DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
PACE R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

I Year - I Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21HST01	Communicative English	3	0	0	3
2	P21BST01	Linear Algebra & Differential Equations	3	0	0	3
3	P21BST02	Applied Physics	3	0	0	3
4	P21EST03	C-Programming for Problem Solving	3	0	0	3
5	P21EST04	Computer Engineering Workshop	3	0	0	3
6	P21HSL01	English Language Communication Skills Lab	0	0	3	1.5
7	P21BSL01	Applied Physics Lab	0	0	3	1.5
8	P21ESL02	C-Programming for Problem Solving Lab	0	0	3	1.5
9	P21MCT01	Induction program	2	0	0	0
					Total Credits	19.5

I Year - II Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21BST04	Applied Chemistry	3	0	0	3
2	P21BST06	Numerical Methods & Vector calculus	3	0	0	3
3	P21EST12	Digital Electronics	3	0	0	3
4	P21EST13	Data Structures	3	0	0	3
5	P21EST14	Python Programming	3	0	0	3
6	P21BSL03	Applied Chemistry Lab	0	0	3	1.5
7	P21ESL06	Data Structures Lab	0	0	3	1.5
8	P21ESL07	Python Programming Lab	0	0	3	1.5
					Total Credits	19.5

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
PACE R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

II Year - I Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21BST08	Transformation Techniques and Differential Equations	3	0	0	3
2	P21ADT01	Java Programming	3	0	0	3
3	P21ITT02	Computer Organization	3	0	0	3
4	P21ITT03	Software Engineering	3	0	0	3
5	P21ITT05	Database Management Systems	3	0	0	3
6	P21ADL01	Java Programming Lab	0	0	3	1.5
7	P21ITL03	Free Open Source Software Lab	0	0	3	1.5
8	P21ITL05	Database Management Systems Lab	0	0	3	1.5
9	P21AMS01	Skill Oriented Course-I	1	0	2	2
10	P21MCT03	Environmental Studies	2	0	0	0
					Total Credits	21.5

II Year - II Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21BST07	Probability and Statistics	3	0	0	3
2	P21CST05	Mathematical Foundations of Computer Science	3	0	0	3
3	P21ITT06	Operating Systems	3	0	0	3
4	P21ADT02	Foundations of Artificial Intelligence	3	0	0	3
5	P21MBT01	Managerial Economics and Financial Analysis	3	0	0	3
6	P21ADL02	Foundations of Artificial Intelligence Lab	0	0	3	1.5
7	P21CBL01	Operating Systems Lab	0	0	3	1.5
8	P21ITL06	R Programming Lab	0	0	3	1.5
9	P21AMS02	Skill Oriented Course-II	1	0	2	2
					Total Credits	21.5
Internship 2 Months (Mandatory) during summer vacation						

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R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

III Year - I Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21AMT01	Machine Learning	3	0	0	3
2	P21CIT02	Web Technologies	3	0	0	3
3	P21CST09	Computer Networks	3	0	0	3
4	P21XXXXX	Professional Elective-I	3	0	0	3
5	P21XXXXX	Open Elective-I	3	0	0	3
6	P21CIL02	Web Technologies Lab	0	0	3	1.5
7	P21AML01	Machine Learning Lab	0	0	3	1.5
8	P21ADS03	Android application development	1	0	2	2
9	P21XXXXX	Professional Ethics	2	0	0	0
10	P21XXXXX	Summer Internship 2 Months (Mandatory) after II Year (to be evaluated during III Year I Semester)	0	0	0	1.5
					Total Credits	21.5

Professional Elective - I		
S.No	**Course Code**	**Course Title**
1	MOOC- I	NPTEL

Open Elective - I		
S.No	**Course Code**	**Course Title**
1	P21XXXXX	Intellectual Property Rights and Patents
2	P21XXXXX	Micro Processors and Micro Controllers
3	P21XXXXX	Digital Signal Processing
4	P21XXXXX	Engineering Mechanics

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R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

III Year - II Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21ADT03	Data Science	3	0	0	3
2	P21AML02	Deep Learning	3	0	0	3
3	P21CST08	Design & Analysis of Algorithms	3	0	0	3
4	P21XXXXX	Professional Elective-II	3	0	0	3
5	P21XXXXX	Open Elective-II	3	0	0	3
6	P21ADL03	Data Science Lab	0	0	3	1.5
7	P21AML02	Deep Learning Lab	0	0	3	1.5
8	P21CSL11	UML Lab	0	0	3	1.5
9	P21ADS04	Web Development using Django	1	0	2	2
10	P21XXXXX	Design Thinking for Innovation	2	0	0	0
					Total Credits	21.5
Industrial/Research Internship (Mandatory) 2 Months during summer vacation						

Professional Elective - II		
S.No	**Course Code**	**Course Title**
5	MOOC- II	NPTEL

Open Elective - II		
S.No	**Course Code**	**Course Title**
1	P21XXXXX	Introduction to Simulation Software's
2	P21XXXXX	Management Information System
3	P21XXXXX	Operations Research
4	P21XXXXX	Information Retrieving System

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

IV Year - I Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21XXXXX	Professional Elective-III	3	0	0	3
2	P21XXXXX	Professional Elective-IV	3	0	0	3
3	P21XXXXX	Professional Elective-V	3	0	0	3
4	P21XXXXX	Open Elective-III	3	0	0	3
5	P21XXXXX	Open Elective-IV	3	0	0	3
6	P21XXXXX	Universal Human Values – II	3	0	0	3
7	P21XXXXX	Employability Skills	1	0	2	2
8	P21XXXXX	Industrial/Research Internship 2 Months (Mandatory) after III Year (to be evaluated during IV Year I Semester)	0	0	0	3
					Total Credits	23

Professional Elective - III		
S.No	**Course Code**	**Course Title**
1	P21XXXXX	Block chain Technology
2	P21XXXXX	Reinforcement Learning
3	P21XXXXX	Big data Analytics
3	P21XXXXX	Green Computing

Professional Elective - IV		
S.No	**Course Code**	**Course Title**
1	P21XXXXX	Wireless And Mobile Computing
2	P21XXXXX	5G Network
3	P21XXXXX	Cyber Security
3	P21XXXXX	Network Analysis

Professional Elective - V		
S.No	**Course Code**	**Course Title**
1	P21XXXXX	Green Computing
2	P21XXXXX	Concurrent Parallel Programming
3	P21XXXXX	Web Scripting Languages
3	P21XXXXX	Performance Evaluation of Computer

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

IV Year - II Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21XXXXX	Project Work, Seminar and Internship in Industry	0	0	0	12
Internship (6 Months)						
					Total Credits	12

Course Code	Course Name	Course Structure			
		L	T	P	C
P21HST01	Communicative English	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: The students should have basic knowledge of English grammar and LSRW skills.

Course Objectives: The student will be able

1. To enable the engineering students to develop their basic communication skills in English for academic and social purposes.
2. To equip the students with appropriate oral and written communication skills.
3. To inculcate the skills of listening, reading and critical thinking.
4. To integrate English Language learning with employability skills and training.
5. To enhance the students' proficiency in reading skills enabling them to meet the academic demands of their course.

Course Outcomes: After going through this course the student will be able to

1. Use English Language effectively in spoken and written forms
2. Interpret the contextual meaning of words
3. Comprehend the given texts and respond appropriately
4. Recall and reproduce the theme in a given context
5. Communicate confidently in formal and informal contexts

UNIT–I **(9 Lectures)**

a. Reading Skills: Leela's Friend – R.K. Narayan
b. Vocabulary: Synonyms, Antonyms and Word formation, Root Words
c. Grammar: Parts of Speech, Sentence structure and Types of sentences
d. Writing: Letter Writing, Note Making and Note Taking

UNIT–II **(10 Lectures)**

a. Reading Skills: Dr. A.P.J. Abdul Kalam's Biography
b. Vocabulary: Prefixes, Suffixes and Affixes
c. Grammar: Prepositions and Articles
d. Writing: Paragraph Writing and Precis Writing

UNIT–III **(9 Lectures)**

a. Reading Skills: Three Days to See – Helen Keller
b. Vocabulary: Collocations, One word substitutes & Idioms
c. Grammar: Tenses, Active voice & Passive voice
d. Writing: Technical Report Writing

UNIT–IV **(9 Lectures)**

a. Reading Skills: Satya Nadella's Email to His Employees on His First Day as CEO of Microsoft
b. Vocabulary: Phrasal verbs and Commonly confused words
c. Grammar: Subject–Verb Agreement (Concord) and Question tags
d. Writing: Curriculum vitae, Cover Letter and Resume Writing. (Functional, Chronological and standard Resumes)

UNIT–V **(9 Lectures)**

a. Reading Skills: Mokshagundam Visveswaraya
b. Vocabulary: Homonyms, Homophones and Homographs
c. Grammar: Modal Auxiliaries, Degrees of Comparison and Direct speech & Indirect Speech
d. Writing: E- mail Writing and Essay Writing

Text Books:

1. New Horizons – Pearson Publishers
2. Fluency in English", A Course Book for Engg. Students, Published by Orient Black Swan, Hyderabad, 2016 print.
3. "Technical Communication- Principles and Practice", Third Edition. New Delhi: Oxford University press.
4. Epitome of Wisdom – Maruthi Publications

Reference Books:

1. Meenakshi raman, Sangeetha, Sharma Fundamentals of technical communication, Pg: 119-153 Oxford University press, 2015
2. Rutherford, Andhrea. J, Communication skills for technology. Pearson, New Delhi.2001
3. Raymond Murphy, Murphy's English Grammar, Cambridge University Press 2004
4. Meenakshi raman, Sangeetha, Sharma,Technical communication: English Skills for Engineers, Oxford University press, 2009
5. Michael Swan, Practical English Usage, Oxford University press, 1996

Web Resources:

1. `www.englishhints.com`
2. `www.enchantedlearning.com`
3. `www.learnenglish.de/grammar/prefixtext.html`

4. http://www.magickeys.com/books/riddles/words.html
5. http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf
6. http://www.yourdictionary.com
7. http://www.learnenglish.com
8. http://www.cambridge.org
9. http://www.eslcafe.com
10. http://www.eslgames.com
11. http://www.penguin.co.uk
12. http://www.edufind.com/english/practice
13. www.englishhints.com,www.enchantedlearning.com,
14. www.learnenglish.de/grammar/prefixtext.html
15. http://www.magickeys.com/books/riddles/words.html

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BST01	Linear Algebra & Differential Equations	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Basics of Matrix Algebra, Differentiation, Integration

Course Objectives: The student will be able to

1. The concept of rank of a matrix which is used to know the consistency of system of linear equations and find the solution by using various analytical and numerical methods.
2. Eigen values and eigenvectors of a given matrix. Cayley-Hamilton theorem to find the inverse and power of a matrix and determine the nature of the quadratic form,
3. Recognize and model differential equations, apply analytical techniques to compute solutions for engineering problems.
4. The general solution to the higher order linear differential equations and applies to calculate the current in electrical circuits.
5. Explore the use of Laplace transform method to solve with initial value problems of ordinary differential equations.

Course Outcomes: After going through this course the student will be able to

1. Demonstrate the understanding of rank of a matrix. Analyze the solution of the system of linear equations.
2. Find the Eigen values and Eigenvectors of a matrix, apply Cayley-Hamilton theorem to determine inverse and power of a matrix and identify the nature of the quadratic form.
3. Solve the differential equations of first order and first degree related to various engineering fields.
4. Find the complete solution to the higher order linear differential equations and apply these methods to find the current in complex electrical circuits.
5. Apply the technique of Laplace transform and solve differential equations for analytical solutions with the initial conditions.

UNIT–I: Solving System of Linear Equations (8 Lectures)

Rank of a matrix by Echelon form-Normal form- Normal form through PAQ method – Solving system of homogeneous and non-homogeneous linear equations – Gauss elimination – Gauss Jordon methods.

UNIT–II: Eigen values – Eigenvectors, Cayley-Hamilton Theorem and Quadratic forms (10 Lectures)

Eigen values - Eigenvectors– Properties – Cayley-Hamilton theorem (without proof) - Finding inverse and power of a matrix by Cayley-Hamilton theorem–Reduction to Diagonal form. Quadratic forms: Rank, index, signature and nature of the

quadratic forms–Reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT–III: Differential Equations of First Order and First Degree (10 Lectures)

Linear differential equation - Bernoulli's differential equation–Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories-Electrical circuits.

UNIT–IV: Linear Differential Equations of Higher order (8 Lectures)

Non-homogeneous equations of higher order with constant coefficients-with RHS term of the type e^{ax}, $sinax$, $cosax$, polynomials in x, $e^{ax}V(x)$, $x^nV(x)$ and general method - Method of Variation of parameters.

Applications: LCR circuit

UNIT–V: Laplace Transforms (9 Lectures)

Laplace transforms of standard functions– First shifting Theorem-Change of scale property multiplication by t^n–division by t, transforms of derivatives and integrals – Second shifting theorem– Laplace transform of Periodic functions.

Inverse Laplace transforms – Convolution theorem (without proof)

Applications: Evaluation of integrals using Laplace transforms - Solving ordinary differential equations (Initial value problems) using Laplace transforms.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers
2. B.V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10^{th} Edition, Wiley-India.
2. H. K. Das, Advanced Engineering Mathematics, 22^{nd} Edition, S. Chand & Company Ltd.
3. David Poole, Linear Algebra- A modern introduction, 4^{th} edition, Cengage.
4. Peter O' Neil, Advanced Engineering Mathematics, Cengage
5. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

Web Resources:

1. `http://tutorial.math.lamar.edu/Classes/DE/DE.aspx`
2. `http://mathworld.wolfram.com/topics`
3. `http://www.nptel.ac.in/course.php`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BST02	Applied Physics	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: The basics of analytical and conceptual understanding of physics

Course Objectives: The student will be able

1. To study the wave nature of light through Interference and diffraction.
2. To learn the basic principles of Lasers and fiber optics.
3. To express the physics of electrostatics and electromagnetic wave concepts through Maxwell's equations.
4. To study the basic concepts of Quantum mechanics.
5. Aware of limits of classical free electron theory and apply band theory of solids.
6. Acquire the knowledge of semiconductor physics.

Course Outcomes: After going through this course the student will be able to

1. Understanding the basic concepts of optics and how to apply them for engineering applications.
2. Acquire the knowledge of fundamentals of Lasers and fiber optics enables the students to develop Laser devices to apply them in various systems like communications, Industries and medicine.
3. Set students to be exposed to Electrostatics, Maxwell's equations, electromagnetic waves and fundamental concepts of quantum mechanics.
4. Enable to learn the fundamental concepts of free electron theory and band theory of solids.
5. Develop knowledge of band theory of solids for fundamentals of Semiconductor physics enables the students to apply the knowledge to various systems like communications, solar cell, photo cells and so on.

UNIT–I: Wave Optics **(9 Lectures)**

Interference: Introduction, Principle of Superposition of waves, colors in thin films, interference in thin films, Newton's rings: Determination of wavelength and refractive index.

Diffraction: Introduction, differences between interference and diffraction, difference between Fraunhofer and Fresnel's diffraction, Fraunhofer diffraction at single slit, Fraunhofer diffraction due to double slit, Diffraction grating (N-slits qualitative), resolving power of grating.

UNIT–II: Lasers and Fiber Optics **(9 Lectures)**

Lasers: Introduction, Characteristics of laser, absorption, spontaneous emission, stimulated emission, Einstein's coefficients, population inversion, pumping, pumping mechanisms, Types of Lasers: Ruby laser, He-Ne laser, diode laser, Applications of Lasers.

Fiber optics: Introduction, Total internal reflection-wave propagation in optical fiber, Acceptance angle, numerical aperture, applications of optical fiber.

UNIT–III: Electrostatics, Maxwell's Equations and Electromagnetic Waves (9 Lectures)

Electrostatics: Coulombs law, electric field, electric field intensity, electric flux density, electrostatic potential, divergence of electric field, Laplace's and Poisson's equations for electrostatic potential, Gauss theorem in electrostatics.

Maxwell's equations and electromagnetic waves: Gauss theorem in magneto statics, Faraday's law of electromagnetic induction, Ampere's law, displacement current, Maxwell's equations in vacuum, electromagnetic wave equation in dielectric medium, velocity of propagation of electromagnetic wave, poynting vector and poynting theorem.

UNIT–IV: Quantum Mechanics, Free Electron Theory and Band Theory (10 Lectures)

Quantum Mechanics: Introduction to quantum physics, de-Broglie's hypothesis and properties of matter waves, Schrodinger's time independent wave equation, Schrodinger's time dependent wave equation, Particle in one dimensional box.

Free electron theory: classical free electron theory of metals- assumptions and failures, quantum free electron theory of metals-assumptions and failures, Fermi Dirac distribution function- Fermi level, Femi energy, density of states.

Band theory of solids: Introduction, Bloch's theorem, Kronig penny model (qualitative), E-K diagram, Brillouin's zones, classification of solids into metals, semiconductors and insulators, effective mass of electron and concept of hole.

UNIT–V: Semiconductor Physics (8 Lectures)

Semiconductor physics: Introduction, intrinsic and extrinsic semiconductors, carrier concentration in intrinsic semiconductors, electrical conductivity of intrinsic semiconductor, Fermi energy, carrier concentration in N-type and P-type semiconductors, dependence of Fermi energy on carrier-concentration and temperature, drift and diffusion, Hall effect and its applications, mechanism in LED, solar cell and photo conductor.

Text Books:

1. A Textbook of Engineering Physics by Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand.
2. Optics by Ajoy Ghatak, Tata McGraw-Hill Publishing company limited
3. Introduction to Electrodynamics by David Griffiths, Cambridge University Press
4. Introduction to Quantum physics by Eisberg and Resnick.

Reference Books:

1. Applied physics by Palanisamy (Scitech publications)
2. Optics by Eugene Hecht, Pearson Education.
3. Principle of Lasers by O. Svelto
4. Electricity, magnetism and light by W. Saslow
5. Semiconductor Optoelectronics by J. Singh, Physics and Technology, Mc Graw-Hill inc
6. Engineering Physics by B.K. Pandey, S. Chaturvedi - Cengage Learing.

Web Resources:

1. https://nptel.ac.in/courses/115/106/115106066/
2. https://ocw.mit.edu/high-school/physics/exam-prep/electromagnetism/maxwells-equations/#1
3. https://ocw.mit.edu/courses/materials-science-and-engineering/3-091sc-introduction-to-solid-state-chemistry-fall-2010/electronic-materials/14-semiconductors/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21EST03	C - Programming for Problem Solving	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Nill

Course Objectives: The student will be able

1. To impart adequate knowledge on the need of programming languages and problem solving techniques.
2. To impart problem solving skills.
3. To enable student to write programs in C and to solve the problems.

Course Outcomes: After going through this course the student will be able to

1. Design algorithms and flowchart / Pseudo code for a given problem.
2. Design programs involving decision structures and loops.
3. Implement different operations on arrays and solve problems using functions.
4. Understand pointers and strings.
5. Implement structures, unions and file operations in C programming for a given application problem.

UNIT–I **(8 Lectures)**

Introduction to Programming: Computer hardware, Bits and Bytes, programming languages, application and system software, the software development process.

Idea of algorithm: steps to solve logical and numerical problems. Representation of algorithm: flowchart/pseudo code with examples, from algorithms to programs.

UNIT–II **(9 Lectures)**

Introduction to C: Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing Input and Output. Decision Making - Branching and Looping. Enumerated Data type, Renaming Data type with type def, Type Casting.

UNIT–III **(10 Lectures)**

Arrays: Definition, Declaration, Initialization, Assignment, Processing array, Passing array to a function, Two and multi dimensional array. **Functions:** Defining a function, Accessing a function, Passing argument to functions, Function prototypes, Nested function call, Storage classes.

UNIT–IV **(9 Lectures)**

Pointers: Definition, initialization, operations on pointers, functions and pointers, arrays and pointers, pointers to pointers, dynamic memory allocation.

Strings: C Strings, String Input / Output functions, arrays of strings, string manipulation functions.

UNIT–V **(9 Lectures)**

Structures: Definition, declaration, initialization, accessing members, array of structures, arrays within structure, functions and structures, pointers to structures, nested structures, unions.
File Handling: Types, operations on files, modes, file I/O functions, Random Access Functions.

Text Books:

1. Byron S Gottfried, —Programming with C, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. Problem Solving and Program Design in C, 4th edition, by jeri R. Hanly and Elli B.Koffman.
3. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. Yashavant P. Kanetkar. —Let Us C, BPB Publications, 2011.

Web Resources:

1. https://www.studytonight.com/c/
2. https://www.cprogramming.com/tutorial/c-tutorial.html
3. https://www.javatpoint.com/c-programming-language-tutorial
4. https://www.tutorialspoint.com/cprogramming/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21EST04	Computer Engineering Workshop	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NILL

Course Objectives:

1. To make the students aware of the basic hardware components of a computer and installation of operating system.
2. To introduce Raptor Tool for flowchart creation.
3. To introduce programming through Visual Programming tool using scratch.
4. To get knowledge in awareness of cyber hygiene that is protecting the personal computer from getting infected with the viruses, worms and other cyber-attacks.
5. To introduce the usage of Productivity tools in crafting professional word documents, excel spreadsheets and power point presentations using open office tools.

UNIT–I:

Simple Computer System: Central processing unit, the further need of secondary storage, Types of memory, Hardware, Software and people. Peripheral Devices: Input, Output and storage, Data Preparation, Factors affecting input, Input devices, Output devices, Secondary devices, Communication between the CPU and Input/ Output devices.

TASK 1: PC Hardware: PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

TASK 2: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

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

UNIT–II:

Problem Solving and Programming: Algorithm development, Flowcharts, Looping, some programming features, Pseudo code, the one-zero game, some structured programming concepts, documents. Programming Languages: Machine Language

and assembly language, high –level and low level languages, Assemblers, Compilers, and Interpreters.

TASK 3: Drawing flowcharts (Raptor Tool)

a) Create flowcharts for take-off landing of an Aeroplane.

b) Create a flowchart to validate an email id entered by user.

c) Create flowchart to print first 50 prime numbers.

TASK 4: Productivity tool:LaTeX and Microsoft (MS) office: Importance of MS office, Details of the three tasks and features that should be covered in each, MS word, Power Point, Excel.

UNIT–III:

Operating systems: Introduction, Evolution of operating systems, , Command Interpreter, Popular operating systems- Microsoft DOS, Microsoft Windows, UNIX and Linux. Introduction to Unix Shell Commands, directory management commands, file operations, users commands, Time and Date commands.

TASK 5: Operating System Installation: Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

TASK 6: Basic Commands: Unix Shell Commands, directory management commands, file operations, users commands, Time and Date commands.

UNIT–IV:

Computer Networks: Introduction to computer Networks, Network topologies-Bus topology, star topology, Ring topology, Mesh topology, Hybrid topology, Types of Networks: Local area Network, Wide Area Networks, Metropolitan Networks, Campus/ Corporate Area Network, Personal Area Network, Network Devices- Hub, Repeater, Switch, Bridge, Router, Gateway, Network interface Card, Basic Networking Commands.

TASK 7: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IPsetting. Finally students should demonstrate how to access the websites and email.

TASK 8: Networking Commands: ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route

UNIT–V:

Introduction to HTML : Basics in Web Design, Brief History of Internet ,World Wide Web Why create a web site ,Web Standards, HTML Documents ,Basic structure of an HTML document Creating an HTML document ,Mark up Tags ,Heading-Paragraphs ,Line Breaks ,HTML Tags. Elements of HTML: Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls.

TASK 9: Basic HTML tags

a) Head Section and Elements of Head Section, Paragraphs, Formatting Styles.

b) Colour tags, Creating Hyperlinks, Images, Tables, lists

c) HTML Forms, Form Attributes, Form Elements.

TASK 10: Web Browsers, Surfing the Web: Students customize their web browsers

with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured. Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. Usage of search engines like Google, Yahoo, ask.com and others should be demonstrated by student.

TASK 11: Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Text Books:

1. Fundamentals of Computers –ReemaThareja-Oxford higher education
2. Computer Fundamentals, Anita Goel, Pearson Education, 2017
3. PC Hardware Trouble Shooting Made Easy, TMH
4. Programming the World Wide Web, 7^{th} Edition, Robet W Sebesta, Pearson, 2013.

Reference Books:

1. An Introduction to Web Design, Programming, 1^{st} Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.
2. An Introduction to Computer studies –Noel Kalicharan-Cambridge

Course Code	Course Name	Course Structure			
		L	T	P	C
P21HSL01	English Language Communication Skills Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: Basic knowledge of English grammar, Basic understanding of English vocabulary, Ability to speak simple sentences, Have interest to learn the language.

Course Objectives: The student will be able

1. To facilitate computer assisted multimedia instructions enabling individualized and independent language learning.
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
3. To bring about a consistence accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.
4. To improve the fluency of students in spoken English and neutralize their mother tongue influence.
5. To train students to use language appropriately for public speaking, group discussion and interviews.

Course Outcomes: After going through this course the student will be able to

1. Better understanding of nuances of English language through audio visual experience and group activities.
2. Neutralization of accent for intelligibility.
3. Speaking skills with clarity and confidence which in turn enhances their employability skills.
4. Better understanding of the production of sounds of language.
5. Suitable body language for employability.

EXERCISE–I **(3 Sessions)**

A. Introduction to Phonetics
   Consonant sounds
   Vowel sounds – Pure Vowels & Diphthongs

B. Greeting, Introducing & taking leave and Ice – Breaking Activity

EXERCISE–II **(2 Sessions)**

A. Structure of Syllables - Plural markers & Past tense Markers

B. JAM Session & Situational Dialogues

EXERCISE–III **(2 Sessions)**

A. Word Stress & Rules of 'r' pronunciation

B. Role play, Giving Directions & Story Narration

EXERCISE–IV **(2 Sessions)**

A. Consonant Cluster, Neutralization of Mother Tongue Influence and Listening Comprehension – Listening for General Details

B. Describing objects, events, places etc. & Presentation Skills – Extempore, Public Speaking.

EXERCISE–V **(3 Sessions)**

A. Intonation & Listening Comprehension – Listening for Specific Details

B. Interview Skills & Group Discussion

Text Books:

1. Strengthen your Communication Skills - Maruthi Publication, Hyderabad 2013
2. A textbook of English Phonetics for Indian Students by T. Balasubramanian (Macmillan)

Reference Books:

1. INFOTECH English (Maruthi Publications).
2. Personality Development and Soft Skills (Oxford University Press, New Delhi)
3. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
4. Speaking English Effectively 2^{nd} Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
5. Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
6. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
7. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad
8. Hewings, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP
9. Marks, J. 2009. English Pronunciation in Use. Elementary. Cambridge: CUP
10. Nambiar, K.C. 2011. Speaking Accurately. A Course in International Communication. New Delhi : Foundation

11. Soundararaj, Francis. 2012. Basics of Communication in English. New Delhi: Macmillan

12. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.

13. English Pronouncing Dictionary Daniel Jones Current Edition with CD.

Web Resources:

1. http://www.cambridge.org
2. http://www.edufind.com/english/practice
3. http://www.learnenglish.com
4. http://www.penguin.co.uk

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BSL01	Applied Physics Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: The basics of analytical and conceptual understanding of physics.

Course Objectives:

1. Deploy scientific method of experiments in the laboratory.
2. Develop the procedures and observational skills for appropriate use of simple and complex apparatus.
3. Enable analytical techniques, statistical analysis and graphical analysis.
4. Reinforce ideas and concepts covered in lecture host of experiments.
5. Train to find the radius of curvature of a Plano-convex lens forming Newton's rings.

Course Outcomes:

1. Apply the phenomenon of interference and diffraction of light waves.
2. HImplement the concept of resonance in LCR circuit and sonometer.
3. HM toAnalyze the S determine its dependent properties.
4. Evaluate the behavior of electronic components and its characteristics.

LIST OF EXPERIMENTS: (any eight of the following to be done)

1. Determination of Radius of Curvature of Plano-Convex lens by forming Newton's Rings.
2. Determination of Wavelengths of various spectral lines using diffraction grating with the normal incidence method.
3. Study of magnetic field along the axis of a current carrying coil and to verify Stewart-Gee's method.
4. Determination of energy gap of PN junction Diode.
5. Determination of hall coefficient and carrier concentration using Hall effect
6. Study of V-I characteristics of Zener diode.
7. Determination of frequency of a vibrating bar or electrical tuning fork using Melde's apparatus.
8. Determination of acceleration due to gravity using compound pendulum
9. Verification of laws of transverse waves by Sonometer.
10. Determination of Velocity of sound by volume resonator.
11. Determination of rigidity modulus by Torsional Pendulum.

Text Books:

1. Physics lab manual, department of physics, PACE Institute of Technology and Sciences.

2. Madhusudhanrao, "Engineering Physics lab manual" 1^{st} edition, Scietech Publication, 2015.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ESL02	C - Programming for Problem Solving Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: Nil

Course Objectives: The student will be able

1. To understand the various steps in program development.
2. To understand the basic concepts in C Programming Language.
3. To understand different modules that includes conditional and looping expressions.
4. To understand how to write modular and readable C Programs.
5. To write programs in C to solve problems using arrays, structures and files.

Experiment Wise Programs

EXERCISE–I

a. Write a simple C program to Print "Hello World"

b. Write a simple C Program to Calculate Area and Circumference of Circle

c. Write a simple C program to implement basic arithmetic operations - sum, difference, product, quotient and remainder of given numbers.

EXERCISE–II: Write C programs to demonstrate the following operators

a. Assignment Operator.

b. Relational and Logical Operator.

c. Increment and decrement operator.

d. Bitwise operators.

e. Ternary operator.

EXERCISE–III

a. Write a C programs - to find the largest and smallest of 2 numbers(if – else), to find the largest and smallest of 3 numbers(Nested if – else), roots of quadratic equation(else – if ladder).

b. The total distance travelled by vehicle in't' seconds is given by distance=ut+1/2 at 2 where 'u' and 'a' are the initial velocity and acceleration.

Write a c program to find the distance travelled at regular intervals of time given the Values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

c. Write a c program, which takes two integer operands and one operator from the user, performs the operation and the prints the result. (consider the operators $+, -, *, /, \%$ and use switch statement).

EXERCISE–IV

a. Write a C program to find the sum of individual digits of a positive integer

b. A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1.Subsequent terms are found by adding the preceding two terms in the sequence .Write a c program to generate the first n terms of the sequence.

c. Write a c program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

EXERCISE–V

a. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1 + x + x^2 + x^3 + ... + x^n$

b. Write a C program to generate Pascal's triangle.

c. Write a C program to construct a pyramid of numbers

EXERCISE–VI

a. Write a c program to find both the largest and smallest number in a list of integers.

b. Write a c program that uses functions to perform the following:

   i. Addition of Two Matrices.

   ii. Multiplication of Two Matrices.

EXERCISE–VII

a. Write a programs that use both recursive and non-recursive functions

b. To find the factorial of a given integer.

c. To find the GCD of two given integers.

EXERCISE–VIII

a. Write a c program that uses functions to perform the following operations:

   i. To insert a sub-string in given main string from a given position.

   ii. To delete n Characters from a given position in a given string.

b. Write a C program to determine if the given string is a palindrome or not.

EXERCISE–IX

a. Write a C program that displays the position or index in the string S Where the string T begins, or - 1 if S doesn't contain T.

b. Write a C program to count the lines, words and characters in a given text .

EXERCISE–X

a. Write a program to print the details of a student like(Name, Rollno, marks) using nested structures.

b. Write a C Program to Calculate Difference Between Two Time Period.

EXERCISE–XI

a. Write a C program that uses functions to perform the following operations:

   i. Reading a complex number
   ii. Writing a complex number
   iii. Addition of two complex numbers
   iv. Multiplication of two complex numbers
   (Note: represent complex number using a structure.)

EXERCISE–XII

a. Write a C program which copies one file to another and display the contents of a file

b. Write a C program to reverse the first n characters in a file.

c. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BST04	Applied Chemistry	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Basic Chemistry at Intermediate or equivalent level.
Course Objectives: The student will be able

1. To analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
2. To utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.
3. To understand various synthetic methods of nonmaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors
4. To analyze the principles of different analytical instruments and their applications.
5. To Design models for energy by different natural sources.

Course Outcomes: After going through this course the student will be able to

1. Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
2. Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.
3. Understand various synthetic methods of nonmaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors
4. Analyze the principles of different analytical instruments and their applications.
5. Design models for energy by different natural sources.

UNIT–I: Polymer Technology (9 Lectures)

Polymerization: Introduction, classification, methods of polymerization (Emulsion and Suspension), mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (Poly ethylene, PVC, Polycarbonates and Bakelite).

Elastomers: Introduction, preparation, properties and applications (Buna S, Thiokol and Polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers,

UNIT–II: Electrochemical Cells and Corrosion (10 Lectures)

Galvanic Cells, Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery, Lead Acid battery and Ni-Cd cells).

Corrosion: Definition, theories of corrosion (Chemical and Electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, corrosion control (Proper designing and cathodic protection), protective coatings (Surface preparation, Cathodic coatings, Anodic coatings, Electroplating and Electroless plating).

UNIT–III: Chemistry of Advanced Materials (10 Lectures)

Nano materials: Introduction, sol-gel method, characterization by (Brunauer Emmet Teller (BET), and transmission electron microscopy (TEM) with example (TiO2), applications of fullerenes, carbon nanotubes (types, preparation and applications).

Liquid crystals: Introduction-types-applications.

Super conductors: Type –I, Type II-characteristics and applications

Non-elemental semiconducting materials: Stoichiometric, controlled valency & chalcogen photo/ semiconductors preparation of semiconductors (zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation)– semiconductor devices (p-n junction diode as rectifier, junction transistor).

UNIT–IV: Spectroscopic Techniques & Synthesis Of Essential Drug Molecules (9 Lectures)

Spectroscopic Techniques: Electromagnetic spectrum-types of molecular spectra and their absorption criteria ,UV-visible spectroscopy (electronic spectroscopy), Beer-Lambert's law and its limitations ,– applications of UV visible spectroscopy ,IR spectroscopy principle, Molecular vibrations – stretching and bending vibrations – applications of IR, NMR (Nuclear magnetic resonance)–working principle and instrumentation of NMR, chemical shift(δ) – applications of NMR

Synthesis of essential drug molecules: Preparation, properties and uses of Paracetamol , Aspirin, Ibuprofen

UNIT–V: Non-Conventional Energy Sources (7 Lectures)

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Text Books:

1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "Engineering Chemistry", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

Reference Books:

1. K. SeshaMaheshwaramma and MridulaChugh, “Engineering Chemistry”, Pearson India Edition.
2. O.G. Palana, “Engineering Chemistry”, Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) “Preparation and characterization of materials” Academic press, New York (latest edition).
4. B. S. Murthy, P. Shankar, “Textbook of Nanoscience and Nanotechnology”, University press (latest edition).

Web Resources:

1. http://jntuk-coeerd.in/
2. http://en.wikipedia.org/wiki/title
3. http://nptel.ac.in/coures/105106/.com
4. https://en.wikipedia.org/wiki/Electrochemistry
5. https://www.youtube.com/watch?v=WLyaZbT97EI&list=PLzW3l18TEXrpqo3jRarGr9ao-61tB2184
6. https://encyclopedia.che.engin.umich.edu/
7. http://encyclopedia.che.engin.umich.edu/Pages/ProcessParameters/Spectrometers/Spectrometers.html

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BST06	Numerical Methods & Vector Calculus	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Differentiation, Partial differentiation, Integration, Differential Equations

Course Objectives: The student will be able to

1. The different numerical techniques to solve algebraic and transcendental equations and evaluate the polynomials from the numerical data.
2. The approximate solutions using numerical methods in the absence of analytical solutions of various systems of ordinary differential equations and integrations.
3. Enhance the knowledge level to visualize integrals in higher dimensional coordinate systems, possible representation and evaluation of geometrical and physical quantities in terms of multiple integrals.
4. Interpret concepts of vector functions, vector fields, differential calculus of vector functions in Cartesian coordinates and apply them for various engineering problems.
5. Evaluate line, surface and volume integrals and construct relation between line, surface and volume integrals using vector integral theorems.

Course Outcomes: After going through this course the student will be able to

1. Evaluate approximate roots of the polynomial and transcendental equations by different algorithms and apply Newton's forward, backward interpolation and Lagrange's formulae for equal and unequal intervals.
2. Apply different algorithms for approximating the integrals of numerical data and solutions of ordinary differential equations to its analytical computations.
3. S Evaluate the multiple integrals by using change of variables and change of order of integration. Also apply double and triple integration techniques in evaluating areas and volumes bounded by regions and solids.
4. nterpret the physical meaning of different operators such as gradient, curl and divergence.
5. Determine line, surface and volume integrals. Apply Green's, Stoke's and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT–I: Iterative Methods, Finite differences and Interpolation (10 Lectures)
Introduction-Solution of algebraic and transcendental equations-Bisection method -Method of false position-Newton-Raphson method (Single variable only)
Interpolation: Introduction-Errors in polynomial interpolation-Finite differences – Forward differences-Backward differences-Relations between operators-Newton's forward and backward formulae for interpolation -Interpolation with unequal intervals -Lagrange's interpolation formula.

UNIT–II: Numerical integration, Solution of ordinary differential equations with initial **(9 Lectures)**

Trapezoidal rule – Simpson's 1/3rd and 3/8th rule– Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Modified Euler's method-Runge-Kutta method (second and fourth order).

UNIT–III:Multiple Integrals: **(9 Lectures)**

Double integrals (Cartesian and Polar) – Change of order of integration – Change of variables (Cartesian to Polar coordinates) –Triple integrals- Change of variables (Cartesian to Cylindrical and Spherical coordinates).

Applications: Areas by double integrals and Volumes by triple integrals.

UNIT–IV: Vector Differentiation: **(8 Lectures)**

Scalar and Vector point functions-Vector Differential operator- Gradient – Directional derivatives – Divergence – Curl – Laplacian second order operator- Vector identities- Applications: Scalar Potential function.

UNIT–V: Vector Integration: **(9 Lectures)**

Line integral – Work done – Circulation- Surface integral- Volume integral

Vector Integral Theorems (without proof): Application of Green's theorem in a plane- Stoke's theorem- Gauss Divergence theorem.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers.
2. B.V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10^{th} Edition, Wiley-India.
2. H. K. Das, Advanced Engineering Mathematics, 22^{nd} Edition,S. Chand & Company Ltd.
3. David Poole, Linear Algebra- A modern introduction, 4^{th} edition, Cengage.
4. Peter O' Neil, Advanced Engineering Mathematics, Cengage
5. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

Web Resources:

1. `http://tutorial.math.lamar.edu/Classes/DE/DE.aspx`
2. `http://mathworld.wolfram.com/topics`
3. `http://www.nptel.ac.in/course.php`

Course Code	Course Name	Course Structure			
P21EST12	Digital Electronics	L	T	P	C
		3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NILL

Course Objectives:

1. Relate the conversion among different number systems.
2. Outline of basic logic gates – AND, OR & NOT, XOR, XNOR and understand Boolean algebra and basic properties of Boolean algebra.
3. Able to optimize simple logic using Karnaugh maps, understand "don't care" concepts.
4. Design simple combinational using basic gates.
5. Understand different memories and able to design different programmable devices.

Course Outcomes:

1. Demonstrate the various number systems and conversion of number systems.
2. Develop Boolean algebra & the underlying features ofvarious logic gates.
3. Conceptualize Design mapping method upto 4-variables.
4. Apply the concepts of Boolean algebra for the analysis & design of various combination logic circuits.
5. Able to compare different memories and their programmable devices.

UNIT–I: (9 Lectures)

Number Systems and Binary Codes : Number System, Types of Number Systems, Number base Conversions from one radix to another radix, Representation of Signed Binary Numbers,1's complement arithmetic, 2's complement arithmetic. Gray code, Excess-3 code, BCD code. Conversions.

UNIT–II: (9 Lectures)

Boolean algebra : Logic gates, Laws of Boolean algebra, Principle of Duality, Principle of Complements, Reducing Boolean Expressions using Boolean algebra, Canonical and Standard Forms, M- Notations: Minterms and Maxterms.

UNIT–III: (9 Lectures)

Gate level Minimization : Map Method, Two-Variable K-Map, Three-Variable K-Map, Four Variable K-Maps: Sum of Products Simplification, Products of Sum Simplification, Don't – Care Conditions. Implementation using NAND and NOR.

UNIT–IV: (9 Lectures)

Combinational Logic Design: Introduction, Design Procedure, Adders, Subtractors, Binary Adder–Subtractor, Decoders, Encoders, Multiplexers and Demultiplexers.

UNIT–V: **(9 Lectures)**

Programmable Logic Devices: Classification of memories, PROM,PAL,PLA – basic Structures, Realization of Boolean function with PLDs , Comparison of PROM, PAL, PLA.

Text Books:

1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA, 2011.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage, 2010.
3. A.K.Singh,Digital Logic Circuits, New Age International Publishers.

Reference Books:

1. Switching Theory and Logic Design, A.Anand Kumar, 2016.
2. Digital Electronics and Logic Design, Dr. Sanjay Sharma, 2010.
3. Modern Digital Electronics, R.P. Jain, TMH, 2010.

Web Resources:

1. www.researchgate.net
2. www.digital-logic-design.en.softonic.com
3. https://nptel.ac.in/courses/117/106/117106086/
4. https://www.coursera.org/learn/digital-systems

Course Code	Course Name	Course Structure			
		L	T	P	C
P21EST13	Data Structures	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: C Programming

Course Objectives: The student will be able to

1. Comprehensive knowledge of data structures and ability to implement the same in software applications.
2. Exposure to algorithmic complexities, recursive algorithms, searching techniques.
3. Exposure to sorting technique, Applying stack techniques for logical operations.
4. Applying queue techniques for logical operations, Exposure to list representation models in various types of applications.
5. Implementation of tree in various forms, Advanced understanding of other variants of trees and their operations.
6. Orientation on graphs, representation of graphs, graph traversals, spanning trees Graphs.

Course Outcomes: After going through this course the student will be able to

1. Student will be able to choose appropriate data structure as applied to specified problem definition.
2. Implement appropriate sorting/searching technique for given problem
3. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
4. Students will be able to implement Linear and Non-Linear data structures

UNIT–I: (9 Lectures) Data Structure, Recursion & Searching:
Preliminaries of algorithm, Algorithm analysis and complexity. Data Structure: Definition, types of data structures. **Recursion:** Definition, Design Methodology and Implementation of recursive algorithms, Types of recursion (Linear, binary and Tail), recursive algorithms for factorial function, GCD Computation, Fibonacci sequence.

Searching: List Searches using Linear Search, Binary Search.

UNIT–II: (10 Lectures)

Sorting Techniques: Basic Concepts, Sorting by: Insertion (Insertion Sort), Selection (heap sort), Exchange(Bubble sort, Quick Sort) Merging(Merge sort) Algorithms.

Stacks: Basic Stack operations, Representation of a stack using arrays, Stack Applications: Reversing list, Infix to postfix transformation.

UNIT–III: (10 Lectures)

Queues: Introduction, Representation of a Queue using arrays, Queue Operations, Applications of queues- Round Robin Algorithm, Circular Queues, Priority Queues.
Linked List: Introduction, single linked list, representation of a linked list in memory, Operations on a single linked list, Reversing a single linked list, Applications: single linked list to represent polynomial expressions, Double linked list. , Circular linked list

UNIT–IV: (9 Lectures)

Trees: Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays, operations on a Binary tree, Binary Tree Traversals (recursive).
Advanced Tree Concepts: Binary search tree, Basic concepts, BST operations: Searching, insertion, deletion, Balanced search trees-AVL Trees.

UNIT–V: (7 Lectures)

Graphs: Basic concepts, Graph Representations- Adjacency matrix, Adjacency lists, Graph algorithms: Graph Traversals (BFS & DFS), applications: Dijkstra's shortest path, Minimum Spanning Tree using Prim's & Kruskal's Algorithm.

Text Books:

1. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage,2007.
2. Data Structures and Algorithms, G.A.V.Pai, TMH, 2008
3. Data Structures and Algorithms Made Easy, Narasimha Karumanchi , Second Edition, 2011.

Reference Books:

1. Data Structure with C, Seymour Lipschutz, TMH,2010.
2. Classic Data Structures, 2/e, Debasis ,Samanta,PHI,2009
3. Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press.

Web Resources:

1. `www.geeksforgeeks.org`
2. `www.hackr.io.`
3. `www.letsfindcourse.com`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21EST14	Python Programming	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NILL

Course Objectives:

1. To read and write simple Python programs.
2. 2. To develop Python programs with conditionals and loops.
3. To define Python functions and apply OOP concept.
4. To use Python data structures — lists, tuples, dictionaries.
5. To develop GUI applications in Python.

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

1. Understand the basics of python programming.
2. Understand control flow and implement various data structures provided by python.
3. Implement packages, methods and functions.
4. Develop real-world applications using oops and exception handling.
5. Build GUI Applications in Python.

UNIT–I: (8 Lectures)

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT–II: (9 Lectures)

Types, Operators and Expressions: Types - Integers, Strings, Booleans, Expressions and order of evaluations, Control Flow- if, if-elif-else, for, while, break, continue, pass.

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions..

UNIT–III: (10 Lectures)

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

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

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

UNIT–IV: (9 Lectures)

Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

UNIT–V: (9 Lectures)

Brief Tour of the Standard Library & Files - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics, file operations.

Text Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2^{nd} edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/).
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Reference Books:

1. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
2. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.

Web Resources:

1. `https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/`
2. `https://www.codecademy.com/learn/learn-python`
3. `https://www.codementor.io/collections/learn-python-bwbc63ulz`
4. `http://www.diveintopython3.net/`
5. `https://www.python.org/3/`
6. `https://www.learnpython.org`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BSL03	Applied Chemistry Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: Basic Chemistry at Intermediate or equivalent level.
Course Objectives: The purpose of this course to provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
Course Outcomes: After going through this course the student will be able to

1. Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.
2. Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.

LIST OF EXPERIMENTS: Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis.

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of water sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (p^Hmetry method).
9. Determination of isoelectric point of amino acids using p^Hmetry method (or) conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Estimation of Vitamin C.
13. Preparation of Nylon-6, 6 and Bakelite (demonstration only).

Reference Books:

1. Dr. Jyotsna Cherukuris (2012) Laboratory Manual of engineering chemistry-II,
2. VGS Techno Series 3. Chemistry Practical Manual, Lorven Publications

Web Resources:

1. https://vlab.amrita.edu/index.php?sub=2&brch=193.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ESL06	Data Structures Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: C- Programming

Course Objectives: The objective of this lab is

1. To choose the appropriate data structure and algorithm design method for a specified application.
2. To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps binary search trees, and graphs and writing programs for these solutions.

Course Outcomes: At the end of the course student can able to

1. Analyze worst-case running times of algorithms using asymptotic analysis and implement various data structures like linked lists.
2. Understand and implement stacks and queues using arrays and linked lists.
3. Analyze and implement various searching and sorting algorithms.
4. Design and implement appropriate hash function and collision-resolution algorithms

List of Experiments:

Exercise 1:

Write recursive program for the following

a. Write recursive C program for calculation of Factorial of an integer
b. Write recursive C program for calculation of GCD (n, m)
c. Write recursive program which computes the n^{th} Fibonacci number

Exercise 2:

a. Write recursive C program for functions to perform Linear search for a Key value in a given list.
b. Write recursive C program for functions to perform Binary search for a Key value in a given list.

Exercise 3:

a. Write C program that implement Bubble sort, to sort a given list of integers in ascending order.
b. Write C program that implement Quick sort, to sort a given list of integers in ascending order

Exercise 4:

a. Write C program that implement Insertion sort, to sort a given list of integers in ascending order
b. Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise 5:

a. Write C program that implement stack (its operations) using arrays
b. Write C program that implement stack (its operations) using Linked list

Exercise 6:

a. Write a C program that uses Stack operations to Convert infix expression into postfix expression
b. Write C program that implement Queue (its operations) using arrays.
c. Write C program that implement Queue (its operations) using linked lists

Exercise 7:

a. Write a C program that uses functions to create a singly linked list
b. Write a C program that uses functions to perform insertion operation on a singly linked list
c. Write a C program that uses functions to perform deletion operation on a singly linked list.

Exercise 8:

a. Write a C program to Create a Binary Tree of integers
b. Write a recursive C program for Traversing a binary tree in preorder, inorder and postorder.

Exercise 9:

Write a C program for BST operations (insertion, deletion)

Exercise 10:

a. Write a C program for finding minimum spanning tree in a graph by using Prim's algorithm.
b. Write a C program for finding minimum spanning tree in a graph by using Kruskal's algorithm.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ESL07	Python Programming Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Outcomes: At the end of the course student can able to

1. ADescribe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.
2. Express different Decision Making statements and Functions.
3. Interpret Object oriented programming in Python.
4. Understand File handling operations.
5. Design GUI Applications.

Exercise1 - Basics

a. Running instructions in Interactive interpreter and a Python Script
b. Write a program to purpose fully raise Indentation Error and Correct it

Exercise 2 - Operations

a. Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).
b. Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise 3 – Control Flow

a. Write a Program for checking whether the given number is a even number or not.
b. Using a for loop, write a program that prints out the decimal equivalents of 1/2,1/3,1/4,...,1/10.
c. Write a program using a for loop that loops over a sequence. What is sequence?
d. Write a program using a while loop that asks the user for a number, and prints a count down from that number to zero.

Exercise 4 – Control Flow-Continued

a. Find the sum of all the primes below two million. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
b. By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise 5 - DS

a. Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
b. Write a program to use split and join methods in the string and trace a birth day with a dictionary data structure.

Exercise 6- DS-Continued

a. Write a program combine lists that combines these lists into a dictionary.
b. Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise 7 - Files

a. Write a program to print each line of a file in reverse order.
b. Write a program to compute the number of characters, words and lines in a file.

Exercise 8 - Functions

a. Write a function dups to find all duplicates in the list.
b. b) Write a function unique to find all the unique elements of a list.

Exercise 9 - Functions –Problem Solving

a. Write a function cumulative product to compute cumulative product of a list of numbers.
b. Write a function reverse to reverse a list. Without using the reverse function.
c. Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 10 – Multi - D Lists

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

Exercise 11 - OOP

Class variables and instance variable and illustration of the self variable
i)Robot.
ii)ATM Machine.

Exercise - 12 GUI, Graphics

a. Write a GUI for an Expression Calculator using tk.
b. Write a program to implement the following figures using turtle

Course Code	Course Name	Course Structure			
P21BST08	Transformation Techniques and Differential Equations	L	T	P	C
		3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite:

1) Differentiation
2) Integration

Course Objectives: The student will be able

1. To understand Fourier series representation of Periodic signals.
2. To The Fourier transform can be used to interpolate functions and to smooth signals.
3. To solve finite difference equations using Z-transforms.
4. To enlighten the learners in the concept of differential equations and multivariable calculus.
5. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

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

1. Find or compute the Fourier series of periodic signals.
2. Know and be able to apply integral expressions for the forwards and inverse Fourier transform to range of non-periodic waveforms.
3. Solving methods for finite difference equations using Z-transforms.
4. Familiarize with functions of several variables which is useful in optimization.
5. Identify the solution methods for partial differential equation related to various engineering fields.

UNIT–I: Fourier series (8 Lectures)

Fourier series: Introduction – Periodic functions – Fourier series of periodic function –Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

UNIT–II: Fourier Transforms (10 Lectures)

Fourier Transforms: Fourier integral theorem (without proof) –Fourier sine and cosine integrals– Sine and cosine transforms –Properties–inverse transforms –Finite Fourier transforms.

UNIT–III: Z-TRANSFORMS (8 Lectures)

Introduction-properties-Damping rule-Shifting rule-Initial and Final value theorems – Inverse Z transform-Convolution theorem-Solution of difference equation by Z-transform

UNIT–IV: Partial differentiation (10 Lectures)

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain

rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT–V: PDE of first order & Second order and Applications (10 Lectures)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.
Second order PDE: Solutions of linear partial differential equations with constant coefficient – RHS term of the type e^{ax+by} , sin(ax+ by) , cos(ax+ by), $x^m\ y^n$
Applications of PDE: Method of separation of Variables

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers.
2. B.V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10^{th} Edition, Wiley-India.
2. H. K. Das, Advanced Engineering Mathematics, 22^{nd} Edition, S. Chand & Company Ltd.
3. David Poole, Linear Algebra- A modern introduction, 4^{th} edition, Cengage.
4. Peter O' Neil, Advanced Engineering Mathematics, Cengage
5. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

text Web Resources:

1. `http://tutorial.math.lamar.edu/Classes/DE/DE.aspx`
2. `http://mathworld.wolfram.com/topics`
3. `http://www.nptel.ac.in/course.php`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ADT01	Java Programming	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: C++ - Programming and Object-Oriented ProgrammingL

Course Objectives: The learning objectives of this course are:

1. To identify Java language ecomponent sand how they work to gether in applications
2. To learn the fundamentals of object-oriented programming in Java, in cluding defining classes, in vokin g methods, using class libraries.
3. To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4. To understand how to design applications with three dsi n Java
5. To understand how to use Java Aap Is for program development

Course Outcomes: By the end of the course, the student will be

1. Able to realize the concept of Object Oriented Programming & Java Programming Constructs.
2. Able to describe the basic concepts of Java such as operators, classes ,objects ,in her it ance, packages, Enumeration and various keywords
3. Apply the concept of exception handling and Input/output operations.
4. Able to design the applications of Java & Java applet
5. Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit.

UNIT–I: (9 Lectures)

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or To ken sin Java Programs, Java Statements, Command Line Arguments, User Input to Programs ,Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators : Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with print f() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedenceand Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

ControlStatements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop ,For–Each for Loop, Break Statement ,Continue Statement.

UNIT–II: (9 Lectures)

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods ,Passing Arguments by Value and by Reference ,Key word this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static

Type Of Instructions: Component of Instructions: Logic Instructions, shift and Rotate Instructions Arithmetic and Logic Instructions, Branch Instructions, Input/output Operations.

UNIT–III: **(9 Lectures)**

Arrays: Introduction ,Declaration and Initialization of Arrays ,Storage of Array in Computer Memory ,Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensionalArrays, Arrays of Varying Lengths,Three-dimensional Arrays, Arraysas Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class,In hibiting Inheritance of Class Using Final,Access Control and Inheritance,MultilevelInheritance,Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes ,Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Inter faces, Annotations.

UNIT–IV: **(9 Lectures)**

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java. Lang Package and its Classes, Class Object, Enumeration, classMath, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java .time. Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw ,try, catch, and finally Blocks, Multiple Catch Clauses, Class Throw able, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception ,Throws Clause

UNIT–V: **(9 Lectures)**

String Handling in Java: Introduction, Inter face Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder. **Multi**

threaded Programming: Introduction, Need for Multiple Threads Multi threaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads,Thread States,Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication-Suspending, Resuming,and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J,JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

Text Books:

1. JAVA one step ahead, Anita Seth,B.L.Juneja, Oxford.
2. The complete Reference Java, 8^{th} edition, Herbert Schildt, TMH.

Reference Books:

1. Introduction to java programming,7^{th} edition by Y Daniel Liang,Pearson
2. Murach's Java Programming, JoelMurach

Web References:

1. www.tutorialspoint.com
2. www.beginnersbook.com
3. www.w3schools.com
4. www.udemy.com
5. https://nptel.ac.in/courses/106/105/106105191/
6. https://www.w3schools.com/java/java_data_types.asp

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ITT02	Computer Organization	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Digital Electronics

Course Objectives: The course objectives of Computer Organization are to discuss and make student familiar with

1. Principles and the Implement action of Computer Arithmetic
2. Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
3. Fundamentals of different Instruction Set Architectures and their relationship to the CPU Design
4. Memory System and/Organization
5. Principles of Operation of Multi process or Systems and Pipelining

Course Outcomes:

1. the student will Develop a detail understanding of computer systems
2. Cite different number systems, binary addition and subtraction, standard, floating-point ,admit cooperation's
3. Develop detailed understanding of architecture and functionality of central processing unit.
4. Exemple Of in a better way they I/O and memory organization
5. Illustrate concepts of parallel processing, pipelining and inter processor communication

UNIT–I: (10 Lectures)

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective ,Bus Structures,

DataRepresentation: Datatypes, Complements, Fixed Point Representation. Floating, Point Representation. Other Binary Codes, Error Detection Codes. Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT–II: (9 Lectures)

Register Transfer Language and Micro operations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt ,Complete Computer Description.

UNIT–III: (10 Lectures)

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

Micro programmed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

UNIT–IV: (8 Lectures) Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

UNIT–V: (9 Lectures)

Multi Processors: Introduction, Characteristic of Multiprocessors, Inter connection Structures, Inter Process or Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISCP ipeline, Array Processor.

Text Books:

1. Computer System Archite cture, Memories Mano, ThirdEdition, Pearson, 2008.
2. Computer Organization, Carl Halmahera, ZvonkoVranesic, SafwatZaky,5/e,McGrawHill,2002

Reference Books:

1. Computer Organization and Architecture, WilliamStallings,6/e,Pearson,2006.
2. Structured Computer Organization, AndrewS.Tanenbaum,4/e,Pearson,2005.
3. Fundamentals of Computer Organization and Design

Web Resources:

1. https://nptel.ac.in/courses/106/105/106105163/
2. http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf

Web References:

1. www.tutorialspoint.com
2. www.studytonight.com

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ITT05	Database Management Systems	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NIL

Course Objectives:

Provides students with theoretical knowledge and practical skills in the design, use of databases and database management systems in information technology applications.

Course Outcomes: After completion of this course, the students would be able to

1. Acquire knowledge in fundamentals of DBMS and identify the differences between traditional file system and DB systems.
2. Understand various DBMS models and how queries are being processed and executed in RDBMS.
3. Analyze DB design methodology and normalization process.
4. Discuss the various transaction and concurrency management techniques
5. Discuss various files indexing techniques.

UNIT–I: (9 Lectures)

INTRODUCTION: Database system, Purpose of Database, view of data, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene) and DBA, Advantages of Database Systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance, and data independence; Three-tier schema architecture for data independence; Database system structure

UNIT–II: (10 Lectures)

ENTITY RELATIONSHIP MODEL: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, subclasses, super class, inheritance, specialization, generalization using ER Diagrams.

RELATIONAL MODEL: Introduction to the relational model, concepts of domain, attribute, tuple, relation, the importance of null values, constraints, and their importance.

BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, views.

UNIT–III: (9 Lectures)

SCHEMA REFINEMENT (NORMALIZATION): Introduction to schema Refinement,functional dependencies, Normal forms : 1NF,2NF,3NF,BCNF, properties decompositions, normalization, schema refinement in database design, case studies.

UNIT–IV: (9 Lectures)

TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL: Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and save point. Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler. Concurrency control with locking methods: lock granularity, lock types, two phases locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering: Wait/Die and Wound/Wait Schemes, Database Recovery management : Transaction recovery.

UNIT–V: (9 Lectures)

OVERVIEW OF STORAGES AND INDEXING: Data on External Storage- File Organization and Indexing – Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Hash-Based Indexing – Tree-Based Indexing, index sequential access method(ISAM).

Text Books:

1. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH, 2014.
2. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA,2010.
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning,2012.

Reference Books:

1. Database System Concepts. 5/e Silberschatz, Korth, TMH,2002.
2. Introduction to Database Systems, 8/e C J Date, PEA,2003.
3. The Database book principles & practice using Oracle/MySql Narain Gehani, University Press,2008.

Web References:

1. www.studytonight.com/dbms/
2. www.tutorialspoint.com/dbms/
3. www.beginnersbook.com/2015/04/dbms-tutorial/
4. www.w3schools.com/sql/

Course Code	Course Name	Course Structure			
P21ITT03	Software Engineering	L	T	P	C
		3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NILL

Course Objectives:

1. To make the students learn about the basic concepts on software engineering methods and practices and their appropriate application in software industry.
2. To develop an understanding of software process models and Software Development Life Cycle.
3. To provide an idea on software testing techniques.
4. To teach an understanding role of the different aspects of Software Project Management.

Course Outcomes: At the end of the course student able to

1. Identify, formulate, and solve software engineering problems.
2. Elicit, analyze and specify software requirements with various stakeholders of a software development project.
3. Participate in design, development, deployment and maintenance of a medium scale software development project.
4. Convey technical material through oral presentation and interaction with an audience.
5. Evaluate the impact of potential solutions to software engineering problems in a global society, using the knowledge of models, tools, and techniques.

UNIT–I: (10 Lectures)

Introduction to Software Engineering: The evolving role of software, Software Characteristics, Changing Nature of Software, Software myths. **A Generic view of Process:** Software engineering- A layered technology, a Process framework, The Capability Maturity Model Integration (CMMI), Process assessment, Product and Process.

UNIT–II: (8 Lectures)

Process models: The waterfall model, Incremental process models, Evolutionary process models, the unified process.

Software Requirements: User requirements, System requirements, Functional and non functional requirements, the Software Requirements Document (SRS).

UNIT–III: (10 Lectures)

Requirements Engineering Process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

Project planning and estimation: Project Planning Activities, Software Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques: COCOMO, PERT/CPM method.

UNIT–IV: **(8 Lectures)**

Design Engineering: Design process and Design quality, Design concepts, Software Architecture, Architectural Styles and Patterns.

Object-Oriented Design: Objects and object classes, An Object-Oriented design process, Design evolution

UNIT–V: **(9 Lectures)**

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Validation testing, System testing, the art of Debugging, Black-Box and White Box testing.

Quality Management: Quality concepts, Software quality assurance, Software Reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 Quality standards.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6^{th} edition, Mc GrawHill International Edition, 2010.
2. Software Engineering- Sommerville , 9^{th} edition, Pearson education, 2011.
3. Software Engineering, concepts and practices, Ugrasen Suman, Cengage learning, 2013.

Reference Books:

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers, 2007.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, JohnWiely,2000.
3. Systems Analysis and Design- Shely Cash man Rosenblatt, Thomson Publications,2016.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies, 2004.

Web References:

1. `www.en.wikibooks.org/wiki/`
2. `www.slideshare.net/`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ADL01	Java Programming Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: Object Oriented Programming Concepts
Course Objectives: The aim of this lab is to

1. Practice programming in the Java
2. Gain knowledge of object-oriented paradigm in the Java programming language
3. Learn use of Java in variety of technologies and on different platforms

Course Outcomes: By the end of the course student will be able to write java program for

1. Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
2. Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
3. Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
4. Construct Threads, Event Handling, implement packages, developing applets

List of Experiments:
Exercise 1: (Basics)

1. Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.
2. Write a JAVA program to display default value of all primitive data type of JAVA
3. Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each race rand print back the speed of qualifying racers.

Exercise 2: (Operations, Expressions, Control-flow, Strings)

1. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
2. Write a JAVA program to sort for an element in a given list of elements using bubble sort.

3. Write a JAVA program to sort for an element in a given list of elements using merge sort.
4. Write a JAVA program using StringBufferto delete, remove character.

Exercise 3: (Class, Objects)

1. Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.
2. Write a JAVA program to implement constructor. .

Exercise 4: (Method)

1. Write a JAVA program to implement constructor overloading.
2. Write a JAVA program implement method overloading.

Exercise 5: (Inheritance))

1. Write a JAVA program to implement Single Inheritance
2. Write a JAVA program to implement multi level Inheritance
3. Write a java program for abstract class to find areas of different shapes

Exercise 6: (Inheritance - Continued)

1. Write a JAVA program give example for "super" keyword.
2. Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise 7: (Exception))

1. WWrite a JAVA program that describes exception handling mechanism b).Write a JAVA program Illustrating Multiple catch clauses

Exercise 8: (Runtime Polymorphism)

1. Write a JAVA program that implements Runtime polymorphism
2. Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise 9: (User defined Exception)

1. Write a JAVA program for creation of Illustrating throw
2. Write a JAVA program for creation of Illustrating finally
3. Write a JAVA program for creation of Java Built-in Exceptions
4. Write a JAVA program for creation of User Defined Exception

Exercise 10: (Threads)

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

2. Write a program illustrating isAlive and join ()
3. Write a Program illustrating Daemon Threads.

Exercise 11: (Thread continuity)

1. Write a JAVA program Producer Consumer Problem
2. Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise 12: (Packages)

1. Write a JAVA program illustrate class path
2. Write a case study on including in class path in your os environment of your package.
3. Write a JAVA program that import and use the defined your package in the previous Problem

Exercise 13: (Applet)

1. Write a JAVA program to paint like paint brush in applet.
2. Write a JAVA program to display analog clock using Applet.
3. Write a JAVA program to create different shapes and fill colors using Applet.

Exercise 14: (Event Handling)

1. Write a JAVA program that display the and position of the cursor movement using Mouse.
2. Write JAVA programs that identify ieskey-up key-down event user entering text in a Applet.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ITL05	Database Management Systems Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: NILL

Course Objectives: After Completion of this course student must be able to

1. Understand, analyze and apply SQL commands like DDL,DML,DCL to perform different Database operations
2. Understand and practice PL/SQL block, control statements and cursors.
3. Develop PL/SQL programs using, functions, procedures, packages and Triggers.

Course Outcomes: After learning the contents of this paper the student must be able to

1. Know about SQL DDL,DML,DCL,TCL commands
2. Know how to write SQL Quires using set operators
3. Know about how to implement PL/SQL programs using conditional ,loops statements
4. Know about implementing of triggers, cursors and exceptions
5. Know about implementing procedures, functions and packages

PROGRAMS LIST

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables).
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions, string functions and date functions
5. (a) Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section
   (b) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.

7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISEAPPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Write a PL/SQL block illustrating packages.
11. Write a PL/SQL code using CURSOR.
12. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and Instead of Triggers.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ITL03	Free Open Source Software Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: NIL

Course Objectives: To teach students various unix utilities and shell scripting

1. **Session-1**

   (a) Log into the system

   (b) Use vi editor to create a file called myfile.txt which contains some text.

   (c) Correct typing errors during creation.

   (d) Save the file

   (e) logout of the system

   Session-2

   (a) Log into the system

   (b) open the file created in session 1

   (c) Add some text

   (d) Change some text

   (e) Delete some text

   (f) Save the Changes

   (g) Logout of the system

2. (a) Log into the system

   (b) Use the cat command to create a file containing the following data. Call it mytable use tabs to separate the fields

   1425 Ravi 15.65

   4320 Ramu 26.27

   6830 Sita 36.15

   1450 Raju 21.86

   (c) Use the cat command to display the file, mytable.

   (d) Use the vi command to correct any errors in the file, mytable.

   (e) Use the sort command to sort the file mytable according to the first field. Call the sorted file my table (same name)

   (f) Print the file mytable

   (g) Use the cut and paste commands to swap fields 2 and 3 of mytable. Call it my table (same name)

   (h) Print the new file, mytable

(i) Logout of the system

(j) Login to the system

(k) Use the appropriate command to determine your login shell

(l) Use the /etc/passwd file to verify the result of step b.

(m) Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.

(n) Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.

3. Write a sed command that deletes the first character in each line in a file.

   (a) Write a sed command that deletes the character before the last character in each line in a file.

   (b) Write a sed command that swaps the first and second words in each line in a file.

4. Pipe your /etc/passwd file to awk, and print out the home directory of each user.

   (a) Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word.

   (b) Repeat

   (c) Part using awk

5. (a) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.

   (b) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.

6. Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.

7. (a) Write a shell script that computes the gross salary of a employee according to the following rules

      i. If basic salary is $<$ 1500 then HRA =10% of the basic and DA =90% of the basic.

      ii. If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic The basic salary is entered interactively through the key board.

8. Write a shell script to search given number using binary search.

9. (a) Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.

(b) Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.

(c) Write a shell script to perform the following string operations:

i. To extract a sub-string from a given string.

ii. To find the length of a given string.

10. Write a shell script which will display Armstrong numbers from given arguments

11. Write a shell script to display factorial value from given argument list

12. Write a C program that simulates ls Command (Use system calls / directory API)

Do the following Shell programs also

1. Write a shell script to check whether a particular user has logged in or not. If he has logged in, also check whether he has eligibility to receive a message or not

2. Write a shell script which will display the username and terminal name who login recently in to the unix system

3. Write a shell script to find no. of files in a directory

4. Write a shell script to check whether a given number is perfect or not

5. Write a menu driven shell script to copy, edit, rename and delete a file

6. Write a shell script for concatenation of two strings

7. Write a shell script which will display Fibonacci series up to a given number of argument

8. Write a shell script to accept student number, name, marks in 5 subjects. Find total, average and grade. Display the result of student and store in a file called stu.data

   Rules: avg>=80 then grade A

   Avg < 80&&Avg>=70 then grade B

   Avg<70&&Avg>=60 then grade C

   Avg<60&&Avg>=50 then grade D

   Avg<50&&Avg>=40 then grade E

   Else grade F

9. Write a shell script to accept empno,empname,basic. Find DA,HRA,TA,PF using following rules. Display empno, empname, basic, DA,HRA,PF,TA,GROSS SAL and NETSAL. Also store all details in a file called emp.data

   Rules: HRA is 18% of basic if basic > 5000 otherwise 550 DA is 35% of basic

PF is 13% of basic

IT is 14% of basic

TA is 10% of basic

10. Write a shell script to demonstrate break and continue statements
11. Write a shell script to display string palindrome from given arguments
12. Write a shell script to display reverse numbers from given argument list
13. 13. Write a shell script which will find maximum file size in the given argument list
14. Write a shell script which will greet you “Good Morning”, ”Good Afternoon”, “Good Evening” and “Good Night” according to current time
15. Write a shell script to sort the elements in a array using bubble sort technique
16. Write a shell script to find largest element in a array
17. Write an awk program to print sum, avg of students marks list
18. Write an awk program to display students pass/fail report
19. Write an awk program to count the no. of vowels in a given file
20. Write an awk program which will find maximum word and its length in the given input File
21. Write a shell script to generate the mathematical tables.
22. Write a shell script to sort elements of given array by using selection sort.
23. Write a shell script to find number of vowels, consonants, numbers, white spaces and special characters in a given string.
24. Write a shell script to search given number using binary search.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21AMS01	Data Analysis Using Python	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: PYTHON Programming

Course Objectives:

1. To acquire programming skills in core Python
2. To acquire Object Oriented skills in Python
3. To develop the skill of designing Graphical user Interfaces in Python
4. To develop the ability to write database applications in Python

Course Outcomes: After completion of the course, students would be able to:

1. Understand the basic principles of Python programming language
2. Implement object-oriented concepts.
3. Implement database and GUI applications.

Exercise 1:
Write a Python program for Machine Learning.

Exercise 2:
Write a Python Program for Data Analysis

Exercise 3:
Data Visualization Applications with Dash and Python Program

Exercise 4:
Data Visualization using Python Program

Exercise 5:
Write a program for Financial Strategies using Python Program

Exercise 6:
Simple Virtual Machine to deploying advanced machine learning APIs with Python

Exercise 7:
Image and Video Analysis with Python programming

Exercise 8:
Distributed and Parallel Computing Tasks using Python programming

Exercise 9:
Natural Language Processing using Python program code

Course Code	Course Name	Course Structure			
		L	T	P	C
P21MCT03	Environmental Science	3	0	0	3

Internal Marks: 100

Course Prerequisite: Basic knowledge about sciences up to intermediate or equivalent level.

Course Objectives: The student will be able to

1. Overall understanding of the natural resources
2. Basic understanding of the ecosystem and its diversity
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
4. An understanding of the environmental impact of developmental activities
5. Awareness on the social issues, environmental legislation and global treaties

Course Outcomes: After going through this course the student will be able to acquire

1. The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
2. The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
3. Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices 21CSS02
4. The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
5. Social issues both rural and urban environment and the possible means to combat the challenges and environmental assessment stages involved in EIA and the environmental audit.

UNIT–I: (9 Lectures)

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Definition, Scope and Importance– Need for Public Awareness. Renewable energy Resources, Solar energy-solar cells, solar batteries, wind energy, wind mills, ocean energy, tidal energy and nonrenewable energy resources: LPG, water gas, producer gas. World food problems, degradation and Soil erosion - overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging and salinity.

UNIT–II: (8 Lectures)

ECOSYSTEMS: Concept of an ecosystem. – Structure, Components and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Ecological pyramids - Food chains, food webs and Introduction, types, characteristic features, structure and function of

the following ecosystem: a. Forest ecosystem. b. Grassland ecosystem c. Desert ecosystem d. Aquatic – River and Lake Ecosystems.

UNIT–III: (8 Lectures)

BIODIVERSITY AND ITS CONSERVATION: Introduction, Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India –Value of biodiversity: consumptive use, Productive use, social, ethical and aesthetic values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT–IV: (9 Lectures)

ENVIRONMENTAL POLLUTION: Definition, Cause, Effects and Control measures of : a. Air Pollution, b. Water pollution, c. Soil pollution, d. Marine pollution, e. Noise pollution, f. Nuclear hazards.

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes

Disaster management: floods, earthquake, cyclone and landslides.

UNIT–V: (8 Lectures)

SOCIAL ISSUES AND THE ENVIRONMENT: From unsustainable to sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management –Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Population growth – Impacts on society, variation among nations. Environmental Impact Assessment (EIA) and Environmental Protection Acts.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press, 2005.
2. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi, 2008.

Reference Books:

1. Environmental Science & Engineering by Dr. A. Ravikrishnan, Hitech Publishing Company Pvt. Ltd. 2013.
2. Perspectives in Environmental Studies, Second edition, AnubhaKoushik and C.P. Koushik, New Age International (P) Limited, Publishers, 2004.

Online References:

1. www.tutorialspoint.com/
2. www.sophia.org/

Course Code	Course Name	Course Structure			
P21CST05	Mathematical Foundations of Computer Science	L	T	P	C
		3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives: This course is designed to:

1. To explain with examples the basic terminology of functions, relations, and sets.
2. To perform the operations associated with sets, functions, and relations.
3. To relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
4. To describe the importance and limitations of predicate logic.
5. To relate the ideas of mathematical induction to recursion and recursively defined structures.
6. To use Graph Theory for solving problems.

Course Outcomes:

1. Ability to illustrate by examples the basic terminology of functions, relations, and sets and demonstrate knowledge of their associated operations.
2. Ability to demonstrate in practical applications the use of basic counting principles of permutations, combinations, inclusion/exclusion principle and the pigeonhole methodology..
3. Ability to represent and Apply Graph theory in solving computer science problems.

UNIT–I: (12 Lectures)

Mathematical Logic: Statements and notations, Connectives, Well formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers. Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving.

UNIT–II: (13 Lectures)

Elementary Combinatorics: Basis of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion – Exclusion. Pigeon hole principles and its application. Algebraic structures: Algebraic systems Examples and general properties, Semi groups and monads, groups sub groups' homomorphism, Isomorphism.

UNIT–III: (13 Lectures)

Elementary Combinatorics: Basis of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion – Exclusion. Pigeon hole principles

and its application. Algebraic structures: Algebraic systems Examples and general properties, Semi groups and monads, groups sub groups' homomorphism, Isomorphism.

UNIT–IV: (11 Lectures)

Discrete Probability and Advanced Counting Techniques: An Introduction to Discrete Probability, Probability Theory, Baye's Theorem, Expected Value and Variance Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion- Exclusion, Applications of Inclusion-Exclusion

UNIT–V: (11 Lectures)

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.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees

Text Books:

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7^{th} Edition, TMH.2007.
2. Elements of DISCRETE MATHEMATICS- A computer Oriented Approach- C L Liu, D P Mohapatra. Third Edition, Tata McGraw Hill.2008.
3. Discrete Mathematics for Computer Scientists and Mathematicians, J.L. Mott, A. Kandel, T.P. Baker, PHI, 2008.

Reference Books:

1. Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R. Manohar, TMH, 2008.
2. Discrete Mathematics- Richard Johnsonbaugh, 7^{th} Edn., Pearson Education,2009.
3. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.2/e, 2002.
4. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5 th edition, Pearson Education, 2004.

Web References:

1. `www.tutorialspoint.com`
2. `www.lecturenotes.in`
3. `www.nptel.ac.in`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BST07	Probability & Statistics	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Principle of counting, Permutations and Combinations.

Course Objectives:

1. To familiarize the students with the foundations of probability and statistical methods.
2. To impart probability concepts and statistical methods in various applications of engineering.

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

1. Explain the basic terms of Statistical Inference.
2. Interpret the association of characteristics and through correlation and regression tools.
3. Make the use of the concepts of probability and their applications. Also apply discrete and continuous probability distributions to solve various engineering problems.
4. Understand the various distribution and sampling and identify the estimation errors in sampling distributions.
5. Apply the proper test statistics to test the hypothetical data by Tests of Hypothesis.

UNIT–I: Descriptive Statistics (9 Lectures)

Introduction - Measures of Central tendency - Measures of Variability (Spread or variance) - Moments – Skewness - Kurtosis.

UNIT–II: Curve Fitting and Correlation and Regression (9 Lectures)

Method of least squares - Straight line - Parabola-Exponential curve - Power curve – Correlation - Correlation coefficient - Rank correlation - Regression and Regression lines.

UNIT–III: Probability Theory and Random Variable: (14 Lectures)

Probability Theory: Probability - Axioms of Probability - Elementary theorems - Conditional probability - Baye's theorem (Without Proofs).

Random Variables: Discrete random variable - Distribution function of a discrete random variable - Probability mass function: Properties - Mean and Variance - Continuous random variable - Distribution function - Density function: Properties- Mean and variance.

Probability Distributions: Binomial distribution - Poisson distribution and their fitting to data - Normal distribution - Mean and Variance (Without proof).

UNIT–IV: Sampling theory and Theory of estimation (9 Lectures)

Sampling Theory: Introduction - Population and Samples - Sampling distribution of means (σ known)-Central limit theorem (without proof).

Theory of estimation: Point estimation- Interval estimation - Estimation of one mean and two means - Estimation of one proportion and two proportions.

UNIT–V: Tests of Hypothesis: (9 Lectures)

Introduction – Hypothesis - Null and Alternative Hypothesis - Type I and Type II errors - Level of significance - One tail and two-tail tests -Tests concerning one mean and two means (Large and Small samples) -Tests on proportions.

Text Books:

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11/e (Reprint) 2019, Sultan Chand & Sons Publications.
2. Miller and Freund's,Probability and Statistics for Engineers, 7/e, Pearson, 2008.

Reference Books:

1. T. K. V. Iyenger, Probability and Statistics, S. Chand & Company Ltd, 2015
2. Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8^{th} Edition, Cengage.
3. Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4^{th} Edition, Academic Foundation, 2011.

Web References:

1. https://leanpub.com/LittleInferenceBook
2. https://www.coursera.org/learn/statistical-inference
3. https://www.datacamp.com/community/open-courses/statistical-inference-and-data-analysis

Course Code	Course Name	Course Structure			
P21ITT06	Operating Systems	L	T	P	C
		3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Computer System fundamentals

Course Objectives:

1. Analyze the tradeoffs inherent in operating system design.
2. Summarize the various approaches to solving the problem of mutual exclusion in an operating system.
3. Understand the principles of Deadlocks.
4. Evaluate the trade-offs in terms of memory size (main memory, cache memory, auxiliary memory) and processor speed.
5. Demonstrate disk storage strategies, file strategies and system protection and security with different crypto models.

Course Outcomes:

1. Describe the important computer system resources and the role of operating system in their management and Identify the System.
2. Design various Scheduling algorithms and Apply the principles of concurrency.
3. Design deadlock, prevention and avoidance algorithms.
4. Compare and contrast various memory management schemes.
5. Design and Implement a prototype file systems. techniques.

UNIT–I: (9 Lectures)

Computer System and Operating System Overview: Overview of Computer System hardware, Operating System Objectives and functions, Evaluation of operating System, Operating System Services, System Calls.

Process Management: Process Description, Process Control, Process States, Cooperating Processes , Inter-process Communication.

UNIT–II: (9 Lectures)

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Threads Overview, Threading issues.

Synchronization: Background, The Critical-Section Problem, Peterson solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors.

UNIT–III: (9 Lectures)

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

UNIT–IV: **(9 Lectures)**

Memory Management Strategies: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

Virtual Memory Management: Background, Demand Paging, Page Replacement, allocation of frames, Thrashing.

UNIT–V: **(9 Lectures)**

File system Interface: The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation: File system structure, allocation methods, free space management Mass storage structure, overview of Mass-storage structure, Disk scheduling.

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9^{th} Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7^{th} Edition, Prentice Hall, 2011.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education", 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, Tata Mc Graw-Hill Education, 2007.

Web References:

1. https://nptel.ac.in/courses/106/106/106106144/
2. https://www.tutorialspoint.com/operating_system
3. https://www.youtube.com/playlist?list=PLEJxKK7AcSEGPOCFtQTJhOElU44J_JAun
4. https://www.pdf-archive.com/2016/12/25/operating-system-concepts-9thedition/operating-system-concepts-9th-edition.pdf.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ADT02	Foundations of Artificial Intelligence	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NIL

Course Objectives:

1. To provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. To provide a basic exposition to the goals and methods of Artificial Intelligence.
3. To provide fundamentals of machine learning

Course Outcomes: Upon successful completion of the course, the student will be able to:

1. Enumerate the history and foundations of Artificial Intelligence
2. Apply the basic principles of AI in problem solving
3. Choose the appropriate representation of Knowledge
4. Enumerate the Perspectives and Issues in Machine Learning
5. Identify issues in Decision Tree Learning

UNIT–I:

Introduction: What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT–II:

Problem Solving: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

UNIT–III:

Knowledge Representation: Knowledge-Based Agents, Logic, And Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

UNIT–IV:

Expert System and Application: Introduction, Phases in building expert systems, Expert system Vs Traditional Systems, Rule based Expert Systems, Block Board Systems, Truth maintenance systems, Application of Expert Systems, List of shells and Tools

UNIT–V:

Uncertainty Measure: Introduction Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster: Shafer Theory, Fuzzy sets and Fuzzy logic introduction, Fuzzy set Operations , Types of membership functions, Multi Valued logic, Linguistic Variables and Hedges, Fuzzy Propositions, Inference rules for Fuzzy Propositions , Fuzzy Systems.

Text Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Pearson
2. Tom M. Mitchell, Machine Learning, McGraw Hill Edition, 2013

Reference Books:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
3. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.
4. Trivedi, M.C., "A Classical Approach to Artificial Intelligence", Khanna Publishing House, Delhi.
5. Christopher Bishop, Pattern Recognition and Machine Learning (PRML), Springer, 2007.
6. ShaiShalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms (UML), Cambridge University Press, 2014.

Web References:

1. https://nptel.ac.in/courses/106105077
2. https://nptel.ac.in/courses/106106126
3. https://aima.cs.berkeley.edu
4. https://ai.berkeley,edu/project_overview.html
5. http://www.zuj.edu.jo/download/machine-learning-tom-mitchell-pdf

Course Code	Course Name	Course Structure			
		L	T	P	C
P21MBT01	Managerial Economics and Financial Analysis	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. The Learning objective of this Unit is to understand the concept and nature of Managerial Economic s and its relationship with other disciplines, Concept of Demand and Demand forecasting.
2. The Learning objective of this Unit is to understand the concept of Production function, Input Output relationship, different Cost Concepts and Concept of Cost-Volume-Profit Analysis.
3. The Learning Objective of this Unit is to understand the Nature of Competition, Characteristics of Pricing in the different market structure and significance of various pricing methods and to know the different forms of Business organization
4. The Learning objective of this Unit is to understand the different Accounting Systems preparation of Financial Statements and uses of different tools for performance evaluation
5. The Learning objective of this Unit is to understand the concept of Capital, Capitalization, Capital Budgeting and to know the techniques used to evaluate Capital Budgeting proposals by using different methods

Course Outcomes:

1. The Learner is equipped with the knowledge of estimating the Demand for a product and the relationship between Price and Demand.
2. One should understand the Cost Concepts for decision making and to estimate the least cost combination of inputs.
3. One has to understand the nature of different markets and Price Output determination under various market conditions and with the knowledge of different Business Units.
4. The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
5. The Learner is able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

UNIT–I: (8 Lectures)

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics-Scope of Managerial Economics and its relationship with other subjects-Concept of Demand, Types of Demand, Determinants of Demand-Demand Schedule, Demand Curve, Law ofDemand and its limitations-Elasticity

of Demand-Types of Elasticity of Demand and Measurement-Demand forecasting and its Methods.

UNIT–II: (10 Lectures)

Production and Cost Analyses: Concept of Production function-Cobb-Douglas Production Function – Law of one Variable proportions-Isoquants and Isocosts and choice of Least cost factor combination-Concepts of Returns to Scale and Economics of Scale-Different Cost Concepts: Opportunity Costs, Explicit Costs and Implicit Costs -Fixed Costs, Variable Costs and Total Costs - Cost Volume Profit analysis - Determination of Break-Even Point (Simple Problem) Managerial Significance and limitations of Breakeven point.

UNIT–III: (8 Lectures)

Introduction to Markets and Types of Business Organization: Market Structures: Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly – Features – Price and Output Determination– Other Methods of Pricing: Average Cost Pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing. Features and Evaluation of Sole Trader – Partnership – Joint Stock Company –Private Public Partnership - State/Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycle.

UNIT–IV: (10 Lectures)

Introduction to Accounting & Financing Analysis: Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements (Simple Problems) GST basic concepts and Slab rates.

UNIT–V: (10 Lectures)

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Meaning of Capital Budgeting-Time value of Money-Methods of appraising Project profitability: Traditional methods (pay back period, accounting rate of return) and Modern Methods (Discounted cash flow method, Net present value method, internal rate of return method and profitability index).

Text Books:

1. Dr. N. Appa Rao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2011.
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011.
3. Prof. J.V.Prabhakara rao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.

Reference Books:

1. V. Maheswari : Managerial Economics, Sultan Chand.
2. Suma Damodaran : Managerial Economics, Oxford 2011.
3. Dr. B. Kuberudu and Dr. T. V. Ramana : Managerial Economics & Financial Analysis, Himalaya Publishing House 2011.

4. Sanjay Dhameja : Financial Accounting for Managers, Pearson.
5. Financial Accounting for Managers, Sanjay Dhameja, Pearson, 2015.
6. S. A. Siddiqui & A. S. Siddiqui : Managerial Economics and Financial Analysis, New Age International Publishers, 2012.
7. Financial Accounting, Maheswari, Vikas Publications, 2018.

Web References:

1. www.lecturenotes.in/
2. www.nptel.ac.in/
3. www.crectirupati.com/

Course Code	Course Name	Course Structure			
P21ITL06	R Programming Lab	L	T	P	C
		0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: Any Programming Language.

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

1. Setup R Programming Environment.
2. Understand and use R – Data types.
3. Understand and use R – Data Structures.
4. Develop programming logic using R – Packages.
5. Analyze data sets using R – programming capabilities

List of Experiments:

1. Download and install R-Programming environment and install basic packages using install.packages() command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,.)
3. Write a program to find list of even numbers from 1 to n using R-Loops.
4. Create a function to print squares of numbers in sequence.
5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write a program to read a csv file and analyze the data in the file in R.
9. Create pie chart and bar chart using R.
10. Create a data set and do statistical analysis on the data using R.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CBL01	Operating Systems Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: NIL

Course Objectives: To give a practical orientation of programming in Linux environment using system calls and advanced concepts in Unix programming.

Course Outcomes:

1. Students will be able to understand the basic commands of linux operating system and can write shell scripts.
2. Students will be able to create file systems and directories and operate them.
3. Students will be able to create processes background and fore ground etc..by fork() system calls.
4. Students will be create shared memory segments,pipes,message queues and can exercise interprocess communication.

Programs List:

1. Simulate the following CPU scheduling algorithms
   (a) Round Robin
   (b) SJF
   (c) FCFS
   (d) Priority
2. Implementation of fork (), wait (), exec() and exit () System calls
3. Simulate the following.
   (a) Multiprogramming with a fixed number of tasks (MFT)
   (b) Multiprogramming with a variable number of tasks (MVT)
4. Simulate Bankers Algorithm for Dead Lock Avoidance
   (a) FIFO
   (b) LRU
   (c) LFU
5. Simulate the following File allocation strategies
   (a) Sequenced
   (b) Indexed
   (c) Linked

Course Code	Course Name	Course Structure			
		L	T	P	C
P21AMS02	Android Application Development	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Objectives:

1. To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2. To understand how to work with various mobile application development frameworks.
3. To learn the basic and important design concept s and issues of development of mobile applications.
4. To understand the capabilities and limitations of mobile devices.

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

1. Identify various concepts of mobile programming that make it unique from programming for other platforms
2. Critique mobile applications on their design pros and cons
3. Utilize rapid prototyping techniques to design and develops sophisticated mobile interfaces,
4. Program mobile applications for the Android operating system that use basic and advanced phone features and
5. Deploy applications to the Android market place for distribution.

List of Experiments:

1. Introduction to mobile technologies and devices, Android platform and applications overview
2. Setting Android development environments
3. Writing Android applications, Understanding anatomy of an Android application
4. Develop an application that uses GUI components, Font and Colours
5. Develop an application that uses Layout Managers and event listeners.
6. Write an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of databases.
8. Develop an application that makes use of Notification Manager
9. Implement an application that uses Multi-threading
10. Develop an application that uses GPS location information

11. Implement an application that writes data to the SDcard.
12. Implement an application that creates an alert upon receiving a message
13. Write a mobile application that makes use of RSS feed
14. Develop a mobile application to send an email.
15. Develop a Mobile application for simple needs(MiniProject)

References:

1. Android Programming unleashed, B.M.Harwani, Pearson, 2013.
2. Android Programming (BigNerd Ranch Guide), by Bill Phillips,Chris Stewart, BrianHardy, Kristin Marsicano, Pearson,2016
3. Android Programming – Pushing the limits by Hellman by Erik Hellman, WILEY,2013

Web References:

1. The Complete Android N DeveloperCourse–Udemy https://www.udemy.com/course/complete-android-n-developer-urse/?altsc=428526
2. Android Development Courses on Google developer straining https://developers.google.com/training/android/
3. MobileComputing-Videocourse-NPTEL https://nptel.ac.in/courses/106/106/106106147/#
4. Android Tutorial–Tutorial Point https://www.tutorialspoint.com/android/index.htm

Course Code	Course Name	Course Structure			
		L	T	P	C
P21AMT01	Machine Learning	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
2. Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

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

1. Explain the fundamental usage of the concept Machine Learning system
2. Demonstrate on various regression Technique
3. Analyze the Ensemble Learning Methods
4. Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
5. Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

UNIT–I: (9 Lectures)

Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning. Statistical **Learning:** Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

UNIT–II: (10 Lectures)

Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes,

Linear Models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Binary Classification: Multiclass/Structured outputs, MNIST, Ranking.

UNIT–III: (11 Lectures)

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking. Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

UNIT–IV: (8 Lectures)

Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures.

Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

UNIT–V: (12 Lectures)

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,2020

Reference Books

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

Web References:

1. https://www.geeksforgeeks.org/machine-learning/
2. https://nptel.ac.in/courses/106106139

Course Code	Course Name	Course Structure			
P21CIT02	Web Technologies	L	T	P	C
		3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisites: Object Oriented Programming

Course Objectives:

1. To develop the static web pages using HTML and CSS.
2. To enables the students to identify the fundamental concepts for developing web application using PHP language for server side scripting.
3. To analyze how data can be transported using XML.
4. To develop a web applications with server side programming using java servlets.
5. To develop a web applications with server side programming using JSP.

Course Outcomes:

1. Summarize the basic tags and properties in HTML, XHTML and CSS.
2. Create web pages using .client side scripting, validating of forms and XML.
3. Identify the role of server side scripting using PHP programming
4. Design dynamic web application using server side programming with java servlets.
5. Contraston how to connect and retrieve data through web page from database usingJDBC.

UNIT–I: (9 Lectures)

HTML Common tags- List, Tables, images, forms, Frames, Links and Navigation, **CSS:** Introduction, CSS Properties, Controlling Fonts, Text Formatting, Pseudo classes, Selectors.

UNIT–II: (9 Lectures)

Client side Scripting: Introduction to Javascript: Javascript language – declaring variables, scope of variables, functions, event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemas, Document Object Model.

UNIT–III: (9 Lectures)

Introduction to PHP: Creating PHP script, Running PHP script, Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies.

UNIT–IV: (9 Lectures)

A: Introduction to Servlets: Common Gateway Interface (CGI), Lifecycle of a servlet, deploying a servlet,

B: The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions.

UNIT–V: (9 Lectures)

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, JSP application design with MVC, Declaring variables and methods, sharing data between JSP pages, Requests and users passing control and data between pages, Sharing sessions and application data.

JDBC connectivity in JSP: Data base programming using JDBC, Studying javax.sql.* package, Accessing a database from a JSP page, Application specific database actions.

Text Books:

1. Web Technologies, Uttam K Roy, Oxford UniversityPress
2. The Complete Reference PHP – Steven Holzner, TataMcGraw-Hill

Reference Books:

1. JWeb Programming, building internet applications, Chris Bates 2nd edition, Wiley Dreamtech
2. Java Server Pages –Hans Bergsten, SPDO'Reilly
3. Java Script, D. Flanagan,O'Reilly,SPD.
4. Beginning Web Programming-Jon DuckettWROX.
5. Programming World Wide Web, R. W. Sebesta, Fourth Edition,Pearson.
6. Internet and World Wide Web – How to program, Dietel and Nieto,Pearson.

Web References:

1. `https://www.w3schools.com/html/`
2. `https://www.javatpoint.com/servlet-tutorial`
3. `http://nptel.ac.in/courses/106105084/`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST09	Computer Networks	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Fundamentals of Computer.

Course Objectives:

1. To introduce the fundamental concepts of computer networking.
2. To familiarize with networking concepts to work on various Protocols of ISO-OSI and TCP/IP.

Course Outcomes:

1. Compare protocol models (OSI, TCP/IP) and select suitable protocol for network design.
2. Design a network by deciding relevant multiplexing and switching technique to improve performance of the network.
3. Apply flow control, error control techniques and protocols to verify the correctness of data in the communicated network.
4. Apply routing and congestion control algorithms to deliver data packets across the networks.
5. Use communication protocols like IP, TCP, UDP, DNS, HTTP, FTP across the Internet

UNIT–I: (8 Lectures)

Introduction: Introduction - components of data communication, data flow, network topologies, categories of networks-LAN, MAN, WAN, ISO-OSI model, TCP/IP.

UNIT–II: (8 Lectures)

Physical Layer: Multiplexing- frequency division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, Introduction to switching - circuit switched networks, datagram networks, virtual circuit networks

UNIT–III: (11 Lectures)

Data Link Layer: Design issues, framing, error control, error detection and correction, CRC, checksum, hamming code. Elementary data link layer protocols-simplex protocol, simplex stop and wait, simplex protocol for noisy channel. Sliding window

protocol: one bit, Go back N, selective repeat, data link layer in HDLC, PPP. Medium Access Control Sub Layer ALOHA, CSMA, CSMA/CD, IEEE standards-standard Ethernet, wireless LAN, bridges..

UNIT–IV: (9 Lectures)

Network Layer: Routing algorithms- shortest path routing, distance vector, link state routing, and hierarchical routing. Congestion control algorithms-congestion control in virtual circuit subnets, datagram subnet, leaky bucket, token bucket. The network layer in the Internet: The IP protocol, IPAddresses-IPv4, IPv6.

UNIT–V: **(12 Lectures)**

Transport Layer: Transmission Control Protocol (TCP)- services, segment header, connection establishment, termination, transmission policy, congestion control. User Datagram Protocol (UDP)- header format.

Application Layer: The Domain Name System (DNS), electronic mailarchitecture, SMTP, FTP, HTTP.

Text Books:

1. Andrew S Tanenbaum, “Computer Networks”, 4 th edition, Pearson. 2003.
2. Behrouz A Forouzan, “Data Communications and Networking”, 5 th edition, TMH, 2007.

References:

1. S. Keshav, “An Engineering Approach to Computer Networks”, 2 nd edition, Pearson Education, 1997.
2. W.A. Shay, Thomson, “Understanding Communications and Networks”, 3 nd edition, Cengage Learning, 2001.

Web References:

1. http://www.cs.ccsu.edu/~stan/classes/CS490/Slides/Networks4-Ch4-4.pdf
2. http://ecourses.vtu.ac.in/nptel/courses/Webcourse-contents/IIT-MADRAS/ComputerNetworks/pdf/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Intellectual Property Rights and Patents	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives: The student will be able

1. This course is aimed at familiarizing researchers with the nuances of Intellectual Property Rights (IPR) so as to help them integrate the IPR process in their research activities.
2. IPR internalization process to help the researchers to set targeted objectives in their research project and also to design and implement their research.
3. To give the Students "hands- on –training" in literature, including patent search and documentation of research activities that would aid an IPR expert to draft apply and prosecute IPR applications.
4. To make the students familiar with basics of IPR and their implications in Research, development and commercialization.
5. Facilitate the students to explore career options in IPR.

Course Outcomes: After going through this course the student will be able to

1. have an understanding of the fundamental legal principles relating to confidential information, copyright, patents, designs, trademarks and unfair competition;
2. be able to identify, apply and assess principles of law relating to each of these areas of intellectual property;
3. understand the legal and practical steps needed to ensure that intellectual property rights remain valid and enforceable;
4. be able to demonstrate a capacity to identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing;
5. understand current and emerging issues relating to the intellectual property protection, including those relating to indigenous knowledge or culture, information technology especially the distribution of material on the internet, biotechnology and international trade

UNIT–I: **(7 Lectures)**

Introduction to Intellectual Property Law – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights.

UNIT–II: **(7 Lectures)**

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law Semiconductor Chip Protection Act.

UNIT–III: (7 Lectures)

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT–IV: (7 Lectures)

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

UNIT–V: (7 Lectures)

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

Text Books:

1. Intellectual Property Rights and the Law, Dr. G.B. Reddy, Gogia Law Agency.
2. Law relating to Intellectual Property, Dr. B.L.Wadehra, Universal Law Publishing Co.
3. Law of Intellectual Property, Dr.S.R. Myneni, Asian Law House

Reference Books:

1. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning , New Delhi.
2. Kompal Bansal & Parishit Bansal ”Fundamentals of IPR for Engineers”, BS Publications (Press).
3. Prabhuddha Ganguli: ‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi.
4. Richard Stim: ”Intellectual Property”, Cengage Learning, New Delhi.
5. R. Radha Krishnan, S. Balasubramanian: ”Intellectual Property Rights”, Excel Books. New Delhi.
6. M.Ashok Kumar and Mohd.Iqbal Ali: “Intellectual Property Right”

Web Resources:

1. http://www.ipindia.nic.in
2. http://ipindia.nic.in/girindia
3. http://ipindia.nic.in/tmr_new/default.htm

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Micro Processors And Micro Controllers	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Semiconductor Devices and Circuits, Switching Theory and Logic Design

Course Objectives: The student will be able to

1. To acquire knowledge on microprocessors and microcontrollers.
2. Understand Interfacing of 8086, With memory and other peripherals
3. Understand Interfacing of 8086, With memory and other peripherals
4. Study the features 8051 microcontroller and programming.
5. Study the hardware features of ARM and its families.

Course Outcomes: After completion of the course the student will be able to

1. Describe the microprocessor capability in general and explore the evaluation of microprocessors.
2. Demonstrate programming skills in assembly language for processors.
3. Describe 8086 interfacing with different peripherals and implement programs.
4. Describe hardware concepts, development of programs for 8051 microcontroller and interfacing.
5. Describe hardware features of ARM and its families.

UNIT–I: (13 Lectures)

Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures.

8086 ARCHITECTURE: Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architecture, bus interfacing unit, execution unit, interrupts and interrupt responses, 8086 system timing, minimum mode and maximum mode configuration and advanced microprocessors.

UNIT–II: (9 Lectures)

8086 PROGRAMMING: Instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT–III: (12 Lectures)

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 Programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers

UNIT–IV: (9 Lectures)

Intel 8051 MICROCONTROLLER: Architecture, hardware concepts, input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.Assembly language programming: Instructions, addressing modes, simple programs.Interfacing: keyboard, displays (LED, 7-segment display unit), A/D and D/A converters.

UNIT–V: (12 Lectures)

ARM Architectures and Processors: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and interfaces. Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions. **Text Books:**

1. Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition.
2. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J.Ayala, DhananjayV.Gadre,CengageLearninbg , India Edition.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by JosephYou.

Reference Books:

1. The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B.Brey, Pearson, Eighth Edition-2012.
2. Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.

Web References:

1. https://nptel.ac.in/courses/106108100/
2. https://www.sanfoundry.com/best-reference-books-microprocessors-microcontrollers/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Digital Signal Processing	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Signals and Systems

Course Objectives: The student will be able

1. Analyze the Discrete Time Signals and Systems
2. Know the importance of FFT algorithm for computation of Discrete Fourier Transform
3. Understand the various implementations of digital filter structures, FIR and IIR Filter design procedures
4. Know the need of Multirate Processing
5. Learn the concepts of DSP Processors

Course Outcomes: After going through this course the student will be able to

1. Apply the difference equations concept in the anayziation of discrete time systems
2. Use the FFT algorithm for solving the DFT of a given signal
3. Design a Digital filter (FIR&IIR) from the given specifications
4. Use the Multirate Processing concepts in various applications
5. Apply the signal processing concepts on DSP Processor.

UNIT–I: (9 Lectures)

Introduction: Introduction to Digital Signal Processing: Discrete-time signals & sequences, Classification of Discrete-time systems, stability, the causality of LTI systems, Invertibility, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations. Frequency domain representation of discrete-time signals and systems.

UNIT–II: (9 Lectures)

Discrete Fourier Series & Fourier Transforms: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, computation of DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT–III: (9 Lectures)

REALIZATION OF DIGITAL FILTERS: Review of Z-transforms, Applications of Z – transforms, solution of difference equations, Block diagram representation of linear constant- coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System function

UNIT–IV: (9 Lectures)

Design Of IIR& FIR Digital Filters& Realizations: Analog filter approximations –

Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Analog and Digital frequency transformations, Design of FIR Digital Filters using Window Techniques, Comparison of IIR & FIR filters

UNIT–V: (9 Lectures)

Multirate Digital Signal Processing: Introduction, Decimation, Interpolation Sampling rate conversion, Implementation of sampling rate converters, Applications – Sub-band Coding of Speech Signals, Implementation of Digital Filter Banks.

Text Books:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, DimitrisG.Manolakis,Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W.
3. Digital Signal Processors – Architecture, Programming and Applications,, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002
4. Digital Signal Processing – K Raja Rajeswari, I.K. International Publishing House

Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. 4. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson , 2007.
5. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006
6. Digital Signal Processing – Ramesh babu, Sci Tech publications

Web Resources:

1. https://nptel.ac.in/courses/117/102/117102060/
2. https://www.tutorialspoint.com/digital_signal_processing/digital_signal_processing_pdf_version.html

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Engineering Mechanics	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Engineering Mathematics, Physics

Course Objectives:

1. Study various types of force systems, basic principles of mechanics of rigid bodies and Calculation the unknown forces through the use of equilibrium equations for a rigid body.
2. Analyze simple trusses using method of joints and method of sections.
3. Study and determine centroids and centre of gravity of various composite shapes.
4. Study the concept of moment of inertia and the mathematical calculations involved in finding moment of inertia of two dimensional areas.
5. Learn principle of dynamics and apply it to impulse and momentum, work and energy which is useful to analyze turbo machineries.

Course Outcomes: After completion of the course the student will be able to

1. Apply the principle of rigid body equilibrium and to determine unknown forces.
2. Analyze the force of friction and trusses using method of Joints and method of sections.
3. Find the centroids and center of gravity of composite areas.
4. Calculate the moment of inertia of various shapes by integration and moment of inertia of composite areas.
5. Understand kinematics, kinetics and rotation of a rigid body.

UNIT–I: (13 Lectures)

Systems of forces: Resolution of coplanar and non-coplanar force systems (both concurrent and non-concurrent), Determining the resultant of planar force systems. Moment of force and its applications and couples.

Equilibrium of force system: Free body diagrams, equations of equilibrium of planar force systems and its applications. Problems on general case of force systems.

UNIT–II: (9 Lectures)

Analysis of Trusses: Introduction, force calculations using method of joints and method of sections.

Theory offriction: Introduction, types of friction, laws of friction, application of friction to a single body & connecting systems. Wedge friction

UNIT–III: (12 Lectures)

Centroid and Centre of gravity: Significance, moment of area, Theorems of Pappus & its applications.

Moment of Inertia: Definition of MI, Polar Moment of Inertia, radius of gyration, transfer theorem, moment of Inertia of elementary & composite areas, product of inertia. Mass moments of inertia for elementary and composite bodies

UNIT–IV: (9 Lectures)

Virtual Work: Virtual work – Principle of virtual work – System of connected rigid bodies – Degrees of freedom – Conservative forces – Potential energy – Potential energy criteria for equilibrium.

UNIT–V: (12 Lectures)

Kinematics: Introduction, Rectilinear kinematics: Continuous motion, General curvilinear motion, Curvilinear motion: Rectangular components, Motion of a projectile, Curvilinear motion: Normal and tangential components, Absolute dependent motion analysis of two particles.

Kinetics: Kinetics of a particle-D'Alemberts principle-Motion in a curved path – work, energy and power. Principle of conservation of energy- Kinetics of rigid body in translation, rotation work done-Principle of work-energy-Impulse-momentum.

Text Books:

1. Engineering mechanics-statics and dynamics by A. K. Tayal - Umesh publications, Delhi (For numerical problems) , 2008.
2. Engineering mechanics by S. Timoshenko, D. H. Young and J V Rao -Tata McGraw-Hill Publishing Company Limited, New Delhi(For concepts) , 2009.
3. Engineering Mechanics by Dr. R. Kumaravelan, Scitech Publications, 2014.

Reference Books:

1. Engineering Mechanics by S.S.Bhavikatti, New Age international Publishers 2012.
2. Engineering Mechanics- Statics and Dynamics by Irving H. Shames, Pearson Education , 2006.
3. Singer's Engineering Mechanics: Statics and Dynamics, K.Vijaya Kumar Reddy and J Suresh Kumar, 3rd Edition SI Units-BS Publications , 2010.
4. A Textbook of Engineering mechanics statics and dynamics by J. L. Meriam and L. Kraige , Wiley India , 6th Edition , 2010.

Web References:

1. www.nptel.ac.in
2. www.smartzworld.com
3. www.lecturenotes.in
4. www.myclgnotes.com

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CIL02	Web Technologies Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Outcomes:

1. Create static web pages using HTML and CSS.
2. Develop JavaScript code for data validation.
3. Integrate frontend and backend technologies in client-server systems.
4. Design dynamic web applications using PHP and JSP.
5. Demonstrate database connectivity for developing web applications.

The students have to choose one of the following project and do the all 12 experiments related to that project.

1. Training and placementcell.
2. School EducationSystem.
3. University ManagementSystem.
4. Hospital ManagementSystem.

The following are the experiments related to Training and Placement cell project. For the remaining projects, the concern lab instructor has to decide the experiments according to the websites given as examples.

List of Experiments:

Experiment 1:

Design the following static web pages required for a Training and placement cell web site.

1) Home Page 2) Login Page 3) Registration page

Experiment 2:

4) Company Details Page 5) Alumni Details Page 6) Placement Staff Details Page

Experimen 3:

7) Student personal Info Page 8) Student Academic Info page 9) SemesterWise Percentage & their Aggregate page

Experiment 4:

Validate login page and registration page using regular expressions.

Experiment 5:

Apply different font styles, font families, font colors and other formatting styles to the above static web pages.

Experiment 6:

Install wamp server and tomcat server, access above developed static web pages using these servers.

Experiment 7:

Write a servlet/PHP to connect to the database, Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration.

Experiment 8:

Write a JSP/PHP to connect to the database, Insert the details of the student academic information with student academic info page.

Experiment 9:

User Authentication:

Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following.

Create a Cookie and add these four user id's and passwords to this Cookie.

Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in thecookies.

If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user ". Use init-parameters to do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the getInitParameters()method.

Experiment 10: Write a JSP which does the followingjob:

Authenticate the user when he submits the login form using the user name and password from the database.

Experiment 11:

write a JSP to insert the student's semester wise percentages and calculate aggregate and insert into database.

Experiment 12:

write a JSP to search the students according to their aggregate and produce sorted list or according to their Enroll number.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21AML01	Machine Learning Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Objectives:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To develop skills of using recent machine learning software for solving practical problems.
3. To gain experience of doing independent study and research.

Course Outcomes:

1. Design java/python programs for various learning algorithms.
2. Apply appropriate data sets to the machine learning algorithms.
3. Identify and apply machine Learning algorithms to solve real world problems.

List of Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build a prediction model to perform logistic regression
5. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
6. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file.
7. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

8. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
9. Perform clustering using k-means clustering algorithm.
10. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
11. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ADS03	Android Application Development	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Objectives:

1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To demonstrate their skills of using Android software development tools.
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform
4. To demonstrate their ability to deploy software to mobile devices.
5. To demonstrate their ability to debug programs running on mobile devices

Course Outcomes:

1. Describe the components and structure of a mobile development framework
2. Understanding of the specific requirements, possibilities and challenges when developing for a mobile context.
3. Apply Java programming concepts to Android application development
4. Design and develop user Interfaces for the Android platform.
5. Publish an application to the Android Market

Experiments:

1. ANDROID – ENVIRONMENT SETUP
2. ANDROID – APPLICATIONS COMPONENT
3. ANDROID – HELLO WORLD EXAMPLE
4. ANDROID – ORGANIZING & ACCESSING THE RESOURCES
5. ANDROID – ACTIVITIES
6. ANDROID – BROADCAST RECEIVERS
7. ANDROID – INTENTS & FILTERS
8. ANDROID – UI LAYOUTS
9. ANDROID – UI CONTROLS
10. ANDROID – EVENT HANDLING
11. ANDROID – DRAG & DROP

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Professional Ethics	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. To introduce the students to the Human values and help them to lead a peaceful life in the society by contributing to peace and safety in the society.
2. To help the students to know about the history of ethics and importance of social experimentation
3. To specify the students about the importance of their responsibility towards safety and risk as Engineers.
4. To specify the students about the importance of their responsibility as Engineers.
5. To help the student explore the ethical values globally.

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

1. To learn about the different Human values to be maintained by all the people.
2. To learn about the history of ethics and the importance of ethics for professionals and application of ethics in social experimentation.
3. To learn about the responsibilities of engineers for safety and risk.
4. To learn about the responsibilities and rights of engineers.
5. To learn about global work environment with respect to ethics.

UNIT–I: Human Values (9 Lectures)

Human Values: Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing –Honesty –Courage – Value time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT–II: Engineering Ethics and Social Experimentation (12 Lectures)

Engineering Ethics: The History of Ethics-Purposes for Engineering Ethics- Engineering Ethics - Consensus and Controversy –Professional and Professionalism – Professional Roles to be played by an Engineer – Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics - Engineering and Ethics-Kohlberg's Theory – Gilligan's Argument –Heinz's Dilemma. Engineering as Social Experimentation: Comparison with Standard Experiments –Knowledge gained – Conscientiousness – Learning from the Past – Engineers as Managers, Consultants, and Leaders – Role of Codes – Codes and Experimental Nature of Engineering.

UNIT–III: Engineers' Responsibility for Safety and Risk (9 Lectures)

Engineers' Responsibility for Safety and Risk: Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk- Short term v/s Long term Consequences- Expected Probability- Reversible Effects- Threshold Levels for Risk- Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk Benefit Analysis-Accidents.

UNIT–IV: Engineers' Responsibilities and Rights (12 Lectures)

Engineers' Responsibilities and Rights: Collegiality-Techniques for Achieving Collegiality –Two Senses of Loyalty - obligations of Loyalty-misguided Loyalty –professionalism and Loyalty - Professional Rights –Professional Responsibilities –confidential and proprietary information-Conflict of Interest-solving conflict problems – Self interest, Customs and Religion- Ethical egoism-Collective bargaining Confidentiality-Acceptance of Bribes/Gifts-when is a Gift and a Bribe examples of Gifts v/s Bribes-problem solving-interests in other companies Occupational Crimes-industrial espionage-price fixing-endangering lives Whistle Blowing-types of whistle blowing-when should it be attempted preventing whistle blowing.

UNIT–V:Global Issues (10 Lectures)

Global Issues: Globalization- Cross-culture Issues-Environmental Ethics-Computer Ethics computers as the instrument of Unethical behaviour-computers as the object of Unethical Acts-autonomous computers-computer codes of Ethics Weapons Development-Ethics and Research-Analysing Ethical Problems in Research-Intellectual Property Rights.

Text Books:

1. "Engineering Ethics and Human Values" by M.Govindarajan, S.Natarajan and V.S. Senthil Kumar-PHI Learning Pvt. Ltd-2009.
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M. Jayakumaran- Laxmi Publications.
4. "Professional Ethics and Human Values" by Prof.

Reference Books

1. "Indian Culture, Values and Professional Ethics" by PSR Murthy, BS Publication.
2. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill – 2003.
3. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.

Web References:

1. crescent.education/wp-content/.../12/Crescent-human-values-professional-ethics.pdf
2. https://www.crectirupati.com/.../HVPE-MBA-K%20YAMUNA-LECTURE%20NOTES...
3. https://nptel.ac.in/courses/109104068/30
4. https://lecturenotes.in/subject/576/professional-ethics-and-human-values-pehv
5. https://onlinecourses.nptel.ac.in/noc18_mg25

Course Code	Course Name	Course Structure			
P21ADT03	Data Science	L	T	P	C
		3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. To understand the mathematical foundations required for data science.
2. To describe a flow process for data science problems.
3. To introduce basic data science algorithms and data visualization.
4. To learn machine tools and techniques.
5. To learn the ideas and tools for data visualization.

Course Outcomes:

1. Explain the basic terms of Linear Algebra and Statistical Inference.
2. Describe the Data Science process and how its components interact.
3. Apply EDA and the Data Science process in a case study.
4. Classify Data Science problems.
5. Analyze and correlate the results to the solutions.
6. Simulate Data Visualization in exciting projects.

UNIT–I: (9 Lectures)

Linear Algebra: Algebraic view – vectors 2D, 3D and nD, matrices, product of matrix & vector, rank, null space, solution of over determined set of equations and pseudo-inverse. Geometric view – Eigen values and Eigen vectors, Equations of line, plane, hyper plane, circle, sphere, hyper sphere.

UNIT–II: (9 Lectures)

Probability And Statistics: Introduction to probability and statistics, Population and sample, Normal/Gaussian distributions, Probability Density Function, Descriptive statistics, notion of probability distributions, mean, variance, covariance, covariance matrix, understanding different normal distributions, introduction to hypothesis testing.

UNIT–III: (9 Lectures)

Exploratory Data Analysis And The Data Science Process: Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Data Visualization - Basic principles, ideas and tools for data visualization, Examples of exciting projects on Data Visualization.

UNIT–IV: (9 Lectures)

Machine Learning Tools, Techniques And Applications: Supervised Learning, Unsupervised Learning, Reinforcement Learning, Dimensionality Reduction, Principal Component Analysis, Classification and Regression models, Bayesian network models, Neural Networks, Evaluation and Validation of Models.

UNIT–V: (12 Lectures)

Introduction to Python: Data Structures, Functions, Python Libraries: NumPy, Matplotlib, Pandas, SciPy and Scikit-learn. Problems based on computational complexity-Simple case studies based on python (Binary search, common elements in list), Hash tables, Dictionary.

TEXT / REFERENCE BOOKS

1. Cathy O'Neil and Rachel Shut. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.
2. Introduction to Linear Algebra - By Gilbert Strang, Wellesley-Cambridge Press, 5th Edition.2016.
3. Applied Statistics and Probability for Engineers – By Douglas Montgomery.2016.
4. Jure Leskovek, Amend Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
5. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.
6. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd Edition. ISBN 0123814790

Course Code	Course Name	Course Structure			
P21AML02	Deep Learning	L	T	P	C
		3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Artificial Intelligence, Machine Learning

Course Objectives:

1. Understand complexity of Deep Learning algorithms and their limitations.
2. Understand modern notions in data analysis oriented computing.
3. Be capable of confidently applying common Deep Learning algorithms in practice and implementing their own.
4. Be capable of performing distributed computations.
5. Be capable of performing experiments in Deep Learning using real-world data.

Course Outcomes:

1. Implement deep learning algorithms, understand neural networks and traverse the layers of data abstraction which will empower the student to understand data more precisely.
2. Learn topics such as convolution neural networks, recurrent neural networks, training deep networks and high-level interfaces.
3. Understand the language and fundamental concepts of artificial neural networks.
4. Troubleshoot and improve deep learning models.
5. Build own deep learning project.
6. Differentiate between machine learning, deep learning and artificial intelligence

UNIT–I: (9 Lectures)

Introduction to Machine Learning: Supervised and Unsupervised learning, Linear Models, Perceptions: What is a Perceptron, XOR Gate Introduction to Tensor Flow: Computational Graph, Key highlights, Creating a Graph, Regression example.

UNIT–II: (9 Lectures)

156 Activation Functions : Sigmoid, ReLU, Hyperbolic Fns, Softmax Artificial Neural Networks : Introduction, Perceptron Training Rule, Gradient Descent Rule. Gradient Descent and Backpropagation: Gradient Descent, Stochastic Gradient Descent, Backpropagation, Some problems in ANN.

UNIT–III: (10 Lectures)

Optimization and Regularization : Over fitting and Capacity, Cross Validation, Feature Selection, Regularization, Hyper parameters Autoencoders (standard, sparse, denoising, contractive, etc), Adversarial Generative Networks, Autoencoder and DBM.

UNIT–IV: (13 Lectures)

Introduction to Convolution Neural Networks: Introduction to CNNs, Kernel filter, Principles behind CNNs, Multiple Filters, CNN applications Introduction to Recurrent Neural Networks: Introduction to RNNs, Unfolded RNNs, Seq2Seq RNNs, LSTM, RNN applications.

UNIT–V: (8 Lectures)

Deep Learning applications: Image Processing, Natural Language Processing, Speech Recognition, Video Analytics.

Text Books:

1. Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016. References: 1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Golub, G., H., and Van Loan, C., F., Matrix Computations, JHU Press, 2013.
3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw- Hill Education, 2004

Web References:

1. https://www.ibm.com/cloud/learn/deep-learning
2. https://en.wikipedia.org/wiki/Deep_learning
3. https://www.geeksforgeeks.org/introduction-deep-learning/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST08	Design and Analysis of Algorithms	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Mathematics, Data Structures

Course Objectives:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

Course Outcomes:

1. Identify time, space complexities for different problems.
2. Implement Greedy Method to solve Problems.
3. Implement Dynamic Programming technique to solve Problems.
4. Able how to apply Backtracking and Branch & Bound Techniques in real-time problems.
5. Analyze the pattern-matching algorithms.

UNIT–I: (12 Lectures)

Introduction: What is an Algorithm, Pseudo code Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Asymptotic Notations .

Dived and Conquer: General Method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort.

UNIT–II: (12 Lectures)

The Greedy Method: The General Method, Knapsack Problem, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, Huffman Coding, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT–III: (12 Lectures)

Dynamic Programming: The General Method, All Pairs Shortest Paths, Single – Source Shortest paths General Weights, String Edition, 0/1 Knapsack, Travelling Salesperson Problem.

UNIT–IV: (12 Lectures)

Backtracking: The General Method, the 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles.

Branch and Bound: The Method, The 15-Puzzle problem, Traveling Salesperson.

UNIT–V: (12 Lectures)

NP-Hard and NP-Complete Problems: Travelling salesman problem NP complete, NP-Hard Graph Problem (Clique Decision Problem). Pattern Matching Algorithms:

Knuth-Morris-Pratt KMP String Matching Algorithm, Rabin Karp String Matching Algorithm.

Text Books:

1. Fundamentals of computer algorithms E. Horowitz, S. Sahni , UniversityPress Second Edition and year 1997.
2. Introduction to Algorithms Thomas H. CormenLearning Third edition.

Reference Books:

1. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, First edition and year 2006.
2. Algorithm Design, JonKleinberg, Pearson First edition 2008.

Web References:

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3. https://slideplayer.com/slide/5877267/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Introduction To Simulation Software	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. By the end of this course, students in this class will understand the basic principles of programming and of implementing mathematical concepts by using MATLAB. Specifically, they will be able to write numerical algorithms and evaluate the computational results using graphical representations. The ultimate goal is to motivatethe students for their profession and for future courses in curriculum.

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

1. Translate mathematical methods to MATLAB code
2. Generalize results and represent data visually.
3. Students will be able to apply computer methods for solving a wide range ofEngineering problems
4. Students will be able to utilize computer skills to enhance learning and performancein other engineering and science courses
5. Students will be able to demonstrate professionalism in interactions with industry

UNIT–I: (8 Lectures)

Introduction to Mat Lab

Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window).Installation procedure of MATLAB. Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

UNIT–II: (9 Lectures)

Data and Data Flow in Mat Lab

Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

UNIT–III: (8 Lectures)

Mat lab Programming

Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Workedout Examples.

UNIT–IV: (10 Lectures)

Mat lab Programming

Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Workedout Examples.

UNIT–V: (10 Lectures)

Simulink Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Importing Exporting Data, Solver Configuration, Masking Block/Model.

Text Books:

1. Getting Started With Mat lab: A Quick Introduction For Scientists And Engineers (English) by Rudra Pratap, OXFORD University Press, 1998.
2. Mat lab Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication, 2008.
3. Understanding MATLAB, A Textbook for Beginners by S.N. ALAM & S.S.ALAM,2013.

References:

1. MATLAB® Programming For Engineers Fourth edition by Stephen J. Chapman,2012.
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang ,Wenwu Cao, Tae-Sang Chung, John Morris, 2005.
3. Signal processing simulation using MATLAB by Dr. V.S.K REDDY &Dr.Y. Madhavee Latha, 2013.

Web References:

1. www.tutorialspoint.com/matlab/
2. www.ocw.mit.edu//

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Management Information Systems	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

Information Systems (IS) enables new approaches to improve efficiency and efficacy of business models. This course will equip the students with understanding of role, advantages and components of an Information System.

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

1. The objective of the course is to help students integrate their learning from functional areas, decision making process in an organization and role of Information Systems to have a vintage point in this competitive world. describe the use and function of management information systems;
2. identify and describe the different roles of people in information systems;
3. explain the strategic value of information systems in the organization;
4. describe the impact of information systems in the larger context of ethics and globalization; and
5. identify trends in information systems that will impact the next generation of business.

UNIT–I: Basic Concepts of Information System (9 Lectures)

Role of data and information, Organization structures, Business Process, Systems Approach and introduction to Information Systems.

UNIT–II: Types of IS (9 Lectures)

Resources and components of Information System, integration and automation of business functions and developing business models. Role and advantages of Transaction Processing System, Management Information System, Expert Systems and Artificial Intelligence, Executive Support Systems and Strategic Information Systems.

UNIT–III: Architecture & Design of IS (9 Lectures)

Architecture, development and maintenance of Information Systems, Centralized and Decentralized Information Systems, Factors of success and failure, value and risk of IS.

UNIT–IV: Decision Making Process (9 Lectures)

Programmed and Non- Programmed decisions, Decision Support Systems, Models and approaches to DSS

UNIT–V: Introduction to Enterprise Management technologies (10 Lectures)

Business Process Reengineering, Total Quality Management and Enterprise Management System viz. ERP, SCM, CRM and Ecommerce.

Text Books:

1. Management Information Systems, Effy OZ, Thomson Leaning/Vikas Publications

2. Management Information Systems, James A. O'Brein, Tata McGraw-Hill

References:

1. Management Information System, W.S Jawadekar, Tata Mc Graw Hill Publication.

2. Management Information System, David Kroenke, Tata Mc Graw Hill Publication.

3. MIS: Management Perspective, D.P. Goyal, Macmillan Business Books.

4. 4. MIS and Corporate Communications, Raj K. Wadwha, Jimmy Dawar, P. Bhaskara Rao, Kanishka Publishers.

5. MIS: Managing the digital firm, Kenneth C. Landon, Jane P. Landon, Pearson Education.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Operations Research	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. To define an objective function and constraint functions in terms of design variables, and thenstate the optimization problem.
2. To state single variable and multi variable optimization problems, without and with constraints.
3. To explain linear programming technique to an optimization problem, define slack and surplusvariables, by using Simplex method.
4. To state transportation and assignment problem as a linear programming problem to determineSimplex method.
5. To study and explain nonlinear programming techniques, unconstrained or constrained, and defineexterior and interior penalty functions for optimization problems.

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

1. State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
2. Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
3. Apply and Solve transportation and assignment problem by using Linear programming Simplex method.
4. Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
5. Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

UNIT–I:

Introduction and Classical Optimization Techniques: Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classificationof Optimization problems.

Classical Optimization Techniques: Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution

by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions

UNIT–II:

Linear Programming : Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm, Duality in Linear Programming, Dual Simplex method.

UNIT–III:

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method, testing for optimality of balanced transportation problems, Special cases in transportation problem.

UNIT–IV:

Nonlinear Programming: Unconstrained cases, One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method, Univariate method, Powell's method and steepest descent method. Constrained cases– Characteristics of a constrained problem, Classification, Basic approach of Penalty

Function method; Basic approaches of Interior and Exterior penalty function methods, Introduction to convex Programming Problem.

UNIT–V:

Dynamic Programming: Dynamic programming multistage decision processes, types, concept of sub optimization and the principle of optimality, computational procedure in dynamic programming, examples illustrating the calculus method of solution, examples illustrating the tabular method of solution.

Text Books:

1. "Engineering optimization: Theory and practice", S. S.Rao, New Age International (P) Limited, 3rd
2. "Introductory Operations Research", H.S. Kasene & K.D. Kumar, Springer (India), Pvt. LTd.

Reference Books:

1. "Optimization Methods in Operations Research and systems Analysis", by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research, Dr. S.D.Sharma, Kedarnath, Ramnath & Co

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Information Retrieval Systems	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. Demonstrate genesis and diversity of information retrieval situations for text and hyper media.
2. Describe hands-on experience store, and retrieve information from www using semantic approaches.
3. Demonstrate the usage of different data/file structures in building computational search engines.
4. Analyze the performance of information retrieval using advanced techniques suchas classification, clustering, and filtering over multimedia.

Course Outcomes:

1. Describe the objectives of information retrieval systems and models like vector-space, probabilistic and language models to iidentify the similarity of query and document
2. Implement clustering algorithms like hierarchical agglomerative clustering and k- means algorithm.
3. Understand relevance feedback in vector space model and probabilistic model.
4. Design the method to build inverted index

UNIT–I: (8 Lectures)

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses..

UNIT–II: (9 Lectures)

Information Retrieval System Capabilities: Search, Browse, Miscellaneous Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing.

UNIT–III: (10 Lectures)

Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT–IV: (8 Lectures)

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages

UNIT–V: (10 Lectures)

Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems.

Text Books:

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.

References:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structuresand Algorithms, Prentice Hall, 1992.
2. Modern Information Retrival By Yates Pearson Education.
3. Information Storage & Retieval By Robert Korfhage – John Wiley & Sons.

Web References:

1. https://link.springer.com/
2. https://www.researchgate.net/
3. https://nptel.ac.in/
4. https://www.tutorialspoint.com/
5. https://www.javatpoint.com/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ADL03	Data Science Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Objectives:

1. To introduce students to the valuable concepts of numpy, pandas and mat plot lib in Data Science
2. To develop analyzing skills to the students for solving practical problems.
3. To gain experience of doing independent study and research.

Course Outcomes:

1. Develop basic programs in Python.
2. Practice and Implement different kinds of Lists, Data Frame, Dictionaries
3. Create dataset and analyze the data by using numpy and pandas.
4. Design different types of plots by using mat plotlib by using dataset.

Experiments:

1. Installation and run Anaconda software.
2. Python Program to find ASCII value of given number.
3. Python Program to Make a Simple Calculator.
4. Python Program to Count the Number of Each Vowel.
5. Python Program to Illustrate Different Set Operations.
6. Create List and apply different functions on it.
7. Create a tuple and apply different built-in functions on it.
8. Apply different string operations.
9. Create a dictionary and apply different operations like accessing, updating and deleting.
10. Create Data Frames and apply merge and join functions on it.
11. Create a Village Dataset and execute the below conditions:
    (a) Check for any null values in the given dataset if you find any
    (b) Calculate the count of people living in hut and using smart TV.
    (c) Count the people using the different type of toilets in all villages.
    (d) Every village and for each and every income group count the number of illiterates.

(e) What is the Proportion of House Holds getting the income through Business did not understand GST.

(f) How Many people having Smartphone and aware of digital fraud.

(g) What is the ratio of Business Income Groups to Other Income Groups in using PHC.

12. Design different types of plots by using above dataset

(a) Plot the Scatter plot Graph for the values obtained in 11.

(b) Plot pie chart for the values across different villages obtained in 11

(c) Plot the Bar Graph for the Values Obtained in 11

Course Code	Course Name	Course Structure			
		L	T	P	C
P21AML02	Deep Learning Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Outcomes:

1. Understand the mathematical and statistical prospectives of machine learning algorithms through python programming.
2. Design and evaluate the unsupervised models through python in built functions.
3. Evaluate the machine learning models pre-processed through various feature engineering algorithms by python programming.
4. Design and apply various reinforcement algorithms to solve real time complex problems.
5. Design and develop the code for recommender system using Natural Language processing
6. Understand the basic concepts of deep neural network model and design the same.

List of Experiments:

Experiment 1: Write the Python program for Exploring and Visualizing Data using Pairwise Distribution.

Experiment 2: Write the Python program for principal component analysis (PCA) to exploring and visualization data.

Experiment 3: Write the Python program for three classes and fteen attributes then reduce data dimension to two and three, and then plot 2-D and 3-D visualization on the compressed data, respectively.

Experiment 4: Write the Python program for make the prediction from breast cancer Wisconsin dataset and try to Nd accuracy per feature

Experiment 5: Write the Python program for Decision Tree classic er

Experiment 6: Write the Python program for Perceptron: a perceptron is a single-layer neural network

Experiment 7: Write the Python program for Implementing Adaline with Gradient Descent

Experiment 8: Write the Python program for various computer vision operations using OpenCV library

Experiment 9: Write the Python program for design Deep Neural Network with various optimization techniques using MNIST Dataset

Experiment 10: Write the python code for image classification using convolutional neural network with CIFAR-10 database

Experiment 11: Write the python program for convolutional neural network using various optimization techniques

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSL11	Unified Modeling Languages Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Objectives:

1. Construct UML diagrams for static view and dynamic view of the system.
2. Generate creational patterns by applicable patterns for given context.
3. Create refined model for given Scenario using structural patterns.
4. Construct behavioral patterns for given applications.

Course Outcomes:

1. Understand the Case studies and design the Model.
2. Understand how design patterns solve design problems.
3. Develop design solutions using creational patterns.
4. Construct design solutions by using structural and behavioral patterns

Week 1:
(Familiarization with Rational Rose or Umbrella For each case study:
Week 2, 3 & 4: For each case study:

1. Identify and analyze events
2. Identify Use cases
3. Develop event table
4. Identify & analyze domain classes
5. Represent use cases and a domain class diagram using Rational Rose
6. Develop CRUD matrix to represent relationships between use cases and problem domain classes

Experiment Week 5 & 6: For each case study:

1. Develop Use case diagrams
2. Develop elaborate Use case descriptions & scenarios
3. Develop prototypes (without functionality)
4. Develop system sequence diagrams

Week 7, 8, 9 & 10: For each case study:

1. Develop high-level sequence diagrams for each use case
2. Identify MVC classes / objects for each use case
3. Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects
4. Develop detailed design class model (use GRASP patterns for responsibility assignment)

5. Develop three-layer package diagrams for each case study

Week 11 & 12: For each case study:

1. Develop Use case Packages
2. Develop component diagrams
3. Identify relationships between use cases and represent them
4. Refine domain class model by showing all the associations among classes

Week 13: For each case study:
Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Design Thinking for Innovation	2	0	0	0

Internal Marks: 30 External Marks: 70

UNIT–I: Design thinking Evolution

Definitions and stories. Design thinking Importance, and Impact-History and Evolution of Design Thinking, - Three Space of Innovation in Design Thinking- knowledge funnel - Design Thinking Process, -Design thinking mindset for innovation

UNIT–II: Building confidence, Mindset and Building Team

Myths of Innovation- Myths of Creativity-Creative Confidence-Innovators DNA - 5 forces of growth (SEPIA),- 5 frictional forces (DCAFE),- 3 capacity levers (VAL)-Building Design Teams.

UNIT–III: Empathy-Define

Initial Problem Description - beginner's mindset-5whys,- persona development-Empathy mapping-interview with empathy and stories collection-Question the critical assumptions -Reframe Problem Definition – (PoV) point of view- how might we

UNIT–IV: Ideation

Ideation and Visualization- Brainstorming-SCAMPER-Mind mapping-sketch –structure idea-Storyboard-Customer Co-Creation-Provocation-Role-play

UNIT–V: Prototyping -Testing

Step-by-step prototyping & low fidelity prototyping -Testing Prototyping -feedback capturing grid, conduct A/B Testing-Experiment grid, user retrospective board-Create a Pitch of the prototype

Text Books:

1. An AVA Book, "Design Thinking", AVA Publishing, 2010
2. Dr.BalaRamaduri, "Karmic Design Thinking", 2020, ISBN:978-9354190100

Reference Books:

1. proach", 3rd edition, Springer, 2007
2. Tom Kelley, Jonathan Littman, "Ten Faces in Innovation", Currency Books, 2006
3. Liedtka, Jeanne and Ogilvie, Timothy, Ten Tools for Design Thinking
4. The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses, and Ecosystems by Michael Lewrick
5. The Myths of Innovation by Scott Berkun, Publisher(s): O'Reilly Media, IncISBN: 9781449389628

6. The Myths of Creativity: The Truth About How Innovative Companies and People Generate Great Ideas, D BurkusJossey-Bass, San Francisco, CA (2014), 214 pp, ISBN: 978-1-118-61114-2
7. Creative Confidence: Unleashing the Creative Potential within Us All by (Author), David Kelley(Author)
8. The innovator's DNA: mastering the five skills of disruptive innovators Author: Dyer, JeffGregersen, Hal B, 1958-Christensen, Clayton MPublished: Boston, Mass: Harvard Business Press, [2011]
9. Collective Genius: The Art and Practice of Leading Innovation, Authors: Linda A Hill, Greg Brandeau, Emily Truelove, Kent Lineback
10. Change by Design, by Tim Brown
11. Unmukt-Science and Art of Design Thinking Authors Arun Jain School of Design Thinking 2019
12. The Design Thinking Play Book by Michael Lewrick, Patrick Link& Larry Leifer, Wiley Press,2018
13. The Design of Business: Why Design Thinking Is the Next Competitive Advantage. Martin, R. (2009). Boston, MA: Harvard Business Press.

Online Resources:

1. https://www.interaction-design.org/literature/topics/design-thinking
2. https://www.interaction-design.org/literature/article/how-to-develop-an-empathic-approach-in-design-thinking
3. https://medium.com/dc-design/what-is-human-centered-design-6711c09e2779
4. https://think.design/user-design-research/user-testing/
5. Mentor-DesignThinking.pdf (aim.gov.in)
6. Mentor-DesignThinking.pdf (aim.gov.in)