GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (A),
RUSHIKONDA, VISAKHAPATANAM 530045 | website: www.gvpcdpgc.edu.in

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ENGINEERING AND TECHNOLOGY PROGRAM

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(Accredited by NBA)

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

ENGINEERING AND TECHNOLOGY PROGRAM

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ADMITTED BATCH 2020-21 (R-20 Regulation)

B. Tech I Year - I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
20091101	BSC	Engineering Mathematics – I	3	0	0	30	70	100	3
20091103	BSC	Engineering Chemistry	3	0	0	30	70	100	3
20091109	HSMC	English	3	0	0	30	70	100	3
20091105	ESC	Computer Programming with C and Numerical Methods (CPNM)	3	0	0	30	70	100	3
20751702	PCC	Discrete Mathematical Structures	3	0	0	30	70	100	3
20091109P	HSMC	English Language Lab	0	0	3	50	50	100	1.5
20091103P	BSC	Chemistry Lab	0	0	3	50	50	100	1.5
20091105P	ESC	Computer Programming with C and Numerical Methods Lab	0	0	3	50	50	100	1.5
		Total	**15**	**0**	**9**	**300**	**500**	**800**	**19.5**

B. Tech I Year - II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
20092101	BSC	Engineering Mathematics – II	3	0	0	30	70	100	3
20092104	BSC	Engineering Physics	3	0	0	30	70	100	3
20092106	ESC	Engineering Graphics	1	0	4	30	70	100	3
20752707	ESC	Electrical and Electronics Engineering (EEE)	3	0	0	30	70	100	3
20752708	ESC	Digital Logic Design (DLD)	3	0	0	30	70	100	3
20092110P	ESC	Workshop Lab	0	0	3	50	50	100	1.5
20092104P	BSC	Engineering Physics Lab	0	0	3	50	50	100	1.5
20752707P	ESC	Electrical and Electronics Engineering Lab	0	0	3	50	50	100	1.5
		Total	**13**	**0**	**13**	**300**	**500**	**800**	**19.5**

ENGINEERING MATHEMATICS - I

(Common for Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering and Mechanical Engineering)

(Effective from the admitted batch of 2020-21)

Description	Subject Teaching Methodology	L	T	P	C
Course Code	**ENGINEERING MATHEMATICS -I**	**3**	**0**	**0**	**3**
	Total Marks : 100	**Ses.**		**Ext.**	
		30		**70**	
20091101		**Ext. Exam Time 3 Hrs.**			

L: Lectures; T: Tutorial; P: Practical; Ses: Sessionals; Ext: External; C: Credits

Course Objectives:

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

Course Outcomes:

CO 1: Find the partial derivatives of functions of two or more variables.
CO 2: Evaluate maxima and minima, errors and approximations.
CO 3: To expand a periodical function as Fourier series and half-range Fourier series.
CO 4: Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.
CO 5: Evaluate double and triple integrals, volumes of solids and area of curved surfaces.

SYLLABUS

UNIT-I
(Partial Differentiation)

Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs)

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
(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. Practical Harmonic analysis.

UNIT-IV
(Multiple Integrals)

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

UNIT-V
(Multiple Integrals-Applications)

Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Center of gravity - Moment of inertia - product of inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma 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.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

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ENGINEERING CHEMISTRY

(Common for CSE, ECE and ME)

(Effective from the admitted batch of 2020-2021)

Description	Subject Teaching Methodology	L	T	P	C
Course Code **20091103**	**ENGINEERING CHEMISTRY**	**3**	**1**	**0**	**3**
	Total Marks : 100	**Ses.**		**Ext.**	
		30		**70**	
Prerequisite (s)	Knowledge of theoretical and experimental chemistry from +2 Level.	**Ext. Exam Time 3 Hrs.**			

Course Objectives

1. To apply the basic knowledge of chemistry to the engineering discipline.
2. To develop knowledge about water and its treatment for industrial and potable purposes.
3. To develop understanding in the areas of polymers, mechanism of corrosion of metals and corrosion control methods, fuels, lubricants and nanomaterials, conducting polymers, bio-degradable polymers and fiber reinforced plastics and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Course Outcomes

CO.1: Analyze and determine the water quality and prescribe the remedial measures for domestic as well as industrial usage.

CO.2: Student will differentiate the moulding techniques of plastic materials & classify the polymers and can apply to specific purposes.

CO.3: Student can able to design the metallic materials to prevent corrosion.

CO.4: Student will apply suitable lubrication mechanisms for various machinery parts.

CO.5: Will be familiar with the fundamentals of nano materials.

Chapter – 1: Water chemistry (8 Hrs)

Sources of water – impurities and their influence of living systems – WHO Limits – Hardness and its determination – boiler troubles and their removal – Water softening methods – Lime-soda, zeolite and ion-exchange - Municipal water treatment - break point chlorination – desalination of sea water – reverse osmosis method. **(CO1)**

Chapter – 2: Polymers and plastics (8 Hrs)

Polymers: Definition – Types of polymerization (addition- polythene, polyvinylchloride, polystyrene & condensation) – mechanisms of addition polymerization – radical and ionic polymerization- Styrene monomer – storage and biological effects.

Plastics: Thermosetting and thermoplastics – effect of polymer structure on properties of cellulose derivatives – vinyl resins – nylon (6, 6) - reinforced plastics – conducting polymers. **(CO2)**

Chapter – 3: Corrosion (8 Hrs)

Corrosion: Origin and theory – types of corrosion - chemical and electrochemical, pitting, inter granular, waterline, stress – galvanic series – factors effecting corrosion.

Corrosion Controlling Methods: Protective coatings: metallic coatings, electroplating and electroless plating – chemical conversion coatings – phosphate, chromate, anodized, organic coatings – paints and special paints. **(CO3)**

Chapter – 4: Fuels and Lubricants (8 Hrs)

Solid Fuels: Wood and coal, ranking of coal – analysis (proximate and ultimate) - coke manufacture – Otto Hoffmann's process – applications.

Liquid Fuels: Petroleum refining – motor fuels – petrol and diesel oil – knocking – octane number – cetane number.

Gaseous Fuels: Biogas, LPG and CNG – characteristics – applications.

Lubricants: Classification – mechanism – properties of lubricating oils – selection of lubricants for engineering applications. **(CO4)**

Chapter – 5: Nanomaterials (8 Hrs)

Nanomaterials - properties and application of fullerenes, fullerols, carbon nanotubes and nanowires - synthesis - top-down and bottom-up approaches - nanocomposites - nanoelectronics- applications of nanomaterials in catalysis, telecommunication and medicine. **(CO5)**

Text Books

- Engineering Chemistry – P.C. Jain and M. Jain, 16th Ed., Dhanpath Rai and Sons, New Delhi.
- A Text book of Engineering Chemistry, S.S. Dara, 12th Ed., S. Chand & Co. New Delhi.
- Introduction to Nanoscience - S. M. Lindsay, 1st Ed., - Oxford University Press.

Reference Books

- Engineering Chemistry, B.K. Sharma, Krishna Prakashan, 6th Ed., Meerut.
- Engineering Chemistry - B.L. Tembe, Kamaluddin and M.S. Krishnan (NPTEL).

ENGLISH
(Common for all Branches)
(Effective from 2020-2021 Admitted Batches)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	Credits
					Ses.	**Ext.**			
20091109	**ENGLISH**	**3**	**0**	**0**	**30**	**70**	**100**	**3hrs**	**3**

Objectives:

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts;
- To apply relevant writing formats to draft essays, letters, emails and presentations; and
- To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problem solving.

Outcomes:

- Students will be able to analyse a given text and discover the various aspects related to language and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication; and
- Learn to apply the topics in real-life situations for creative and critical use.

Textbook:

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

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.

Vocabulary:

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

Writing:

Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary

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
- *Study Writing*, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
- *Communication Skills*, Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- *Exercises in Spoken English*, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

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COMPUTER PROGRAMMING WITH C & NUMERICAL METHODS (Common for CE and CSE) (**20091105**)		
Instruction: 3 Hours /week		Credits: 3
Internal: 30 Marks	External Exam: 70 Marks	Total: 100 Marks

COURSE OBJECTIVES:

1. Aims to provide exposure to problem-solving through C programming.
2. Aims to train the student to the basic concepts of the C-programming language and Numerical Methods

COURSE OUTCOMES:

CO1. Student will be able to write code using control structures & arrays.
CO2. Student will be able to write code using strings & functions.
CO3. Student will be able to write code using user defined data types.
CO4. Student will be able to write code using Pointers for operations on files.
CO5. Student will be able to write code for Numerical & Integral Methods.

UNIT-I

Introduction to C, Decision Making, Branching, Looping, Arrays: 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, the (? :) operator, the GOTO statement., The while statement, The do statement, The for statement, Jumps in Loops, One, Two-dimensional Arrays.

UNIT-II

Functions & Strings: 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, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

UNIT-III

Structure and Unions: 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- Program applications.

UNIT-IV

Pointers & File handling: 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, File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments-Program Applications.

UNIT-V

Solutions of Algebraic and Transcendental Equations: Bisection Method, Newton Raphson Method. Interpolation: Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals, Trapezoidal rule, Simpson's 1/3 rule. Solutions of OrdinaryFirst Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Text Books:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India)Private Limited.
2. Introduction to Numerical Methods, SS Sastry, Prentice Hall.

Reference Books:

1. Let Us C, YashwantKanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan andR.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), Enzo Marinari (Author), Giovanni Organtini, World cientific.

DISCRETE MATHEMATICAL STRUCTURES **(20751702)**		
Instruction: 3 Hours/week		Credits: 3
Internal: 30 Marks	External Exam: 70 Marks	Total: 100 Marks

COURSE OBJECTIVES:

1. To understand mathematical arguments using logical connectives and quantifiers and verifythe 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:

1. Solve the basic principles of Logics and proofs.
2. Solve different kinds of problems related to Relations and set theory.
3. Analyze the fundamental algorithms and construct simple mathematical proofs.
4. Acquire knowledge to solve network problems using graph theory.
5. 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 and Strategy.

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 books:

1. Discrete Mathematics & Its Applications with Combinatorics and Graph Theory by Kenneth 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.

ENGLISH LANGUAGE LAB

(Common for all branches)

(Effective from 2020-2021 Admitted Batches)

Subject Code	Subject Name/ Title	L	T	P	Allotment of Marks		Total Marks	Credits
					Internal Examination	**External Examination**		
20091109P	**English Language lab**	**0**	**0**	**2**	**50**	**50**	**100**	**1.5**

Objectives:

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

Outcomes:

- Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
- Students will be able to participate in group activities like roleplays, group discussions and debates; and
- 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.

ENGINEERING CHEMISTRY LABORATORY

(Common for Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering and Mechanical Engineering)
(Effective from the admitted batch of 2020-2021)

Description	Subject Teaching Methodology	L	T	P	C
Course Code **20091103P**	**ENGINEERING CHEMISTRY LABORATORY**	**0**	**0**	**3**	**1.5**
	Total Marks : 100	**Int.**		**Ext.**	
		50		**50**	
Prerequisite (s)	Knowledge of theoretical and experimental chemistry from +2 Level.	**Ext. Exam Time 3 Hrs.**			

Course Objectives

1. To develop the fine skills of quantitative determination of various chemical components through titrimetric analysis.

Course Outcomes

At the end of the course student will be able to

CO.1 Quantitatively determine the amount of various chemical species in solutions by titrations.
CO.2 Conduct the quantitative determinations with accuracy.

List of Laboratory Experiments

1. Determination of sodium hydroxide with HCl (with Na_2CO_3 as primary standard)
2. Determination of alkalinity (carbonate and hydroxide) of water sample
3. Determination of Fe (II)/Mohr's salt by permanganometry
4. Determination of oxalic acid by permanganometry
5. Determination of chromium (VI) by Mohr's salt solution
6. Determination of zinc by EDTA method
7. Determination of hardness of water sample by EDTA method
8. Determination of chlorine in water by iodometric titration

Reference Books

- Vogel's Quantitative Chemical Analysis – V Edition – Longman

Experiments in Applied Chemistry (For Engineering Students) – Sinita Rattan – S. K. Kataria & Sons, New Delhi.

COMPUTER PROGRAMMING WITH C & NUMERICAL METHODS LAB-CSE (**20091105P**)		
Instruction: 3 Hours/week		Credits: 1.5
Internal: 50 Marks	External Exam: 50 Marks	Total: 100 Marks

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 datatypes.
CO4: Ability to implement the programs using pointers and operations on files.
CO5: Ability to implement the programs using numerical & integral methods.

1. a) Write a C program to find the roots of a quadratic equation
   b) Write a C program, which takes two integer operands and one operator from the user performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use Switch statement.
   c) Write a C program to find the sum of individual digits of that number and also print and save it in reverse order.
2. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line?
3. Write a program which generates 100 random real numbers in the range of 10.0 to 20.0 and sort them in descending order.
4. Write a function for transporting a square matrix in place (in place means that you are not allowed to have full temporary matrix).
5. Write a program to add two matrices with the dimension of the matrix specified by the user at the time of executing the program.
6. Write a program e.g., for getting a sub-string from a given position, copying one string to another, reversing a string and adding one string to another with and without using string manipulation functions.
7. Write a 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.
8. Write a program to demonstrate the difference between pointer to an array and array of pointers.
   a) Store your name, address and phone number in a 2-D character array and display the same using pointer notations.
   b) Use pointer to an array and array of pointers.

9. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.

10. Implement bisection method to find the square root of a given number to a given accuracy.
11. Implement Newton Raphson Method to determine a root of polynomial equation.

12. Given a table of x and corresponding f(x) values, write a program which will determine f(x) value at an intermediate x value using Lagrange Interpolation.
13. Implement Simpson's $1/3^{rd}$ rule for numerical integration.
14. Implement Trapezoidal rule for numerical integration.
15. Write a program to solve a differential equation using Runge-Kutta Method.

B. Tech I Year - II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
20092101	BSC	Engineering Mathematics – II	3	0	0	30	70	100	3
20092104	BSC	Engineering Physics	3	0	0	30	70	100	3
20092106	ESC	Engineering Graphics	1	0	4	30	70	100	3
20752707	ESC	Electrical and Electronics Engineering (EEE)	3	0	0	30	70	100	3
20752708	ESC	Digital Logic Design (DLD)	3	0	0	30	70	100	3
20092110P	ESC	Workshop Lab	0	0	3	50	50	100	1.5
20092104P	BSC	Engineering Physics Lab	0	0	3	50	50	100	1.5
20752707P	ESC	Electrical and Electronics Engineering Lab	0	0	3	50	50	100	1.5
		Total	**13**	**0**	**13**	**300**	**500**	**800**	**19.5**

ENGINEERING MATHEMATICS - II

(Common for Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering and Mechanical Engineering)
(Effective from the admitted batch of 2020-21)

Description	Subject Name	L	T	P	C	Ext. Exam Time
Course Code 20092101	**ENGINEERING MATHEMATICS -II**	**3**	**0**	**0**	**3**	3 Hrs.
	Total Marks : 100	**Ses.**		**Ext.**		
		30		**70**		

L: Lectures; T: Tutorial; P: Practical; Ses: Sessionals; Ext: External; C: Credits

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:

- Find rank, Eigen values and Eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- 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
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

SYLLABUS

UNIT-I

(Linear 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 and it's Application to ODE)

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, 43r^{d} 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.

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ENGINEERING PHYSICS

(Common for CE, CSE, ECE and ME)

(Effective from the admitted batch of 2020-2021)

Description	Subject Teaching Methodology		L	T	P	C
Course Code **20092104**	**PHYSICS**		**3**	**1**	**0**	**4**
Teaching	**Total Contact Hours : 60**	**Total Marks : 100**	**Ses. 30**		**Ext. 70**	
Prerequisite (s)	Knowledge of theoretical and experimental Physics from +2 Level. Application of Physics theory and calculations to required course		**Ext. Exam Time 3 Hrs.**			

Course Objectives:

The fundamentals of sciences are essential to learn as the application of science in solving problems is technology. The 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's rings 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.

SYLLABUS

THERMODYNAMICS

Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

ELECTROMAGNETISM

Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

OPTICS

Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.

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

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

LASERS and FIBRE OPTICS

Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers

Introduction to optical fibers, principle of propagation of light in optical fibers, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibers, Fibre optics in communications, Application of optical fibers.

MODERN PHYSICS

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semiconductors and insulators.

Nanophase Materials : Introduction, properties, Top-down and bottom up approaches, Synthesis - Ball milling, Chemical vapour deposition method , sol-gel methods, Applications of nano materials.

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 –Dhanpat Rai

Reference Books:

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

ENGINEERING GRAPHICS (20092106)

(Common for CE, CSE, ECE and ME)

(Effective from the admitted batch of 2020-2021)

Credits	*Periods*			*Total*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	***Tutorial***	***Lab***	*Contact Hrs/Week*			
4	2	-	4	6	30	70	100

COURSE OBJECTIVES

COB 1 The course is aimed at developing Basic Graphic skills.

COB 2 Develop Skills in Preparation of Basic Drawings

COB 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.

SYLLABUS

UNIT-I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions.

Curves: Construction of Conic sections, cycloids and involutes - 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 plane and parallel to the other - Projections of straight line inclined to both the reference planes - Traces.

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 - Projection of Oblique planes. Introduction to Auxiliary Planes.

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 - inclined to both the reference planes.

UNIT – IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section - Sections of solids (Prism, Pyramid, Cylinder and Cone) in simple positions only. Development of Surfaces: Methods of Development: Parallel line development and radial line development - Development of a cube, prism, cylinder, pyramid and cone.

UNIT – V

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

TEXT BOOK

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

REFERENCE BOOK

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

ELECTRICAL AND ELECTRONICS ENGINEERING (**20752707**)

Instruction: 3 Periods /week, External Exam: 3 Hours		Credits: 3
Internal: 30 Marks	External: 70 Marks	Total: 100 Marks

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 student will be able to:

1) Understand the basic theorems and components used in Electrical circuits and also the functionality of electrical machines.
2) Discuss the functionality of basic semiconductors and their applications.
3) Implement the concepts of BJT, Rectifiers and Thermal stabilization to design CE, CB, CC amplifiers.
4) Analyse the Characteristics of FET & MOSFET.
5) Elaborate the Knowledge of Communication Engineering.

UNIT-I

ELECTRICAL CIRCUITS & MEASUREMENTS: Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits Introduction to AC Circuits Waveforms and RMS Value Power and Power factor Single Phase and Three Phase Balanced Circuits. Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT-II

ELECTRICAL MACHINES: Construction of D.C Generator, D.C Motor, Principle of Operation, EMF equation, Basic Equations and Applications of DC Generators, DC Motors, Torque equation, Single Phase Transformer operation, EMF equation, Single phase induction Motor.

UNIT-III

SEMICONDUCTOR DEVICES AND APPLICATIONS: Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage

Regulation. Bipolar Junction Transistor CB, CE, CC Configurations and Characteristics

UNIT-IV

FIELD EFFECT TRANSISTORS: Junction Field Effect Transistors (JFET), JFETcharacteristics, JFET Parameters, MOSFETS Construction and working Depletion and Enhancement MOSFETS.

UNIT-V

FUNDAMENTALS OF COMMUNICATION ENGINEERING: Types of Signals: Analog and Digital Signals Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.

Text books:

1) D.P.Kotharti and I.J.Nagarath, Basic Electrical and Electronics Engineering, Mc graw hill, 2016, Third edition.
2) M.S.Sukhija and T.K.Nagsarkar, Basic Electrical and Electronics Engineering, Oxford, 2016.

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Reference Books:

1) S.B.Lal Seksena and Kaustuv Dasgupta, Fundamentals of Electrical Engineering, Cambridge, 2016.
2) B.L.Thereza, Fundamentals of Electrical Engineering and Electronics, Chand & Co 2008.
3) S.K.Sahdev, Basics of Electrical Engineering, Pearson, 2015

DIGITAL LOGIC DESIGN (**20752708**)		
Instruction: 3 Hours /week		Credits: 3
Internal: 30 Marks	External Exam: 70 Marks	Total: 100 Marks

COURSE OBJECTIVES:

1. To introduce the basic principles for design of combinational circuit and sequentialcircuits.
2. To learn simple digital circuits in preparation for computer engineering.

COURSE OUTCOMES:

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

1. Represent different number systems and solve problems on binary addition, subtraction, 2‘scomplement.
2. Minimize the Boolean expression using Boolean algebra and design it using logic gates.
3. Realize and simplify Boolean Algebraic functions using K-Maps and design combinationalcircuits.
4. Design and develop sequential circuits
5. Understand memories like RAM and ROM, Programmable Logic Array and ProgrammableArray Logic.

UNIT-I

Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers. Binary Codes, Binary Storage and Registers, Binary Logic.

UNIT-II

Boolean Algebra and Logic Gates: Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNIT-III

Gate-Level Minimization: The Map Method, Four-Variable Map, Five-Variable Map, Product of Sums Simplification, Don't-Care Conditions, NAND and NOR Implementation, Other Two- Level Implementations, Exclusive-OR Function, Hardware Description Language (HDL). **Combinational Logic:** Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, HDL for Combinational Circuits.

UNIT-IV

Sequential Logic Design, Synchronous Sequential Logic: Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, HDL for Sequential Circuits, StateReduction and Assignment, Design Procedure. **Registers ad Counters:** Registers, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters, HDL for Registers and Counters.

UNIT-V

Memory and Programmable Logic: Introduction, Random-Access Memory, Memory Decoding, Error Detection and Correction, Read-Only Memory, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.

Text books:

1. Digital Design, 3rdEdition, M.Morris Mano, Pearson Education.
2. Digital Logic Design, Lokesh Chaudhary & Sunil S. Chaudhary Hardeep Singh

Reference Books:

1. Digital Logic Design Principles, Norman Balabanian & Bradley Carlson, John Wiley & Sons (Asia) Pvt.Ltd.,2002.
2. Fundamentals of Digital Logic with VHDL Design, Stephen Brown and Zvonko Vranesic,Tata McGraw-Hill Edition,2002.
3. Digital Design Principles and Practices 4th Editon, Pearson Publications, John F.Wakerly.

WORKSHOP LAB
(Common for CE, CSE, ECE and ME)
(Effective from the admitted batch of 2020-2021)

Course Code	Title of the Course	Contact Periods for delivering the course			Credits	Sessional Marks	External Marks
20092110P	WORKSHOP	L 0	T 0	P 3	1.5	50	50

COURSE OUTCOMES

CO 1 Identify and use various tools required for performing operations in Carpentry for making various components

CO 2 Identify and use various tools required for performing operations in Fitting for making various components

CO 3 Identify and use various tools required for performing operations in Tin-smithy for making various components

CO 4 Identify and Usage of House Wiring applications.

LIST OF EXPERIMENTS:

S.No	Trade	Job
1.	Carpentry	(a) Cross Lap Joint (b) Corner Dovetail Joint (c) Mortise and Tenon Joint (d) Bridle Joint
2.	Fitting	(a) V-Fit (b) Square Fit (c) Half Round Fit (d) Dovetail Fit
3.	Tin Smithy	(a) Taper Tray (b) Square Tray (c) 90^{o} Elbow (d) Funnel
4.	House Wiring	(a)Wiring of two bulbs in Parallel (b)Wiring of two bulbs in Series (c) Wiring to control a lamp with two-way switches (d) Wiring to control a fluorescent tube light with one-way switch

REFERENCE

1. Elements of workshop technology, Vol.1 by S. K. and H. K. Choudary.
2. A course in Workshop Technology,Vol.1 by B.S.Raghuwanshi, Danpat Rai

ENGINEERING PHYSICS LABORATORY

(Common for CE, CSE, ECE and ME)

(Effective from the admitted batch of 2020-2021)

Description	Subject Teaching Methodology		L	T	P	C
Course Code **20092104P**	**ENGINEERING PHYSICS LABORATORY**		**0**	**0**	**3**	**1.5**
Teaching	**Total Contact Hours : 30**	**Total Marks : 100**	**Int. 50**		**Ext. 50**	
Prerequisite (s)	Knowledge of theoretical and experimental Physics from +2 Level. Application of Physics theory and calculations to required course		**Ext. Exam Time 3 Hrs.**			

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

CO. 1. 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 Extraordinary μe 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.

ELECTRICAL AND ELECTRONICS ENGINEERING LAB (20752707P)		
Instruction: 3 Periods/week	External. Exam: 3 Hours	Credits: 1.5
Internal:50 Marks	External: 50 Marks	Total: 100 Marks

COURSE OBJECTIVES:

1. To Verify basic laws and theorems for a given resistive network
2. To determine the performance parameters for D.C & A.C Machines.
3. To Verify the V-I Characteristics of Diodes (PN Junction Diode & Zener Diode).
4. To Verify the Characteristics of BJT & FET
5. To perform Amplitude Modualtion & Demodulation for Sinusoid Waveform.

COURSE OUTCOMES:

By the end of course a student would be able to:

1. Verify Ohm's law and Kirchhoff's law, superposition theorem for a given resistive network excited by a D.C. source.
2. Determine Regulation of a single-phase transformer, efficiency of a Three-Phase Induction motor, D.C Shunt motor.
3. Verify the V-I characteristics of PN Junction Diode & zener diode, Rectify & regualte a sinusoid using half wave & full wave rectifier.
4. Verify the characteristics of CE configuration of BJT & characteristics of JFET
5. For a given sinusoid perform Amplitude Modulation & Demodulation and calculate modulation index for under, critically and over modulation cases.

LIST OF EXPERIMENTS

1. Verification of Ohm's law & Kirchhoff's law
2. Verification of Superposition Theorem
3. Open circuit test and short circuit test on 1-phase transformer
4. No load and blocked rotor tests on 3-phase squirrel cage Induction motor
5. Brake test on a D.C Shunt motor.
6. V-I Characteristics of P-N Junction diode
7. V-I & Regulation Characteristics of Zener diode
8. Half Wave Rectifier with filter
9. Full wave Rectifier with filter
10. Input and Output Characteristics of CE Configuration
11. Drain and Transfer Characteristics of JFET
12. Amplitude modulation & Demodulation.

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

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

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ENGINEERING AND TECHNOLOGY PROGRAM

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.TECH. (CSE) II YEAR I SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS2101	BS/BSC	Probability, Statistics and Queuing Theory	3	0	0	30	70	100	3
CS 2102	PC/PCC	Data Structures	3	0	0	30	70	100	3
CS 2103	PC/PCC	Computer Organization and Architecture	3	0	0	30	70	100	3
CS 2104	PC/PCC	Operating Systems	3	0	0	30	70	100	3
CS 2105	PC/PCC	Object Oriented Programming through Java	3	0	0	30	70	100	3
CS 2106	PC/PCC	Data Structures Using ‘C’ Lab	0	0	3	50	50	100	1.5
CS 2107	PC/PCC	Object Oriented Programming (through Java) Lab	0	0	3	50	50	100	1.5
CS 2108	PC/PCC	Operating Systems Lab	0	0	3	50	50	100	1.5
CS 2109	SC(MC)	Design Thinking and Innovation	1	0	2	50	50	100	2
CS 2110	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
	Probability, Statistics and Queuing Theory	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. To discuss basics of probability and related theorems, Problems. To study about conditional probability and Bayes theorem.
2. To study about random variables and their properties. To examine, analyze and compare Probability distributions.
3. To discuss regression and estimation techniques.
4. 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:

1: Ability to solve various problems regarding probability and conditional Probability.
2: Examine, analyze and compare probability distributions.
3: Prepare null and alternative hypothesis and test its validity based on random sample.
4: Solve various types of regression problems.
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 Variablesand their Properties: Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions Their Properties, Transformation Variables, Mathematical Expectations, Probability GeneratingFunctions.

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

Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-Biasedness, 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, M/M/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	
	Data Structures	**3**	**0**	**0**	**30**	**70**	3

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:

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

REFERENCE BOOKS:

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

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
	Computer Organization and 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

1. Understand the Concepts of Register Transfer and Microoperations and detailed idea about Computer Organization and Design.
2. Describe Micro-programmed Control & Organization of the CPU.
3. Discuss the design concepts of pipeline and vector processing
4. Classify various I/O devices and the I/O interface.
5. 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.
3. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S Gaonkar

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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.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
	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 and to investigate case studies to understand the design philosophies.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Understand Operating System structure, classify OS services and analyze scheduling algorithms.
2. Identify solutions to overcome synchronization problems and deadlocks in modern operating system design.
3. Explain about memory management functions and compare various page replacement algorithms.
4. Understand how File Systems and I/O Systems are organized, implemented and managed by operating system.
5. Distinguish the relative merits of LINUX, Windows OS and Recognize how OS 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 Concepts, 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, 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. **I/O systems**: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, swap- space management.

UNIT-V

System Protection: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights.
Case Study: Overview of LINUX, Windows OS.

TEXT BOOKS:

1. Operating Systems, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, John Wiley 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
	Object - Oriented Programming through JAVA	L	T	P	Int	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. To learn the basics of object oriented programming concepts and Java programming.
2. To learn inheritance, polymorphism and how they relate to the design of abstract classes.
3. To understand the concepts of packages and interfaces with exception handling and multithreading.
4. To design concepts of real time problems are realized using Graphical User Interface.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Understand the object oriented programming concepts and basics of Java.
2. Write programs using polymorphism, inheritance, packages and interfaces in Java.
3. Develop applications using multithreading with exception handling.
4. Design GUI applications using Applets and AWT.
5. Understand Java Swing and develop applications using Swing components.

UNIT-I

Introduction- Summary of oops concepts, Java Basics- History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, classes and objects – concepts of classes, objects, constructors, methods, Introducing access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling.

UNIT-II

Inheritance, Interface and Packages– Inheritance and its types with examples, benefits of inheritance, Member access rules, super keyword, using final with inheritance, polymorphism- method overriding, abstract classes. Interface- defining an interface, implementing interface. **Packages**- Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT-III

Exception handling and multithreading - Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, java built in exceptions, creating own exception sub classes. Thread life cycle, creating threads, synchronizing threads.

UNIT-IV

Applets - Concept of Applets, differences between applets and application, life cycle of an applet, types of applets, creating applets. **Event Handling**- Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, dialogs, menu bar, graphics, layout manager types – boarder, grid, flow, card and grid bag.

UNIT-V

Swing – MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes.

TEXT BOOKS:

1. Java; the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS:

1. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, eighth Edition, Pearson Education.
2. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, eighth Edition, Pearson Education
3. Object Oriented Programming through Java, P. Radha Krishna, and University Press.
4. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
	Data Structures using 'C' 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:

1. Implement programs on stacks, queues and various types of linked list.
2. Develop programs using various graph algorithms
3. Implement program on Binary search tree traversals
4. 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 and for 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 in a 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.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
	Object - Oriented Programming through JAVA LaB	**0**	**0**	**3**	**50**	**50**	1.5

COURSE OBJECTIVES:

1. Practice object-oriented programs and build java applications.
2. Implement java programs for inheritance, interfaces and polymorphism.
3. Implement sample programs for developing reusable software components.
4. Design GUI applications using Applets, AWT and Swing.

COURSE OUTCOMES:

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

1. Develop java programs using control structure statements, inheritance, interfaces and polymorphism, package and multithreading.
2. Create GUI applications, and Swing applications.

CYCLE -1

BASIC PROGRAMS

1. Try debug step by step with small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a java program that prints all real solutions to the quadratic equation ax2 +bx+c=0. Read inputs a, b, c and use the quadratic formula.

MATRICES, OVERLOADING, OVERRIDING

1. Write a java program to multiply two given matrices.
2. Write a java program to implement method overloading and constructors overloading.
3. Write a java program to implement method overriding.

PALINDROME, ABSTRACT CLASS

1. Write a java program to check whether a given string is palindrome.
2. Write a java program for sorting a given list of names in ascending order.

3. Write a java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

INTERFACE

1. Write a program for hybrid inheritance.

PACKAGE, MULTITHREADING

1. Create user defined package.

2. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

CYCLE -2

TRAFFIC LIGHT

1. Write a java program that simulates a traffic light. The program lets the user select one of three lights: Red, Yellow or Green with radio buttons. On selecting a button an appropriate message with "STOP" or "READY" or "GO" should appear above the buttons in selected color. Initially, there is no message shown.

MOUSE EVENTS

1. Write a java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. Use adapter classes.

KEY EVENTS

1. Write a java program to demonstrate the key event handlers.

CALCULATOR

1. Write a java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +,-,*, % operations. Add a text field to display the result. Handle any possible exception like divided by zero.

APPLET and Swing

1. Develop an applet that displays a simple message.
2. Develop an applet that receives an integer in one text field and computes its factorial value and returns it in another text field, when the button named "compute" is clicked.
3. Write a program that creates a user interface to perform integer division. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box using Swing concept.

REFERENCE BOOKS:

1. "Complete Reference Java" by Herbert Schildt.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
	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 to synchronization, deadlocksand file allocation methods.

COURSE OUTCOMES:

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

1. **Examine** different Unix commands and Experiment programs using system calls.
2. **Develop** shell programs using vi editor
3. **Employ** various data structures to implement OS functions.

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, child process 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 Round Robin algorithms.
2. C programs to study page replacement implementing FIFO, Optimal, and LRU page replacement algorithms.
3.C programs to study deadlock avoidance and detection.
4.C Programs to simulate free space management.
5.Implement the Producer – Consumer problem using Semaphores.
6.Implement Paging memory management scheme.
7.Implement any file allocation technique Linked-Indexed-Contiguous.

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
	Design Thinking and Innovation	L	T	P	Int.	Ext	2
		1	**0**	**2**	**50**	**50**	

COURSE OUTCOMES:

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

1: Outline a problem; apply methods of Empathy on user groups.
2: Describe and define the problem specific to the user group.
3: Apply Ideation tools to generate Ideas to solve the problem.
4: Develop prototype.
5**:** 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 up - 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 Alam, 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

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

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 the society.
3. Apprise the impact of pollution getting generated through the anthropogenic activities on the environment
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:

1: In this unit the students learn about the scope and importance of Environmental studies. The students understand about different kinds of ecosystems.
2: The students learn about biodiversity and its conservation. They also learn about types of biodiversity, values of biodiversity and threats to biodiversity.
3: The students understand about the types of natural resources and problems associated with them.
4: In this unit the students gain knowledge about different types of environmental pollution- causes, effects and control measures.
5: In this unit the students gain knowledge about characteristics of human population growth and its impact on 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, Mining and 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 and control 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 all Branches 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.

REFERENCE BOOKS:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

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. (CSE) II YEAR II-SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS2201	ES/ESC	Microprocessors & Microcontrollers	3	0	0	30	70	100	3
CS2202	PC/PCC	Design and Analysis of Algorithms	3	0	0	30	70	100	3
CS2203	PC/PCC	Database Management Systems	3	0	0	30	70	100	3
CS2204	PC/PCC	Formal Languages and Automata Theory	3	0	0	30	70	100	3
CS2205	HSS/HSMC	Managerial Economics	3	0	0	30	70	100	3
CS2206	ES/ ESC Lab	DEMP Lab	0	0	3	50	50	100	1.5
CS2207	PC/PCC	Database Management Systems Lab	0	0	3	50	50	100	1.5
CS 2208	SC	Problem Solving Using Python	1	0	2	50	50	100	2
CS2209	MC	Professional Ethics And Universal Human Values	3	0	0	30	70	100	0
CS2210	MOOCS	Massive Open Online Courses	0	0	3	0	100	100	1.5
CS2211	MC	NSS / NCC	0	0	2	-	-	-	0
Total Credits									**21.5**
Summer Internship (Community Service)									

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**

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
	Microprocessors & Microcontrollers	L	T	P	Int	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. To discuss the architectures of 8085, 8086 microprocessors, their instruction sets andrelated ALP programs.
2. To discuss interfacing semiconductor memories, interfacing peripheral to Intel 8086.
3. To study interfacing data converters to 8086 and discuss about micro controller 8051architecture, Programming and its applications.

COURSE OUTCOMES:

1. Understand the basic architecture of 8085 and ability to write ALP Programs usingInstruction Set.
2. Understand the basic architecture of 8086 and ability to write ALP Programs usingInstruction Set.
3. Implement the Interfacing of 8086 Microprocessor with Semiconductor Memories and I/O Devices, Interfacing of 8086 Microprocessor with various peripheral devices and dataconverters.
4. Develop Applications of 8051 using the knowledge of Architecture, Programming conceptsof 8051 Microcontroller.
5. Develop Applications of Arduino Microcontroller using the knowledge of Architecture, Programming conceptsof Arduino Microcontroller.

UNIT-I

Introduction to Microprocessors and Microcomputers: Introduction to 8085 Microprocessor**,** Architecture of 8085 Microprocessor, PIN Diagram of 8085 Microprocessor, Instruction Set of 8085 Microprocessor, Addressing Modes of 8085, Programming of 8085 Microprocessor, 8085 Interrupts.

UNIT – II

8086 Architecture: Introduction to 8086 Microprocessor**,** Architecture of 8086 Microprocessor, Pin Diagram of 8086 Microprocessor, Instruction Set of 8086 Microprocessor, Addressing Modes of 8086 Microprocessor, Programming Techniques of 8086 Microprocessor.

UNIT – III

Interfacing Semiconductor Memories and I/O Devices: Semiconductor Memories: RAM and

ROM, SRAM, DRAM, Classification Internal Organization & Functional Description, Interfacing SRAMs and EPROMs to 8086. Parallel I/O Interface- 8255, Timer Interface - 8253/8254, **Interfacing Data Converters to 8086:** D/A ConversionMethods, A/D Conversion methods.

UNIT – IV

Introduction to Micro controllers: Intel 8051Architecture, 8051 Pin Diagram, Instruction Set, Addressing Modes, Programming and Applications of 8051.

UNIT – V

Introduction to Arduino Boards: The Origin of Arduino, The Arduino Family, C Language Basics for Arduino, Variables, Experiments in C, Numeric Variables and Arithmetic Commands: if, for, while, the #define Directive, LCD Displays A USB Message Board Using the Display.

TEXT BOOKS:

1. Microprocessor Architecture, Programming, and Applications with the 8085 Ramesh S. Gaonkar, 4th Edition, Penram International, 1999

2. The 80x86 Family, Design, Programming and Interfacing, John E.Uffenbeck,3rd Edition, Pearson Education Inc., 2002.

3. KennethJ.Ayala, 8051 Microcontroller Architecture, Programming and Applications, 2nd Edition, Penram International Publications.

4. Programming Arduino: Getting Started with Sketches, Simon Monk, MC GrawHill.

REFERENCE BOOKS

1. Microprocessors and Microcomputers : Hardware and Software - 6th edition.

2.8051 Microcontroller and Embedded Systems (English, Paperback, Mazidi Muhammad Ali.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
	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, divide and conquer, backtracking, branch and bound etc. for common engineering design situations.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Analyze the efficiency of algorithms using mathematical analysis and asymptotic notations.
2. Employ divide-and-conquer and decrease-and-conquer strategies for problem solving.
3. Apply transform-and-conquer and string-matching techniques appropriately when an algorithmic design situation calls for it.
4. Solve problems using algorithm design methods such as the greedy method, dynamic programming.
5. 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 Heap sort, 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, Approximation Algorithms for NP-hard Problems, Algorithms for solving Nonlinear Equations.

TEXT BOOKS:

1. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, New Delhi, 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 Delhi

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

COURSE OBJECTIVES:

1. To learn the evolution of DBMS Versus File systems, data models, and layers of abstraction.
2. To understand conceptual and physical aspects of database design.
3. To learn formal and commercial query language specifications.
4. To understand concurrency control, recovery management, and other related issues.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Understand the advantages of DBMS over traditional file system and its Characteristics
2. Design relational database and execute various queries using SQL
3. Design ER-models to represent simple database applications.
4. Understand various anomalies that can occur in databases and overcome those with the help of normal forms.
5. Describe the concepts of Transaction Management, Concurrency Control and data Recovery.

UNIT-I

Introduction: File system versus DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

UNIT-II

Relational Algebra and SQL: Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

UNIT-III

Introduction to Database Design and The Relational Model: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/ Altering Tables and Views.

UNIT-IV

Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD 's, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

UNIT-V

Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control. **Concurrency Control**: 2PL, Serializability and Recoverability, Introduction to Lock Management Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking. **Crash Recovery**: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media Recovery.

TEXT BOOKS:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGraw- Hill

REFERENCE BOOKS:

1. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
	Formal Languages and 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 the 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 ϵ-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 of Turing machine, halting problem, church's thesis, universal Turing machine, Gödel number, definitions of recursive functions- prf, rf, decidability.

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

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

COURSE OBJECTIVES:

1. To bring about an awareness about the nature of Managerial Economics and its linkages with other disciplines.
2. To understand the Micro and Macro Environment of Business.
3. To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

COURSE OUTCOMES:

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

1. Understand the various economic activities in business and industry.
2. Analyze the real-world business problems.
3. Make optimal business decisions for the effective and efficient management of Organizations.

UNIT-I

Significance of Economics and Managerial Economics: Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions **Classification of Economics**- Micro and Micro Economics. Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

UNIT-II

Demand and Utility Analysis: Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve. **Elasticity of demand** - Definition, Measurement of elasticity, Types of Elasticity (Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

UNIT-III

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations.
Theory of Production and Cost analysis: Production - Meaning, Production function and its assumptions, use of production function in decision making.

UNIT-IV

Cost analysis - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale. **Market Structures:** Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly, Oligopoly, Importance of kinked demand curve; Monopolistic Competition.

UNIT-V

Pricing and Business Cycles: Pricing Analysis: Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing, Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers. **Business cycles** - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

TEXT BOOKS:

1. Sankaran,S., Managerial Economics, Marghan Publications, 2015, Chennai.
2. Aryasri, A.R., Managerial Economics and Financial Analysis, MC Graw Hill Education, New Delhi,2015.

REFERENCE BOOKS:

1. Dwivedi, D.N., Managerial Economics, Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.
2. Dewett, K.K., Modern Economic Theory, S.Chand & Company Ltd., New Delhi, 2005.

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

COURSE OBJECTIVES:

1. To learn the about logic gates, half adders, full adders and flip -flops.
2. To learn about the microprocessor programming.
3. To learn about the microprocessor interfacing with stepper motor, R-2R ladder.
4. To learn about 8051 Microcontroller Programming.

COURSE OUTCOMES:

1. The student understands the logic gates, half adders, full adders and flip-flops to design acircuit.
2. The student develops the skill of writing microprocessor programming.
3. The student understands the interfacing of microprocessor with stepper motor, R-2Rladder.
4. Write basic Programs 8051 Microcontroller using Keil Software.

CYCLE 1

1. DIGITAL EXPERIMENTS

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

2. MICROPROCESSOR using 8085 Kit

- Binary addition & subtraction. (8-bit & 16-bit)Multiplication & Division.
- Picking up largest/smallest number.
  Arranging ascending/descending order.
  Decimal addition (DAA) &
  Subtraction.Time delay generation

CYCLE – 2

3. MICROPROCESSOR using 8085 Interfacing Kits

- Interfacing R-2R Ladder network (DAC) (4 bits) to generate waveforms.

- Interfacing a stepper motor and rotating it clockwise/anti clockwise through a known angle.
  Interfacing a seven-segment display.
- Interfacing ADC for temperature measurement.

4. Microcontroller using 8051 Keil Software

- Addition
- Subtraction
- Multiplication
- Division
- Addition of Array of Numbers

REFERENCE BOOKS:

1) Fundamental of Digital Electronics and Microprocessors by Anokh Singh, ISBN: 9788121922159, S.Chand Publishers.
2) DIGITAL ELECTRONICS AND MICROPROCESSOR by Dr. Narendra S Jadhav , Dr. (Mrs.) Alpana P Adsul, ISBN 9789388293006, Pragathi Publishers.

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

COURSE OBJECTIVES:

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. Understand Design and implement a database schema for a given problem-domain
4. Normalize a database
5. Develop mini project using DBMS Concepts.

CYCLE-I

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL & Structured Query Language (SQL) used with the RDBMS.

I. Laboratory Exercises Should Include:

a. Defining Schemas for Applications,
b. Creation of Database,
c. Writing SQL Queries,
d. Retrieve Information from Database,
e. Creating Views
f. Creating Triggers
g. Normalization up to Third Normal Form
h. Use of Host Languages,
i. Interface with Embedded SQL,
j. Use of Forms
k. Report Writing

CYCLE-II

II. Some sample applications are given below:

1. Accounting Package forShops,
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
	Problem Solving using Python	L	T	P	Int	Ext	2
		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

1: Develop the Python programs using operators, conditional and looping statements and strings.
2: 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 exam or 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 by key
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
	Professional Ethics and Universal Human Values	L	T	P	Int	Ext	0
		3	**0**	**0**	**30**	**70**	

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 Relatio -nship: 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	
	NCC/NSS	**0**	**0**	**2**	**0**	**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 time to 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 do at least 2 hours of service in a Week.

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

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

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ENGINEERING AND TECHNOLOGY PROGRAM

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B. Tech III Year - I Semester (5th 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: 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
CS 3108	SAC/SC	Skill Course – 3 C++ Programming	1	0	2	50	50	100	2
CS3109	MC	Technical Communication & Soft Skills	3	0	0	100	0	100	0
Summer Internship 2 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

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. 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, 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.

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

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS3102	**Compiler Design**	L	T	P	Int.	Ext	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

CO1: Describe the various phases of Compiler and generate tokens for the given program.
CO2: Explain the working of syntax analyzer and generate a parsing table to parse a string.
CO3: Construct intermediate code for the given parse tree.
CO4: Construct an Optimized Code for the given intermediate code using different techniques.
CO5: 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, Reviewof 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, Syntax 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, 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 for Symbol 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 Books:

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

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS3103	**Computer Networks**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. To make the students understanding of basic requirements of network hardware, software and its architecture.
2. Familiarize the students with layered architecture of the network software and hierarchal nature of the network physical infrastructure.
3. Study of various network interconnecting devices and other associated network hardware.
4. Introduction of advanced networking concepts and wireless and wireless sensor networks.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Understand the design and estimate the requirements for practical setup of a given network.

CO2: Understand concepts of sub netting and routing mechanisms.

CO3: Explain the concepts of Transport layer

CO4: Describe various application layer protocols and classify the different types of network devices.

CO5: Understand various wireless Networks.

UNIT- I

Introduction to Computer Networks: Introduction, Network Hardware, Network Software, Reference Models, Network Examples, Internet Based Applications.

The Medium Access Control: The Channel Allocation Problem, CSMA, Collision Free Protocols, The Ethernet, Wireless LANS, Bluetooth.

UNIT- II

Network Layer : Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service (QoS), Internetworking, Network Layer in the Internet, IP Protocol, IP Address, Subnets.

UNIT- III

Transport layer: Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues.

UNIT- IV

Application Layer: Over View of DNS, Electronic Mail, FTP, HTTP, SNMP Protocols, World Wide Web. **Network Devices:** Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.

UNIT-V

Overview of Networks: Cellular Networks, Ad-hoc Networks, Mobile Ad-hoc Networks,Sensor Networks.

Text Books:

1. Computer Networks, Andrews S Tanenbaum,, 5th Edition, Pearson Edu.
2. An Engineering Approach to Computer Networks- S.Keshav, 2nd Edition, Pearson Education.

Reference Books:

1.Data Communications and Networking, Behrouz A Forouzan, Tata McGraw-Hill Co Ltd, Second Edition, and ISBN: 0-07-049935-7.
2.William Stallings, "Data and Computer Communications", Eighth Edition, Pearson Education.
3.James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Third Edition, Pearson Education,

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

COURSE OBJECTIVES

1. To understand the significance of object-orientation in designing a s/w.
2. To design object-oriented applications using C++.

COURSE OUTCOMES:

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

CO1: Understand the importance of object-oriented concepts.
CO2: Explain classes and objects in C++.
CO3: Design applications using inheritance in C++.
CO4: Design applications using polymorphism in C++.
CO5: Explain how exception handling, File I/O is handled in C++.

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 & type conversions.

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.

UNIT-V

Advanced Concepts in C++: Templates, Exception handling, console I/O and File I/O: class templates, Function templates, member function templates, exception handling, managing console I/O operations, and working with files.

Text Books:

1. JAVA 2.0- Complete Reference : Herbert Schildt& F. Naughton.
2. Introduction to JAVA PROGRAMMING by Y.Daniel Liang (PHI).
3. Object oriented Programming using C++: E. Balagurusamy, PHI.

Reference Books:

1. Object Oriented Programming in C++: N. Barkakati, PHI.
2. Object Oriented Programming through C++ by RobatLaphore.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3105	**Introduction to Data Science (Elective-I)**	**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
CS3105	**Embedded Systems (Elective-I)**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1.To learn the basics of embedded systems with Microcontroller and interrupts.
2.To study various software architectures used in embedded systems.
3.To analyze Inter Task Communication procedures and design issues of RTOS.
4.To distinguish various embedded software development tools and debugging techniques.
5.To design various embedded systems with advanced processors.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Interpret the hardware components and interrupts
CO2: Classify software architectures and identify importance of RTOS architecture.
CO3: Infer Inter Task Communication methods and design issues in RTOS.
CO4: Compare various embedded software development tools and debugging techniques.
CO5: Develop embedded systems.

UNIT-I

Introduction to Embedded Systems: Examples, Typical Hardware, Memory, Microcontrollers, Busses. **Interrupts**: Interrupt Basics, Shared-Data problem, Interrupt Latency.

UNIT-II

Software Architectures: Round-Robin Architecture, Round-Robin with Interrupts Architecture, Function-Queue Scheduling Architecture, Real-Time Operating Systems Architecture, Selection of Architecture. **Real Time Operating System**: Tasks and Task States, Tasks and Data, Semaphores and Shared Data, Semaphore Problems, Semaphore variants.

UNIT-III

Inter Task Communication: Message Queues, Mailboxes, Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in RTOS Environment. **Design issues of RTOS:** Principles, Encapsulation Semaphores and Queues, Hard Real- Time Scheduling Considerations, Saving Memory Space, Saving Power.

UNIT-IV

Embedded Software Development Tools: Host and Target Machines, Linker/Locator for Embedded Software, Getting Embedded Software into the Target System. **Embedded Software Debugging Techniques: Testing** on your Host Machine, Instruction Set Simulators, Laboratory Tools used for Debugging.

UNIT-V

Introduction to advanced Microcontrollers: Introduction to ARM, ARM Architecture and Assembly Language Programming, ARM Memory Map, Memory Access and Stack. Arduino UNO-Pin Configuration, Architecture, Interfacing to real-world devices. (Ch1,2 and 6 of Text book 2 and Text Book 3)

Text Books:

1. An Embedded Software Primer, David E. Simon, Pearson Education, 2005.
2. ARM Assembly Language Programming & Architecture. 2nd Edition, Md Ali Mazidi, Sarmad Naimi, Sepehr Naimi and Shujen Chen.
3. The AVR Microcontroller and Embedded Systems Using Assembly and C: Using Arduino Uno and Atmel Studio, M. A. Mazidi, Sarmad Naimi , 2nd Edition, Micro Digital Edition.

Reference Books:

1. Embedded Systems: B.Kanta Rao, PHI.
2. Embedded Systems: Architecture, Programming and Design, Raj Kamal, Tata McGraw- Hill Education, 2
3. Introduction to Embedded Systems by K.V Shibu.
4. Computers as Components-principles of Embedded computer system design, Wayne Wolf, Elseveir.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS3105	**Introduction to Arduino and Raspberry PI (Elective-I)**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

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.
2. 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 behavior of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and

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, overview of the graphic user interface for Raspian Linux distribution.

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

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS3106	**Computer Networks LAB**	L	T	P	Int.	Ext	1.5
		0	**0**	**3**	**50**	**50**	

COURSE OBJECTIVES:

1. Learn various network protocols and verify simple network topologies using simulation tool.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Demonstrate various network components and Implement network protocols.

CO2: Implementation of error and flow control techniques on network.

CO3: Design and implementation of network topologies, routing algorithms using network tools.

CYCLE-1

1. a) Study of different types of network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
   - **b)** Study of network devices in detail
   - **c)** Connect the computer in Local Area Networks
2. 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).

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

CYCLE-2

1. Demonstrate the packets captured traces using Wire shark Packet Analyzer Tool for peer to peer mode.

2. Study of Network Simulator (NS 2).

3. Network Topology: Bus Topology, RING Topology, and STAR Topology.

Reference Books:

1. Internet and Web Technologies by Raj Kamal, TataMcGraw-Hill

2. Programming the World Wide Web by Robert W. Sebesta, PearsonEducation.

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 OBJECTIVES:

1. To study the various data analysis techniques in R Programming language.
2. To apply the 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: Student will be able to write 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.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3108	**C++ Programming (Skill Course-3)**	**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 concepts.
CO3**:** Utilize try and 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 to generate the following sequence
   1
   1 2
   1 2 3
   1 2 3 4

   b) Write a program which uses function to swap two integers and two float numbers by using reference variable.
   c) Write a program that demonstrates default arguments.

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

3. a) Write a program that illustrates the following forms of inheritances Single, Multiple, Multilevel, Hierarchical.
   b) Create multiple objects for the class and observe the order in which Constructors and Destructors are called.

4. a) Write a program to use pointers for both base and derived classes and call the Member functions.

b) Write a program that demonstrates function overloading, operator overloading, overriding.

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

6. 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.

7. 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.

8. Write a Program to demonstrate user defined exceptions.

9. Write a program to create a generic template for adding two integers and two float values and make use of the template to perform addition.

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

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

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

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

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

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

16. Write a program to implement binary search tree using traverse the tree using any traversal schema.

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs38/preview
2. https://www.coursera.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
CS3109	**Technical Communication & Soft skills**	L	T	P	Int.	Ext	0
		3	**0**	**0**	**100**	**0**	

PREREQUISITES

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.

COURSE OBJECTIVES

By the end of the soft skills training program, the students should be able to:
CO1: Develop effective communication skills (spoken and written).
CO2: Develop effective presentation skills.
CO3: Conduct effective business correspondence and prepare business reports which produceresults.

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 Behaviour, Analysing 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.

Reference 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).

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

COURSE OBJECTIVES:

1. The student should be able to choose appropriate data structures, understand them, and use them to design algorithms for a specific problem.
2. To understand the concepts of several tree data structures.
3. To familiarize students with applications of priority queues.
4. To discuss the concepts related to disjoint set ADT.

COURSE OUTCOMES:

At the end of the course student will be able to:
CO1. Develop and analyze algorithms for implementing AVL Trees red-black trees, B-trees.
CO2. Understand the implementation of Hashing and dictionaries.
CO3. Apply concepts of Priority queues.
CO4. Understand the concepts of Disjoint Set ADT.
CO5. 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, algorithms and Applications in C++, Sartaj Sahani, 2nd Edition.
2. Data Structures and Algorithm Analysis in C – Mark Allen Weiss, Pearson.

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.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	3
	Operating Systems(Minor)	**3**	**0**	**0**	**30**	**70**	

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 storage management and deadlocks.

COURSE OUTCOMES:

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

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

UNIT-I

Introduction to Operating Systems:
What Operating Systems do, Operating System Structure, Operations, Services, Types of operating 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, Monitors.

UNIT III

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

UNIT IV

Memory Management:

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, Free Space Management.

Text Book:

1. Operating System Concepts: Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, John Wiley Publ., 8th Edition.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, 2nd edition, 1995,PHI.
2. Operating Systems, William Stallings 5th Edition -PHI
3. Operating Systems: A Practical Approach, Rajiv Chopra.

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

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

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ENGINEERING AND TECHNOLOGY PROGRAM

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B. Tech III Year - II Semester (6th 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	Web Technologies	3	0	0	30	70	100	3
CS3203	PC/PCC	Artificial Intelligence	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 & Mini Project Lab	0	0	3	50	50	100	1.5
CS3207	PC/PCC	Web Technologies 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: Advanced Java Programming	1	0	2	50	50	100	2
CS3210	MC	Intellectual Property Rights	3	0	0	100	0	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**	**0**	**2**	**4**

Elective-II
Introduction to Soft Computing
Big Data Analytics
Cryptography & Network Security

Open Elective - II
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	
CS3201	**Object-Oriented Software Engineering**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. Learn the importance of Object Oriented Software Engineering in Software Development.
2. Learn to develop problem statement and requirements elicitation.
3. Learn to design UML Diagrams.
4. Learn about architectural models and design patterns.
5. 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, 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 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:

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 Engineeing, K.K. Agarwal, New Age Publications 2008.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS3202	**Web Technologies**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

COURSE OBJECTIVES:

1. To get familiar with basics of the Internet Programming.
2. To acquire knowledge and skills for creation of web site considering both client and server side Programming.
3. To gain ability to develop responsive web applications

COURSE OUTCOMES:

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

CO1: Describe about WWW, Protocols and deployment of websites using HTML and CSS.
CO2: Use the various JavaScript functions for web page development.
CO3: Apply XML to develop the dynamic web pages.
CO4: Understand JSON functionalities and role of NoSQL databases.
CO5: Develop dynamic web applications using PHP and MySQL.

UNIT-1

Basics of WWW & HTML : Introduction to WWW, web 2.0,3.0,40, Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5 and CSS.

UNIT-2

JavaScript : Variables, functions, conditions, loops, Pop up boxes, Advance JavaScript: Javascript and objects, DOM , Manipulation using DOM, forms and validations, DHTML.

UNIT-3

XML : Introduction to XML, XML key components, DTD and Schemas, Transforming XML using XSL and XSLT.

UNIT-4:

JSON : Introduction to JSON, syntax, data types, Client-side and Server-side Frameworks, NoSQL databases.

UNIT-5

PHP : Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions PHP. MySQL: Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin management.

Text Books:

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.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3203	**Artificial Intelligence**	**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

CO1: Solve AI Problems using the knowledge of State Space Search.
CO2: Apply several optimal search strategies and heuristic techniques to solve AI problems.
CO3: Learn relational, inferential, inheritable and procedural knowledge and the corresponding

Knowledge representation approaches.

CO4: Apply the concepts of Reasoning under Uncertainty and solve the complex problems of AI.

CO5: Implement AI problem solving approaches to develop natural language processing, planning and expertsystems.

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:** Components of 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 : 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	
CS3204	**Programming in Java (Open elective-II)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. To familiarize basic java programming language constructs.
2. To illustrate how to simple applications using java classes and class libraries.
3. To demonstrate various types of Inheritance mechanisms.
4. To introduce and designing graphical effects through Applets.

COURSE OUTCOMES:

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

CO1: Explain various data types and operators for writing basic programs in Java.
CO2: Describe control structures of Java and advantages of using classes.
CO3: Design applications using concepts of inheritance and interfaces.
CO4: Employ exception handling in Java Application design.
CO5: Explain multithreading concepts of Java and design Applet interface.

UNIT-I

Java Programming Fundamentals: Java Language, Key Attributes of Object-Oriented Programming, Java Development Kit, Simple Program, Keywords, Identifiers, data types and operators, the 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, Constructor execution hierarchy, Super class References and Subclass Objects, Method Overriding, Abstract Classes. **Interfaces:** Fundamentals, Creating and Implementing an Interface, Implementing Multiple Interfaces, Extending 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, extending the Thread class, implementing Runnable interface, life cycle of a thread. **Applet Programming:** Introduction, building applet code, applet life cycle, about HTML, designing a web page, passing parameters to applets, getting input from the user.

Text Books:

1. Herbert Schildt, Dale Skrien, Java Fundamentals A Comprehensive Introduction, 1/e, Tata McGraw Hill, 2017.

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.
4. Balagurusamy, Programming with JAVA, 2/e, Tata McGraw Hill, 2014.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3205	**Introduction to Soft Computing (Elective-II)**	**3**	**0**	**0**	**30**	**70**	3

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
CS3205	**Big Data Analytics (Elective-II)**	L	T	P	Int.	Ext	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

UNIT-I

Introduction to Big Data: Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data , Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop, Introduction to Hadoop:Hadoop- definition, Understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, Counting words with Hadoop running your first program.

UNIT-II

Hadoop Architecture: History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker, YARN. 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 Filesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives.

UNIT-III

MapReduce: Anatomy of a MapReduce program, A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes, Developing a MapReduce Application - The Configuration API, Configuring the Development Environment,

Running Locally on Test Data, Running on a Cluster, Tuning a Job, MapReduce Workflows, Getting the patent data set, constructing the basic template of a Map Reduce program, Counting things, Adapting for Hadoop's API changes, Streaming in Hadoop, Improving performance with combiners.

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, Parallelized Bloom filter creation in MapReduce, Map-Reduce semi-join with Bloom filters.

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.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS3205	**Cryptography & Network Security (Elective-II)**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

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: Explain 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 Stegnography.

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, and IDEA. **Block Cipher Operations**: Multiple Encryption and Triple DES, 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. **User Authentication**: Remote User-Authentication Principles, Kerberos.

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.

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

COURSE OBJECTIVES:

1. Learn to draw UML Diagrams.
2. Learn to develop a Mini- Project.

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: Design different Behavioral UML Diagrams for a project using Rationale Architect SoftwareDesigner.
CO3: Develop the contents of Mini-Project for a given problem.

The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, **Rational Products**. 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.

Cycle I: Practicing UML diagrams using IBM Rational Rose.

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.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3207	**Web Technologies LAB**	**0**	**0**	**3**	**50**	**50**	1.5

COURSE OBJECTIVES:

1. To enable students to have skills that will help them to develop various web applications

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Able to work in a team.
CO2: Able to analyze the project requirements and design the project.
CO3: Able to implement and integration of the various modules involved in the project.
CO4: Able to document and demonstrate the project.

EACH STUDENT SHOULD DEVELOP TWO PROJECTS OUT OF THIS LIST USINGPHP & MYSQL

1. Design Airlines Ticket Reservation System.
2. Design ONLINE Banking system.
3. Design Library Information system.
4. Design Gram Panchayat Information system for House tax, water tax, wealth tax, Library
5. tax collection, phone bill, Electricity bill collection.
6. Design student information system portal which maintain attendance, marks etc.
7. Design online examination system.

Reference Book:

1. PHP Web 2.0 Mashup Projects by Shu-Wai Chow, Packt Publishing.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3208	**Soft Computing LAB**	**0**	**0**	**3**	**50**	**50**	1.5

COURSE OBJECTIVES:

1. Understand Fuzzy concepts
2. Learn neural networks with back propagation and without preparation

COURSE OUTCOMES:

CO1: Learn the operators of genetic algorithms
CO2: Practice on crisp partitions.

LIST OF EXPERIMENTS:

1. PERCEPTRON
Create a perceptron with appropriate number of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights.

2. ARTIFICIAL NEAURAL NETWORKS
Write a program to implement artificial neural network without back propagation.Write a program to implement artificial neural network with back propagation.

3. FUZZY SETS
Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Alsocreate fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.

4. GENETIC ALGORITHMS
Plot the correlation plot on dataset and visualize giving an overview of relationships among data on soya bins data. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.

5. DATA FITTING BY REGRESSION
Implement linear regression and multi-regression for a set of data points.

6. CRISP MODEL
Implement crisp partitions for real-life iris dataset.

7. PERCEPTRON RULE
Write a program to implement Hebb's rule Write a program to implement Delta rule.

8. CLASSIFICATION

Implement SVM classification by Fuzzy concepts.

Reference Books:

D.K Prathikar, ―Soft Computing‖, Narosa Publishing House, New Delhi, 2008.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS3208	**Big Data Analytics LAB**	L	T	P	Int.	Ext	1.5
		0	**0**	**3**	**50**	**50**	

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	
CS3208	**Cryptography & 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

CO1: Construct new security applications by implementing the cipher techniques.
CO2: Apply various cryptographic authentication techniques.
CO3: Design symmetric and asymmetric cryptographic protocols for secure data transmission.

MODULE-1 (Symmetric Cryptosystem)

1. Write a program to implementation of Caesar cipher for Encryption and Decryption.
2. Write a program to implementation of Playfair cipher for Encryption and Decryption.
3. Write a program to implementation of Hill cipher for Encryption and Decryption.
4. Write a program to implementation of DES algorithm for Encryption and Decryption.
5. Write a program to implementation of AES algorithm for Encryption and Decryption.

MODULE-II (Asymmetric Cryptosystem)

6. Design a web application to implementation of RSA algorithm for Encryption and Decryption.
7. Write a program to implementation of Diffie-Hellman Key Exchange.

MODULE-III (Hash Based Cryptosystem)

8. Write a program to implementation of SHA-1 algorithm.
9. Write a program to implementation of Digital Signature Standard.

MODULE-IV (Malwares and Vulnerability Tool)

10. Demonstrate and build a harmless Trojan malware in a computer system.
11. Demonstrate rootkit hunter and find the malwares in a computer system.
12. Demonstrate N-Stalker Vulnerability Assessment Tool.

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.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS3209	**Advanced Java Programming (Skill Course-4)**	**1**	**0**	**2**	**50**	**50**	2

COURSE OBJECTIVES:

1. Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.
2. Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
3. Design and develop Web applications
4. Designing Enterprise based applications by encapsulating an application's business logic.
5. Designing applications using pre-built frameworks.

COURSE OUTCOMES:

CO1: Learn the Internet Programming, using Java Applets, apply event handling on AWT and Swing components.

CO2: Learn to access database through Java programs, using Java Data Base Connectivity (JDBC), create dynamic web pages, using Servlets and JSP.

CO3: Invoke the remote methods in an application using Remote Method Invocation (RMI) understand the multi-tier architecture of web-based enterprise applications.

CO4: Use Struts frameworks, which gives the opportunity to reuse the codes for quick development.

CO5: map Java classes and object associations to relational database tables with Hibernate mapping files Programs.

Programs:

1) Write a java program to create sample application form in JApplet using swing control.

2) a) Write a Program to show connectivity with database using JDBC/ ODBC driver.
   b) Use JDBC connectivity and create Table, insert and update data.

3) Write a java program to demonstrate two-tier client/server model.

4) Write a program in Java to create a Cookie and set the expiry time of the same.

5) Write java program to create Servlet to count the number of access time of that servlet page.

6) Write a java program to create a form and validate password using servlet.

7) JSP program to demonstrate jsp: forward action tag.

8) JSP program to request implicit object.

9) Write a java program to convert an image in RGB to a grayscale image.

10) Program to implement usebean tag.

11) Write a program to demonstrate struts validation.

13) Write a program to implement struts application.

14) Program to implement basic hibernate program.

15) Write a program to show Database operations using hibernate.

Reference books:

1. Internet and World wide web- How to program, Dietel and Nieto, Pearson. (Chapters: 3, 4, 8, 9, 10, 11, 12 to 18).

2. The Complete Reference, Java 2, 3ed, Patrik Naughton, Herbert Schildt, TMH. (Chapters: 19, 20, 21, 22, 25, 27).

3. Java Server Pages , Hans Bergstan, Oreilly (Chapters: 1-9) .

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS3210	**Intellectual Property Rights**	L	T	P	Int.	Ext	0
		3	**0**	**0**	**100**	**0**	

COURSE OBJECTIVES:

1. To impart awareness on Intellectual Property Rights
2. To Understand and solve various regulatory issues related to IPR.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Demonstrate a breadth of knowledge in Intellectual property.
CO2: Understand the concepts of Patents, Searching, filling and drafting of Patents.
CO3: Learn about copyright & GI.
CO4: Implement the concepts of Trade Mark & Trade Secret.
CO5: Gain Knowledge about different national and international: Conventions and Treaties. Governing the IPRs.

UNIT-I

Introduction to IPR: Discovery, Invention, Creativity, Innovation, History & Significance of IPR, Overview of IPR -Patent, Copyright, Trade Mark, Trade Secret , GI, Industrial Design & Integrated Circuit, Non-patentable criteria.

UNIT-II

Patents: Patents- Patentability Criteria, Types of Patents-Process, Product & Utility Models, Software Patenting and protection, Patent infringement- Case studies- Apple Vs Samsung, Enfish LLC Vs Microsoft, Overview of Patent search-Types of Searching, Public & Private Searching Databases, Basics of Patent Filing & Drafting, Indian Patents Law.

UNIT-III

Copyrights and Geographical Indications: Types of Copyrights, Procedure for filing, copyright infringement, Copyright Law, Geographical Indications -Tirupati Laddu , Darjeeling Tea, Basmati rice.

UNIT-IV

Trademark and Trade secrets: Trade Marks –Commercial importance, protection, registration, Case

Studies- Sabena and Subena, Castrol Vs Pentagon, Trade Secrets- Case Studies-Kentucky Fried Chicken (KFC), Coca-Cola.

UNIT-V

International Conventions & Treaties: Overview of WTO, GATT, TRIPS, WIPO, Berne Convention, Rome convention, Paris Convention, Patent Cooperation Treaty (PCT), Madrid Protocol, Budapest Treaty, Hague agreement.

Text books:

1. Deborah E. Bouchoux, Intellectual Property for Paralegals – The law of Trademarks, Copyrights, Patents & Trade secrets, 3rd Edition, Cengage learning, 2012

2. N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property, Eastern Book Company, Lucknow, 2009.

Reference Books:

1. M. M. S. Karki , Intellectual Property Rights: Basic Concepts, Atlantic Publishers, 2009
2. Neeraj Pandey & Khushdeep Dharni, Intellectual Property Rights, Phi Learning Pvt. Ltd
3. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd, 2006.
4. B. L. Wadehra. Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000.
5. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.

Open Elective Courses Offered by CSE Department to other Departments

Course Code	Category	Semester	Name of the Open Elective Course	Credits
CS3104	OEC/JOE	5th Sem	Open Elective – I : C++ Programming	**3**
CS3204	OEC/JOE	6th Sem	Open Elective – II : Programming in Java	**3**
CS4104	OEC/JOE	7th Sem	Open Elective – III : Introduction to Artificial Intelligence	**3**
CS4105	OEC/JOE	7th Sem	Open Elective – IV : Introduction to Data Science	**3**

Curricular Framework for Honors Programme

1. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.
2. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 SGPA upto the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.
3. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same.

   e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.
4. In addition to fulfilling all the requisites of a Regular B. Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).
5. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.
6. It is the responsibility of the student to acquire/complete prerequisite before taking therespective course.
7. MOOC courses is of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.
8. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will

remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

9. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
10. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

HONORS COURSES

Note 1. The subjects opted for Honors should be Advanced type which are not covered in regularcurriculum

2. Students has to acquire 16 credits with minimum one subject from each pool.

3. Concerned BoS can add or delete the subjects as per the decision of the board.

4. Pre-requisites to be defined by the board for each course.

5. Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)

POOL – I					
S.no	**Title of the Paper**	**Internal Marks**	**External Marks**	**L-T-P**	**Credits**
1	**Object Oriented Modeling and Design**	**30**	**70**	**3-1-0**	**4**
2	**Advanced Data Structures**	**30**	**70**	**3-1-0**	**4**
3	**NOSQL Databases**	**30**	**70**	**3-1-0**	**4**
4	**A dvanced Software Engineering**	**30**	**70**	**3-1-0**	**4**
POOL – 2					
S.no	Title of the Paper	Internal Marks	External Marks	L-T-P	Credits
1	Artificial Neural Networks	30	70	3-1-0	4
2	Deep Learning	30	70	3-1-0	4
3	Recommender Systems	30	70	3-1-0	4
4	Cyber Law	30	70	3-1-0	4
Department of Computer Science and Engineering					
POOL – 3					
S.no	Title of the Paper	Internal Marks	External Marks	L-T-P	Credits
1	Advanced Machine Learning	30	70	3-1-0	4
2	Software Defined Networks	30	70	3-1-0	4
3	Computer Vision	30	70	3-1-0	4
4	Multi Agent Systems	30	70	3-1-0	4
Department of Computer Science and Engineering					
POOL – 4					
S.no	Title of the Paper	Internal Marks	External Marks	L-T-P	Credits
1	Social Mobile Analytics & Cloud	30	70	3-1-0	4
2	Software Design and System Integration	30	70	3-1-0	4
3	Python Application Programming	30	70	3-1-0	4
4	Advanced Java and J2EE	30	70	3-1-0	4

Curricular Framework for Minor Programme

1. a) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specializationgroups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.
2. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.
3. A student shall be permitted to register for Minors program at the beginning of 4^{th} semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) upto the end of 2^{nd} semester without any history of backlogs. It is expected that the 3rd semesterresults may be announced after the commencement of the 4^{th} semester. If a student failsto acquire 8 SGPA upto 3^{rd} semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.
4. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).
5. It is the responsibility of the student toacquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.
6. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not bemonitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.
7. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

8. In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
9. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

GENERAL AND INDUSTRIAL MINOR TRACKS

Note 1. The student can opt any 4 subjects from each pool.
2. Concerned BoS can add or delete the subjects as per the decision of the board.
3. Pre-requisites to be defined by the board for each course.
4. Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)

Department of Computer Science and Engineering:

General Track for Minors

S. No	Subject	L-T-P	Internal	External	Credits
1	Data Structures using C	**3-1-0**	**30**	**70**	**4**
2	Operating Systems	**3-1-0**	**30**	**70**	**4**
3	Data Warehousing and Data Mining	**3-1-0**	**30**	**70**	**4**
4	Object Oriented Software Engineering	**3-1-0**	**30**	**70**	**4**
5	Computer Vision	**3-1-0**	**30**	**70**	**4**
6	Computer Organization and Architecture	**3-1-0**	**30**	**70**	**4**
7	Artificial Intelligence	**3-1-0**	**30**	**70**	**4**
8	Object Oriented Programming with Java	**3-1-0**	**30**	**70**	**4**

Industrial Tracks for Minors

Track – I: PROGRAMMING					
S.No	**Title of the Paper**	**Internal Marks**	**External Marks**	**L-T-P**	**Credits**
1	DBMS	30	70	3-1-0	4
2	Programming with Python	30	70	3-1-0	4
3	Web Technologies	30	70	3-1-0	4
4	R - Programming	30	70	3-1-0	4

Track – 2 : IoT					
S.No	**Title of the Paper**	**Internal Marks**	**External Marks**	**L-T-P**	**Credits**
1	Introduction to Arduino Programming	30	70	3-1-0	4
2	Wireless Sensor Networks	30	70	3-1-0	4
3	Cloud Computing	30	70	3-1-0	4
4	Internet of Things(IoT)	30	70	3-1-0	4
Track – 3: NETWORK SECURITY					
S.No	**Title of the Paper**	**Internal Marks**	**External Marks**	**L-T-P**	**Credits**
1	Computer Networks	30	70	3-1-0	4
2	Cryptography & Network Security	30	70	3-1-0	4
3	Cyber Security & Digital Forensics	30	70	3-1-0	4
4	Introduction to Blockchain	30	70	3-1-0	4
Track – 4: ARTIFICIAL INTELLIGENCE					
S.No	Title of the Paper	Internal Marks	External Marks	**L-T-P**	**Credits**
1	Introduction to Data Science	30	70	3-1-0	4
2	Soft Computing	30	70	3-1-0	4
3	Machine Learning	30	70	3-1-0	4
4	Big Data Analytics	30	70	3-1-0	4

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagementAs per the decision

of the decision of the concerned department BoS

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningfulcommunity service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.

- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination withpublic and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to differentsections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The log book has to be countersigned by the concerned mentor/faculty in charge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also beconducted by a committee constituted by the principal of the college.

- Award of marks shall be made as per the guidelines of Internship/apprentice/ on thejobtraining

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
    - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed.This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
    - Secondly, the student/s could take up a social activity, concerning their domain orsubject area. The different areas, could be like –

        - Agriculture
        - Health
        - Marketing and Cooperation
        - Animal Husbandry
        - Horticulture
        - Fisheries
        - Sericulture
        - Revenue and Survey
        - Natural Disaster Management
        - Irrigation
        - Law & Order
        - Excise and Prohibition
        - Mines and Geology
        - Energy Internet, Free Electricity,

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 - 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 Semesterto 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
Machine Learning & Deep Learning
Internet of Things
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 services, 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: Floodingand

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
		L	T	P	Int.	Ext	
CS4103	**Machine Learning & Deep Learning (Elective-V)**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

1. What is the need for Machine Learning?
2. How to differentiate between different types of Machine Learning
3. how to frame tasks into deep learning problems
4. When and why specific deep learning techniques work for specific problems.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Understand the concepts of Machine Learning and its importance
CO2: Differentiate between Supervised and Unsupervised Learning
CO3: Analyze various Hyper parameters, and recurrent neural networks
CO4: Identify and evaluate various Convolutional Neural Network Architectures
CO5: Implement deep learning algorithms and solve real-world problems

UNIT-I

Introduction: Introduction to Machine Learning, Applications of Machine Learning, processes involved in Machine Learning, Introduction to Machine Learning Techniques: Supervised Learning, Unsupervised Learning and Reinforcement Learning, Real life examples of Machine Learning.

UNIT-II

Supervised learning: Classification and Regression, K-Nearest Neighbor, Linear Regression, Logistic Regression, Support Vector Machine (SVM), Evaluation Measures: SSE, MME, R2, confusion matrix, precision, recall, F-Score, ROC-Curve. **Unsupervised learning:** Introduction to clustering, Types of Clustering: Hierarchical, Agglomerative Clustering and Divisive clustering; Partitional Clustering - K-means clustering.

UNIT-III

Deep Neural Networks**:** Difficulty of training deep neural networks, Greedy layerwise training, Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization). **Recurrent Neural Networks:** Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs.

UNIT-IV

Convolutional Neural Networks**:** LeNet, AlexNet, Generative models**:** Restrictive Boltzmann,Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

UNIT-V

Recent trends: Variational Autoencoders, Generative Adversarial Networks, Multi-task Deep Learning, Multi-view Deep Learning and various Applications & Tools.

Text Books:

1. 1. Introduction to Machine Learning, By Jeeva Jose, Khanna Book Publishing Co., 2020.
2. 2. Machine Learning for Dummies, By John Paul Mueller and Luca Massaron, For Dummies, 2016.
3. 3. Machine Learning, By Rajeev Chopra, Khanna Book Publishing Co., 2021.
4. Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.
5. Deep Learning for Vision Systems by Mohamed Elgendy, Manning Publications, January 2019.
6. Hands-On Machine Learning with Scikit-Learn, Keras and Tensor Flow: Concepts, Tools and Techniques to Build Intelligent Systems, Shroff/O'Reilly, Second edition, 2019.

Reference Books:

1. Machine Learning: The New AI, By Ethem Alpaydin, The MIT Press, 2016.
2. Machine Learning, Tom M. Mitchell, McGraw Hill Education, 2017.
3. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
4. Pattern Recognition and Machine Learning, Christopher Bishop, 2007
5. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
6. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
7. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int.	Ext	
CS4103	**Internet of Things (Elective-V)**	**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 the course student will be able to:

CO1: Understand IoT framework and architecture.
CO2: Understand design principles and standards of connected devices.
CO3: Understand design principles for web connectivity and protocols.
CO4: Classify various sensors used in IoT networks.
CO5: Design IoT devices using Raspberry Pi and other microcontroller boards.

UNIT-I

Internet of Things: An Overview: Internet of Things, IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M Communication, Examples of IoT.

UNIT-II

Design Principles for Connected Devices: Introduction, IoT/M2M Systems Layers and Design Standardization, Communication Technologies, Data Enrichment, Data Consolidation and Device Management at Gateway, Ease of Designing and Affordability.

UNIT-III

Design Principles for Web Connectivity: Introduction, Web Communication Protocols for Connected Devices, Message Communication Protocols for Connected Devices, Web Connectivity for Connected Devices Network using Gateway, SOAP, REST, HTTP RESTfuland Web Sockets.

UNIT-III

Sensors, Participatory Sensing, RFID and Wireless Sensor Networks: Introduction, Sensor

Technology, Participatory Sensing, Industrial IoT and Automotive IoT, Actuator, Sensor Data Communication Protocols, Radio Frequency Identification Technology, Wireless Sensor Networks Technology.

UNIT-V

IoT Physical Devices & Endpoints: What is an IoT Device- Basic Building blocks of an IoT Device, Exemplary Device: Raspberry Pi, About the board, Linux on Raspberry Pi, Raspberry Pi Interfaces-Serial, SPI, I2C, 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, Other IoT Devices- pcDuino, BeagleBone Black, Cubie board.

Text Books:

1. INTERNET OF THINGS Architecture and Design Principles by Raj Kamal, McGraw Hill Education India Pvt. Ltd (Chapters 1,2,3,7)

2. INTERNET OF THINGS A –Hands On Approach by Arshdeep Bahga, Vijay Madisetti, Universities Press (India) Private Limited (Chapter 7)

Reference Books:

1.Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Marina Ruggieri & Homayoun Nikookar, River Publishers Series in Communications.

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 knowledgerepresentation 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 expertsystems.

UNIT-I

Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI echniques, 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 Networkbased, 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
CS4105	**Introduction to Data Science(Open Elective-IV)**	L	T	P	Int.	Ext	3
		3	**0**	**0**	**30**	**70**	

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	**Understanding Harmony**	**3**	**0**	**0**	**30**	**70**	3

COURSE OBJECTIVES:

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

COURSE OURCOMES

CO1: The students identify the importance of human values and skills for sustained happiness.
CO2: The students strike a balance between profession and personal happiness/ goals.
CO3: The students realize/ explain the significance of trust, mutually satisfying human behavior and enriching interaction with nature.
CO4: The students develop/ propose appropriate technologies and management patterns to create Harmony in professional and personal life.
CO5: Understanding of Harmony on Professional Ethics**.**

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

Understanding Harmony in the nature and Existence - Whole existence as Co-existence: 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 (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT-V

Implications of the 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, Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, 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 Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

Reference Books:

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

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
CS4107	**Android Programming (Skill Course-5)**	L	T	P	Int.	Ext	2
		1	**0**	**2**	**50**	**50**	

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
10.1 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.

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

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(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 – 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.