perspective of Science and Technology: Nature and Definitions; Roots of Science – In Ancient Period and Modern Period (During the British Period); Science and Society; Role of Scientist in the Society.

UNIT-II

Policies and Plans after Independence: Science and Technology Policy Resolutions New Technology Fund; Technology Development (TIFAC); Programs aimed at Technological Self Reliance; Activities of Council of Scientific and Industrial Research

UNIT-III

Science and Technological Developments in Critical Areas Space – The Indian Space Program: India‟s Geostationary Satellite Services – INSAT System And INSAT Services; Defense Research and Technology – Research Coordination, Research efforts and Development of technologies and Spin-off technologies for civilian use; Nuclear Energy –Effects of a nuclear explosion and India's safety measures.

UNIT-IV

Impact of Science and Technology in Major Areas Ocean Development: Objectives of Ocean Development, Biological and Mineral resources, Marine Research and Capacity Building; Biotechnology: Meaning, Biotechnology techniques Bioreactors, Cell fusion, Cell or Tissue Culture, DNA Fingerprinting, Cloning, Artificial Insemination and Embryo Transfer Technology and Stem Cell Technology; Application of Biotechnology – Medicine, Biocatalysts, Food Biotechnology, Fuel and Fodder and Development of Biosensors.

UNIT-V

Technology Transfer and Development Transfer of Technology – Types, Methods, Mechanisms, Process, Channels and Techniques; Appropriate Technology - Criteria and Selection of an Appropriate Technology; Barriers of Technological Change.

TEXT BOOKS:

1. Kalpana Rajaram, Science and Technology in India, Published and Distributed by Spectrum Books (P) Ltd., New Delhi-58. 2. Srinivasan, M., Management of Science and Technology (Problems & Prospects), East – West Press (P) Ltd., New Delhi

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ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
Honors 3-2	NoSQL Databases	4	0	0	30	70	4

COURSE OBJECTIVES:

The main objective of this course is to cover core concepts of NoSQL databases, focusing on MongoDB and Cassandra, their deployment, and data models. It also discusses data and distribution models, replication, sharding, and the Map-Reduce paradigm. Additionally, the course introduces key-value and graph databases, highlighting their features, consistency, transactions, scaling, and suitable use cases.

COURSE OUTCOMES:

At the end of the course student will be able to:
CO 1: Understand basic concepts of DBMS
CO 2: Compare and contrast RDBMS with different NoSQL databases
CO 3: Differentiate between various Data and Distribution Models
CO 4: Discuss about performance tune of Key-Value Pair NoSQL databases
CO 5: Evaluate when graph databases are not the ideal solution for specific scenarios.

UNIT-I

Introduction to Database Management: History of Database Systems. Database System Applications, database System VS file System. Data Models: ER Model, Relational Model and Other Models. Database Languages: DDL, DML. Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical database Design – Introduction to Views – Destroying /altering Tables and Views. Introduction of Object Database Systems, Structured Data types, operations on structured data, Encapsulation and ADTS, Inheritance.

UNIT-II

Introduction To Nosql: Overview and History of NoSQL, Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points. Comparison of relational databases to new NoSQL stores. **Introduction to MongoDB:** MongoDB, Cassandra use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases.

UNIT-III

Data and Distribution Models: Replication and Sharding, Map-Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. NoSQL Key/Value databases using MongoDB, Document Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Web Analytics or Real-Time Analytics, Queries against Varying Aggregate Structure.

UNIT-IV

Key-value Databases: NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations bySets.

UNIT-V

Graph Databases: What Is a Graph Database, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use.

TEXT BOOKS:

1. Raghuramakrishnan and Johannes Gehrke, *"Database Management Systems"*, 3rdEdition, TMH, 2006.

2. Sadalage, P. & Fowler, M., NoSQL Distilled: A Brief Guide to the Emerging Worldof Polyglot Persistence. (1st Ed.). Upper Saddle River, NJ: Pearson Education, In, 2012.

REFERENCE BOOKS:

1. Gauravvaish, Getting started with NoSQL, PACKT publishing, ISBN:978184969488.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
ENGINEERING AND TECHNOLOGY PROGRAM
RUSHIKONDA CAMPUS, VISAKHAPATNAM–530045.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
Minors 3-2	**Data warehousing and Data Mining**	**4**	**0**	**0**	**30**	**70**	4

COURSE OBJECTIVES:

1. To understand the evolution of data warehouses and data mining systems.
2. To understand extracting, cleaning and transformation of data into a warehouse.
3. To learn the principles of statistics, information theory, machine learning and other areas AI and implementation of data mining techniques.
4. To understand pattern mining using classification and clustering methods.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Understand the concepts related to Data Mining and Data Pre-Processing.
CO2: Understand data ware house design and how data cube technology supports summarization and querying high dimensional data.
CO3: Understand various approaches of association rule mining, supervised and unsupervised learning.
CO4: Apply knowledge for various classification and prediction techniques for developing new Data Mining algorithms.
CO5: Apply knowledge for various clustering analysis algorithms for designing new Data Mining algorithms.

UNIT-I

Introduction to Data Mining: Evolution of IT into DBMS, Motivation and importance of Data Warehousing and Data Mining, Kinds of Patterns, Technologies, Applications, Major Issues in Data Mining, Data Objects and Attributes Types,

UNIT-II

Data Preprocessing: Quality data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation.

UNIT-III

Data Warehouse, OLAP Technology: Basic Concepts of Data warehouse, Data Modeling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs.

Mining Closed and Max Patterns, Pattern Evaluation Methods, Association mining in multi-level, multi-dimensional space.

UNIT-IV

Association Rule Mining : Basic Concepts, Frequent Item set Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP- Growth Approach.

Classification: Basic Concepts, Decision Tree Induction, Bayes Classification, Rule- Based Classification, K-nearest neighbor classifier.

UNIT-V

Cluster Analysis: Basic Concepts and issues in clustering, Types of Data in Cluster Analysis, k-means clustering, Hierarchical Methods, Density Based Methods.

Text Book:

1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei – Morgan Kaufmann publishers –--3rd edition

Reference Books:

1. Introduction to Data Mining, Adriaan, Addison Wesley Publication
2. Data Mining Techniques, A.K.Pujari, University Press Data mining concepts by Tan, Steinbech, and Vipin Kumar - Pearson Edu publishers

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND P.G. COURSES (A)

RUSHIKONDA, VISAKHAPATANAM 530045 | website: www.gvpcdpgc.edu.in

(Approved by A.I.C.T.E | Affiliated to Andhra University | An ISO 9001:2015 Certified Institute)

ENGINEERING AND TECHNOLOGY PROGRAM

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B. Tech IV Year - I Semester (7th Semester)

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS4101	PEC	Elective -III	3	0	0	30	70	100	3
CS4102	PEC	Elective – IV	3	0	0	30	70	100	3
CS4103	PEC	Elective -V	3	0	0	30	70	100	3
CS4104	OEC/JOE	Open Elective-III: Introduction to Artificial Intelligence	3	0	0	30	70	100	3
CS4105	OEC/JOE	Open Elective-IV : Introduction to Data Science	3	0	0	30	70	100	3
CS4106	HSS /HSMC	UHV – 2: Understanding Harmony	3	0	0	30	70	100	3
CS4107	SAC/SC	Skill Course – 5: Android Programming	1	0	2	50	50	100	2
CS4108	Industrial/ Research Internship (2 months Mandatory after 6th Semester to be evaluated in 7th Semester)		0	0	0	0	100	100	3
Total Credits									**23**

Title of the Program	L	T	P	**Credits**
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**3**	**0**	**2**	**4**

Elective-III
Natural Language Processing
Cloud Computing
Data Visualization & Analytics

Elective-IV
Computer Vision
Wireless Sensor Networks
Cyber Security & Digital Forensics

Elective-V
Soft Computing
Deep Learning
Introduction to Blockchain Technologies.

Open Elective – III
Offered by Mechanical Engineering
Offered by Civil Engineering
Offered by ECE

Open Elective - IV
Offered by Mechanical Engineering
Offered by Civil Engineering
Offered by ECE

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4101	**Natural Language Processing (Elective-III)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. Learn the techniques in natural language processing.
2. Perform natural language generation..
3. Apply the techniques of machine translation.
4. Understand Semantic Analysis and Syntactic Analysis
5. Understand the information retrieval techniques

COURSE OUTCOMES:

At the end of the course student will be able to:

CO1: Analyze the natural language text and language modeling.
CO2: Understand Words, Word classes and Syntactic Analysis.
CO3: Understand Semantic Analysis, coherence and structure
CO4: Generate the Language and do machine translation
CO5: Apply information retrieval techniques on different models.

UNIT-I

Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages - NLP Applications-Information Retrieval. **Language Modeling**: Various Grammar - based Language Models-Statistical Language Model.

UNIT-II

Word level analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. **Syntactic Analysis**: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.

UNIT-III

Semantic analysis: Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. **Discourse Processing**: cohesion-Reference Resolution- Discourse Coherence and Structure.

UNIT-IV

Natural language Generation: Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG. **Machine Translation**: Problems in Machine Translation- Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages

UNIT-V

Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, and Alternative Models of Information Retrieval – valuation. **Lexical Resources**: World Net- Frame Net- Stemmers-POS Tagger- Research Corpora.

Text Books:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval",Oxford University Press, 2008.

Reference Books:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 2nd Edition, Prentice Hall, 2008.

2. James Allen, "Natural Language Understanding", 2nd Edition, Benjamin /Cummings publishing company, 1995.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4101	**Cloud Computing (Elective-III)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. To understand fundamental concepts in the area of cloud computing.
2. To learn different service models and concepts of Virtualization and cloud data storage.
3. To differentiate cloud Application Development concepts.
4. To analyze cloud Governance and economics.
5. To gain competence in Map Reduce and Hadoop Overview in view of cloud.

COURSE OUTCOMES:

CO1: Able to Understand the architecture and infrastructure of cloud computing.
CO2: Able to identify importance of virtualization cloud computing.
CO3: Able to classify different cloud service models
CO4: Able to develop applications for cloud computing.
CO5: Able to understand cloud business economics and role of big data in cloud.

UNIT-I

Introduction to cloud computing: Definition, Features**,** Architecture, Components, Infrastructure services, storage applications, database servi~~e~~es, introduction to SaaS, PaaS, IaaS, IdaaS, data storage in cloud.

UNIT-II

Virtualization: Enabling technologies, types of virtualization, server virtualization, desktop virtualization, memory virtualization, application and storage virtualization - tools and products available for virtualization.

UNIT-III

SaaS, PaaS, IaaS and Cloud data storage: Getting started with SaaS, SaaS solutions, SOA, PaaS and benefits. Understanding IaaS, improving performance for load balancing, server types within IaaS, utilizing cloud based NAS devices, cloud based data storage, and backup services, cloud based block storage.

UNIT-IV

Cloud Application Development: Client server distributed architecture for cloud designing cloud based solutions, coding cloud based applications, and traditional Apps vs. cloud Apps, client side programming, and server side programming overview- cloud based web application frameworks.

UNIT-V

Cloud Governance and Economics: Securing the cloud, disaster recovery and business continuity in the cloud, managing the cloud, migrating to the cloud, governing and evaluating the clouds business impact and economics. **Inside Cloud**: Introduction to Map Reduce and Hadoop- over view of big data and its impact on cloud, Introduction to fog computing.

Text Books:

1. Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Kris Jamsa, Jones & Bartlett Publishers, Paperback edition,2013
2. Hadoop Map Reduce cookbook, Srinath Perera and Thilina Gunarathne, Packet publishing

Reference Books:

1. Cloud Computing: A Practical Approach, Anthony T .Velte, Toby J.Velte, Robert Elsenpeter,Tata McGraw Hill Edition

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4101	**Data Visualization & Analytics (Elective-III)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. Understand the Explorative data analysis.
2. Understand the data handling with Pandas.
3. Understand the various visualization tools.
4. Understand the Power BI for data analysis and visualization.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Understand types of data and explorative data analysis for business intelligence.
CO2: Apply the concept of Pandas to perform various data analytics operations.
CO3: Illustrate data visualization through various python tools.
CO4: Demonstrate advanced data analytics and time series data analysis operations.
CO5: Demonstrate the basic data analysis and visualization using Power BI.

UNIT-I

Introduction to Data Analytics - Types – Phases - Quality and Quantity of data – Measurement - Exploratory data analysis - Business Intelligence.

UNIT-II

Getting Started with Pandas: Arrays and Vectorized Computation, Introduction to pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics. Data Loading, Storage and File Formats. Reading and Writing Data in Text Format, Web Scraping, Binary Data Formats, interacting with Web APIs, Interacting with Databases Data Cleaning and Preparation. Handling Missing Data, Data Transformation, String Manipulation

UNIT-III

Data Wrangling: Hierarchical Indexing, Combining and Merging Data Sets Reshaping and Pivoting. **Data Visualization:** matplotlib, Basics of matplotlib, plotting with pandas and seaborn, other python visualization tools.

UNIT-IV

Data Aggregation and Group operations: Group by Mechanics, Data aggregation, General split-apply-combine, Pivot tables and cross tabulation. **Time Series Data Analysis**: Date and Time Data Types and Tools, Time series Basics, date Ranges, Frequencies and Shifting, Time Zone Handling, Periods and Periods Arithmetic, Resampling and Frequency conversion, Moving Window Functions.

UNIT-V

Introduction to Power BI: Basics, Power BI Desktop and Data Transformation, Data Analysis Expressions, Basics Power BI Data Visualization and services.

Text Books:

1. Richmond, Brian. "Introduction to Data Analysis Handbook." Academy for Educational Development (2006).
2. Hands-On Exploratory Data Analysis with Python (2020) by Suresh Kumar Mukhiya, Usman Ahmed, Packt publication.
3. Python for Data Analysis, 2nd Edition (2017), by Wes McKinney, O'Reilly.
4. Mastering Microsoft Power BI - Second Edition(2022) By Greg Deckler , Brett Powell, Packt Publication.

Reference Book:

1. Mastering Power BI(2021) by Chandraish Sinha, BPB Publications.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4102	**Computer Vision (Elective-IV)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. Identify basic concepts, terminology, theories, models and methods in the field of computer vision.
2. Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.
3. Developed the practical skills necessary to build computer vision applications.
4. To have gained exposure to object and scene recognition and categorization from images.

COURSE OUTCOMES:

At the end of the course student will be able to:

CO1: Understand the basic concepts of Image processing.
CO2: Understand various image transformation techniques.
CO3: Explain Fourier transformation and Segmentation as image processing techniques.
CO4: Understand feature extraction techniques and how to use CVIP tools for image processing.
CO5: Illustrate various image classification and clustering techniques.

UNIT-I

Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis.

UNIT-II

Edge detection, Edge detection performance, Hough transform, corner detection.

UNIT-III

Segmentation, Morphological filtering, Fourier transformation.

UNIT-IV

Feature extraction, shape, histogram, color, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance /similarity measures, data pre-processing.

UNIT-V

Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised, Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.

Text Books:

1. Computer Vision Algorithms and Applications, Richard Szeliski, Springer.
2. Computer Vision: Models. Learning and Interface, 1st Edition, Simon J.D Prince.
3. Computer Vision, a Modern Approach, 2nd Edition, Forsyth, Ponce.

Reference Books:

1. Computer Vision, a Modern Approach, David Forsyth, Jean Ponce, 2nd Edition Pearson Publishers.
2. Programming Computer Vision with Python, O'REILLY Publishing, Jan Erik Solem.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4102	**Wireless Sensor Networks (Elective-IV)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. To understand wireless networks principles.
2. To understand the functional aspects, operating system prototypes, and energy consumption in WSN.
3. To analyze the wireless sensor networks performance.
4. To understand the routing techniques in WSN.
5. To understand synchronization and security concepts of WAN.

COURSE OUTCOMES:

At the end of the course student will be able to:

CO1: Understand and analyze the various architectures of wireless sensor network.
CO2: Explain about operating system for wireless sensor networks.
CO3: Discuss simulation tools for wireless sensor networks.
CO4: Analyze the communication protocols.
CO5: Understand the security principles in wireless sensor networks.

UNIT-I

Fundamentals Of Wireless Sensor Networks: Introduction to wireless sensor networks, challenges of wireless sensor Networks, Single node architecture, network architecture, sensor network scenario, network Design principles of wireless sensor networks.

UNIT-II

Operating Systems and Power Management: Operating Systems: functional and nonfunctional aspects, prototypes, Tiny OS, Contiki, LiteOS, SOS. Power management in wireless sensor networks.

UNIT-III

Simulation and Programming tools: C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet).

UNIT-IV

Protocols: Communication protocols: MAC protocols and Network layer protocols: Flooding and

gossiping, data centric routing, proactive routing, On-Demand routing, Hierarchical routing, location-based routing.

UNIT-V

Synchronization And Security: Time Synchronization in Wireless Sensor Networks, Basics of Time Synchronization, Fundamentals of Network Security, Challenges of Security inWireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, Zig Bee Security.

Text Books:

1. H. Karl and A. Willig, "Protocols and Architectures for Wireless Sensor Networks", 1st edition, John Wiley & Sons, India, 2012.
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", 2nd edition, Wiley publications, 2010.

Reference Books:

1. C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, "Wireless Sensor Networks", Springer Verlag, 1st Indian reprint, 2010.
2. F. Zhao and L. Guibas, "Wireless Sensor Networks: An Information Processing Approach", Morgan Kaufmann, 1st Indian reprint, 2013.
3. Mohammad S. Obaidat, SudipMisra, "Principles of Wireless Sensor Networks", Cambridge, 2014.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4102	**Cyber Security & Digital Forensics (Elective-IV)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. To understand underlying principles and many of the techniques associated with the digital forensic practices and cybercrimes.
2. To explore practical knowledge about ethical hacking Methodology.
3. To develop an excellent understanding of current cyber security issues (Computer Security Incident) and analysed the ways that exploits in securities.
4. To apply digital forensic knowledge to use computer forensic tools and investigation report writing.

COURSE OUTCOMES:

At the end of the course student will be able to:

CO1: Gain the knowledge on effective use of computer, data and internet securely.
CO2: Understand concepts and ethics of cyber security and cyber laws.
CO3: Acquire the knowledge on various web architectures, vulnerabilities, penetration testing, attacks and security of web applications
CO4: Illustrate the methods for Forensic Technologies, evidence collection, EvidentiaryReporting and information risk management
CO5: Analyze and respond to the cyber incidents.

UNIT-I

Introduction to Information Security Fundamentals and Best Practices: Protecting Your Computer and its Contents, Securing Computer Networks-Basics of Networking, Compromised Computers, Secure Communications and Information Security Best Practices, Privacy Guidelines, Safe Internet Usage.

UNIT-II

Ethics in Cyber Security & Cyber Law: Privacy, Intellectual Property, Professional Ethics, Freedom of Speech, Fair User and Ethical Hacking, Trademarks, Internet Fraud, Electronic Evidence, Cybercrimes.

UNIT-III

Penetration Testing: Overview of the web from a penetration testers perspective, Exploring the

various servers and clients, Discussion of the various web architectures, Discussion of the different types of vulnerabilities, Defining types of penetration testing. **Web Application Security:** Common Issues in Web Apps, Whatis XSS, SQL injection, CSRF, Password Vulnerabilities, SSL, CAPTCHA, Session Hijacking, Local and Remote File Inclusion, Audit Trails, Web Server Issues.

UNIT-IV

Forensics & Network Assurance: Forensic Technologies, Digital Evidence Collection, Evidentiary Reporting, Layered Defense, Surveillance and Reconnaissance, Outsider Thread Protection. **Information Risk Management:** Asset Evaluation and Business Impact Analysis, Risk Identification, Risk Quantification, Risk Response Development and Control, Security Policy, Compliance, and Business Continuity. Forensic investigation using Access Data FTK.

UNIT-V

Cyber Incident Analysis and Response: Incident Preparation, Incident Detection and Analysis. Containment, Eradication, and Recovery. Proactive and Post-Incident Cyber Services, CIA triangle.

Text Books:

1. The Official CHFI Study Guide for Computer Hacking Forensic Investigator by Dave Kleiman.
2. CISSP Study Guide, 6th Edition by James M. Stewart.
3. Title: Cyber Forensics by Dejey & S.Murugan, OXFORD University Press.

Reference Book:

1. Introduction to Information Security and Cyber Laws (English, Paperback, Tripathi Surya Prakash).

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS4103	**Soft Computing (Elective-V)**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. To Improve Data Analysis Solutions is to strengthen the dialogue between the statistics and soft computing research communities in order to cross-pollinate both fields and generate mutual improvement activities.

2. With Soft Computing as a consortia of methodologies which collectively provide a body of concepts and techniques for designing intelligent systems.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Able to understand the concepts of Soft computing and Hard Computing and Applications of Soft Computing.
CO2: Understanding of Neural Networks and its Types and recent applications of ANN. CO3: Understand the concepts of Fuzzy Systems and use them in various applications of classification.
CO4: Apply the concepts of Genetic Algorithms to get the optimized solutions to problems.
CO5: Implement Neural Network Back Propagation Algorithms on Genetic Algorithms and Fuzzy Logic.

UNIT-I

Introduction: What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

UNIT-II

Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Backpropagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

UNIT-III

Fuzzy Systems: Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minimax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy

Decision Making, Fuzzy Control Systems, Fuzzy Classification.

UNIT-IV

Genetic Algorithm: History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

UNIT-V

GA based Backpropagation Networks: GA based Weight Determination, K - factor determination in Columns. Fuzzy Backpropagation Networks: LR type Fuzzy numbers, Fuzzy Neuron, Fuzzy BP Architecture, Learning in Fuzzy BP, Application of Fuzzy BP Networks.

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.

Reference Books:

1. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI.
2. Build_Neural_Network_With_MS_Excel_sample by Joe choong

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4103	**Deep Learning (Elective-V)**	**3**	**0**	**0**	**30**	**70**	3

Course Objectives:

1. Learn deep learning fundamentals, regularization techniques, and optimization methods.
2. Comprehend the architecture and applications of convolutional neural networks.
3. Understand various sequence modeling techniques, including recurrent and recursive networks.
4. Design and implement real-time deep learning applications.
5. Understand and apply different types of autoencoders and deep generative models

Course Outcomes:

At the end of the course, the student will be able to:
CO1: Understand deep learning, regularization techniques, and optimization methods, enabling them to design and train effective deep learning models.
CO2: Understand the convolutional neural networks.
CO3: Describe various sequence modeling techniques.
CO4: Design various real time deep learning applications.
CO5: Understand various types of Autoencoders and different techniques of Deep Generative Models.

UNIT-I

Introduction to Deep Learning: Introduction - Curse of Dimensionality, Historical trends in Deep Learning, Deep feed - Networks, Gradient Learning, Hidden Units, Architecture design, back propagation, activation functions.

Regularization and Optimization: Regularization techniques- L1, L2, dataset augmentation, early stopping, dropout, surrogate loss functions, batch and mini batch algorithms. batch normalization, Comparison of shallow learning and deep learning, Importance and Applications of Deep Learning.

UNIT-II

Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks, Dataset Augmentation, Image Captioning.

UNIT- III

Sequence Modeling- Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Leaky Units, LSTM.

UNIT-IV

Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Case study: Multi-Digit Number Recognition.
Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

UNIT-V

Autoencoders: Undercomplete Autoencoders, Regularized Autoencoders, Representational Power, Layer Size and Depth Stochastic Encoders and Decoders, Denoising Autoencoders, Applications of Autoencoders.

Deep Generative Models: Directed Generative Nets - Variable Autoencoders, Generative adversarial networks, Representation Learning.

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press,2016.

Reference Books:

1. Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition, 2017.
2. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019.
3. Deep learning CookBook, Practical recipes to get started Quickly, Douwe Osinga, O'Reilly, Shroff Publishers, 2019.

WEB REFERENCES:

1. https://www.coursera.org/specializations/deep-learning
2. https://onlinecourses.nptel.ac.in/noc20_cs11/preview

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4103	**Introduction to Blockchain Technologies (Elective-V)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. Understand digital currencies and how blockchain systems work.
2. Design, build, and deploy smart contracts and distributed applications.

COURSE OUTCOMES:

CO1**:** Explain Blockchain basic concepts and cryptography primitives.
CO2**:** Differentiate between proof-of-work and proof-of-stake consensus.
CO3**:** Explain Ethereum wallets and Smart Contracts.
CO4**:** Describe hyperledger fabric as an open source blockchain framework.
CO5: Explain Bblockchain usecases and allied technologies.

UNIT-I

Blockchain Basics: Introduction, Concept of Blockchain, History, Definition of Blockchain, fundamentals of Blockchain, Characteristics of Blockchain, Consensus in Trust-Building Exercise, Public, Private, and Hybrid Blockchains, Distributed Ledger Technologies, DLT Decentralized Applications and Databases, Architecture of Blockchain, Transactions, Chaining of Blocks. **Cryptography concepts**: Cryptography Primitives, Symmetric Cryptography, Asymmetric Cryptography, Hashing, Message Authentication Code, Digital Signatures.

UNIT-II

Consensus: Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods. **Crypto-currency**: wallets, types of crypto-currency: Proof of Work (PoW), Proof of Stake (PoS), Tokens, Stable coins. Mining strategy and rewards.

UNIT-III

Ethereum: Introduction, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Ethereum Key Pairs, Ethereum Addresses, Ethereum Wallets, Ethereum Transactions Ethereum Languages, Ethereum Development Tools. **Smart Contracts:** Introduction, Absolute and Immutable, Contractual confidentiality, Law Implementation and Settlement, Characteristics and applications of smart contracts.

UNIT-IV

Hyperledger Fabric: Why Hyperledger?, Hyperledger features, Advantages, Architecture, Applications and use cases.

UNIT-V

Blockchain Use Cases: Blockchain in Insurance, Life Insurance, Healthcare, Assets Management, Financial Institutional Assets, Smart Assets, Electronic Currency, Manufacturing. **Blockchain and Allied Technologies**: Blockchain and IoT, Blockchain and Cloud computing, Blockchain and AI, Blockchain and Machine Learning.

Text Book:

1. Blochain Technology, concepts and applications, by Kumar Saurabh and Ashutosh Saxena, WILEY Publishers.

Reference Books:

1. The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them by By Antony Lewis.
2. Blockchain Basics: A Non-Technical Introduction By Daniel Drescher, APRESS.
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
4. The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing, and Securing Distributed Blockchain-based Projects By Elad Elrom.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4104	**Introduction to Artificial Intelligence (Open Elective-III)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. To learn about AI problem, Production Systems and their characteristics.
2. To understand the importance of search and the corresponding search strategies forsolving AI problem.
3. To introduce to Planning, Natural Language Processing and Expert Systems.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Solve AI Problems using the knowledge of State Space Search.
2. Apply several optimal search strategies and heuristic techniques to solve AI problems.
3. Learn relational, inferential, inheritable and procedural knowledge and the corresponding knowledge representation approaches.
4. Apply the concepts of Reasoning under Uncertainty and solve the complex problems of AI.
5. Implement AI problem solving approaches to develop natural language processing, planning and expert systems.

UNIT-I

Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI techniques, Defining the Problem as a State Space Search, Problem Characteristics, Production Systems.

UNIT-II

Search Techniques: Issues in The Design of Search Programs, Un-Informed Search, BFS, DFS; Heuristic Search Techniques: Generate-And- Test, Hill Climbing, Best- First Search, A* Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction Problem.

UNIT-III

Knowledge Representation using Rules: Procedural Vs Declarative Knowledge, Logic programming, Forward Vs Backward Reasoning, AI Programming languages: Overview of LISP and PROLOG. **Symbolic Logic**: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Frames, Scripts, Conceptual Graphs.

UNIT-IV

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non-Monotonic Reasoning, **Statistical Reasoning**: Bayes Theorem, Certainty Factors and Rule-Based Systems, Fuzzy Logic: Crisp Sets , Fuzzy Inferences &Fuzzy Systems.

UNIT-V

Experts Systems: Overview of an Expert System, Architecture of an Expert Systems, Different Types of Expert Systems- Rule Based, Frame Based, Decision Tree based, Case Based, Neural Network based, Black Board Architectures, Knowledge Acquisition and Validation Techniques.

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Text books:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mcgraw-Hill Publications.

Reference Books:

1.Artificial Intelligence, George F Luger, Pearson Education Publications 2.Artificial Intelligence : A modern Approach, Russell and Norvig, Prentice Hall.
3.Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4105	**Introduction to Data Science(Open Elective-IV)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. Students will able to learn the relationship of Data Science with the other allied sciences.
2. Students will able to grasp insights of data preprocessing.
3. Students will have proficiency with statistical analysis of data.
4. Students will develop the ability to build and assess data-based models.
5. Students will demonstrate skill in data management.

COURSE OUTCOMES:

CO1: Illustrate the Data Science Methodology.
CO2: Identify different sources of Data and Demonstrate different computing tools involved in data handling.
CO3: Demonstrate various Techniques involved in Data analysis and Analytics
CO4: Understanding of when to use supervised and unsupervised statistical learning methods on labeled and unlabeled datasets
CO5: Apply domain expertise to solve real world problems using data science

UNIT-I

Introduction: What Is Data Science, Where Do We See Data Science, How Does Data Science Relate to Other Fields, The Relationship between Data Science and Information Science, Computational Thinking, Skills for Data Science, Tools for Data Science, Issues of Ethics, Bias, and Privacy in Data Science .

UNIT-II

Data: Introduction, Data Types, Structured Data, Unstructured Data, Challenges with Unstructured Data, Data Collection, Open Data, Social Media Data, Multimodal Data, Data Storage and Presentation, Data Pre-processing, Data Cleaning, Data Integration, Data Transformation, Data Reduction, Data Discretization.

UNIT-III

Techniques: Introduction , Data Analysis and Data Analytics, Descriptive Analysis, Variables, Frequency Distribution, Measures of Centrality, Dispersion of a Distribution, Diagnostic Analytics, Correlation, Predictive Analytics, Prescriptive Analytics, Exploratory Analysis, Mechanistic Analysis, Regression.

UNIT-IV

Supervised Learning: Introduction, Logistic Regression, Softmax Regression, and Classification with kNN, Decision Tree, Decision Rule, Classification Rule, Association Rule, Random Forest, Naïve Bayes, Support Vector Machine (SVM). Unsupervised Learning: Introduction, Agglomerative Clustering, Divisive Clustering, Expectation Maximization (EM)

UNIT-V

Applications, Evaluations, and Methods: Hands-On with Solving Data Problems: Introduction, Collecting and Analyzing Twitter Data, Collecting and Analyzing YouTube Data. Data Collection, Experimentation, and Evaluation: Introduction, Data Collection Methods, Surveys, Survey Question Types, Survey Audience, Survey Services, Analyzing Survey Data, Pros and Cons of Surveys, Interviews and Focus Groups, Why Do an Interview?, Why Focus Groups?, Interview or Focus Group Procedure, Analyzing Interview Data, Pros and Cons of Interviews and Focus Groups, Log and Diary Data, User Studies in Lab and Field. Picking Data Collection and Analysis Methods,: Introduction to Qualitative Methods, Mixed Method Studies, Evaluation, Comparing Models, Training–Testing and A/B Testing, Cross-Validation.

Text Book:

1. Chirag Shah, 2020, A Hands-On Introduction to Data Science, Cambridge University Press

Reference Books:

1 .Jeffrey S. Saltz, Jeffrey M. Stanton, 2018, An Introduction to Data Science, SAGE Publications
2. Joel Grus, 2015, “Data Science from Scratch”.
3. Lillian Pierson, Jake Porway, “Data Science for Dummies”, 2nd Edition, For Dummies, 2017.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4106	**Professional Ethics and Universal Human Values (Understanding Harmony)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

The objective of the course is Six-fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. This course will illuminate the students in the concepts of laws and its applicability to engineers
3. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
4. Strengthening of self-reflection, Development of commitment and courage to act and also enable the students to imbibe and internalize the Values and Ethical Behavior in the personal and professional lives
5. To enable the students to imbibe the Values and Ethical Behavior in the personal and Professional live.
6. The students will learn the rights and responsibilities Individual, employee, team member and a global citizen

COURSE OUTCOMES:

By the end of the course Student will be able to:

1. Grasp the meaning of the concept – Law and also Get an overview of the laws relating to Engineers and also Apprehend the importance of being a law-abiding person and They would have better critical ability.
2. Self-explore by using different techniques to live in harmony at various levels.
3. Analyze themselves and understand their position with respect to the moral and ethical character needed for a successful and satisfactory work life.
4. Students are expected to become more aware of themselves and their surroundings (family, society, nature).
5. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
6. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society.

UNIT-I

Need, Basic Guidelines, Content and Process for Value Education

Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation - as the process for self-exploration, Continuous Happiness and Prosperity - A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility - the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario,

Method to fulfill the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking, Include practice sessions and case studies.

UNIT-II

Understanding Harmony in the Human Being - Harmony in Myself!
Understanding human being as: a co-existence of the sentient 'I' and the material 'Body', the needs of Self ('I') and 'Body' - happiness and physical facility, the Body as an instrument of 'I' (I being the doer, seer and enjoyer), the characteristics and activities of 'I' and harmony in 'I', the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, P to ensure Sanyam and Health, Include practice sessions and case studies.

UNIT-III

Understanding Harmony in the Family and Society - Harmony in Human – Human Relationship: Understanding values in human-human relationship: meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, the meaning of Trust; Difference between intention and competence, the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, the harmony in the society (society being an extension of family), Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order from family to world family, Include practice sessions and case studies. **Understanding Harmony in the Nature and Existence - Whole existence as Coexistence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co- existence of mutually interacting units in all – pervasive space, Holistic perception of harmony at all levels of existence, Include practice sessions and case studies.

UNIT-IV

Concept of Law and Law of Torts: Understanding Essentials of a Valid Contract and the basics of contract law protecting rights and obligations, Introduction to the Law of Torts and the basics to protect oneself and the company Law affecting the Workplace Employers Responsibilities/Duties Hiring Practices, Introduction to Intellectual Property Law, Professional Code of Conduct for Engineers, Relationship between Law and Ethics, Include practice sessions and case studies.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Include practice sessions and case studies.

TEXT BOOKS:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
3. R. Subramanian, "Professional Ethics", Oxford University Press.
4. S.B. Srivasthva, "Professional Ethics & Human Values", SciTech Publications (India) Pvt. Ltd. New Delhi.
5. D.R. Kiran, "Professional Ethics & Human Values", TATA Mc Graw Hill Education.
6. Saroj Kumar, "Business Law" and Avtar Singh, "Law of Contract"

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book), Mohandas Karamchand Gandhi "The Story of My Experiments with Truth", E. FSchumacher. "Small is Beautiful", Slow is Beautiful –Cecile Andrews, J C Kumarappa "Economy of Permanence", Pandit Sunderlal "Bharat Mein Angreji Raj" and Dharampal, "Rediscovering India
4. G K Kapoor, "Business Law" and Sen & Mitra, "Business & Commercial Laws" and Calvin Frank Allen, "Business law for Engineers"
5. Hilgard, E. R.; Atkinson, R. C. & Atkinson, R.L. (1975). Introduction to Psychology. 6th Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
6. Govindarajan, M; Natarajan, G. M. & Senthilkumar, V.S. (2013). Professional Ethics & Human Values. Prentice Hall: New Delhi
7. Gogate, S. B. (2011). Human Values & Professional Ethics. Vikas Publishing: New Delhi.
8. Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, "Engineering Ethics, Concepts Cases: 4e, Cengage learning, 2015.
9. Caroline Whitbec, "Ethics in Engineering Practice & Research: 2e, Cambridge University Press 2015.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4107	**Android Programming (Skill Course-5)**	**1**	**0**	**2**	**50**	**50**	2

COURSE OBJECTIVES

- To learn how to develop Applications in android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.
-

COURSE OUTCOMES

- CO1: Student understands the working of Android OS Practically.
- CO2: Student will be able to develop user interfaces.
- CO3: Student will be able to develop, deploy and maintain the Android Applications.

Unit 1: Get started:

Week 1: Build your first app

1.1: Android Studio and Hello World,
1.2 Part A: Your first interactive UI
1.2 Part B: The layout editor
1.3: Text and scrolling views
1.4: Learn to help yourself

Week 2: Activities and intents:

2.1: Activities and intents
2.2: Activity lifecycle and state
2.3: Implicit intents

Week 3: Testing, debugging, and using support libraries

3.1: The debugger
3.2: Unit tests
3.3: Support libraries

Unit 2: User experience

Week 4: User interaction

4.1: Clickable images
4.2: Input controls
4.3: Menus and pickers
4.4: User navigation
4.5: Recycler View

Week 5: Delightful user experience
5.1: Drawables, styles, and themes
5.2: Cards and colors
5.3: Adaptive layouts

Week 6: Testing your UI
6.1: Espresso for UI testing

Unit 3: Working in the background

Week 7: Background tasks
7.1: Async Task
7.2: Async Task and Async Task Loader
7.3:Broadcast receivers

Week 8: Alarms and schedulers
8.1: Notifications
8.2: The alarm manager
8.3: Job Scheduler

Unit 4: Saving user data

Week 9: Preferences and settings
9.1: Shared preferences
9.2: App settings

Week 10: Storing data with Room
1.1 Part A: Room, LiveData, and ViewModel
10.1 Part B: Deleting data from a Room database

Web References:

1. https://developer.android.com/courses/fundamentals-training/overview-v2

2. https://developer.android.com/codelabs/android-training-welcome?hl=en#0

3. https://developers.google.com/learn?text=android%20developer%20fundame.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
Honors	**Advanced Software Engineering**	**3**	**0**	**0**	**30**	**70**	**3**

COURSE OBJECTIVES:

1. To provide an idea of using various process models in the software industry according to given circumstances.
2. To provide the idea of various Software engineering phases Analysis, Design, Testing.
3. To provide the idea of Project Management Concepts.
4. To measure the quality of the software products in terms of metrics.

COURSE OUTCOMES:

CO 1. Understand nature of the software and process models.
CO 2. Understand the requirements and design effective user interface.
CO 3. Explain how to manage projects and measure the quality of the project.
CO 4. Understand the estimation of time and effort to build a software product.
CO 5. Explain Project Scheduling Concepts.

UNIT-I: Introduction: Nature of Software, The unique nature of WebApps, Software Engineering, The Software Process, Software engineering Practice, software Myths . Process Models: The generic process model, Process Assessment and improvement, prescriptive models, specialized process models, the unified process. Agile Development: Agile Process, Extreme Programming, Other Agile process Models.

UNIT-II: Understanding requirements: Requirements Engineering, Establishing the ground work, Eliciting requirements, Developing Use Cases, Building Requirements model, Negotiating and validating Requirements. Design Concepts: The Design Process, Design Concepts, the Design Model, User-Interface testing.

UNIT-III: Project management concepts: Management Spectrum, People, Product, Process, Project and W5HH Principle. Process and Product metrics: Metrics in Software Project and Product domains, Software Measurement, Metrics Software Quality, Integrating metrics with Software Process.

UNIT-IV: Estimation for Software Projects: Observations on Estimations, The project planning process, Software Scope and feasibility, Resources, Software Project Estimation, Decomposition techniques, Empirical Estimation models, Estimation for Object-oriented Projects.

UNIT-V: Project Scheduling: Project Scheduling, Defining a Task Set, Scheduling, Earner Value Analysis. Software Process Improvement: SPI, SPI Process, the CMMI, the People CMM, Other SPI Frameworks.

TEXT BOOK:

1. Software Engineering, A Practitioner's Approach. Roger Pressman, 7th Edition, McGraw-Hill.

REFERENCES:

1. A Practical Guide to Testing Object-Oriented Software, John D. McGregor; David A. Sykes, Addison-Wesley Professional.
2. Software Engineering, K.K. Agarwal, New Age Publications 2008.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
MINORS	Object-Oriented Software Engineering	L	T	P	Int.	Ext	3
		3	0	0	30	70	

COURSE OBJECTIVES:

Learn the importance of Object Oriented Software Engineering in Software Development.

1. Learn to develop problem statement and requirements elicitation.
2. Learn to design UML Diagrams.
3. Learn about architectural models and design patterns.
4. Learn different testing methodologies.

COURSE OUTCOMES:

At the end of the course student will be able to
CO1: Understand the concepts related to development of Software Engineering.
CO2: Apply the knowledge of requirements elicitation process.
CO3: Design the UML Diagrams for improving communication between client and developer.
CO4: Analyze architecture models and design patterns.
CO5: Apply various testing strategies on the developed products.

UNIT-I

Introduction to Object Oriented Software Engineering: Nature of the Software, Types of Software, Software Engineering Projects, Software Engineering Activities, Software Quality, and Introduction to Object Orientation, Software Process Models-Waterfall Model, and Opportunistic Model, Phased Released Model, Spiral Model, Evolutionary Model, Concurrent Engineering Model.

UNIT-II

Requirements Engineering: Domain Analysis, Problem Definition and Scope, Requirements Definition, Types of Requirements, Techniques for Gathering and Analyzing Requirements, Requirement Documents, Reviewing, Managing Change in Requirements.

UNIT-III

Unified Modeling Language: Introduction to UML, Modeling Concepts: Systems, Models and Views Data Types, Abstract Data Types, Instances Classes, Abstract Classes, Objects, Event Classes, Events, and Messages Object-Oriented Modeling, Falsification and Prototyping. Types of UML Diagrams- **Structural diagrams**: Class Diagrams, Associations and Multiplicity, Labelling Associations, Validating associations, Reflexive Associations, Generalization, Component Diagrams, Deployment Diagrams, and Object Diagrams. **Behavioral Diagrams**: Use Case Diagrams, Activity Diagrams, State Machine Diagrams, Sequence Diagrams.

UNIT-IV

Software Design and Architecture: Process of Design, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document; Pattern Introduction.

UNIT-V

Software Testing: Overview, Testing Conventional Applications: **White-Box Testing**: Basis Path Testing: Flow Graph Notation, Independent Program Paths, Deriving Test Cases, Graph Matrices, Control Structure Testing: Condition Testing, Data Flow Testing, Loop Testing, Introduction to Black Box Testing.

Text Books:

1. Object-Oriented Software Engineering Practical software development using UML and Java by Timothy C. Lethbridge & Robert, Langaniere Mcgraw-Hill.
2. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia.

Reference Books:

Software Engineering: A Practitioner's Approach, Roger S Pressman.

1. A Practical Guide to Testing Object-Oriented Software, John D. McGregor; David A. Sykes, Addison-Wesley Professional.
3. Software Engineering, K.K. Agarwal, New Age Publications 2008.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND P.G. COURSES (A)

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ENGINEERING AND TECHNOLOGY PROGRAM

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B. Tech IV Year – II Semester (8th Semester)

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS4201	Major Project	Project Work, Seminar & Internship in Industry	0	0	0	50	50	100	12
Total Credits									**12.0**

CS4201	PROJECT	
Instruction: 24 Periods /week, External Exam: 3 Hours		**Credits: 12**
Internal: 50Marks	**External: 50 Marks**	**Total: 100 Marks**

Student submits a high-end project work to assess his/her ability of performing an industrial project or applied research linked to the knowledge discipline.