**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I /Semester-I**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH (CSE) | Year: I<br>Semester: I |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject:** Engineering Mathematics-I |
| **Course Code:**SEAS-111 | **Title:** Engineering Mathematics-I |

**Course Objectives:**

1. To apply the knowledge of differential calculus in the field of engineering.
2. To deal with functions of several variables that is essential in optimizing the results of real life problems.
3. To understand the essential tools of matrices and linear algebra, Eigen values and diagonalization in a Comprehensive manner are required.
4. To understand Multiple integral tools to deal with engineering problems involving centre of gravity, volume etc.
5. To deal with vector calculus that is required in different branches of Engineering to graduate engineers.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks /4**

L: 3
T:1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **DIFFERENTIAL CALCULUS-I:** Successive Differentiation (nth order derivatives), Leibnitz theorem and its application. Curve tracing: Cartesian and Polar co-ordinates. Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions. | **8L** |
| II | **DIFFERENTIAL CALCULUS-II:** Taylor and Maclaurin's theorems for a function of two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians. | **8L** |
| III | **MATRICES:** Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, System of linear equations, Characteristic equation, Eigen values and eigenvectors, Cayley-Hamilton Theorem and its application Diagonalisation of a Matrix | **8L** |
| IV | **INTEGRAL CALCULUS:** Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, Application: Areas and volumes. | **8L** |
| V | **Vector Calculus:** Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem | **8L** |

| | | |
|---|---|---|
| | (without proof) and their applications | |

**Reference / Text Books:**

**Text Books:**


1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008


**Reference Books:**


1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002


If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3)Assignments | |
| 4)Research Project ReportSeminar On Research Project Report | 20 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**CO1** Understand the concept of differentiability and apply in the study of Successive differentiation, Leibnitz theorems and Partial differentiation.

**CO2** Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.

**CO3** Remember the concept of matrices and apply for solving linear simultaneous equations

**CO4** Illustrate the working methods of multiple integral and apply for finding area, volume.

**CO5** Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

**CO6** Apply the concept of calculus in solving engineering problems

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I / Semester-II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH (CSE) | Year: I<br>Semester: II |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject:** Engineering Mathematics-II |
| **Course Code:**SEAS-121 | **Title:** Engineering Mathematics-II |

**Course Objectives:**

1. To understand the effective mathematical tools for the solutions of differential equations that model physical processes
2. To get the idea of types of partial differential equations and their solutions.
3. To deal with applications of partial differential equations e.g. wave and heat equations.
4. To understand the concept of Laplace Transform and its application to solve differential and integral equations.
5. To be familiar with the concept and expansion of Fourier series.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks /4**

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **ORDINARY DIFFERENTIAL EQUATIONS:** Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation. | **8L** |
| II | **PARTIAL DIFFERENTIAL EQUATIONS:** Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order, Lagrange's Equations, Charpit's method, Solution of Linear Partial Differential Equation of Higher order with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients. | **8L** |
| III | **APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**: Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension. | **8L** |
| IV | **LAPLACE TRANSFORM:** Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential | **8L** |

| | | |
|---|---|---|
| | equations. | |
| V | **FOURIER SERIES:** Euler's Formulae, Functions having arbitrary periods,πPeriodic functions, Fourier series of period 2 Change of interval, Even and odd functions, Half range sine and cosine series. | **8L** |

**Reference / Text Books:**

**Text Books:**

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

**Reference Books:**

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3)Assignments | |
| 4)Research Project Report Seminar On Research Project Report | 20 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

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

**CO1** Understand the concept of differentiation and apply for solving differential equations

**CO2**Remember the concept of partial differential equation and to solve partial differential equations.

**CO3**Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations

**CO4** Understand the concept of Laplace Transform and apply for solving differential equations.

**CO5** Remember &Understand the concept of Fourier Series.

**CO6** Apply the concept of calculus in solving engineering problems

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I / Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH (CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject:** Engineering Physics |
| **Course Code:**SEAS-112/122 | **Title:** Engineering Physics |

**Course Objectives:**

1. To Understand the concept of Relativistic Mechanics
2. To know the significance of Maxwell's equations in the Engineering applications of electromagnetic waves.
3. Explain Quantum Mechanics to understand wave particle dualism. Necessity of quantum mechanics to explore.
4. To know the concept of Interference and Diffraction.
5. To Understand the Phenomenon of Polarization and Laser.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 60%Marks /4**

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Relativistic Mechanics:** Inertial and Non- Inertial Frames; Michelson-Morley Experiment; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Mass Energy Equivalence and Variation of Mass with Velocity. | **8L** |
| II | **Electromagnetic:** Gauss law Ampere's law and displacement current; Equation of continuity; Maxwell's equations in Integral and Differential Forms; Electromagnetic Wave Propagation in Free Space and Conducting Media; Poynting Theorem | **8L** |
| III | **Quantum Mechanics:** Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box. | **8L** |
| IV | **Wave Optics:**<br>**Interference:** Basics of interference of light; Principle of superposition, coherent Sources, Conditions of Interference; Interference by division of wave front and amplitude (Fresnel's bi-prism, Interference due to thin film, Newton's Rings).<br>**Diffraction:** Fraunhoffer Diffraction Due Single and N-slit; Diffraction Grating; Rayleigh's criterion of resolution; absent spectra, dispersive Power of grating, Resolving power of Grating. | **8L** |

| | | |
|---|---|---|
| V | **Polarization:** Phenomenon of double refraction; Ordinary and extra-ordinary rays; Nicol Prism; quarter wave plate and half wave plate; Production and analysis of Plane, Circularly and Elliptically Polarized Light; Optical Activity; Specific Rotation, Laurent half's half shade Polari meter. | **8L** |

**Reference / Text Books:**

**Text Books:**

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)

**Reference Books:**

1. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
2. Engineering Physics-Malik HK and Singh AK (McGrawHill)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report Seminar On Research Project Report | 20 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**CO1** To describe the classical relativity and wave mechanics problems.
**CO2** To demonstrate the electromagnetic waves and their application in various processes
**CO3** To calculate and solve the engineering problems of quantum mechanics.
**CO4** To evaluate and grade the engineering problems of wave optics.
**CO5** To prepare the classical physics & to prepare the ideas in solving the problems in their parent streams.
**CO6** To prepare the Production and analysis of Plane

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I /Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject:** Engineering Physics Lab |
| **Course Code:**SEAS-112P/ SEAS-122 P | **Title:** Engineering PhysicsLab |

**Course Objectives:** The objectives of studying this course are,

1. To understand the concept of wave length by the interference
2. To understand the concept of wave length by the diffraction.
3. To understand the concept of viscosity of liquid and flow of liquid.
4. To understand the energy band gap in the semiconductors.
5. To understand the concept of polarization.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks / 1**

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Practical | Contents |
|---|---|
| **Practical-1** | To determine the wavelength of Sodium light by Newton's rings |
| **Practical-2** | To determine the wavelength of prominent lines of mercury by plane diffraction grating |
| **Practical-3** | To determine the focus length combination of two lenses separated by distance and verify the formula for the focal length of combination of lenses |
| **Practical-4** | To determine the wave length of sodium light with the help of Fresnel's bi-prism |
| **Practical-5** | To determine the coefficient of viscosity of a given liquid |
| **Practical-6** | To verify Stefan's law |
| **Practical-7** | Calibration of a volt meter with potentiometer |
| **Practical-8** | To determine the resistance per unit length and specific resistance of a given resistance using Carey Foster 's Bridge |
| **Practical-9** | To determine the energy bend gap of a given semiconductor material |
| **Practical-10** | To determine the Specific Rotation of the Cane sugar solution with the help of Polarimeter. |

**Reference / Text Books:**

1. Practical Physics- K. K. Dey& B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics- Practical- Katiyar&Pandey (Wiley India)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br>30 |
| **Total:** | 50 |
| Prerequisites for the course: | |
| **Course Learning Outcomes:** After the completion of the course the student will be able to<br>**CO1.** To determine the wavelength of sodium light by Newton's ring experiment.<br>**CO2.** To determine the wavelength of sodium light with the help of Fresnel's bi-prism.<br>**CO3.** Understand measurement technology, usage of new instruments and real time applications in engineering studies.<br>**CO4.** To determine the viscosity of liquid.<br>**CO5.** To determine the emission of energy with respect the temperature and verify Stefan's law.<br>**CO6.** To determine the calibration of potential and draw the curve. | |

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I / Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject:** Engineering Chemistry |
| **Course Code:**SEAS-113/123 | **Title:** Engineering Chemistry |

**Course Objectives:**

1. Student will be able to apply fundamental concepts of chemistry in different fields of Engineering.
2. Student will be able to identify compounds using different spectroscopic techniques
3. Student will be able to understand the basic principles of electrochemistry for different engineering applications
4. Student will be able to illustrate different types of impurities in water and its softening techniques
5. Student will be able to apply the concepts of determination of calorific values and analyze the coal
6. Student will be able to recall the basic knowledge of polymerization & and applications

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks /4**

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Atomic and Molecular Structure:** Molecular orbitals of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application | **8L** |
| II | **Spectroscopic techniques and Applications:** Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy. | **8L** |
| III | **Electrochemistry:** Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and Δ S). Lead storage battery.<br>**Corrosion**; causes, effects and its prevention.<br>**Phase Rule** and its application to water system. | **8L** |
| IV | **Water Analysis:** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).<br>**Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulon'smethos). | **8L** |
| V | **Polymers:** Basic concepts of Polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications. | **8L** |

**Reference / Text Books:**

**Text Books:**

1. University Chemistry ByB.H.Mahan
2. University Chemistry ByC.N.R.Rao
3. Organic Chemistry By I.L.Finar
4. Physical Chemistry By S.Glasstone
5. Engineering Chemistry By S.S.Dara
6. Polymer Chemistry By FreW.Billmeyer

**Reference Books:**

1. Elementary Organic Spectroscopy ByY.R.Sharma
2. Principles of Physical Chemistry By Puri, Sharma,Pathania
3. Principles of Inorganic Chemistry By Puri, Sharma,Kalia
4. Concise Inorganic Chemistry ByJ.D.Lee

If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report Seminar On Research Project Report | 20 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**CO1** Apply fundamental concepts of chemistry in different fields of Engineering
**CO2** Identify compounds using different spectroscopic techniques.
**CO3** Understand the basic principles of electrochemistry for different engineering applications
**CO4** Illustrate different types of impurities in water and its softening techniques
**CO5** Apply the concepts of determination of calorific values and analyze the coal
**CO6** Recall the basic knowledge of polymerization and its applications

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I /Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH (CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject:** Engineering Chemistry Lab |
| **Course Code**: SEAS-113P/SEAS-123P | **Title:** Engineering Chemistry Lab |
| **Course Objectives:** The objectives of studying this course are,<br>1. Student will be able to Estimate different impurities present in water sample.<br>2. Student will be able to Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution<br>3. Student will be able to Identify iron concentration and percentage of available chlorine in supplied sample using titration methods. | |
| **Nature of Paper: Core** | |
| **Minimum Passing Marks/Credits: 50% Marks / 1** | |
| L: 0<br>T: 0<br>P: 2 (n Hours/Week)<br>Theory - 1 Hr. = 1 Credit<br>Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits) | |

| **Practical** | **Contents** |
|---|---|
| **Practical-1** | To determine total alkalinity in the given water sample. |
| **Practical-2** | To determine the temporary and permanent hardness in water sample using EDTA as standard solution. |
| **Practical-3** | To determine the available chlorine in bleaching powder solution. |
| **Practical-4** | To determine the chloride content in the given water sample by Mohr's method. |
| **Practical-5** | To determine the pH of the given solution using pH meter and pH-metric titration. |
| **Practical-6** | To determine the Equivalent weight of Iron by the chemical displacement method. |
| **Practical-7** | To determine the Viscosity of an addition polymer like polyester by Viscometer. |
| **Practical-8** | To find chemical oxygen demand of waste water sample by potassium dichromate |
| **Practical-9** | To determine the iron content in the given sample using external indicator |
| **Practical-10** | To determine the strength of given HCL solution by titrating against N/10 Standard Sodium hydroxide solution |

**Reference / Text Books:**

1. Practical Chemistry B.Tech. Text Book, Dr. UshaNakra and Laxmi Kant Sharma Dr. VivekPandey, Dr. T. L. Rajawat, Dr. Sama Jain, Dr. Monika Sharma, Dr. Virendra Singh (Neelkanth Publishers(P) Ltd.)

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br>30 |
| **Total:** | 50 |
| Prerequisites for the course: | |
| **Course Learning Outcomes:** After the completion of the course the student will be able to<br>**CO1.** Analyze the need, design and perform a set of experiments.<br>**CO2.** Identify the structure of unknown/new compounds with the help of spectroscopy<br>**CO3.** Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.<br>**CO4.** Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution<br>**CO5.** Equipped with basic knowledge of polymer reinforced composites, applications of semiconductor photochemistry in energy harnessing and optical sensors.<br>**CO6.** Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation. | |

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I / Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject:** Learning Computers with Thinking and Programming in C |
| **Course Code:**SECS-111/121 | **Title:** Learning Computers with Thinking and Programming in C |

**Course Objectives:**

1. After studying this course students will be able to develop simple algorithms for arithmetic and logical problems.
2. After studying this course students will be able to translate the algorithms to programs &finally execution in C language.
3. After studying this course students will be able to implement conditional branching, iteration and recursion in C language.
4. After studying this course student will be able to decompose a problem into functions and synthesize a complete program using divide and conquer approach using C language.
5. After studying this course students will be able to use arrays, pointers and structures to develop algorithms and programs for implementation in C language.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks /4**

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Introduction to Programming basics.**<br>Conceptual Introduction to components of a computer system i.e. Memory, processor, I/O Devices, storage, operating system.<br>Understanding assembler, compiler, interpreter, loader and linker.<br>Understanding Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.<br>**Programming Basics of C language**.<br>Core Structure of C program: writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language: Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes. | **8L** |
| II | **Arithmetic expressions & Conditional Branching in C language**:<br>Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, | **8L** |

| | | |
|---|---|---|
| | operator precedence and associatively. Conditional Branching: Applying if and switch statements, nesting of if and else, use of break and default with switch | |
| III | **Loops & Functions in C language:** Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements. Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions. | **8L** |
| IV | **Arrays & Basic Algorithms in C language**: Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions. Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity. | **8L** |
| V | **Pointer& File Handling in C language**: Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation) File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments. | **8L** |

**Reference / Text Books:**

**Text Books:**

1. Let Us C By Yashwant P. Kanetkar.
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House.
3. Computer Basics and C Programming by V.Rajaraman, PHI Learning Pvt. Limited, 2015.

**Reference Books:**

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Programming in C by Kochan Stephen G. Pearson Education – 2015.
3. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
4. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication

If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report Seminar On Research Project Report | 20 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**CO1** To understand the basic computer concepts and programming principles of C language.
**CO2** To develop simple algorithms for arithmetic and logical problems.
**CO3** To translate the algorithms to programs & execution (in C language).
**CO4** To implement conditional branching, iteration and recursion.
**CO5** To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
**CO6** To use arrays, pointers and structures to develop algorithms and programs

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I /Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject:** Learning Computers with Thinking and Programming in C Lab |
| **Course Code:**SECS-111 P/SECS-121P | **Title:** Learning Computers with Thinking and Programming in C Lab |

**Course Objectives:** The objectives of studying this course are,

1. After studying the above course the student will be able to implement algorithms and draw flowcharts for solving easy and complex Mathematical as well as engineering problems..
2. After studying the above course the student will be able to, understand and demonstrate programming language concepts by implementing programs in C language.
3. After studying the above course the student will be able to, design and develop programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage in computer language C.
4. After studying the above course the student will be able to, able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures in C language which will be latter helpful in understanding the concept of object oriented programming in C++.
5. After studying the above course the student will be able to, develop confidence for self-learning and ability for life-long learning needed for learning any computer language.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks / 1**

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| **Practical** | **Contents** |
|---|---|
| **Practical-1** | Write a program to calculate the area of triangle using formula Area=√s(s- a)(s-b)(s-c) where s=(a+b+c)/2. |
| **Practical-2** | We input the basic salary of an employee through the keyboard. The Dearness allowance (DA) is25% of the basic salary while the house rent allowance (HRA) is 15% of the basic salary. While the provident fund is deducted at the rate of 10% of the gross salary (BS+DA+HRA).<br>Write a program in C to calculate the Net Salary. |
| **Practical-3** | Write a program in C to determine the roots of quadratic equation. |
| **Practical-4** | Write a program in C to find the largest of three numbers using the nested if else construct. |
| **Practical-5** | Write a program in C to receive marks of history, geography & civics from user& check its eligibility for course if<br>a) Marks of history>40<br>b) Marks of geography>50 |

| | |
|---|---|
| | c) Marks of civics>60<br>d) Total of history & civics marks>150 or Total of three subjects marks>200 |
| **Practical-6** | Write a program in C to find the value of y for a particular value of n. The a, x, b, n is input by user<br>if n=1<br>y=ax%b<br>if n=2<br>y=ax2+b2<br>if n=3<br>y=a-bx<br>ifn=4<br>y=a+x/b |
| **Practical-7** | Write a program in C to construct a Fibonacci series up to n terms. |
| **Practical-8** | Write a program in C to find whether the number is Armstrong number or not. |
| **Practical-9** | Write a programin C togeneratesumofseries1!+2!+3!+ n! |
| **Practical-10** | Write a program in C to find the sumoffollowingseries1-X1/1!+X2/2!-……Xn/n!. |
| **Practical-11** | Write a program in C to print the entire prime no between1and 500. |
| **Practical-12** | Write a program in C to print out all the Armstrong number between 50and 600. |
| **Practical-13** | Write a program in C to draw the following figure:<br>4 3 2 1<br>321<br>2 1<br>1 |
| **Practical-14** | Writeaprogram in Ctoreceiveafive-digit no anddisplayas like12345:<br>1<br>2<br>3<br>4<br>5 |
| **Practical-15** | Writea function in Cthatreturnsumofalltheevendigitsofagivenpositiveno entered through keyboard. |
| **Practical-16** | Writeaprogram in C toprintareaofa trapezium using function&returnitsvalue to main function. |
| **Practical-17** | Writeaprogram in Ctocalculatethefactorialforgivennumberusingfunction. |
| **Practical-18** | Writea program in CtofindsumofFibonacciseriesusingfunction. |
| **Practical-19** | Writeaprogramin C to findthefactorialofgivennumberusingrecursion. |
| **Practical-20** | Writeaprogram in Ctofindthesumofdigitsofa5digit number using recursion. |
| **Practical-21** | Writeaprogramin C tocalculatetheGCDofgivennumbersusingrecursion. |
| **Practical-22** | Writeaprogram in Ctoconvertdecimalnumberintobinarynumber. |
| **Practical-23** | Writeaprogramin C toconvertbinarynumberintodecimalnumber. |
| **Practical-24** | Writeaprogramin C todeleteduplicateelementina listof20elements& display it on screen. |
| **Practical-25** | Writeaprogram in Ctomergetwosortedarray&no element isrepeatedduringmerging. |
| **Practical-26** | Writeaprogram in C to evaluatetheadditionofdiagonalelementsoftwo square matrixes. |
| **Practical-27** | Writeaprogram in Ctofindthetransposeofagivenmatrix&checkwhether it is symmetric or not. |
| **Practical-28** | Writeaprogram in Cto print themultiplicationoftwoN*N (Square) matrix. |

| | |
|---|---|
| **Practical-29** | WriteaprograminCtocheckwhetherthegivenstringisapalindromeor not. |
| **Practical-30** | Writeprogram in Ctosortthearrayofcharacter (String) inalphabeticalorder like STRING in GNIRTS. |
| **Practical-31** | Writeaprogram in Ctoremoveallthe blankspacefromthestring&print it, also count the no of characters. |
| **Practical-32** | Writeaprogram in Ctostorethefollowingstring“zero”,“one” ---------“five”. Printthenoinwords,giveninfigureas3205. |
| **Practical-33** | Write a program in C to compare two given dates. To store a date use a structurethatcontainsthreemembersnamelyday, monthandyear.Ifthe dates are equal then display message equal otherwise unequal. |
| **Practical-34** | WriteaCprogramtocopy&countthecharactercontentofonefilesays c.txt to another file d.txt. |
| **Practical-35** | Writeaprogram in Ctoprint alltheprimenumber,between2to 200ina file nameprime.txt. |
| **Practical-36** | WritethefollowingCprogramusingpointer:<br>a) Tosortthelistofnumbersthroughpointer<br>b) Toreversethestringthroughpointer. |
| **Practical-37** | Writeaprogram in Ctofindthe largest no among30 integersarrayusing dynamic memory allocation. |
| **Practical-38** | UsingDynamicMemoryAllocation, Writeaprogramin C to findthetranspose of given matrix. |
| **Practical-39** | Writeaprogram in Ctofindthefactorialofgivennumberusingcommand line argument. |

If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 20 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report Seminar On Research Project Report | |
| 5) ESE | 30 |
| **Total:** | 50 |

Prerequisites for the course:

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

**CO1.** Implementation of algorithms and drawing flowcharts for solving easy and complex Mathematical as well as Engineering problems.

**CO2**. Computer programming language concepts understanding and demonstration.

**CO3**. Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

**CO4.** Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures.

**CO5**. Development of confidence for self-education and ability for life-long learning needed for Computer language.

**CO6**. Understand the basics of file handling mechanisms

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I / Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:**B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject:** Concepts of Mechanical Engineering &Mechatronics |
| **Course Code:**SEME-111/121 | **Title:** Concepts of Mechanical Engineering & Mechatronics |

**Course Objectives:**

1. Acquire knowledge of various types of force system , free body diagram and equilibrium of body under various types of forces
2. Acquire knowledge of basic concepts of strength of materials, and statically determinate and indeterminate structures, simple beams subjected to various types of loading and plot shear force and bending moment diagrams
3. Acquire knowledge of the fundamentals of thermodynamics, temperature scales and various modes of heat transfer so that student will now begin to utilize these concepts in real-world applications
4. Acquire knowledge of various types of engines and its components, mechatronics with their advantages,
5. The learner will have a good understanding of the all-important basic technologies that are useful in daily activities

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks% /4**

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Force Systems**: Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Classification of forces & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces<br>**Coplanar Concurrent Force system and Coplanar:** Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem. | **8L** |
| II | **Introduction to mechanics of solid:** Normal and shear Stress, strain, Hookes' law, Poisson's ratio, elastic constants and their relationship, stress-strain diagram for ductile and brittle materials, factor of safety. Basic Numerical problems. Types of beams under various loads, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment. Basic Numerical problems | **8L** |
| III | **Basic concepts of thermodynamics**: Basic concepts, Concept of continuum, Microscopic and Macroscopic approach, Thermodynamic equilibrium, State and process, Reversible and Quasi-static process, Work, | |

| | | |
|---|---|---|
| | Zeroth law, Concept of temperature and heat. First law of thermodynamics and its importance,<br>**Second law of thermodynamics**: Kelvin Planck and Clausius statements, Heat engine, Refrigerator and Heat pump, Efficiency and COP, Thermodynamic temperature scale.<br>**Heat transfer and its various modes**: Conduction, Convection and Radiation. | **8L** |
| IV | **Introduction to IC engines**: IC Engine: Basic Components, Construction and Working of Two stroke and four stroke SI & CI engine, merits and demerits, scavenging process; Introduction to electric, and hybrid electric vehicles | **8L** |
| V | **Introduction to mechatronics**: Evolution, Scope, Advantages and disadvantages of Mechatronics, Industrial applications of Mechatronics, Introduction to autotronics, bionics, and avionics and their applications. Sensors and Transducers: Types of sensors, types of transducers and their characteristics.<br>**Overview of mechanical actuation system**: Kinematic Chains, Cam, Train Ratchet Mechanism, Gears and its type, Belt, Bearing.<br>**Hydraulic and pneumatic actuation systems**: Overview: Pressure Control Valves, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems | **8L** |

**Reference / Text Books:**

**Text Books:**


1. Engineering Mechanics: Statics" , J.L Meriam , Wiley.
2. "Engineering Mechanics", Thimoshenko& Young , 4ed, Tata McGraw Hill.
3. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson.


**Reference Books:**


1. Engineering Mechanics", Dr Sadhu Singh , Umesh Publications.
2. "Engineering Mechanics", Bhavikatti , New Age.
3. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI.
4. Mechatronics : Principles, Concepts and Applications, NitaigourMahalik, McGraw Hill.
5. Mechatronics, As per AICTE: Integrated Mechanical Electronic Systems, K.P.


If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3)Assignments | |
| 4)Research Project Report Seminar On Research Project Report | 20 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**CO1** Understand the basics of mechanics, construct free body diagrams and appropriate equilibrium equations.

**CO2** Understand and draw shear force and bending moment diagram for a beam under different loading conditions

**CO3** Understand the basic concepts of thermodynamics and their applications

**CO4** Understand the basic component and working of internal combustion engines, electric and hybrid vehicles, refrigerator and heat pump

**CO5** Understand the concept of mechatronics with their advantages, scope and Industrial application, the different types of mechanical actuation, hydraulic and pneumatic

**CO6** Understand the analysis of different machine parts and working principal and future prospects of mechatronics fields.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I / Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:**B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject:** Fundamentals of Electronics Engineering |
| **Course Code:** SEEC-111/121 | **Title:** Fundamentals of Electronics Engineering |

**Course Objectives:**

1. To develop a strong foundation of concept of PN Junction and solid state devices
2. To present the Operational amplifier and its applications
3. To familiarize with digital electronics & the design of various digital circuits using logic gates
4. To introduce the various communication systems

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks/4**

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Overview of Semiconductors**, PN junction Diode, Zener Diodes, Diode Application: Half and Full Wave rectification, Clippers, Clampers<br>Special Purpose two terminal Devices: Light-Emitting Diodes, Photo Diodes, Varactor Diodes, Tunnel Diodes, Liquid-Crystal Displays. | **8L** |
| II | **BJT**: Transistor Construction, Operation, Amplification action (Common Base, Common Emitter, Common Collector)<br>**Field Effect Transistor:** Construction, Operation and Characteristic of JFET and MOSFET (Depletion and Enhancement) Type | **8L** |
| III | **OP AMP:** Introduction, Op-amp symbol, terminals, packages, Block diagram Representation of op-amp- Ideal opamp& practical op-amp – Open loop & closed loop configurations, characteristics of op-amp, Op-Amp Circuits: Inverting Amplifier, Non-inverting Amplifier, Voltage Follower, Summing Amplifier, scaling & averaging amplifiers, Integrator, Differentiator. | **8L** |
| IV | **Digital Electronics:** Number systems, Binary codes – Binary Arithmetic, Logic gates, Boolean algebra, laws and theorems, Simplification of Boolean expressions, Implementation of Boolean expressions using logic gates Standard forms of Boolean expression, K Map Minimization upto 4 Variables. | **8L** |
| V | **Fundamentals of Communication Engineering**: Block diagram of a basic communication system, Frequency spectrum, Need for modulation, Methods of modulation, Introduction of various analog modulation techniques, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM. | **8L** |

**Reference / Text Books:**

**Text Books:**

1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, "Electronic Communication Systems", McGraw Publication

**Reference Books:**

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, "Electronic Devices and Circuits", McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford Uni Press India.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3)Assignments | |
| 4)Research Project Report Seminar On Research Project Report | 20 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**CO1** Understand the concept of PN Junction and devices.
**CO2** Understand the concept of BJT, FET and MOFET
**CO3** Understand the concept of Operational amplifier
**CO4** Understand the Principles of digital electronics
**CO5** Principles of various communication systems
**CO6** Design rectifier & measure the waveform parameters

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I /Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:**B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject**: Fundamentals of Electronics Engineering Lab |
| **Course Code:**SEEC-111P/ SEEC-121P | **Title:** : Fundamentals of Electronics Engineering Lab |

**Course Objectives:** The objectives of studying this course are,

1. To introduce the concepts of electronic circuits and its components
2. To introduce the concepts of diodes & transistors
3. To impart the knowledge of various configurations, characteristics and applications.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks / 1**

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Practical | Contents |
|---|---|
| **Practical-1** | Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board. |
| **Practical-2** | To verify the PN diode characteristics |
| **Practical-3** | To verify the Zener diode characteristics |
| **Practical-4** | To verify the BJT characteristics (either of the configurations) |
| **Practical-5** | Study of Logic Gate |
| **Practical-6** | Design and implementation of Adder and Subtractor using logic gates. |
| **Practical-7** | To determine the external characteristics of DC Shunt generator |
| **Practical-8** | Implement an Adder and Subtractor Circuit using Operational Amplifier |
| **Practical-9** | To study Full Wave Rectifier Circuit |
| **Practical-10** | Study of AM modulator and Demodulator |

**Reference / Text Books:**

**Text Books:**


1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, "Electronic Communication Systems", McGraw Publication


**Reference Books:**


1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, "Electronic Devices and Circuits", McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India


If the course is available as Generic Elective then the students of following departments may opt it.
NO

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br>30 |
| **Total:** | 50 |
| Prerequisites for the course: | |
| **Course Learning Outcomes:** After the completion of the course the student will be able to<br>**CO1.** Conduct experiments illustrating the application of Fundamentals of semiconductor, electronic components/devices.<br>**CO2**. Demonstrate the behavior of Principles of digital electronics.<br>**CO3.** Apply the operation and discuss the performance of several fundamentally important op-amp circuits that have certain features or characteristics oriented to special applications.<br>**CO4.** Analyze the concept with the working principles of forward and reverse bias characteristics.<br>**CO5.** Demonstrate the basic skills in design and analysis of filter circuits, biasing circuits.<br>**CO6.** Discriminate the principle, construction and operation of BJTs, FETs and MOSFETs. | |

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I / Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject:** Basic Electrical Engineering |
| **Course Code:**SEEE-111/121 | **Title:** Basic Electrical Engineering |

**Course Objectives:**

1. The objective of this course is to teach the students Introduction to Electrical Engineering
2. To understand the fundamental concept of Electrical Engineering like DC Network, AC Network,
3. Measuring Instruments, Energy Conversion Devices

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks/4**

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Circuit theory Concepts**-Mesh and nodal analysis; Network Theorems-Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem; Star Delta transformation.. | **8L** |
| II | Sinusoidal and phasor representation of voltage and current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their combination in series & parallel; Apparent, active & reactive powers, Power factor; Series and parallel resonance; Bandwidth and quality factor. | **8L** |
| III | **Measuring Instruments:** Construction and principles of operation of voltage and current measuring instruments; introduction to power and energy meters.<br>**Three Phase A.C. Circuits:** Star-Delta connections; Line and phase voltage/current relations; Three phase power and its measurement. | **8L** |
| IV | **Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and voltage regulation of single phase transformer.<br>**D.C. Machines:** Principles of electromechanical energy conversion; Types of D.C. machines; E.M.F. equation; Losses and efficiency; applications of DC machines. | **8L** |
| V | **Three phase induction Motor:** Principle of operation; Types, slip-torque characteristics; Applications. **Synchronous Machines:** Principle of Operation of Alternator and synchronous motor. **Single phase Motors:** Principle of operation of induction motor. | **8L** |

**Reference / Text Books:**

**Text Books:**

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, "Electrical Engineering", Kataria and Sons.
4. BL Theraja , A Textbook of Electrical Technology - Volume I, S. Chand Publishing

**Reference Books:**

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.
4. Cotton H., Advanced Electrical Technology, Wheeler Publishing.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report Seminar On Research Project Report | 20 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**CO1** Apply the concepts of KVL/KCL and network theorems in solving DC circuits.

**CO2** Analyze the steady state behavior of single phase and three phase AC electrical circuits.

**CO3** Identify the application areas of a single phase two winding transformer and calculate their efficiency.

**CO4** Illustrate the working principles of induction motor, synchronous machine and employ them in different area of applications.

**CO5** To make students capable of analyzing and solving the varieties of problems and issues coming up in the vast field of electrical measurements.

**CO6** Illustrate the working principles of DC machine and employ them in different area of applications.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I /Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:**B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject**: Basic Electrical Engineering Lab |
| **Course Code:**SEEE-111P/SEEE-121P | **Title:** Basic Electrical Engineering Lab |

**Course Objectives:**
The objectives of studying this course are,
1. Understand and gain knowledge about circuit laws and theorems.
2. Gain knowledge about time domain analysis of circuit transients.
3. Understand the concept of resonance in series and parallel circuits.

**Nature of Paper: Core/DSE/SEC/GE/AECC**

**Minimum Passing Marks/Credits: 50% Marks / 1**

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Practical | Contents |
|---|---|
| **Practical-1** | To verify the Kirchhoff's current and voltage laws |
| **Practical-2** | To verify the Superposition theorem |
| **Practical-3** | To verify the Thevenin's theorem |
| **Practical-4** | To verify the Norton's theorem |
| **Practical-5** | To determine the external characteristics of DC Shunt generator |
| **Practical-6** | To measure current and speed for speed control of D.C. Shunt Motor |
| **Practical-7** | To measure the power in a 3-phase system by two-wattmeter method |
| **Practical-8** | To study running and speed reversal of a three phase induction motor and record speed in both directions. |
| **Practical-9** | To perform open circuit and short circuit test on a single phase transformer |
| **Practical-10** | To perform polarity test on a single phase transformer |
| **Practical-11** | Measurement of Power and power factor of Single phase AC circuits |

**Reference / Text Books:**
**Text Books:**

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, "Electrical Engineering", Kataria and Sons.

**Reference Books:**

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.


If the course is available as Generic Elective then the students of following departments may opt it.
NO

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br>30 |
| **Total:** | 50 |
| Prerequisites for the course: | |
| **Course Learning Outcomes:** After the completion of the course the student will be able to<br>**CO1.** Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.<br>**CO2**. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase.<br>**CO3.** Calculate efficiency of a single phase transformer and DC machine.<br>**CO4.** Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.<br>**CO5.** Understand 3 phase balanced and unbalanced, star and delta connected supply andload and to measure power in 3 phase circuits<br>**CO6.** Determination of efficiency of a single-phase transformer by direct load test. | |

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I / Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 2<br>Practical: 0 | **Subject:** Professional Communication |
| **Course Code:**PCE-111/121 | **Title:** Professional Communication |

**Course Objectives:**

1. To enhance one's ability to be fully self-aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
2. Toincreaseone'sknowledgeandawarenessofemotionalcompetencyandemotionalintelligenceatplaceofstudy/work.
3. To provide opportunity for realizing one's potential through practical experience.

**Nature of Paper: AECC**

**Minimum Passing Marks/Credits: 40% Marks /2**

L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Listening**<br>• Techniques of effective listening<br>• Listening and comprehension<br>• Probing questions<br>• Barriers to listening<br>**Speaking**<br>• Pronunciation<br>• Enunciation<br>• Vocabulary<br>• Fluency<br>• Common Errors<br>***Reading***<br>• Techniques of effective reading<br>• Gathering ideas and information from a given text<br>. Identify the main claim of the text<br>. Identifythepurposeofthetext<br>. Identifythecontextofthetext<br>. Identify the concepts mentioned<br>• Evaluating these ideas and information<br>. Identify the arguments employed in the text<br>. Identify the theories employed or assumed in the text<br>• Interpretthetext | **8L** |

| | | |
|---|---|---|
| | . To understand what a text says<br>. To understand what a text does<br>. To understand what a text means | |
| II | ***Writing and different modes of writing***<br>• Clearly state the claims<br>• Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues<br>• Provide background information<br>• Effectively argue the claim<br>• Provide evidence for the claims<br>• Use examples to explain concepts<br>• Follow convention<br>• Be properly sequenced<br>• Use proper signposting techniques | **8L** |
| III | • Be well structured<br>. Well-knit logical sequence<br>. Narrative sequence<br>. Category groupings<br>• Different modes of Writing -<br>a. E-mails<br>b. Proposal writing for Higher Studies<br>c. Recording the proceedings of meetings<br>d. Any other mode of writing relevant for learners<br>***Effective use of Social Media***<br>• Introduction to social media websites<br>• Advantages of social media<br>• Ethics and etiquettes of social media<br>• How to use Google search better<br>• Effective ways of using Social Media<br>• Introduction to Digital Marketing<br>***Non-verbal communication***<br>• Meaning of non-verbal communication<br>• Introduction to modes of non-verbal communication<br>• Breaking the misbeliefs<br>• Open and Closed Body language<br>• Eye Contact and Facial Expression<br>• Hand Gestures<br>• Do's and Don'ts<br>• Learning from experts<br>• Activities-Based Learning | **8L** |
| IV | ***Resume Skills***<br>• Resume Skills : Preparation and Presentation<br>a. Introduction of resume and its importance<br>b. Difference between a CV, Resume and Bio data<br>c. Essential components of a good resume<br>• Resume skills : common errors<br>. Common errors people generally make in preparing their resume | **8L** |

| | | |
|---|---|---|
| | . Prepare a good resume of her/his considering all essential components<br>***Interview Skills***<br>• Interview Skills : Preparation and Presentation<br>a. Meaning and types of interview (F2F, telephonic, video, etc.)<br>b. Dress Code, Background Research, Do's and Don'ts<br>c. Situation, Task, Approach and Response (STAR Approach) for facing an interview<br>d. Interview procedure (opening, listening skills, closure, etc.)<br>e. Important questions generally asked in a job interview (open and closed ended questions)<br>• Interview Skills : Simulation<br>a. Observation of exemplary interviews<br>b. Comment critically on simulated interviews | |
| V | • Interview Skills : Common Errors<br>a. Discuss the common errors generally candidates make in interview<br>b. Demonstrate an ideal interview | **8L** |

**Reference / Text Books:**


1. Adair, John. Effective Communication. London: Pan Macmillan Ltd., 2003.
2. Brown, Michele & GylesBrandreth. How to Interview and be Inter viewed. London: Sheldon Press1994.
3. Carnegie, Dale. The Quick and Easy Way to Effective Speaking. New York: Pocket Books, 1977.
4. Collins, Patrick. Speak with Power and Confidence. New York: Sterling, 2009.
5. Hughes, Shirley. Professional Presentations: A Practical Guide to the Preparation and Performance ofSuccessful Business Presentations. Sydney: McGraw-Hill, 1990.
6. Kratz, Abby Robinson. Effective Listening Skills. Toronto: ON: Irwin Professional Publishing, 1995.


If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 10 |
| 2) Presentations /Seminar | |
| 3) Assignments | 05 |
| 4) Research Project Report Seminar On Research Project Report | |
| 5) ESE | 35 |
| **Total:** | 50 |

Prerequisites for the course:

**Course Learning Outcomes:**

**CO1** The students will Gain Self Competency and Confidence.
**CO2** They will be fluent speaker and proficient writer and enhance their LSRW Skills.
**CO3** The students will demonstrate a fuller and deeper understanding of all the facets of Professional communication.
**CO4** They will be able to enrich their vocabulary and their correct usage.
**CO5** They will develop Coherence, Cohesion and Competence in Oral Discourse through Intelligible Pronunciation.
**CO6** The students will Gain Knowledge about the world of work**.**

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I /Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject**: Professional Communication Lab |
| **Course Code**: PCE-111P/121P | **Title:** Professional Communication Lab |

**Course Objectives:** The objectives of studying this course are,

1. Improve the dynamics of professional presentations.
2. Develop the ability to compeer professional occasions.
3. Enable to read newspaper for their communicative competence.
4. Equip with effective business correspondence.
5. Develop in them communication and social graces necessary for functioning.

**Nature of Paper: Core/DSE/SEC/GE/AECC**

**Minimum Passing Marks/Credits: 50% Marks / 1**

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Practical | Contents |
|---|---|
| **Practical 1** | Group Discussion: Practice Based on Accurate and Current Grammatical Patterns |
| **Practical 2** | Intonation Pattern Practice: Rising, Falling, and Level Tones. |
| **Practical 3** | Communication Skills /Conversational Skills for Interviews/ Seminars/ Workshops with Emphasis on Kinesics/Para linguistics along with Promotion of Phonetic Script Skills. |
| **Practical 4** | Presentation Skills for Technical Paper / Project Reports / Professional Report based on Proper Stress and Intonation Mechanics. |
| **Practical 5** | Theme Presentation Practices Based on Linguistic Patterns |
| **Practical6** | ***Digital Literacy***<br>• Role of Digital literacy in professional life<br>• Trends and opportunities in using digital technology in workplace<br>• Internet Basics<br>• Introduction to MS Office tools<br>a. Paint<br>b. Office<br>c. Excel<br>d. Powerpoint |

**Reference / Text Books:**
**Text Books:**

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, “Electrical Engineering”, Kataria and Sons.

**Reference Books:**

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report Seminar On Research Project Report | 20 |
| 5) ESE | 30 |
| **Total:** | 50 |

Prerequisites for the course:

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

**CO1.** Develop all-round personalities with a mature outlook to function effectively in different circumstances.

**CO2**. Develop effective communication and presentation skills

**CO3.** Learn corporate etiquette - organizing and managing professional events and will understand how reading enhances their communicative competency

**CO4.** Conduct effective correspondence and prepare reports which produce results.

**CO5.** Write logical sentences and paragraphs, use appropriate diction, grammar and punctuation.

**CO6.** Produce business documents for mailing to external recipients or intra-organizational circulation

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I / Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 2<br>Practical: 0 | **Subject:** Environment Studies |
| **Course Code:**SEHU-111/122 | **Title:** Environment Studies |

**Course Objectives:**

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
3. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
5. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
6. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.

**Nature of Paper: AECC**

**Minimum Passing Marks/Credits: 40% Marks /2**

L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Introduction to environmental studies**<br>• Multidisciplinary nature of environmental studies;<br>• Scope and importance; Concept of sustainability and sustainable development. | **4L** |
| II | **Ecosystems**<br>• What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems:<br>a) Forest ecosystem<br>b) Grassland ecosystem<br>c) Desert ecosystem<br>d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) | **4L** |
| III | **Natural Resources: Renewable and Non-renewable Resources**<br>• Land resources and land use change; Land degradation, soil erosion and desertification. | |

| | | |
|---|---|---|
| | • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.<br>• Water: Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & interstate).<br>• Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. | **4L** |
| IV | **Biodiversity and Conservation**<br>• Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots<br>• India as a mega--biodiversity nation; Endangered and endemic species of India<br>• Threats to biodiversity: Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.<br>• Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value. | **4L** |
| V | **Environmental Pollution**<br>• Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution<br>• Nuclear hazards and human health risks<br>• Solid waste management: Control measures of urban and industrial waste.<br>• Pollution case studies. | **4L** |
| VI | **Environmental Policies & Practices**<br>• Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture<br>• Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).<br>• Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context. | **4L** |
| VII | **Human Communities and the Environment**<br>• Human population growth: Impacts on environment, human health and welfare.<br>• Resettlement and rehabilitation of project affected persons; case studies.<br>• Disaster management: floods, earthquake, cyclones and landslides.<br>• Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.<br>• Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.<br>• Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). | **4L** |
| VIII | **Field work**<br>Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. | **4L** |

| | | |
|---|---|---|
| | Visit to a local polluted site---Urban/Rural/Industrial/Agricultural.<br>Study of common plants, insects, birds and basic principles of identification.<br>Study of simple ecosystems---pond, river, Delhi Ridge, etc. | |

**Reference / Text Books:**


1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., &Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36--37.


If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 10 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report Seminar On Research Project Report | 05 |
| 5) ESE | 35 |
| **Total:** | 50 |

Prerequisites for the course:

**Course Learning Outcomes:**

**CO1.** Gain in-depth knowledge on natural processes that sustain life, and govern economy.

**CO2.** Estimate and predict the consequences of human actions on the web of life, global economy and quality of human life.

**CO3.** Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.

**CO4.** Acquire values and attitudes towards understanding complex environmental economic social challenges, and participate actively in solving current environmental problems and preventing the future ones.

**CO5.** Adopt sustainability as a practice in life, society and industry.

**CO6.** Develop real field experience.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I /Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:**B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject**: Engineering Workshop Lab |
| **Course Code:** SEME-112P/ SEME-122P | **Title:** Engineering Workshop Lab |

**Course Objectives:** The objectives of studying this course are,

1. To understand the importance of tools used in workshop.
2. To prepare various joints used in workshop.
3. To identify & apply the most appropriate tools for various applications.
4. To perform the various types of black smithy and sheet metal shop operations.
5. To prepare core and mould in foundry shop.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks / 1**

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Practical | Contents |
|---|---|
| **Module -1** | Carpentry Shop:<br>Practical-1: To prepare half-lap corner joint.<br>Practical-2: To prepare mortise &Tenon joint.<br>Practical-3: To prepare a cylindrical pattern on woodworking lathe |
| **Module -2** | Fitting Bench Working Shop:<br>Practical-1: To prepare a V-joint fitting<br>Practical-2: To prepare a U-joint fitting<br>Practical-3: To make a perfect square job |
| **Module -3** | Black Smithy Shop:<br>Practical-1: To prepare a square rod from given circular rod<br>Practical-2: To prepare a square S- shape from given circular rod<br>Practical-3: To prepare a nail from given circular rod. |
| **Module -4** | Welding Shop:<br>Practical-1: To prepare a butt welded joints using arc welding machine.<br>Practical-2: To prepare a Lap welded joints using arc welding machine.<br>Practical-3: To prepare a Lap welded joint using spot welding machine. |
| **Module -5** | Sheet-metal Shop:<br>Practical-1: To make round duct of GI sheet using ‘soldering’ process.<br>Practical-2: To prepare a tray of GI by fabrication |
| **Module -6** | Machine Shop:<br>Practical-1: To prepare a bolt on the lathe machine as per given. Diagram.<br>Practical-2: To prepare a job on the lathe machine as per given diagram. |
| **Module -7** | Foundry Shop: |

| | |
|---|---|
| | Practical-1: To prepare core as per given size.<br>Practical-2: To prepare a mould for given casting. |
| **Practical-8** | To study running and speed reversal of a three phase induction motor and record speed in both directions. |
| **Practical-9** | To perform open circuit and short circuit test on a single phase transformer |
| **Practical-10** | To perform polarity test on a single phase transformer |
| **Practical-11** | Measurement of Power and power factor of Single phase AC circuits |

**Reference / Text Books:**

**Text Books:**

1. G. B. Hart, "Cambridge English Business Bench Mark: Upper Intermediate', 2nd edition, CUP, 2004.
2. CUP, Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

**Reference Books:**

1. Business Communication, II Ed, OUP, by Meenakshi Raman &Prakash Singh, 2012.
2. Speak well----- orient black swan.
3. Everyday dialogues in English----- Robert J.Dixon.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br>30 |
| **Total:** | 50 |

Prerequisites for the course:

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

**CO1**. Understand the tools used in workshop & their applications.

**CO2.** Prepare various joints used in carpentry, fitting and welding shop.

**CO3.** Identify & apply the most appropriate tools for various manufacturing operations like turning, facing and threading.

**CO4.** Perform the various types of black smithy and sheet metal shop operations.

**CO5.** Prepare core and mould in foundry shop.

**CO6.** Ability to design and model various basic prototypes in the trade of Welding such as Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year – I /Semester-I/II**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH(CSE) | Year: I<br>Semester: I/II |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject:** Engineering Graphics & Design Lab |
| **Course Code:**SEME-111P/ SEME-121P | **Title:** Engineering Graphics & Design Lab |

**Course Objectives:** The objectives of studying this course are,

1. To study the standard and rules to be trailed by engineers for making precise drawings.
2. To understand the fundamental dimensioning practices that must be continued in the arrangement of drawings.
3. To draw the various types of projection of lines, planes and solids.
4. To apply the CAD for design.
5. To create the engineering models.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks / 1**

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Practical | Contents |
|---|---|
| **Module-1** | Introduction to Engineering Drawing, Orthographic Projections: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales |
| **Module -2** | Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes. |
| **Module -3** | Projections and Sections of Regular Solids: Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans they include: windows, doors. Prism, Cylinder, Pyramid, Cone – Auxiliary Views. |
| **Module -4** | Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions. |
| **Module -5** | Computer Graphics: Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids]. |

**Reference / Text Books:**
**Text Books:**

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Charotar Publishing House
2. Engineering Drawing, Narayana, K.L. & P Kannaiah (2008), Scitech Publishers.

3. Engineering Drawing Paperback, P.S. Gill (Author) , S.K. Kataria& Sons.

**Reference Books:**

1. Engineering Drawing and Computer Graphics, Shah, M.B. &Rana B.C. (2008), Pearson Education.
2. Engineering Graphics, Agrawal B. &Agrawal C.M. (2012), TMH Publication.
3. Engineering Graphics & Design, A.P. Gautametc, Khanna Publishing House.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3)Assignments<br>4)Research Project Report Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br>30 |
| **Total:** | 50 |

Prerequisites for the course:

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

**CO1.** Understand the basic concepts and principles of engineering graphics and their significance.
**CO2.** Understand the theory of projections and regular solids.
**CO3**. Draw the various types of projection of lines, planes and solids.
**CO4.** Apply the CAD for design.
**CO5.** Creating the engineering models using solid modeling.
**CO6.** Gain knowledge about orthographic and isometric projections

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester III**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech CSE** | Year: II<br>Semester: III |
| **Credits 4**<br>Theory: 3<br>Tutorial: 1<br>Practical:0 | **Subject:** Engineering Mathematics-III |
| **Course Code:**<br>SEAS-231 | **Title:** Engineering Mathematics-III |

**Course Objectives:**

- To make the students familiar with complex functions and its calculus.
- To deal with applications, residues and conformal mapping.
- To understand the concept and applications of integral transforms.
- To deal with numerical solutions of algebraic equations and differential equations.
- To understand the statistical aspect of functions.

**Nature of Paper: Applied Science Courses(Core)**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Functions of a Complex Variable I**: Analytic functions; C-R equations and harmonic functions ;Line integral in the complex plane; Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions; Liouvilles theorem. | **8** |
| II | **Functions of a Complex Variable II**: Representation of a function by power series; Taylor's andLaurent's series; Singularities, zeroes and poles; Residue theorem, evaluation of real integrals; conformal mapping and bilinear transformations. | **8** |
| III | **Integral Transforms:** Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z – Transform and its application to solve difference equations. | **8** |
| IV | **Numerical Techniques:** Solution of polynomial and transcendental equations Bisection method, RegulaR – Falsi method, Newton - Raphson method.<br>**Interpolation:** Finite difference, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals;<br>**Numerical Differentiation**, **Numerical Integration**; Trapezoidal, Simpson's 1/3 and 3/8 rules.<br>**Numerical solutions of first order differential equations** by Euler's method and 4th order Runge-Kutta method. | **8** |

| | | |
|---|---|---|
| V | **Statistical Techniques:** Moments, Moment generating functions, Skewness, Kurtosis, CurveFitting and Solution of Equations: Method of least squares and curve fitting of straight line and parabola, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution. | **8** |

**Reference / Text Books:**

**Text books:**


1. *B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.*
2. *B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008.*
3. *Dass H.K., Engineering Mathematics Vol-I, S. Chand.*
4. *E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.*
5. *R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002.*
6. *Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.*


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report | 20 |
| Seminar On Research Project Report | |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course: **Engineering Mathematics-I(SEAS-111)&Engineering Mathematics-II(SEAS-121)**

**Course Learning Outcomes:**

CO1. Understand and check the Analyticity of a complex function.
CO2.To apply the concept of Analytic functions in residue and conformal mappings.
CO3.To solve and apply the concepts of transforms in the area of engineering.
CO4.To solve numerically the Algebraic equations, Differential equations, and to differentiate & integrate numerically.
CO5.To understand and use the concept of statistical tools to analyze the different data.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester III**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: III |
| **Credits**<br>Theory: 4<br>Practical:2 | **Subject:** Data Structures |
| **Course Code:**<br>SECS-231 | **Title:** Data Structures |

**Course Objectives:**

- Student will be able to describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.
- Student will be able to discuss the computational efficiency of the sorting and searching algorithms.
- Student will be able to implement trees and Graphs and perform various operations on these data structure.
- Student will be able to understand the concept of recursion, application of recursion and its implementation and removal of recursion.
- Student will be able to identify the alternative implementations of data structures with respect to its performance to solve a real world problems.

**Nature of Paper: Engineering Courses (Core)**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Introduction:** Basic Terminology, Elementary Data Organization, Built in Data Types available in C. Overview of Algorithms, Efficiency of an Algorithms and its time and space complexity. Asymptotic notations: Big Oh, Big Theta and Big Omega, Discussion on Time-Space trade-off, Introduction to Abstract Data Types (ADT).<br>**Arrays**: Definition and types: Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Arrays, Application of arrays, Sparse Matrices and their representations.<br>**Linked lists:** Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Subtraction & Multiplications of Single variable & Two variables polynomial. | **10** |
| II | **Stacks:** Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary | **10** |

| | | |
|---|---|---|
| | search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion.<br>**Queues:** Operationson Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue | |
| III | **Searching:** Concept of Searching and types of searching: Sequential search, Index Sequential Search, Binary Search.<br>Concept of Hashing & Collision resolution Techniques used in Hashing.<br>**Sorting:** Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort. | **10** |
| IV | **Graphs:** Terminology used with Graph, Data Structure for Graph representations by using C: Adjacency Matrices and Adjacency List.<br>Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm. | **10** |
| V | **Trees:** Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Strictly Binary Tree, Complete Binary tree. Extended Binary Trees, Tree Traversal algorithms: In order, Preorder and Post order, Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search. Threaded Binary trees, Traversing Threaded Binary trees, Huffman coding using Binary Tree, Concept & Basic Operations for AVL Tree, B Tree & Binary Heaps. | **10** |

**Reference / Text Books:**

**Text books:**


1. Lipschutz,"DataStructures"Schaum'sOutlineSeries,TataMcGraw-hillEducation(India)Pvt.Ltd
2. A K Sharma,"Data Structure Using C", Pearson Education India.
3. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J.Augenstein, "Data Structures Using C and C++",PHI Learning Private Limited, Delhi India.
4. HorowitzandSahani,"FundamentalsofDataStructures",GalgotiaPublicationsPvtLtdDelhiIndia.
5. Thareja,"Data Structure Using C"Oxford Higher Education.
6. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3)Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br><br>100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.

CO2.Discuss the computational efficiency of the sorting and searching algorithms.

CO3.Implementation of Trees and Graphs and perform various operations on these data structure.

CO4.Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.

CO5.Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester III**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: III |
| **Credits**<br>Theory: 4<br>Practical:2 | **Subject:** Computer Organization and Architecture |
| **Course Code:**<br>SECS-232 | **Title:** Computer Organization and Architecture |

**Course Objectives:**

- Student will be able to study basic structure and operation of a digital computer system.
- Student will be able to analyze the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.
- Student will be able to implement control unit techniques and the concept of Pipelining.
- Student will be able to understand the hierarchical memory system, cache memories and virtual memory
- Student will be able to understand the different ways of communicating with I/O devices and standard I/O interfaces.

**Nature of Paper: Engineering Courses (Core)**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction: Functional units of digital system and their interconnections, Overview of bus their architecture, types of buses and bus arbitration.<br>Details of Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes and their types | **10** |
| II | **Arithmetic and logic unit:** Look ahead carries adders, Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations, Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers. | **10** |
| III | **Control Unit:** Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc.), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programming sequencing, concept of horizontal and vertical micro programming. | **10** |
| IV | **Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization, ROM memories, Cache memories: concept, design issues & performance, address mapping, Auxiliary memories: magnetic disk, magnetic tape and optical disks, | **10** |

| | | |
|---|---|---|
| | Virtual memory: concept and implementation. | |
| V | **Input / Output**: Overview of peripheral devices, I/O interface, I/O ports. Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access, I/O channels and processors.<br>Serial Communication: Synchronous & asynchronous communication and standard communication interfaces. | **10** |

**Reference / Text Books:**

**Text books:**

1. Computer System Architecture-M.Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012

**Reference Books:**

1. John P. Hayes, Computer Architecture and Organization, Tata Mc Graw Hill, Third Edition,1998.Reference books
2. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
3. Behrooz Parahami, "Computer Architecture",Oxford University Press, Eighth Impression,2011.
4. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed India Private Limited, Fifth edition, 2012

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br><br>100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.Study of the basic structure and operation of a digital computer system.

CO2.Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.

CO3.Implementation of control unit techniques and the concept of Pipelining

CO4.Understanding the hierarchical memory system, cache memories and virtual memory

CO5.Understanding the different ways of communicating with I/O devices and standard I/O interfaces

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester III**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: III |
| **Credits**<br>Theory: 4<br>Practical:2 | **Subject:** Operating System |
| **Course Code:**<br>SECS-233 | **Title:** Operating System |

**Course Objectives:**

- Student will be able to understand the structure and functions of OS
- Student will be able to learn about Processes, Threads and Scheduling algorithms.
- Student will be able to study and understand the principles of concurrency and Deadlocks
- Student will be able to study and learn various memory management scheme
- Student will be able to study I/O management and File systems.

**Nature of Paper: Engineering Courses (Core)**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction of Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multi process Systems, Multithreaded Systems.<br>Details of Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems. | **10** |
| II | Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation.<br>Classical Problem in Concurrency i.e Dining Philosopher Problem and Sleeping Barber Problem. Overview of Inter Process Communication models and Schemes, Process generation. | **10** |
| III | CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock. | **10** |
| IV | Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory | **10** |

| | | |
|---|---|---|
| | organization, Locality of reference. | |
| V | I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID.<br>File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security. | **10** |

**Reference / Text Books:**

**Text books:**

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education

**Reference Books:**

1. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
2. TMH 5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3)Assignments | 20 |
| 4) Research Project Report | |
| Seminar On Research Project Report | |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.Understand the structure and functions of OS
CO2.Learn about Processes, Threads and Scheduling algorithms.
CO3.Understand the principles of concurrency and Deadlocks
CO4.Learn various memory management scheme
CO5.Study I/O management and File systems.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester III**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: III |
| **Credits**<br>Theory: 2<br>Practical:0 | **Subject:** Python Programming |
| **Course Code:** STCS-239 | **Title:** Python Programming |

**Course Objectives:**

- Students will be able to read and write simple Python programs.
- Students will be able to develop Python programs with conditionals and loops
- Students will be able to define Python functions and to use Python data structures –- lists, tuples, dictionaries
- Students will be able to do input/output with files in Python
- Students will be able to do searching ,sorting and merging in Python

**Nature of Paper: Engineering Courses (Core)**

**Minimum Passing Marks/Credits: 40% Marks/2**

L:3 T:0 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction of Python, Overview of Python IDE, Overview of Python Programs, Basic elements of Python, Type Conversion in Python. Basics of python: Concept of expressions, Assignment Statement, Usage of Arithmetic Operators, Operator Precedence, Evaluation of Boolean Expressions. | **10** |
| II | Illustration of Conditional statements in Python and their implementation, Evaluation of expressions & Float Representation. Loops basics and working of loops, Use of Break and Continue. | **10** |
| III | Implementation of functions in detail, Strings, Python Data Structure : Tuples , Unpacking Sequences , Lists , Mutable Sequences , List Comprehension , Sets , Dictionaries, Higher Order Functions, Overview of Lambda Expressions | **10** |
| IV | Implementation of Sieve of Eratosthenes, File input and output operations, Exceptions and Assertions Modules, Importing Modules, Abstract Data types, Classes, Special Methods (such as _init_, _str_, comparison methods and Arithmetic methods etc.), Inheritance and OOP implementations. | **10** |
| V | Recursive Fibonacci, Tower of Hanoi Search, Binary Search and Sorting& Merging, Selection Sort, List merging, Merge Sort, Higher Order Sort. | **10** |

**Reference / Text Books:**
**Text books:**

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016).

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. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016
3. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,, 2015.

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3)Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 10<br><br><br>05<br><br>35 |
| **Total:** | 50 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.To read and write simple Python programs.
CO1.To develop Python programs with conditionals and loops
CO1.To define Python functions and to use Python data structures –- lists, tuples, dictionaries
CO1.To do input/output with files in Python
CO1.To do searching ,sorting and merging in Python

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester III**

| | |
|---|---|
| **Programme: UG**<br>**Class:B.Tech (CSE)** | Year: II<br>Semester: III |
| **Credits**<br>Theory: 0<br>Practical:2 | **Subject:** Data Structures using C Lab |
| **Course Code: SECS-231P** | **Title:** Data Structures using C Lab |

**Course Objectives:**

- To write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues.
- To write and execute programs in C to solve problems using data¬ structures such as trees, graphs, hash tables and search trees.
- To write and execute write programs in C to implement various¬ sorting and searching methods.

**Nature of Paper: Engineering Courses (Core)**

**Minimum Passing Marks/Credits: 50% Marks/2**

L:0 P:3(In Hours/Week)
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Practical No. | Name of the Practical | No. of Lectures Allotted for practical |
|---|---|---|
| 1 | Write C Programs to illustrate the concept of the following: | **2L** |
| 2 | Sorting Algorithms-Non-Recursive. | **2L** |
| 3 | Sorting Algorithms-Recursive. | **2L** |
| 4 | Searching Algorithm. | **2L** |
| 5 | Implementation of Stack using Array. | **2L** |
| 6 | Implementation of Queue using Array. | **2L** |
| 7 | Implementation of Circular Queue using Array. | **2L** |
| 8 | Implementation of Stack using Linked List. | **2L** |
| 9 | Implementation of Queue using Linked List. | **2L** |
| 10 | Implementation of Circular Queue using Linked List. | **2L** |
| 11 | Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search BST Tree, Insertion and Deletion in BST. | **2L** |
| 12 | Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm. | **2L** |

**Reference / Text Books:**

**Text books:**

1. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education.
2. Berztiss, AT: Data structures, Theory and Practice, Academic Press.

**Reference Books:**

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.
3. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Practical Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report | 20 |
| 5) ESE | 30 |
| **Total:** | 50 |

Prerequisites for the course:

**Course Learning Outcomes:**

At the end of this lab session, the student will

CO1. Be able to design and analyze the time and space efficiency of the data structure

CO2.Be capable to identity the appropriate data structure for given problem

CO3.Have practical knowledge on the applications of data structures.

CO4.Be able to Implement Stack using Array.

CO5.Be able to Implement Tree Structures, Binary Tree, Tree Traversal, Binary Search BST Tree, Insertion and Deletion in BST.

CO6.Be able to do Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester III**

| | |
|---|---|
| **Programme: UG**<br>**Class:B.Tech (CSE)** | Year: II<br>Semester: III |
| **Credits**<br>Practical:2 | **Subject:** Computer Organization and Architecture Lab |
| **Course Code:**<br>**SECS-232P** | **Title:** Computer Organization and Architecture Lab |

**Course Objectives:**

1. Understand the theory and architecture of central processing unit.
2. Analyze some of the design issues in terms of speed, technology, cost, performance.
3. Design a simple CPU with applying the theory concepts.
4. Use appropriate tools to design verify and test the CPU architecture.
5. Learn the concepts of parallel processing, pipelining and inter processor communication.
6. Understand the architecture and functionality of central processing unit.
7. Exemplify in a better way the I/O and memory organization. 8. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

**Nature of Paper: Engineering Courses: Core**

**Minimum Passing Marks/Credits: 50% Marks/2**

L:0 T:0 P:3(In Hours/Week)
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Practical No. | Name of the Practical | No. of Lectures Allotted for practical |
|---|---|---|
| 1 | Implementing HALF ADDER, FULL ADDER using basic logic gates | **2L** |
| 2 | Implementing Binary -to -Gray, Gray -to -Binary code conversions. | **2L** |
| 3 | Implementing 3-8 line DECODER. | **2L** |
| 4 | Implementing 4x1 and 8x1 MULTIPLEXERS. | **2L** |
| 5 | Verify the excitation tables of various FLIP-FLOPS. | **2L** |
| 6 | Design of an 8-bit Input/ Output system with four 8-bit Internal Registers. | **2L** |
| 7 | Design of an 8-bit ARITHMETIC LOGIC UNIT. | **2L** |
| 8 | Design the data path of a computer from its register transfer language | **2L** |
| 9 | Design the control unit of a computer using either hardwiring | **2L** |
| 10 | Micro programming based on its register transfer language description. Transfer language description. | **2L** |
| 11 | Implement a simple instruction set computer with a control unit and a data path. | **2L** |

**Reference / Text Books:**

**Text books:**


1. Computer System Architecture - M. Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books


**Reference Books:**


1. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
2. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Practical Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report | 20 |
| 5) ESE | 30 |
| **Total:** | 50 |

Prerequisites for the course: NA

**Course Learning Outcomes:**

**Student will be able to:**

CO1.Analyze the behavior of logic gates
CO2.Design combinational circuits for basic components of computer system and applications.
CO3.Analyze the operational behavior and applications of various flip-flop
CO4.Design Arithmetic logic units and different types of memory blocks.
CO5.Design the control unit of a computer using either hardwiring.
CO6.Implement a simple instruction set computer with a control unit and a data path.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester III**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech(CSE)** | Year: II<br>Semester:III |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject: Operating System Lab** |
| **Course Code:**<br>**SECS-233P** | **Title: Operating System Lab** |

**Course Objectives:**
1. To learn shell programming and the use of filters in the LINUX environment.
2. To practice multithreaded programming.
3. To implement CPU Scheduling Algorithms and memory management algorithms.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks/2**

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Write a C programs to implement UNIX system calls and file management. | 2 |
| II | Write C programs to demonstrate various process related concepts. | 2 |
| III | Write C programs to demonstrate various thread related concepts. | 2 |
| IV | Write C programs to simulate CPU scheduling algorithms: FCFS, SJF, and Round Robin. | 2 |
| V | Write C programs to simulate Intra & Inter – Process Communication (IPC) techniques: Pipes, Messages Queues, and Shared Memory. | 2 |
| VI | Write C programs to simulate solutions to Classical Process Synchronization Problems. | 2 |
| VII | Dining Philosophers, Producer – Consumer, Readers – Writers. | 2 |
| VIII | Write a C program to simulate Bankers Algorithm for Deadlock Avoidance. | 2 |

**Reference / Text Books:**
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7 the edition, Wiley India Private Limited, New Delhi.

If the course is available as Generic Elective then the students of following departments may opt it.
1. NA

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks:50** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br><br>30 |
| **Total:** | 50 |

**Coures Learning Outcomes:**

Student will be able to :

CO1.Ensure the development of students applied skills in operating systems related areas.

CO2.Students will gain knowledge in writing software routines modules or implementing various concepts of operating system.

CO3.Implement Dining Philosophers, Producer – Consumer, Readers – Writers.

CO4.Write C programs to simulate solutions to Classical Process Synchronization Problems.

CO5.Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.

CO6.Write C programs to simulate solutions to Classical Process Synchronization Problems.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: IV |
| **Credits**<br>Theory: 4<br>Practical:2 | **Subject:** Theory of Automata and Formal Languages |
| **Course Code:**SECS-241 | **Title:** Theory of Automata and Formal Languages |

**Course Objectives:**

- Student will be able to analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars
- Student will be able to analyze and design, Turing machines, formal languages, and grammars
- Student will be able to analyze and demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving
- Student will be able to analyze the basic results of the Theory of Computation.
- Student will be able to analyze, State and explain the relevance of the Church-Turing thesis.

**Nature of Paper: Engineering Courses (Core)**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages.<br>Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem. | **8** |
| II | Regular Expressions and Languages: Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem.<br>Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma.<br>Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language. | **8** |
| III | Regular and Non-Regular Grammars:<br>Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and | **8** |

| | | |
|---|---|---|
| | Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs. | |
| IV | Push Down Automata and Properties of Context Free Languages: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs. | **8** |
| V | Turing Machines and Recursive Function Theory : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondance Problem, Introduction to Recursive Function Theory. | **8** |

**Reference / Text Books:**

**Text books:**


1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI


**Reference Books:**


1. Mathematical Foundation of Computer Science, Y.N.Singh, New Age International


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br><br>100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars

CO2.Analyze and design, Turing machines, formal languages, and grammars

CO3.Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving

CO4.Prove the basic results of the Theory of Computation.

CO5.State and explain the relevance of the Church-Turing thesis

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: IV |
| **Credits**<br>Theory: 4<br>Practical:2 | **Subject:** Software Engineering |
| **Course Code:**SECS-242 | **Title:** Software Engineering |

**Course Objectives:**

- Knowledge of basic SW engineering methods and practices, and their appropriate application and understanding of software requirements and the SRS documents.
- To provide the idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases.
- To provide an idea of using various process models in the software industry according to given circumstances
- Understanding of software testing approaches such as unit testing and integration testing.
- To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.

**Nature of Paper: Engineering Courses (Core)**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Introduction:** Evolution and impact of Software Engineering, Software Development Life Cycle(SDLC) Models: Waterfall Model, Prototype Model, Spiral Model, Agile methodology, Layered Approach. **Software Requirements Analysis and Specifications** Feasibility Study, Functional and Non-Functional Requirements, Requirements Gathering, Requirement Analysis and Specifications using DFD, Data Dictionaries and ER Diagrams, Requirements documentation, Characteristics and Organization of Software Requirement Specifications (SRS) | **8** |
| II | **Software-Design and Coding:** Principles; Problem Partitioning; Abstraction; Top-Down andBottom-Up design; Structured Approach; Functional vs. Object Oriented Approach; UML, Design Specifications and Verification; Cohesion; Coupling. Distributed Software Design, User Interface Design, Coding standards and Code Review Techniques | **8** |
| III | **Software Testing :**Software Testing Fundamentals, SDLC Testing : Unit Testing, IntegrationTesting, System Testing, Regression Testing, Smoke Testing, Security Test, Stress Test, Performance Test, Functional Testing or Black Box Testing: Boundary Value Analysis, Alpha Testing, Beta Testing, and Acceptance Testing, Structural Testing or White Box Testing: Basis Path Testing, DD-Paths, Cyclomatic Complexity, Data Flow Testing, Mutation. | **8** |

| | | |
|---|---|---|
| IV | **Test Management:** Test Cycle, Test Estimation, Test Cases, Test Scenarios **Testing Tools:** Static, Dynamic, Characteristics of Modern Tools and Automation.<br>**Software Maintenance:** Updates-Upgrades-Patches-Versions, Error Reporting, Customer Support, Maintenance Process. | **8** |
| V | **Software Reliability**: Importance, Hardware Reliability and Software Reliability, Failure and Faults, Reliability Models, Software Reuse, Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management | **8** |

**Reference / Text Books:**

**Text books:**

1. Agarwal, K.K., *Software Engineering*, New Age International.
2. Pankaj Jalote, Software Engineering, Wiley
3. Tamres, L., Software Testing, Pearson Education.

**Reference Books:**

1. Sommerville, I., *Software Engineering*, Addison-Wesley.
2. R S Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
3. Boris, B., *Software Testing Techniques,* Van Nostrand Reinhold

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br><br>100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1. Correctly create a model of the structure and behavior of a software system.

CO2. Design and implement, in a programming language, an executable solution to a given problem using common software principles and best practices.

CO3. Apply appropriate software testing techniques and evaluate the quality of a software product at module, integration, and system granularity levels.

CO4. Select and adapt suitable elements from among conventional and evolving software development life-cycle processes and apply the resulting process to a software project.

CO5. Collaborate in teams to develop a significantly sized software system from conceptualization to completion.

CO6. Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: IV |
| **Credits**<br>Theory: 4<br>Practical:0 | **Subject:** Data Analytics |
| **Course Code:** SDCS-241 | **Title:** Data Analytics |

**Course Objectives:**

- Student will be able to describe the life cycle phases of Data Analytics through discovery, planning and building.
- Student will be able to understand and apply Data Analysis Techniques.
- Student will be able to implement various Data streams
- Student will be able to understand item sets, Clustering, frame works & Visualizations.
- Student will be able to apply R tool for developing and evaluating real time applications

**Nature of Paper: Discipline Specific Electives**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction to Data Analytics: Sources and nature of data, classification of data, characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. Data Analytics Lifecycle: Need, key roles for successful analytic projects, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, and operationalization. | **8** |
| II | Data Analysis: Regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods, analysis of time series: linear systems analysis & nonlinear dynamics, rule induction, neural networks: learning and generalisation, competitive learning, principal component analysis and neural networks, fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods. | **8** |
| III | Mining Data Streams: Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-time Analytics Platform ( RTAP) applications, Case studies – real time sentiment analysis, stock market predictions | **8** |
| IV | Frequent Itemsets and Clustering: Mining frequent itemsets, market based modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent itemsets in a stream, | **8** |

| | | |
|---|---|---|
| | clustering techniques: hierarchical, K-means, clustering high dimensional data, CLIQUE and ProCLUS, frequent pattern based clustering methods, clustering in non-euclidean space, clustering for streams and parallelism. | |
| V | Frame Works and Visualization: MapReduce, Hadoop, Pig, Hive, HBase, MapR, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems, Visualization: visual data analysis techniques, interaction techniques, systems and applications. Introduction to R - R graphical user interfaces, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data. | **8** |

**Reference / Text Books:**

**Text books:**


1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press


**Reference Books:**


1. Bill Franks, Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & Sons.
2. John Garrett, Data Analytics for IT Networks : Developing Innovative Use Cases, Pearson Education
3. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
4. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big Data Analytics”, EMC Education Series, John Wiley


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report | 20 |
| Seminar On Research Project Report | |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.Describe the life cycle phases of Data Analytics through discovery, planning and building.
CO2.Understand and apply Data Analysis Techniques.
CO3.Implement various Data streams.
CO4.Understand item sets, Clustering, frame works & Visualizations.
CO5.Apply R tool for developing and evaluating real time applications.

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: IV |
| **Credits**<br>Theory: 4<br>Practical:0 | **Subject:** Web Designing |
| **Course Code:** SDCS-242 | **Title:** Web Designing |

**Course Objectives:**

- Student will be able to understand principle of Web page design and about types of websites
- Student will be able to visualize and Recognize the basic concept of HTML and application in web designing.
- Student will be able to recognize and apply the elements of Creating Style Sheet (CSS).
- Student will be able to understand the basic concept of Java Script and its application.
- Student will be able to introduce basics concept of Web Hosting and apply the concept of SEO.

**Nature of Paper: Discipline Specific Electives**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction : Basic principles involved in developing a web site, Planning process, Domains and Hosting, Responsive Web Designing , Types of Websites (Static and Dynamic Websites), Web Standards and W3C recommendations, Introduction to HTML: What is HTML , HTML Documents, Basic structure of an HTML document , Creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks | **8** |
| II | Elements of HTML: HTML Tags., Working with Text , Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls | **8** |
| III | Concept of CSS: Creating Style Sheet, CSS Properties, CSS Styling (Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model (Introduction, Border properties, Padding Properties, Margin properties) CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Color, Creating page Layout and Site Designs. | **8** |
| IV | Introduction to Client Side Scripting, Introduction to Java Script , Java script Types, Variables in JS, Operators in JS, Conditions Statements, Java Script Loops, JS Popup Boxes, JS Events, JS Arrays, Working with Arrays, JS Objects, JS Functions, Using Java Script in Real time, Validation of Forms, Related Examples | **8** |
| V | Web Hosting: Web Hosting Basics, Types of Hosting Packages, | |

| | | |
|---|---|---|
| | Registering domains, Defining Name Servers, Using Control Panel, Creating Emails in Cpanel, Using FTP Client, Maintaining a Website Concepts of SEO: Basics of SEO, Importance of SEO, Onpage Optimization Basics | **8** |

**Reference / Text Books:**

**Text books:**


1. Steven M. Schafer, "HTML, XHTML, and CSS Bible, 5ed", Wiley India
2. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design", Wiley India


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br><br>100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.Understand principle of Web page design and about types of websites
CO2.Visualize and Recognize the basic concept of HTML and application in web designing
CO3.Recognize and apply the elements of Creating Style Sheet (CSS)
CO4.Understand the basic concept of Java Script and its application
CO5.Introduce basics concept of Web Hosting and apply the concept of SEO.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: IV |
| **Credits**<br>Theory: 4<br>Practical:0 | **Subject:** Computer Graphics |
| **Course Code:** SDCS-243 | **Title:** Computer Graphics |

**Course Objectives:**

- Student will be able to understand the graphics hardware used in field of computer graphics.
- Student will be able to understand the concept of graphics primitives such as lines and circle based on different algorithms.
- Student will be able to apply the 2D graphics transformations, composite transformation and Clipping concepts.
- Student will be able to apply the concepts of and techniques used in 3D computer graphics, including viewing transformations.
- Student will be able to perform the concept of projections, curve and hidden surfaces in real life.

**Nature of Paper: Discipline Specific Electives**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction and Line Generation: Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms. | **8** |
| II | Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithmsLine clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping | **8** |
| III | Three Dimensional: 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3- D viewing, projections, 3-D Clipping. | **8** |
| IV | Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces. | **8** |
| V | Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, | **8** |

| | | |
|---|---|---|
| | Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows. | |

**Reference / Text Books:**

**Text books:**


1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education


**Reference Books:**


1. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill
2. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – McGraw Hill.
3. Amrendra N Sinha and Arun D Udai," Computer Graphics", McGraw Hill.
4. R.K. Maurya, "Computer Graphics " Wiley Dreamtech Publication.
5. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited.


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br><br>100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.Understand the graphics hardware used in field of computer graphics.

CO2.Understand the concept of graphics primitives such as lines and circle based on different algorithms.

CO3.Apply the 2D graphics transformations, composite transformation and Clipping concepts.

CO4.Apply the concepts of and techniques used in 3D computer graphics, including viewing transformations.

CO5.Perform the concept of projections, curve and hidden surfaces in real life.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: IV |
| **Credits**<br>Theory: 4<br>Practical:0 | **Subject:** Object Oriented System Design using Java |
| **Course Code:** SDCS-244 | **Title:** Object Oriented System Design using Java |

**Course Objectives:**

- Student will be able to develop Applications for Range of Problems Using Object-Oriented Programming Techniques.
- Student will be able to design Simple Graphical User Interface Applications.

**Nature of Paper: Discipline Specific Electives**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Object Oriented Thinking and Java Basics:**<br>Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class. | **8** |
| II | **Inheritance, Packages and Interfaces:**<br>Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes.<br>The Object ClassDefining, Creating and Accessing a Package, Understanding Classpath, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO. | **8** |
| III | **Exception Handling and Multithreading:**<br>Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes.String Handling, Exploring Java.Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating | **8** |

| | | |
|---|---|---|
| | Threads, Thread Priorities, Synchronizing Threads, Interthread communication, Thread Groups, Daemon Threads, Enumerations, Autoboxing, Annotations, Generics. | |
| IV | **Event Handling:**<br>Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes.<br>The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scrollpane, Dialogs, Menubar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag. | **8** |
| V | **Applets:**<br>Concepts f Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets.<br>**Swing:**<br>Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- J applet, J frame and J component, Icons and Labels, Text Fields, Buttons – The Jbutton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables. | **8** |

**Reference / Text Books:**

**Text books:**


1. An Introduction to Programming and OO Design using Java, J. Nino and F.A. Hosch, John Wiley & Sons
2. An Introduction to OOP, Third Edition, T. Budd, Pearson Education.


**Reference Books:**


1. Introduction to Java Programming, Y. Daniel Liang, Pearson Education.
2. An Introduction to Java Programming and Object-Oriented Application Development, R.A. Johnson- Thomson.
3. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Eighth Edition, Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, eighth Edition, Pearson Education


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report | 20 |
| Seminar On Research Project Report | |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.Develop Applications for Range of Problems Using Object-Oriented Programming Techniques
CO2.Design Simple Graphical User Interface Applications.
CO3.Able to develop multithreaded applications with synchronization.
CO4.Able to develop applets for web applications.
CO5.Able to design GUI based applications

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year II /Semester IV**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech (CSE)** | Year: II<br>Semester: IV |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject: Theory of Automata and Formal Languages Lab** |
| **Course Code:**<br>**SECS-241P** | **Title: Theory of Automata and Formal Languages Lab** |

**Course Objectives:**

1. Demonstrate the concept of Finite Automata and Regular Expression.
2. Demonstrate the designing of Finite Automata
3. Design the grammar for respective language.
4. Demonstrate the designing of Push Down Automata
5. Demonstrate the designing of Turing Machine

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks/2**

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Understanding of software like JFLAP (Java Formal Languages and AutomataPackage) for experimenting with formal languages | 2 |
| II | Deterministic Finite Automata (DFA) | 2 |
| III | Nondeterministic Finite Automata (NFA) | 2 |
| IV | Conversion of NFA to DFA | 2 |
| V | DFA Minimization | 2 |
| VI | DFA to regular grammar conversion | 2 |
| VII | DFA to regular expression conversion | 2 |
| VIII | Combining automata | 2 |
| IX | Regular expression to DFA conversion | 2 |
| X | Mealy and Moore machine | 2 |

**Reference / Text Books:**

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks:50** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br><br>30 |
| **Total:** | 50 |

**Course Learning Outcomes:**

**Student will be able to:**

CO1.Demonstrate the concept of Finite Automata and Regular Expression.
CO2.Demonstrate the designing of Finite Automata.
CO3.Design the grammar for respective language.
CO4.Demonstrate the designing of Push Down Automata.
CO5.Demonstrate the designing of Turing Machine.
CO6.Convert Regular expression to DFA conversion.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II /Semester IV**

| | |
|---|---|
| **Programme:** UG<br>**Class: B.Tech (CSE)** | Year: II<br>Semester: IV |
| **Credits**<br>Theory:<br>Practical: 2 | **Subject: Software Engineering Lab** |
| **Course Code:**<br>**SECS-242P** | **Title: Software Engineering Lab** |

**Course Objectives:**
To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits:50% Marks/2**

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case | 2 |
| II | Preparation of Software Requirement Specification Document, Design Documents and | 2 |
| III | Develop a Testing Phase related documents. | 2 |
| IV | Preparation of Software Configuration Management and Risk Management related documents | 2 |
| V | Study and usage of any Design phase CASE tool | 2 |
| VI | Performing the Design by using any Design phase CASE tools. | 2 |
| VII | Develop test cases for unit testing and integration testing | 2 |
| VIII | Develop test cases for various white box and black box testing techniques. | 2 |
| IX | Draw the activity diagram | 2 |
| X | Draw the state chart diagram. | |

**Reference / Text Books:**
1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks:50** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br><br>30 |
| **Total:** | 50 |

**Course Learning Outcomes:**

**Student will be able to:**

CO1.Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement

CO2.Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship

CO3.Draw a class diagram after identifying classes and association among the

CO4.Graphically represent various UML diagrams , and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially

CO5.Able to use modern engineering tools for specification, design, implementation and testing

CO6.Develop test cases for various white box and black box testing techniques.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester V**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech (CSE)** | Year: III<br>Semester: V |
| **Credits**<br>Theory:4<br>Practical: 0 | **Subject:** Design and Analysis of Algorithm |
| **Course Code:** SECS-351 | **Title:** Design and Analysis of Algorithm |

**Course Objectives:**
**The Student will Learn:**

1. To analyze performance of algorithms & Understanding the growth of function.
2. To choose the appropriate data sorting algorithm for performing sorting in data structure.
3. To choose the appropriate data structure and algorithm design method for a specified application.
4. To solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.
5. To analyze performance of string matching and randomized algorithms. To introduce P and NP classes.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Introduction:** Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Asymptotic Notations Performance Measurements, Recurrence Relation, Method of Solving recurrence function<br>**Sorting and Order Statistics** – Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time. | **8L** |
| II | **Advanced Data Structures:** Red-Black Trees, B – Trees, Binomial Heaps, and Fibonacci Heaps. | **8L** |
| III | **Divide and Conquer:** Matrix Multiplication, Convex Hull and Searching. Longest Common Subsequence (LCS) Problem **Greedy Methods**: Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths – Dijkstra's and Bellman Ford Algorithms. | 8L |
| IV | **Dynamic Programming:** Knapsack, All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Resource Allocation Problem. Branch and Bound : Travelling Salesman Problem, **Backtracking:** Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets. | 8L |
| V | **String Matching:** Algorithm for string matching, Theory of NP-Completeness, Approximation Algorithms and Randomized Algorithms. | 8L |

**Reference / Text Books:**


1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms", 3. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008.
3. LEE "Design & Analysis of Algorithms (POD)",McGraw Hill
4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
5. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
6. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report | 20 |
| Seminar On Research Project Report | |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course: Data Structure

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.

CO2.Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).

CO3.Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.

CO4.Apply classical sorting, searching, optimization and graph algorithms.

CO5.Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.

CO6.Understand string matching algorithms, approximation algorithms and randomized algorithms.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester V**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech (CSE)** | Year: III<br>Semester: V |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject:** Database Management System |
| **Course Code:** SECS-352 | **Title:** Database Management System |

**Course Objectives:**
**The Student will Learn:**

- To understand the basic concepts and the applications of database systems. To apply channel allocation, framing, error and flow control techniques.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles and implementations.
- To understand the transaction processing
- To implement the concurrency techniques in transaction processing

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Introduction:** Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree. | **8L** |
| II | Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL | **8L** |
| III | Data Base Design & Normalization: Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design | **8L** |
| IV | Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable | **8L** |

| | | |
|---|---|---|
| | Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System. | |
| V | Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle. | **8L** |

**Reference / Text Books:**


1. “Data base System Concepts”, A. Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition
2. "Fundamental of Database systems " by Elsmasri &Navathe , 6th edition, Addison-Wesley
3. "Data base Concepts” by CJ. Date, 7th edition
4. "Database Management Concepts" by Raghu Ramakrishnan & Johannes Gehrke, 2nd edition.
5. Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2nd ed., ELSEVIER.
6. Database Management Systems, G.K. Gupta, TMH.


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | 10 |
| 4) Research Project Report | |
| Seminar On Research Project Report | 10 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course: Nil

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.To memorize the basic concept of database systems and to understand the database modeling concept using ER modeling.

CO2.To understand and apply the concept of relational data model and SQL for database management.

CO3.To understand and apply the concept of normalization using FD, MVD & JD’s for designing database effectively.

CO4.To understand the Transaction processing fundamentals and transaction management.

CO5.To understand the concept of deadlock and distributed database.

CO6.To understand various protocols for maintaining concurrency in transactions of real world scenarios.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester V**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech (CSE)** | Year: III<br>Semester: V |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject:** Discrete Structures & Theory of Logic |
| **Course Code:** SECS-353 | **Title:** Discrete Structures & Theory of Logic |

**Course Objectives:**
**The Student will Learn:**

- To acquaint the concept of set theory, relations and functions.
- To understand the concepts related to algebraic structures.
- To introduce the fundamentals of Boolean algebra and its properties.
- To acquaint the concept of Propositional Logic and Predicate Logic
- To use concept of trees and graph theory for solving practical problems.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions. | **8L** |
| II | Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields. | **8L** |
| III | Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. | **8L** |
| IV | Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic | **8L** |
| V | Trees: Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph | **8L** |

| | | |
|---|---|---|
| | coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle | |

**Reference / Text Books:**


1. Hari Krishan, Discrete Mathematics, Pragati Edition
2. Lipchitz, S. & Lipson S., Discrete Mathematics, Outline series Tata McGraw Hill.
3. Kumar, S.S., Discrete Mathematics, S. Chand.
4. Dean, N., Essence of Discrete Mathematics, Prentice Hall Liu, C.L., Elements of Discrete Mathematics, McGraw Hill.
5. Rosen, Kenneth H., Discrete Mathematics and Its Applications, McGraw Hill.


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report | 20 |
| Seminar On Research Project Report | |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.To memorize and understand the concept of set theory, relation and function.

CO2.To understand the fundamentals of algebraic structures

CO3.To understand the fundamentals of Boolean algebra and illustrate their properties

CO4.To understand the concept of Propositional Logic and Predicate Logic and illustrate their properties.

CO5.To memorize and understand the concept of trees & graphs and exhibit their properties effectively.

CO6.To memorize and understand the concept of Recurrence Relation, Generating function and Combinatorics.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester V**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech CSE** | Year: III<br>Semester: V |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject:** Machine Learning Techniques |
| **Course Code:**<br>SDCS- 351-1 | **Title:** Machine Learning Techniques |

**Course Objectives:**
**The Student will Learn:**
1. To understand the concept of machine learning.
2. To acquaint the concept of Regression and Support vector machine.
3. To introduce the concept of decision tree learning.
4. To understand the concept of artificial neural network and deep learning.
5. To acquaint the concept of Reinforcement Learning.

**Nature of Paper: Department Elective**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | INTRODUCTION – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning; | **8L** |
| II | REGRESSION: Linear Regression and Logistic Regression BAYESIAN LEARNING - Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. SUPPORT VECTOR MACHINE: Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel,and Gaussiankernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM | **8L** |
| III | DECISION TREE LEARNING - Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning. INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning | **8L** |
| IV | ARTIFICIAL NEURAL NETWORKS – Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks, Derivation of Backpropagation Algorithm, Generalization, Unsupervised Learning – SOM Algorithm and its variant; DEEP | **8L** |

| | | |
|---|---|---|
| | LEARNING - Introduction,concept of convolutional neural network , Types of layers – (Convolutional Layers , Activation function , pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network, Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker, Self-deriving car etc. | |
| V | REINFORCEMENT LEARNING–Introduction to Reinforcement Learning , Learning Task,Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process , Q Learning - Q Learning function, Q Learning Algorithm ), Application of Reinforcement Learning,Introduction to Deep Q Learning. GENETIC ALGORITHMS: Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications | **8L** |

**Reference / Text Books:**


1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009
4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report | 20 |
| Seminar On Research Project Report | |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.To understand the need for machine learning for various problem solving.

CO2.To understand a wide variety of learning algorithms and how to evaluate models generated from data.

CO3.To understand the latest trends in machine learning.

CO4.To design appropriate machine learning algorithms and apply the algorithms to a real-world problems.

CO5.To optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

CO6.To understand the concept of reinforcement Learning and genetic algorithms.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester V**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech CSE** | Year: III<br>Semester: V |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject:** Application of Soft Computing |
| **Course Code:**<br>SDCS- 351-2 | **Title:** Application of Soft Computing |

**Course Objectives:**
**The Student will Learn:**
1. To introduce the concept of soft computing.
2. To acquaint the concept of Fuzzy System.
3. To understand the concepts of Neuro-fuzzy Modeling.
4. To introduce the concept of genetic algorithms.
5. To understand the applications of soft computing and to introduction MATLAB Environment.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction to Soft Computing, ARTIFICIAL NEURAL NETWORKS Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self-organizing networks - Hopfield network. | **8L** |
| II | FUZZY SYSTEMS Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making. | **8L** |
| III | NEURO - FUZZY MODELING Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation | **8L** |
| IV | GENETIC ALGORITHMS Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method | **8L** |
| V | APPLICATION OF SOFT COMPUTING Optimization of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques. | **8L** |

**Reference / Text Books:**

**An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)**

1. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer ( Springer)
2. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
3. Neural Networks and Learning Machines Simon Haykin (PHI)
4. Sivanandam, Deepa, " Principles of Soft Computing", Wiley

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br><br>100 |
| **Total:** | 150 |

Prerequisites for the course: Fuzzy Logic

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.To memorize and understand the concept of soft computing.
CO2.To understand the fundamentals of Fuzzy System.
CO3.To understand the fundamentals of Neuro-fuzzy Modeling
CO4.To understand the concept of genetic algorithms.
CO5.To understand the concept of genetic algorithm based Internet Search Techniques.
CO6.To memorize and understand the concept of applications of soft computing.

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester V**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech CSE** | Year: III<br>Semester: V |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject:** Augmented & Virtual Reality |
| **Course Code:**<br>SDCS- 351-3 | **Title:** Augmented & Virtual Reality |

**Course Objectives:**
**The Student will Learn:**
1. To introduce the concept of Virtual reality and virtual environments.
2. To acquaint the concept of 3D user interface input hardware.
3. To understand the concepts of Software technologies and VR environment.
4. To introduce the concept of 3D Interaction Techniques.
5. To understand the applications of Augmented and Mixed Reality.

**Nature of Paper: Department elective**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | VIRTUAL REALITY AND VIRTUAL ENVIRONMENTS: The historical development of VR: Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality. HARDWARE TECHNOLOGIES FOR 3D USER INTERFACES: Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces | **8L** |
| II | 3D USER INTERFACE INPUT HARDWARE: Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interfaces. | **8L** |
| III | SOFTWARE TECHNOLOGIES: Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market | **8L** |
| IV | 3D INTERACTION TECHNIQUES: 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Deign Guidelines - 3D Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations of Wayfinding, User Centered Wayfinding Support, Environment | **8L** |

| | | |
|---|---|---|
| | Centered Wayfinding Support, Evaluating Wayfinding Aids, Design Guidelines - System Control, Classification, Graphical Menus, Voice Commands, Gestrual Commands, Tools, Mutimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry . DESIGNING AND DEVELOPING 3D USER INTERFACES: Strategies for Designing and Developing Guidelines and Evaluation. VIRTUAL REALITY APPLICATIONS: Engineering, Architecture, Education, Medicine, Entertainment, Science, Training. | |
| V | Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems | **8L** |

**Reference / Text Books:**


1. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
2. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.
3. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005.
4. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005.
5. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | 10 |
| 4) Research Project Report | 10 |
| Seminar On Research Project Report | |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course: Computer Graphics

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.To memorize and understand the concept of Virtual reality and virtual environments.

CO2.To understand the fundamentals of 3D user interface input hardware.

CO3.To understand the fundamentals of Software technologies and VR environment.

CO4.To understand the concept of 3D Interaction Techniques.

CO5.To understand the concept of designing and developing 3D user interface and Virtual reality applications.

CO6.To memorize and understand the concept of Augmented and Mixed Reality.

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester V**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech CSE** | Year: III<br>Semester: V |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject:** Human Computer Interface |
| **Course Code:**<br>SDCS- 351-4 | **Title:** Human Computer Interface |

**Course Objectives:**
**The Student will Learn:**
1. To introduce the concept of user interface and graphical user interface.
2. To acquaint the concept of design process.
3. To understand the concepts of screen designing.
4. To introduce the concept of windows and multimedia.
5. To understand the applications of software tools and interaction tools.

**Nature of Paper: Department Elective**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Importance of user Interface its definition, importance and benefits of good design, Overview history of Screen design.<br>The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface | **8L** |
| II | Design process: Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen Designing: Design goals of screen designing. | **8L** |
| III | Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design. | **8L** |
| IV | Windows: New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors | **8L** |
| V | Software tools: Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers. | **8L** |

**Reference / Text Books:**


1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.
3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report | 20 |
| Seminar On Research Project Report | |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course: Nil

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.Understanding user interface good design.
CO2.Analyzing the design process and understanding human interaction with computers.
CO3.Analyzing the screen design process and understanding human interaction with computers.
CO4.Understand the technological consideration in interface design.
CO5.Understanding windows, components and multimedia.
CO6.Understanding software tools and interaction devices.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year: III /Semester: V**

| | |
|---|---|
| **Programme: UG**<br>**Class:B.Tech-CSE** | Year: III<br>Semester: V |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject: Design Analysis and Algorithm lab** |
| **Course Code:**<br>**SECS-251P** | **Title: Design Analysis and Algorithm lab** |

**Course Objectives:**

1. The principle objective of this course is to build solid foundation in algorithms and their applications.
2. To implement various divide and conquer techniques examples.
3. To implement various Greedy techniques examples.
4. To implement various Dynamic Programming techniques examples.
5. To provide a practical exposure of all algorithms.
6. To understand the importance of algorithm and its complexities

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks/2**

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Write a program to perform operation count for a given pseudo code | 2 |
| II | Write a program to perform Bubble sort for any given list of numbers. | 2 |
| III | Write a program to perform Insertion sort for any given list of numbers. | 2 |
| IV | Write a program to perform Quick Sort for the given list of integer values. | 2 |
| V | Write a program to find Maximum and Minimum of the given set of integer values. | 2 |
| VI | Write a Program to perform Merge Sort on the given two lists of integer values. | 2 |
| VII | Write a Program to perform Binary Search for a given set of integer values recursively and nonrecursively. | 2 |
| VIII | Write a program to find solution for knapsack problem using greedy method. | 2 |
| IX | Write a program to find minimum cost spanning tree using Prim's Algorithm. | 2 |
| X | Write a program to find minimum cost spanning tree using Kruskal's Algorithm | 2 |

**Reference / Text Books:**

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms".

**Evaluation/Assessment Methodology**

**Max. Marks:50**

| | |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3)Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br><br>30 |
| **Total:** | 50 |

**Course Learning Outcomes:**

Student will be able to :

CO1.To learn the importance of designing an algorithm in an effective way by considering space and time complexity
CO2.To learn divide and conquer strategy based algorithms
CO3.To learn greedy method based algorithms
CO4.To learn the dynamic programming design techniques
CO5.To develop Recursive backtracking algorithms
CO6.To learn graph search and network flow algorithms

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III / Semester V**

| | |
|---|---|
| **Programme:** UG (R)<br>**Class: B.Tech(CSE)** | Year: III<br>Semester: V |
| **Credits**<br>Theory: 0<br>Practical: 2 | **Subject: DBMS LAB** |
| **Course Code:**<br>**SECS-352P** | **Title: DBMS LAB** |

**Course Objectives:**
1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. To understand the relational database design principles.
4. To become familiar with the basic issues of transaction

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks/2**

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Installing oracle. | 2 |
| II | Creating Entity-Relationship Diagram using case tools. | 2 |
| III | Writing SQL statements Using ORACLE | 2 |
| IV | Writing basic SQL SELECT statements | 2 |
| V | Restricting and sorting data. | 2 |
| VI | Displaying data from multipletables. | 2 |
| VII | Aggregating data using group function | 2 |

**Reference / Text Books:**
1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill 2. Date C J, "An Introduction to Database Systems", Addision Wesley

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

**Evaluation/Assessment Methodology**

**Max. Marks:50**

| | |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br><br>30 |
| **Total:** | 50 |

**Course learning outcomes:**

Student will be able to :

CO1.Get practical knowledge on designing and creating relational database systems.

CO2.Understand various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.

CO3.Use various software to design and build ER Diagrams, UML, Flow chart for related database systems.

CO4.Able to design and implement database applications on their own.

CO5.Display data from multiple tables

CO6.Able to implement Restrict and sort data.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III/ Semester V**

| | |
|---|---|
| **Programme:** UG (R)<br>**Class:B.TECH-CSE** | Year: III<br>Semester: V |
| **Credits**<br>Theory: 4<br>Practical: 2 | **Subject: Discrete Structures & Theory of Logic Lab** |
| **Course Code: SECS-353P** | **Title: Discrete Structures & Theory of Logic Lab** |

**Course Objectives:**

1. To implement basic discrete structures algorithms
2. To analyze algebraic techniques and implement algebraic operations.
3. To implement logical problems like Boolean algebra, poker hand problem and birthday problem
4. To implement closed formula of recursive sequence

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks/2**

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Implementation basic python program related to Data types, operators. a) Evaluate value of 2x3 - 6x2 + 2x - 1 for x = 3 b) Write a Python program to find the roots of a quadratic function ax2 + bx + c = 0, where a, b and c are real numbers and a ≠ 0 | 2 |
| II | Implementation of decision, Loop in python. a) Write a program to calculate factorial of a number. b) Write a program to calculate sum of first n natural numbers where n is finite. c) Write a program for cube sum of first n natural numbers where n is finite. | 2 |
| III | Implementation of various set operations (union, intersection, difference, symmetric difference, Power set, cardinality). | 2 |
| IV | Write program to perform following operation: a) Is the given relation is reflexive? b) Is the given relation is symmetric? c) Is the given relation is Transitive. | 2 |
| V | Write program to generate recursive sequence of a closed formula and also calculate its value at particular non negative integer recursively for the following: a) Polynomial 2n b) Fibonacci sequence c) Factorial of a number | 2 |
| VI | Write program to: a. Perform + m (addition modulo) and xm (multiplication modulo)for a particular set. b. Check closure property for + m (addition modulo) and xm (multiplication modulo) for any set you have assumed. c. Find identity element in any given algebraic system if exist. Find inverse of all elements in a given group if identity element is given. | 2 |

| | | |
|---|---|---|
| VII | Write program for various number systems: a. Decimal to binary, octal & hexadecimal b. Binary to decimal, octal and hexadecimal c. Octal to decimal, binary and hexadecimal d. Hexadecimal to decimal, binary and octal e. Logic gate simulation AND, OR, NOT, EXOR, NOR | 2 |

**Reference / Text Books:**

**1.** Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

**Evaluation/Assessment Methodology**

**Max. Marks:50**

| | |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br><br>30 |
| **Total:** | 50 |

**Course Learning outcomes**

**Student will be able:**

CO1.To implement basic discrete structures algorithms.
CO2.To analyze algebraic techniques and implement algebraic operations.
CO3.To implement logical problems like Boolean algebra, poker hand problem and birthday problem.
CO4.To implement closed formula of recursive sequence.
CO5.Implement the following operation: a) Is the given relation is reflexive? b) Is the given relation is symmetric c) Is the given relation is Transitive.
CO6.Implement various set operations union, intersection, difference, symmetric difference, Power set, cardinality.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester VI**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech CSE** | Year: III<br>Semester: VI |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject: Computer Networks** |
| **Course Code:** SECS-361 | **Title: Computer Networks** |

**Course Objectives:**
**The Student will Learn:**

- To explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission, Vulnerabilities in any computing system and security solution.
- To apply channel allocation, framing, error and flow control techniques.
- To describe the functions of Network Layer i.e. Logical addressing, sub netting & Routing Mechanism.
- To explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.
- To explain the functions offered by session and presentation layer and their Implementation.
- To explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.

**Nature of Paper:Core**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Introductory Concepts**: Goals, applications and categories of networks, Internet Organization, ISP, Network structure and architecture (layering principles, services, protocols and standards), Overview of OSI reference model, Overview of TCP/IP protocol suite, Network devices and components.<br>**Physical Layer:** Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing. | **8L** |
| II | **Link layer:** Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols).<br>Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms). | **8L** |
| III | **Network Layer:** Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic routing,Routing algorithms and protocols, Congestion control algorithms, IPv6. | **8L** |

| | | |
|---|---|---|
| IV | **Transport Layer:** Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service. | **8L** |
| V | **Application Layer:** DNS, WWW and HTTP, Electronic mail, FTP, Remote login, Network management, Data compression, Cryptography – basic concepts. | **8L** |

**Reference / Text Books:**


1. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill
2. Andrew Tanenbaum "Computer Networks", Prentice Hall.
3. William Stallings, "Data and Computer Communication", Pearson
4. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson.
5. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | 10 |
| 4) Research Project Report | |
| Seminar On Research Project Report | 10 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course: NIL

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission

CO2.Apply channel allocation, framing, error and flow control techniques.

CO3.Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.

CO4.Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.

CO5.Explain the functions offered by session and presentation layer and their Implementation.

CO6.Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester VI**

| | |
|---|---|
| **Programme:**UG(R)<br>**Class:B.Tech CSE** | Year: III<br>Semester:VI |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject: Compiler Design** |
| **Course Code:** SECS-362 | **Title: Compiler Design** |

**Course Objectives:**
**The Student will Learn:**

- To understand the concept of phases and passes of compiler and its tools like LEX and YAAC.
- To acquaint with knowledge of various parsers and parsing techniques.
- To analyze and implement compiler by Syntax-directed Translation schemes.
- To understand the concept of symbol table and error detection and recovery mechanism.
- To understand the concept of code generation and code optimization.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40$ Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Introduction to Compiler:** Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG. | **8L** |
| II | Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables. | **8L** |
| III | **Syntax-directed Translation:** Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements | **8L** |
| IV | **Symbol Tables:** Data structure for symbols tables, representing scope information. **Run-Time Administration:** Implementation of simple stack allocation scheme, storage allocation in block structured language. **Error** | **8L** |

| | | |
|---|---|---|
| | **Detection & Recovery:** Lexical Phase errors, syntactic phase errors semantic errors. | |
| V | **Code Generation**: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. **Code optimization:** Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis. | **8L** |

**Reference / Text Books:**


1. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill, 2003.
3. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
4. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
5. V Raghvan, " Principles of Compiler Design", TMH
6. Kenneth Louden," Compiler Construction", Cengage Learning.


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br><br>100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.To explain the different phases and passes of compiler and eventually recognize patterns, tokens and regular expressions.
CO2.To implement the concept of parsers and construct the parsing tables
CO3.To illustrate and create the intermediate code
CO4.To analyze and implement compiler by Syntax-directed Translation schemes.
CO5.To summarize the knowledge of various parsers and parsing techniques.
CO6.To integrate the concept of code generation and code optimization.

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester VI**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech CSE** | Year: III<br>Semester:VI |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject: BIG DATA** |
| **Course Code:** SDCS-361 | **Title: BIG DATA** |

**Course Objectives:**
**The Student will Learn:**

- To demonstrate knowledge of Big Data Analytics concepts and its applications in business.
- To demonstrate functions and components of Map Reduce Framework and HDFS.
- To discuss Data Management concepts in NoSQL environment.
- To explain process of developing Map Reduce based distributed processing applications.
- To explain process of developing applications using HBASE, Hive, Pig etc.
- To demonstrate knowledge of Big Data Analytics concepts and its applications in business.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Introduction to Big Data**: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools. | **8L** |
| II | **Hadoop:** History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System.<br>**Map Reduce:** Map Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce. | **8L** |
| III | **HDFS (Hadoop Distributed File System):** Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data | **8L** |

| | | |
|---|---|---|
| | structures.<br>**Hadoop Environment:** Setting up a Hadoop cluster, cluster specification, cluster setup and installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS<br>monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud | |
| IV | **Hadoop Eco System and YARN**: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features - NameNode high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN.<br>**NoSQL Databases:** Introduction to NoSQL<br>**MongoDB:** Introduction, data types, creating, updating and deleting documents, querying, introduction to indexing, capped collections<br>**Spark:** Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed Databases, anatomy of a Spark job run, Spark on YARN<br>**SCALA:** Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, inheritance. | **8L** |
| V | **Hadoop Eco System Frameworks**: Applications on Big Data using Pig, Hive and HBase<br>**Pig** - Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators, **Hive** - Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries.<br>**HBase** – Hbase concepts, clients, example, Hbase vs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper. IBM Big Data strategy, introduction to Infosphere, BigInsights and Big Sheets, introduction to Big SQL. | **8L** |

**Reference / Text Books:**


1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
2. Big-Data Black Book, DT Editorial Services, Wiley
3. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch,"Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill.
4. Thomas Erl, Wajid Khattak, Paul Buhler, "Big Data Fundamentals: Concepts, Drivers and Techniques", Prentice Hall.
5. Bart Baesens "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons
6. ArshdeepBahga, Vijay Madisetti, "Big Data Science & Analytics: A HandsOn Approach ", VPT


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3)Assignments<br>4)Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br>20<br><br><br><br>100 |
| **Total:** | 150 |

| Prerequisites for the course: DBMS |
| --- |
| **Course Learning Outcomes:**<br>**After completing the course, students should be able to:**<br>CO1.Demonstrate knowledge of Big Data Analytics concepts and its applications in business.<br>CO2.Demonstrate functions and components of Map Reduce Framework and HDFS<br>CO3.Discuss Data Management concepts in NoSQL environment.<br>CO4.Explain process of developing Map Reduce based distributed processing applications.<br>CO5.Explain process of developing applications using HBASE, Hive, Pig etc.<br>CO6.Explain demonstrate knowledge of Big Data Analytics concepts and its applications in business. |

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester VI**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech CSE** | Year: III<br>Semester:VI |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject: Image Processing** |
| **Course Code:** SDCS-362 | **Title: Image Processing** |

**Course Objectives:**
**The Student will Learn:**

- Student will be able to explain the basic concepts of two-dimensional signal acquisition, sampling, quantization and color model.
- Student will be able to apply image processing techniques for image enhancement in both the spatial and frequency domains.
- Student will be able to apply and compare image restoration techniques in both spatial and frequency domain
- Student will be able to compare edge based and region based segmentation algorithms for ROI extraction.
- Student will be able to explain compression techniques and descriptors for image processing.

**Nature of Paper:Elective Paper**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **DIGITAL IMAGE FUNDAMENTALS:** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models,Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT. | **8L** |
| II | **IMAGE ENHANCEMENT:**<br>Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement. | **8L** |
| III | **IMAGE RESTORATION:**<br>Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering | **8L** |

| | | |
|---|---|---|
| IV | **IMAGE SEGMENTATION:**<br>Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm. | **8L** |
| V | **IMAGE COMPRESSION AND RECOGNITION:**<br>Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching. | **8L** |

**Reference / Text Books:**


1. Rafael C. Gonzalez, Richard E. Woods,Digital Image Processing Pearson, Third Edition, 2010
2. Anil K. Jain, Fundamentals of Digital Image Processing Pearson, 2002.
3. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,Digital Image Processing using MATLAB Pearson Education, Inc., 2011.
5. D,E. Dudgeon and RM. Mersereau,Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.
6. William K. Pratt,Digital Image Processing John Wiley, New York, 2002


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | 10 |
| 4) Research Project Report | |
| Seminar On Research Project Report | 10 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course: NIL

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.Explain the basic concepts of two-dimensional signal acquisition, sampling,quantization

CO2.Compare and contrast different color model.

CO3.Apply image processing techniques for image enhancement in both the spatial and frequency domains.

CO4.Apply and compare image restoration techniques in both spatial and frequency domain.

CO5.Compare edge based and region based segmentation algorithms for ROI extraction.

CO6.Explain compression techniques and descriptors for image processing.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester VI**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech CSE** | Year: III<br>Semester:VI |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject: Real Time Systems** |
| **Course Code:** SDCS-363 | **Title: Real Time Systems** |

**Course Objectives:**
**The Student will Learn:**

1. To illustrate the need and the challenges in the design of hard and soft real time systems.
2. To compare different scheduling algorithms and the schedule criteria.
3. To discuss resource sharing methods in real time environment.
4. To compare and contrast different real time communication and medium access control techniques.
5. To analyze real time Operating system and Commercial databases.

**Nature of Paper:Elective Paper**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Introduction**<br>Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency. | **8L** |
| II | **Real Time Scheduling**<br>Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-DeadlineFirst (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm,Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems. | **8L** |
| III | **Resources Sharing**<br>Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects. | **8L** |

| | | |
|---|---|---|
| IV | **Real Time Communication**<br>Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols | **8L** |
| V | **Real Time Operating Systems and Databases**<br>Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases | **8L** |

**Reference / Text Books:**


1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, "Real Time Systems", Pearson Education
4. Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | 10 |
| 4) Research Project Report | |
| Seminar On Research Project Report | 10 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:NIL

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.Illustrate the need and the challenges in the design of hard and soft real time systems.
CO2.Compare different scheduling algorithms and the schedule criteria.
CO3.Discuss resource sharing methods in real time environment.
CO4.Compare and contrast different real time communication techniques
CO5.Compare different medium access control techniques.
CO6.Analyze real time Operating system and Commercial databases.

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester VI**

| | |
|---|---|
| **Programme:UG**<br>**Class:B.Tech CSE** | Year: III<br>Semester:VI |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject: Data Compression** |
| **Course Code:** SDCS-364 | **Title: Data Compression** |

**Course Objectives:**
**The Student will Learn:**

- Student will be able to explain the basic concepts of Compression Techniques.
- Student will be able to apply coding algorithm Techniques.
- Student will be able to apply Applications like Bi-level image compression, JBIG standard, JBIG2, Image compression and Dictionary Techniques.
- Student will be able to understand different Models and Scalar Quantization.
- Student will be able to compare Vector Quantization andScalar Quantization.

**Nature of Paper:Elective Paper**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Overview of Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: Introduction to information theory, Description of Models: Physical models, Probability models, Markov models, composite source model, Overview of Coding: uniquely decodable codes and Prefix codes. | **8L** |
| II | Description of Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Huffman coding: Loss less image compression, Text compression, Audio Compression. | **8L** |
| III | Coding of sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Moveto- front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy | **8L** |

| | | |
|---|---|---|
| | Compression. | |
| IV | Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization. | **8L** |
| V | Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured Vector Quantizers. | **8L** |

**Reference / Text Books:**


1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers.
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition, Khalid Sayood,The Morgan aufmann Series
4. Data Compression: The Complete Reference 4th Edition by David Salomon, Springer
5. Text Compression1st Edition by Timothy C. Bell Prentice Hall.


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | 10 |
| 4) Research Project Report | |
| Seminar On Research Project Report | 10 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course: Image Processing

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1.Explain the basic concepts of Compression Techniques.
CO2.Explain different models.
CO3.Apply coding algorithm Techniques.
CO4.Apply Applications like Bi-level image compression, JBIG standard, JBIG2, Image compression and Dictionary Techniques.
CO5.Explain different Models and Scalar Quantization.
CO6.Compare Vector Quantization and Scalar Quantization.

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester VI**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech CSE** | Year: III<br>Semester: VI |
| **Credits**<br>Theory:4<br>Practical:0 | **Subject: Universal Human Values & Professional Ethics** |
| **Course Code:**<br>UVE-601 | **Title: Universal Human Values & Professional Ethics** |

**Course Objectives:**
**The Student will Learn:**

1. To reinstate the rich cultural legacy and human values of which we are the custodians.
2. To focus on professional ethics which are broader indicators of desirable actions vis-à-vis undesirable actions.
3. To lay down broader guidelines of values and ethics for internal and external stakeholders.
4. To suggest operational guidelines for value-based and ethical practices in the higher educational institutions leading to implementation and monitoring.
5. To indicate the outcomes of creating a value-based and ethical culture in HEIs.
6. To suggest indicative reinforcement programm for nurturing human values and ethics in HEIs.

**Nature of Paper:Elective Paper**

**Minimum Passing Marks/Credits: 40% Marks/3**

L:3 T:0 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education:** Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels. | **8L** |
| II | **Understanding Harmony in the Human Being - Harmony in Myself**<br>Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya. | **8L** |
| III | **Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**<br>Understanding harmony in the Family- the basic unit of human interaction, | **8L** |

| | | |
|---|---|---|
| | Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha )- from family to world family!.<br>Universal Human Values of truth (Satya), nonviolence, love (Prem), Peace (Shanti) and righteous conduct (dharma). | |
| IV | **Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**<br>Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence. | **8L** |
| V | **Implications of the above Holistic Understanding of Harmony on Professional Ethics**<br>Natural acceptance of human values, Definiteness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.<br>**Workshop on Life Skills** | **8L** |

**Reference / Text Books:**


1. R R Gaur, R Sangal, G P Bagaria, 2009, a Foundation Course in Human Values and Professional Ethics.
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
3. E.F. Schumacher, 1973, small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
6. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3 Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 10<br><br><br><br>05<br>35 |
| **Total:** | 50 |
| Prerequisites for the course: NIL | |
| **Course Learning Outcomes:**<br>**After completing the course, students should be able to:**<br>CO1.Explain learning process for holistic development<br>CO2.Define Impeccable governance<br>CO3.Explain Effective institutional management<br>CO4.Use Well laid system of rewards and chastisement<br>CO5.Analyse Institutional climate where 'rights' enjoy and 'wrongs' are discouraged.<br>CO6.Development of Humanistic, Ethical, Constitutional and Universal Human Values. | |

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester VI**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech CSE** | Year: III<br>Semester: VI |
| **Credits**<br>Theory:0<br>Practical:2 | **Subject: Computer Networks lab** |
| **Course Code:** SECS-361P | **Title: Computer Networks lab** |

**Course Objectives:**
**The Student will Learn:**

- To understand the Implementation of Stop and Wait Protocol and Sliding Window Protocol.
- To understand the concept of ARP/RARPprotocols.
- To understand creation ofa socketfor HTTPforweb page
- To understand subnetting and applications using TCPand UDP Sockets.

**Nature of Paper:Core**

**Minimum Passing Marks/Credits: 50% Marks/2**

L:0 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| **I** | Implementation of Stop and Wait Protocol and Sliding Window Protocol. | **1L** |
| **II** | Study of Socket Programming and Client – Server model | **1L** |
| **III** | Write a code simulating ARP /RARP protocols. | **1L** |
| **IV** | Write a code simulating PING and TRACEROUTE commands | **1L** |
| **V** | Create a socket for HTTP for web page upload and download. | **1L** |
| **VI** | Write a program to implement RPC (Remote Procedure Call) | **1L** |
| **VII** | Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. i. Link State routing ii. Flooding iii. Distance vector | **1L** |
| **VIII** | To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc. | **1L** |
| **IX** | Configuration of router, hub, switch etc. (using real devices or simulators) | **1L** |
| **X** | Network packet analysis using tools like Wire shark, tcpdump, etc | **1L** |
| **XI** | Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc. | **1L** |
| **XII** | Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers) | **1L** |

**Reference / Text Books:**

1. BehrouzForouzan,“DataCommunicationandNetworking”,McGrawHill
2. AndrewTanenbaum“ComputerNetworks”, Prentice Hall.
3.WilliamStallings,“DataandComputer Communication”,Pearson
4. KuroseandRoss,“Computer Networking-ATop-DownApproach”, Pearson.
5. PetersonandDavie,“ComputerNetworks:ASystems Approach”, MorganKaufmann

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br><br>30 |
| **Total:** | 50 |
| Prerequisites for the course: | |
| **Course Learning Outcomes:**<br>**After completing the course, students should be able to:**<br>CO1.Simulate different network topologies.<br>CO2.Implement various farming methods of Data Link Layer.<br>CO3.Implement various Error and flow control techniques.<br>CO4.Implement network routing and addressing techniques.<br>CO5.Implement transport and security mechanisms<br>CO6.Implement Socket programming using UDP and TCP | |

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year III /Semester VI**

| | |
|---|---|
| **Programme:UG**<br>**Class:B.Tech CSE** | Year: III<br>Semester:VI |
| **Credits**<br>Theory:0<br>Practical:2 | **Subject: Compiler Design Lab** |
| **Course Code:** SECS-362P | **Title: Compiler Design Lab** |

**Course Objectives:**
**The Student will Learn:**

- To understand the different phases and passes of compiler and eventually recognize patterns, tokens and regular expressions.
- To understand the concept of parsers and construct the parsing tables.
- To understand and create the intermediate code

**Nature of Paper:Core**

**Minimum Passing Marks/Credits: 50% Marks/1**

L: T: P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| **Practical-1** | Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines. | **1L** |
| **Practical-2** | Implementation of Lexical Analyzer using Lex Tool | **1L** |
| **Practical-3** | Generate YACC specification for a few syntactic categories.<br>a) Program to recognize a valid arithmetic expression that uses operator +, –, * and /.<br>b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.<br>c) Implementation of Calculator using LEX and YACC<br>d) Convert the BNF rules into YACC form and write code to generate abstract syntax tree | **1L** |
| **Practical-4** | Write program to find ε – closure of all states of any given NFA with ε transition. | **1L** |
| **Practical-5** | Write program to convert NFA with ε transition to NFA without ε transition. | **1L** |
| **Practical-6** | Write program to convert NFA to DFA | **1L** |
| **Practical-7** | Write program to minimize any given DFA. | **1L** |
| **Practical-8** | Develop an operator precedence parser for a given language. | **1L** |
| **Practical-9** | Write program to find Simulate First and Follow of any given grammar. | **1L** |
| **Practical-10** | Construct a recursive descent parser for an expression | **1L** |

**Reference / Text Books:**

1. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill, 2003.

3. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001.
4. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools”, Pearson Education
5. V Raghvan, “ Principles of Compiler Design”, TMH
6. Kenneth Louden,” Compiler Construction”, Cengage Learning.

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report | 20 |
| 5) ESE | 30 |
| **Total:** | 50 |

Prerequisites for the course:

**Course Learning Outcomes:**

**After completing the course, students should be able to:**

CO1. Recognize patterns, tokens & regular expressions for lexical analysis.
CO2.Implement Lexical analyzer for source language using C and LEX or YACC tools
CO3.To analyze and construct top down and bottom up parsers.
CO4.To evaluate and create the intermediate code
CO5.To create machine code from the intermediate code format.
CO6.To Construct a recursive descent parser for an expression

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year : IV/Semester : VII**

| | |
|---|---|
| **Programme:UG**<br>**Class: B.Tech (CSE)** | Year: IV<br>Semester: VII |
| **Credits**<br>Theory: 4<br>Practical: 3 | **Subject: Distributed System** |
| **Course Code: SECS-471** | **Title: Distributed System** |

**Course Objectives:**

1. To understand theoretical concept of distributed system and message passing system.
2. To understand the concepts of Mutual Exclusion and classification of algorithm and Distributed deadlock**.**
3. To understand theoretical concepts of Agreement Protocol and distributed Resource Management**.**
4. To get knowledge failure recovery in distributed system and, fault tolerance services.
5. To understand the concepts of transaction and concurrency control and Replication Process and error recovery.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 40% Marks /3**

L: 3
T: 1
P: 3 ( In Hours/Week )
Theory - 3
Practical- 3

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.<br>Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks.<br>Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, and termination detection. | 8 |
| II | Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.<br>Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms. | 8 |
| III | Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.<br>Distributed Resource Management: Issues in distributed File Systems, | 8 |

| | | |
|---|---|---|
| | Mechanism for building distributed file systems, Design issues in Distributed Shared Memory. | |
| IV | Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.<br>Fault Tolerance: Issues in Fault Tolerance, Fault - tolerant services, Commit Protocols, Voting protocols, Dynamic voting protocols. | 8 |
| V | Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.<br>Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Transaction recovery.<br>Replication: System model and group communication, highly available services, Transactions with replicated data. | 8 |

**Reference/ Text Books:**


1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Computing , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Assignments | 20 |
| 3) External Theory | 100 |
| **Total:** | 150 |

**Course Learning Outcomes:**

CO1.Define the characterization of Distributed Systems, Theoretical Foundation for Distributed System and Concepts in Message Passing System
CO2.Explain the Distributed Mutual Exclusion and Distributed Deadlock Detection
CO3.To know about Shared Memory Techniques and have Sufficient knowledge about file access
CO4.Apply the Agreement Protocols and Distributed Resource Management
CO5.Analyze the Failure Recovery in Distributed Systems and Fault Tolerance
CO6.Evaluate the Transactions and Concurrency Control, Distributed Transactions and Replication

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year: IV/Semester: VII**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech (CSE)** | Year: IV<br>Semester: VII |
| **Credits**<br>Theory:<br>Practical: 2 | **Subject: Distributed System Lab** |
| **Course Code:**<br>**SECS-471P** | **Title: Distributed System Lab** |

**Course Objectives:**

1. To understand the principles & basic concepts of distributed systems.
2. To understand the concepts of Fault Tolerance and failure recovery of resources in distributed system.
3. To solve problems in distributed Mutual Exclusion using various algorithms and methods.
4. To analyze different Protocols in Distributed Systems.
5. To analyze different distributed system transactions and concurrency controls.

**Nature of Paper: Core**

**Minimum Passing Marks/Credits: 50% Marks/2**

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Program to implement non token based algorithm for Mutual Exclusion | 2 |
| II | Program to implement Lamport's Logical Clock | 2 |
| III | Program to implement edge chasing distributed deadlock detection algorithm. | 2 |
| IV | Program to implement locking algorithm. | 2 |
| V | Program to implement Remote Method Invocation. | 2 |
| VI | Program to implement Remote Procedure Call. | 2 |
| VII | Program to implement Chat Server. | 2 |
| VIII | Program to implement termination detection | 2 |

**Reference / Text Books:**
**Reference/ Text Books:**


1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Computing , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI


If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks:50** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 20<br><br><br><br><br>30 |
| **Total:** | 50 |

**Course Learning Outcomes:**

CO1.Students will get the concepts of Inter-process communication

CO2.Students will get the concepts of Distributed Mutual Exclusion and Distributed Deadlock Detection algorithm.

CO3.To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.

CO4.Student will be able to implement Chat Server.

CO5.Student will be able to implement Lamport's Logical Clock

CO6.Student will be able to distributed deadlock detection algorithm.

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year : IV/Semester :VIII**

| | |
|---|---|
| **Programme:UG**<br>**Class: B.Tech (CSE)** | Year: IV<br>Semester: VIII |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject: Mobile Computing** |
| **Course Code: SDCS-481** | **Title: Mobile Computing** |

**Course Objectives:**

1. Students will be able to explain and discuss issues in mobile computing and illustrate overview of wireless telephony and channel allocation in cellular systems.
2. Students will be able to explore the concept of Wireless Networking and Wireless LAN.
3. Students will be able to analyze and comprehend Data management issues like data replication for mobile computers, adaptive clustering for mobile wireless networks and Disconnected operations.
4. Students will be able to Identify Mobile computing Agents and state the issues pertaining to security and fault tolerance in mobile computing environment.
5. Students will be able to compare and contrast various routing protocols and will identify and interpret the performance of network systems using Adhoc networks.

**Nature of Paper: Elective (Regular)**

**Minimum Passing Marks/Credits: 40% Marks/3**

L: 3
T: 1
P: 0 ( In Hours/Week )
Theory - 3
Practical- 0

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction and issues in mobile computing, Details of wireless telephony: details of cellular concept, GSM details, air-interface in GSM, channel structure in GSM, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, Review of CDMA and GPRS. | 10 |
| II | Overview of wireless networking, Overview of wireless LAN: Medium access control issues, Overview of IEEE802.11, Overview of Bluetooth technology, Overview of wireless multiple access protocols, Comparison of Transmission control protocol over wireless transmission control protocol, Explanation of wireless applications, data broadcasting, Overview of MobileIP.<br>WAP: Architecture, protocol stack, application environment and applications. | 10 |
| III | Discussion of data management issues, Overview of data replication for mobile computers, Overview of adaptive clustering for mobile wireless networks: File system and Disconnected operations. | 10 |
| IV | Concept of mobile agents, Concept of security and fault tolerance and overview of transaction processing in mobile computing environment. | 10 |
| V | AdHoc networks: Issues of localization, overview of medium access control issues, discussion of Routing protocols, Understanding global state routing(GSR),Destination sequenced distance vector routing (DSDV), Dynamic | 10 |

| | | |
|---|---|---|
| | source routing (DSR), Ad Hoc on demand distance vector routing(AODV), Temporary ordered routing algorithm(TORA), Explanation of quality of service in Ad-hoc networks, applications. | |

| **Evaluation/Assessment Methodology** | |
|---|---|
| | **Max. Marks** |
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Assignments | 20 |
| 5) External Theory | 100 |
| **Total:** | 150 |

**Course Learning Outcomes:**

CO1.Discussion of issues in mobile computing and over view of wireless telephony and allocation of channel in cellular networks.
CO2.Walkthrough through the concept of Wireless Networking and Wireless local area networks.
CO3.Data management issues like data replication for mobile computers, adaptive clustering for mobile wireless networks and disconnected operations, analysis and comprehension.
CO4.Identify Mobile computing Agents and state the issues pertaining to security and fault tolerance in mobile computing environment.
CO5.Compare and contrast various routing protocols and will identify and interpret the performance of network systems using Ad-hoc networks.

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year : IV/Semester :VIII**

| | |
|---|---|
| **Programme: UG**<br>**Class: B-Tech CSE** | Year: IV<br>Semester:VIII |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject: INTERNET OF THINGS** |
| **Course Code: SDCS-482** | **Title: Internet of Things** |
| **Course Objectives:** | |
| Vision and introduction to IOT.<br>Understand IOT market perspective.<br>Data and knowledge management and use of devices in IOT technology.<br>Understand the State of the art-IOT Architecture.<br>Understand real world IoT design, constraints, IoT Automation and Comeercial building automation in IoT. | |
| **Nature of Paper: Elective (Regular)** | |
| **Minimum Passing Marks/Credits: 40% Marks/ 3** | |
| L: 3<br>T: 1<br>P: 0 ( In Hours/Week )<br>Theory - 3<br>Practical- 0 | |

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Internet of Things (IoT): Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, IoT sources, M2M Communication, Examples of IoT.<br>Design Principles for Connected Devices: IoT/M2M systems layers, design standardization, communication technologies, data enrichment, consolidation, ease of designing, affordability. | 10 |
| III | Wireless Medium access issues, medium access protocol survey, Survey routing protocols, Sensor deployment, Node discovery, Data aggregation & dissemination. | 10 |
| IV | Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, IoT programming using Arduino. | 10 |
| V | Development Challenges, Security Challenges, Other challenges in IoT Applications: Overview of Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city using IoT. | 10 |

| Evaluation/Assessment Methodology | |
|---|---|
| | **Max. Marks** |
| 1) Class tasks/ Sessional Examination<br>2) Assignments<br>3) External Theory | 30<br>20<br>100 |
| **Total:** | 150 |

**Course Learning Outcomes:**

CO1.Demonstrate basic concepts of IoT, and understand the principles and challenges in IoT implementation.
CO2.Understand the functioning of hardware devices and sensors used in IoT.
CO3.Network communication aspects and protocols used in IoTare part of analysis.
CO4.Apply IoT for developing real life applications using Ardunio programming.
CO5.Development of IoT infrastructure for popular applications.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year : IV/ Semester :VIII**

| | |
|---|---|
| **Programme:UG**<br>**Class: B-Tech (CSE)** | Year: IV<br>Semester: VIII |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject: CLOUD COMPUTING** |
| **Course Code: SDCS-483** | **Title: CLOUD COMPUTING** |

**Course Objectives:**

1. Understand the basic principles of cloud computing.
2. To study the basic technologies that forms the foundations of Big Data.
3. To study the programming aspects of cloud computing with a view to rapid prototyping of complex applications.
4. To understand the specialized aspects of big data including big data application, and big data analytics.
5. To study different types Case studies on the current research and applications of the Hadoop and big data in industry

**Nature of Paper: Elective (Regular)**

**Minimum Passing Marks/Credits: 40% Marks/3**

L: 3
T: 1
P: 0 ( In Hours/Week )
Theory - 3
Practical- 0

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Overview of Cloud Computing, history, definition and evolution, Underlying concept of Parallel and Distributed computing, Cloud Architecture, and its types. Business models built around cloud technology, Case studies of major players in Cloud Computing. Discussion of issues in Clouds, Eucalyptus, Nimbus, Open Nebula, and CloudSim. | 10 |
| II | Overview of Cloud Services, Software as a Service Platform, Infrastructure as a Service, Database as a Service, Monitoring as a Service, communication as services. Discussion of service providers such as Google, Amazon, Microsoft Azure, IBM, Sales force. | 10 |
| III | Collaborating Using Cloud Services such as Email Communication over the Cloud, Project Management, Calendar, Schedules, Word Processing, Presentation, Spreadsheet, Databases, Desktop, Social Networks, customer relationship management and Groupware. | 10 |
| IV | Virtualization, Need, Pros and cons, Types of Virtualization in cloud, System and Process VM, Virtual Machine monitor, machine, Interpretation and binary translation, Overview of HLL VM supervisors, Xen, KVM, VMware, Virtual Box, Hyper-V. | 10 |

| | | |
|---|---|---|
| V | Security in Clouds and challenges, Software as a Service Security, Overview of Common Standards in cloud i.e The Open Cloud Consortium ,The Distributed management Task Force , Standards for application Developers, Standards for Messaging, Standards for Security, End user access to cloud computing, Discussion on Mobile Internet devices and the cloud. Overview of Hadoop, Map Reduce, Virtual Box.<br>Discussion on Google App Engine and Programming Environment for Google App Engine | 10 |

**Reference/ Text Book:**


1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Assignments | 20 |
| 3) External Theory | 100 |
| **Total:** | 150 |

**Course Learning Outcomes:**

CO1.Student must be Able to understand the building blocks of Big Data.
CO2.Student must be able to articulate the programming aspects of cloud computing(map Reduce etc).
CO3.Student must be able to understand the specialized aspects of big data with the help of different big data applications.
CO4.Student must be able to represent the analytical aspects of Big Data.
CO5.Student must be know the recent research trends related to Hadoop File System, MapReduce and Google File System etc.
CO6.Student must be able to understand the Security in Clouds and challenges.

Format-3

**IIMTU-NEP IMPLEMENTATION**
**Year : IV/ Semester :VIII**

| | |
|---|---|
| **Programme:UG**<br>**Class: B.Tech (CSE)** | Year: IV<br>Semester:VIII |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject: Block chain Architecture Design** |
| **Course Code: SDCS-484** | **Title: Block chain Architecture Design** |

**Course Objectives**

1. Understanding the core concepts of Blockchain in details.
2. Impart strong technical understanding of consensus protocols.
3. Develop familiarity of current technologies, tools, and implementation strategies of blockchain
4. Understand use of Hyperledger fabric tool and its implementation.
5. Introduce application areas, current practices, and research activity

**Nature of Paper: Elective (Regular)**

**Minimum Passing Marks/Credits: 40% Marks/3**

L: 3
T: 1
P: 0 ( In Hours/Week )
Theory - 3
Practical- 0

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Overview of block chain, Journey of Digital Money to Distributed Ledgers, Design parameters: Protocols, Security, Consensus, Permissions, Privacy. Architecture and Design of Block chain: Discussion on crypto primitives: Signature and Hash, Journey of Hash chain to Blockchain, Primitive consensus mechanisms | 10 |
| II | Consensus protocol requirements, Proof of Work, Scalability aspects of Blockchain consensus protocols, Permissioned Blockchains Consensus protocols and their design goals. | 10 |
| III | Overview of Hyperledger Fabric and their components, Decomposing the consensus process , Chain code Design and Implementation Hyperledger Fabric, Beyond Chain code fabric SDK and Front End and working of Hyperledger composer tool | 10 |
| IV | Case study of Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance<br>Case study of Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc | 10 |
| V | Case Study of Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain | 10 |

| | |
|---|---|
| **Reference/ Text Book:**<br>1. Mstering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos<br>2. Blockchain by Melanie Swa, O'Reilly<br>3. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric | |
| **Evaluation/Assessment Methodology** | |
| | **Max. Marks** |
| 1) Class tasks/ Sessional Examination<br>2) Assignments<br>3) External Theory | 30<br>20<br>100 |
| **Total:** | 150 |
| | |
| **Course Learning Outcomes:** | |
| CO1.Basic understanding of Blockchain architecture along with its primitive.<br>CO2.Requirements for basic protocol along with scalability aspects.<br>CO3.We design and deploy the consensus process using frontend and backend.<br>CO4.Application of Block chain techniques for different cases like Finance, Trade/Supply and Government activities.<br>CO5.Design and deploy the consensus process using frontend and backend.<br>CO6.Apply Block chain techniques for different use cases like Finance, Trade/Supply and Government activities. | |

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**
**(**ENGINEERING SCIENCE ELECTIVES)**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: IV |
| **Credits**<br>Theory: 4<br>Practical: | **Subject:** Basic Data Structure & Algorithm |
| **Course Code:**SESB-235/245 | **Title:** Basic Data Structure & Algorithm |

**Course Objectives:**

- Acquire some basic mathematical tools and techniques of algorithm analysis.
- To familiarise with basic data structures and to develop the ability to choose the appropriate data structure for designing efficient algorithms.
- Learn some basic algorithms with their rigorous proofs of correctness and efficiency analysis of implementation using appropriate data structures

**Nature of Paper: Engineering Science Elective**

**Minimum Passing Marks/Credits: 40% Marks/4**

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction to data structure and Algorithms: Performance analysis of Algorithm, time complexity, Big-oh notation, Elementary data organization data structure operations, Recurrences, Arrays, Operation on arrays, representation of arrays in memory, single dimensional and Multi dimensional arrays, spare matrices, Character storing in C, String operations. | **8** |
| II | Stack And Queue and Link List: Stack operation, PUSH and POP, Array representation of stacks, Operation associated with stacks Application of stacks, Recursion, Polish experession, Representation Queue, operation on Queue, Priority Queue, D-Queue, Singly and circularly linked list, List operations Lists implementations | **8** |
| III | Trees : Basic terminology, Binary Trees, Binary tree representation, Algebraic/expressions, Complete Binary Trees, Extended binary tree, representing binary tress in memory, linked representation of Binary trees, Traversing binary trees & Searching in binary trees, Inserting in binary search trees, Complexity of searching algorithm, Heaps, general trees, Threaded binary tree. | **8** |
| IV | Graphs: Terminology & representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, adjacency Matrices, Transversal, connected component and spanning trees, Minimum Cost spanning tree, Prims and Kruskal Algorithm, BFS, DFS, Shortest path and transitive closure, Activity networks, topological sort and critical paths. | **8** |
| V | Searching and Sorting: Linear search, binary Search, Internal and External | |

| | | |
|---|---|---|
| | sorting, Bubble sorting, selection sort, Insertion sort, quick sort, Two way merge sort, Heap sort, sorting on different keys, practical consideration for internal sorting, External Sorting, Storage Devices: Magnetic tapes, Disk Storage, Sorting with disks and Indexing techniques, introduction to B tree and B+ tree, File organization and storage management, Introduction to hoisting. | **8** |

**Reference / Text Books:**


1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
3. Weiss, "Data Structure & Algorithm Analysis in C", Addision Wesley.
4. Basse, "computer Algorithms: Introduction to Design & Analysis", Addision Wesley.
5. Lipschutz, "Data structure, "Schaum series.
6. Aho, hopcropt, Ullman, “Data Structure & Algorithm", Addision Wesley.
7. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008


**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br><br>100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.Understand and analyze the time and space complexity of an algorithm
CO2.Understand and implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming)
CO3.Discuss various algorithm design techniques for developing Algorithms
CO4.Discuss various searching, sorting and graph traversal Algorithms
CO5.Understand operation on Queue , Priority Queue , D-Queue.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**
**(**ENGINEERING SCIENCE ELECTIVES)**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | Year: II<br>Semester: IV |
| **Credits**<br>Theory: 4<br>Practical: | **Subject:** Introduction to Soft Computing |
| **Course Code:** SESB-236/246 | **Title:** Introduction to Soft Computing |
| **Course Objectives:**<br>NA | |
| **Nature of Paper: Engineering Science Elective** | |
| **Minimum Passing Marks/Credits: 40% Marks/4** | |
| L:3 T:1 P:3(In Hours/Week)<br>Theory - 1 Hr. = 1 Credit<br>Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits) | |

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Introduction to Soft Computing,<br>ARTIFICIAL NEURAL NETWORKS<br>Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self-organizing networks - Hopfield network. | **8** |
| II | FUZZY SYSTEMS<br>Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making. | **8** |
| III | NEURO - FUZZY MODELING<br>Adaptive networks based Fuzzy interface systems - Classification and Regression Trees – Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing – Evolutionary computation | **8** |
| IV | GENETIC ALGORITHMS<br>Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method | **8** |
| V | APPLICATION OF SOFT COMPUTING<br>Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB<br>Environment for Soft computing Techniques | **8** |

**Reference / Text Books:**


1. An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)
2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer ( Springer)

3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4. Neural Networks and Learning Machines Simon Haykin (PHI)
5. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
6. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
7. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
8. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
9. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
10. Wang, "Fuzzy Logic", Springer

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br><br>100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

CO1.Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.

CO2.Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning,fuzzy inference systems, and fuzzy logic

CO3.Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self learning situations.

CO4.Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.

CO5.Develop some familiarity with current research problems and research methods in Soft Computing Techniques

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**
**(**ENGINEERING SCIENCE ELECTIVES)**

| | |
|---|---|
| **Programme: UG**<br>**Class:** B.TECH (CSE) | Year: II<br>Semester: IV |
| **Credits**<br>Theory: 4<br>Practical: 0 | **Subject:** Energy Science and Engineering |
| **Course Code:**SESB-233 | **Title:** Energy Science and Engineering |

**Course Objectives:**

1. To develop a strong foundation of concept of Energy and its units
2. To familiarize with Conventional & non-conventional energy source.
3. To introduce the various Systems and Synthesis.

**Nature of Paper: ESE**

**Minimum Passing Marks/Credits: 40% Marks/4**

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Energy and its Usage: Units and scales of energy use, Mechanical energy and transport, Heat energy: Conversion between heat and mechanical energy, Electromagnetic energy: Storage, conversion, transmission and radiation, Introduction to the quantum, energy quantization, Energy in chemical systems and processes, flow of CO2, Entropy and temperature, carnot and Stirling heat engines, Phase change energy conversion, refrigeration and heat pumps, Internal combustion engines, Steam and gas power cycles, the physics of power plants. Solid-state phenomena including photo, thermal and electrical aspects | **8L** |
| II | **Nuclear Energy:** Fundamental forces in the universe, Quantum mechanics relevant for nuclear physics, Nuclear forces, energy scales and structure, Nuclear binding energy systematics, reactions and decays, Nuclear fusion, Nuclear fission and fission reactor physics, Nuclear fission reactor design, safety, operation and fuel cycles. | **8L** |
| III | **Solar Energy:** Introduction to solar energy, fundamentals of solar radiation and its measurement aspects, Basic physics of semiconductors, Carrier transport, generation and recombination in semiconductors, Semiconductor junctions: metal-semiconductor junction & p-n junction, Essential characteristics of solar photovoltaic devices, First Generation Solar Cells, Second Generation Solar Cells, Third Generation Solar Cells | **8L** |
| IV | **Conventional & non-conventional energy source:** Biological energy sources and fossil fuels, Fluid dynamics and power in the wind, available resources, fluids, viscosity, types of fluid flow, lift, Wind turbine dynamics and design, wind farms, Geothermal power and ocean thermal energy conversion, | **8L** |

| | | |
|---|---|---|
| | Tidal/wave/hydro power. | |
| V | **Systems and Synthesis:** Overview of World Energy Scenario, Nuclear radiation, fuel cycles, waste and proliferation, Climate change, Energy storage, Energy conservation. Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts, LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption | **8L** |

**Reference/Text Books**


1. Energy and the Challenge of Sustainability, World Energy Assessment, UNDP, New York, (2000).
2. Perspective of Modern Physics, A. Beiser, McGraw-Hill International Editions (1968).
3. Introduction to Modern Physics, H.S. Mani and G.K.Mehta, East-West Press (1988).
4. Introduction to Electrodynamics, D. J. Griffiths, Fourth Edition, Prentice Hall (2013).
5. Introductory Nuclear Physics, R. K. Puri and V.K. Babbar, Narosa Publishing House (1996).
6. Physics of Solar Cells: From Basic Principles to Advanced Concepts by Peter Wurfel, John Wiley & Sons, 2016
7. Principles of Solar Engineering, D.Y. Goswami, F.Kreith and J.F. Kreider, Taylor and Francis, Philadelphia, 2000.


If the course is available as Generic Elective then the students of following departments may opt it.
NO

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | |
| 3) Assignments | |
| 4) Research Project Report Seminar On Research Project Report | 20 |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course:

**Course Learning Outcomes:**

**CO1** Understand the concept of Energy and its Usage
**CO2** Understand the concept of Nuclear Energy**.**
**CO3** Understand the concept of solar Energy
**CO4** Understand the Principles of Conventional & non-conventional energy source
**CO5** Principles of various Systems and Synthesis

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**
**(**ENGINEERING SCIENCE ELECTIVES)**

| | |
|---|---|
| **Programme:UG**<br>**Class: B.Tech (CSE)** | **Year: II**<br>**Semester: IV** |
| **Credits**<br>**Theory: 4**<br>**Practical: 0** | **Subject: Sensor and Instrumentation** |
| **Course Code:** | **SESB-234** |

**Course Objectives:** The objectives of studying this course are,

1. Apply the use of sensors for measurement of displacement, force and pressure.
2. Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.

**Nature of Paper: ESE**

**Minimum Passing Marks/Credits: 40% Marks /4**

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder, and Measurement of **pressure** using LVDT based diaphragm & piezoelectric sensor. | 09 |
| II | Measurement of temperature using Thermistor, Thermocouple & RTD, Concept of thermal imaging, Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive. | 09 |
| III | Virtual Instrumentation: Graphical programming techniques, Data types, Advantage of Virtual Instrumentation techniques, Concept of WHILE & FOR loops, Arrays, Clusters & graphs, Structures: Case, Sequence & Formula nodes, Need of software based instruments for industrial automation. | 09 |
| IV | Data Acquisition Methods: Basic block diagram, Analog and Digital IO, Counters, Timers, Types of ADC: successive approximation and sigma-delta, Types of DAC: Weighted Resistor and R-2R Ladder type, Use of Data Sockets for Networked Communication. | 09 |
| V | Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control. | 09 |

| | |
|---|---|
| If the course is available as Generic Elective then the students of following departments may opt it.<br>**Not applicable** | |
| **Evaluation/Assessment Methodology** | |
| | **Max. Marks** |
| 1) Class tasks/ Sessional Examination<br>2) Presentations /Seminar<br>3) Assignments<br>4) Research Project Report<br>Seminar On Research Project Report<br>5) ESE | 30<br><br><br>20<br>--<br>100 |
| **Total:** | 150 |
| Prerequisites for the course: | |
| **Course Learning Outcomes:**<br>After undergoing this course, the students will be able to: | |
| CO1.Apply the use of sensors for measurement of displacement, force and pressure.<br>CO2.Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.<br>CO3.Demonstrate the use of virtual instrumentation in automation industries.<br>CO4.Identify and use data acquisition methods.<br>CO5.Comprehend intelligent instrumentation in industrial automation. | |

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**
**(**ENGINEERING SCIENCE ELECTIVES)**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech (CSE)** | **Year:II**<br>**Semester: IV** |
| **Credits**<br>**Theory: 4**<br>**Practical:** | **Subject: Electronics Engineering** |
| **Course Code:SESB-238** | **Title: Digital Electronics** |

**Course Objectives:** The students will learn

- To develop a strong foundation in analysis, design and implementation of electronic circuits To present the electronics applications in diode systems
- learn Bipolar junction transistors and its applications
- Understand Operational amplifiers.
- Understand Electronic instrumentation and measurements.

**Nature of Paper: ESE**

**Minimum Passing Marks/Credits: 40% Marks/ 4**

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | PN junction diode: Introduction of semiconductor materials; Semiconductor diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, diode equivalent circuits, transition and diffusion capacitance, Zener diodes breakdown mechanism (Zener and | (L-9) |
| II | Diode application: Series, parallel and series, parallel diode configuration, half and full wave rectification, clippers, clampers, Zener diode as shunt regulator, voltage-multiplier circuits special purpose two terminal devices : | (L-9) |
| III | Bipolar junction transistors and field effect transistor: Bipolar junction transistor: Transistor construction, operation, amplification action, common base, common emitter, common collector configuration dc biasing BJTs: operating point, fixed-bias, emitter bias, voltage-divider bias configuration. Collector feedback, emitter-follower configuration. Bias | (L-9) |
| IV | Operational amplifiers: Introduction and block diagram of Op-Amp, ideal & practical characteristics of Op-Amp, differential amplifier circuits, practical Op-Amp circuits (inverting amplifier, non-inverting amplifier, unity gain amplifier, summing amplifier, integrator, And differentiator), Op- Amp parameters: input offset voltage, output offset voltage, input biased current, input offset current differential and common-mode operation. | (L-9) |

| | | |
|---|---|---|
| V | Electronic instrumentation and measurements: Digital voltmeter: Introduction, RAMP techniques digital multimeters: Introduction Oscilloscope: introduction, basic principle, CRT, block diagram of oscilloscope, simple, measurement of voltage, current phase and frequency using CRO, introduction of digital storage oscilloscope and comparison of DSO with analog oscilloscope. | (L-9) |

**Reference / Text Books:**


1. Robert L. Boylestand / Louis Nashelsky, "Electronic Devices and Circuit Theory," Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication.
3. Meetidehran/ A.K. singh "fundamental of electronics Engineering", New age international publisher.


If the course is available as Generic Elective then the students of following departments may opt it.
- NA

**Evaluation/Assessment Methodology**

| **Max. Marks** | |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | NA |
| 3) Assignments | 20 |
| 4) Research Project Report<br>Seminar On Research Project Report | NA |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course: NA

**Course Learning Outcomes:**

At the end of this course students will demonstrate the ability to:

CO1.Understand the concept of PN junction and special purpose diodes.

CO2.Study the application of conventional diode and semiconductor diode.

CO3.Analyse the I-V characteristics of BJT and FET.

CO4.Analyzethe of Op-Amp, amplifiers, integrator, and differentiator.

CO5.Understand the concept of digital storage oscilloscope and compare of DSO with analog oscillo scope.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year II / Semester IV**
**(**ENGINEERING SCIENCE ELECTIVES)**

| | |
|---|---|
| **Programme: UG**<br>**Class: B.Tech (CSE)** | **Year:II**<br>**Semester: IV** |
| **Credits**<br>**Theory: 4**<br>**Practical:00** | **Subject: Digital Electronics** |
| **Course Code:SESB-239** | **Title: Digital Electronics** |

**Course Objectives:** The students will learn

1. To develop a strong foundation in analysis, design and implementation of digital electronic circuits
2. To present the Digital fundamentals, Boolean algebra and its applications in digital systems
3. To familiarize with the design of various combinational digital circuits using logic gates
4. To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
5. To introduce the fundamentals of digital logic families.

**Nature of Paper:** Core

**Minimum Passing Marks/Credits: 40% Marks/ 4**

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | **Digital System and Binary Numbers**: Number System and its arithmetic, Signed binary numbers, Binary codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc Clusky method (Tabular method). | (L-9) |
| II | Combinational Circuits: Analysis & Design procedure, Binary Adder, Subtractor, n-bit parallel Adder & Subtractor, Magnitude Comparator, Multiplexers, Demultiplexer, Decoders, Encoders. | (L-9) |
| III | Sequential Logic: Flip-flop and Latch, SR latch, JK flip-flop, T flip-flop, D flip-flop, Master-slave JK flip-flop, Flip Flop Conversion, Registers & Counters: Shift registers (SISO, SIPO, PISO, PIPO), Counters: Asynchronous/Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter. | (L-9) |
| IV | Digital Logic Families: DTL, TTL, ECL & Metal Oxide Semiconductor logic families: N- MOS, P-MOS and CMOS logic circuits, Fan Out, Fan in, Noise Margin. | (L-9) |
| V | **Memory & Programmable Logic Devices:** RAM, ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL), Programmable Logic Array (PLA), Circuit Implementation using ROM, PLA and PAL. | (L-9) |

**Reference / Text Books:**


1. *M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.*
2. *David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.*
3. *RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.*
4. *Charles H Roth (Jr), Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning India Edition, 5th Edition, 2010.*


If the course is available as Generic Elective then the students of following departments may opt it.
- NA

**Evaluation/Assessment Methodology**

| **Max. Marks** | |
|---|---|
| 1) Class tasks/ Sessional Examination | 30 |
| 2) Presentations /Seminar | NA |
| 3) Assignments | 20 |
| 4) Research Project Report<br>Seminar On Research Project Report | NA |
| 5) ESE | 100 |
| **Total:** | 150 |

Prerequisites for the course: NA

**Course Learning Outcomes:**

After completing the course, students should be able to:

CO1.Understand the concept of number system, Logic Gates, Boolean algebra, K-map and Quine Mclusky method

CO2.Design combinational and sequential logic circuits and their applications

CO3.Understand concepts of Synchronous & Asynchronous Sequential Circuits

CO4.Understand the idea of Digital Logic Families, memory and Programmable Logic Devices

CO5.To develops a strong foundation in analysis, design and implementation of digital electronic circuits.

CO6.To introduce the fundamentals of digital logic families.

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year: II / Semester: IV**
**(**ENGINEERING SCIENCE ELECTIVES)**

| | |
|---|---|
| **Programme: UG**<br>**Class: B-Tech (CSE)** | **Year: II**<br>**Semester: IV** |
| **Credits**<br>**Theory: 3**<br>**Practical: 0** | **Subject: Material Science** |
| **Course Code:** | **SEME-231** |

**Course Objectives:** The objectives of studying this course are,

1. To reinstate the Solid solutions – Hume Rothery's rules – the phase rule – single component system
2. To focus on iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels
3. To lay down Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip
4. To suggest Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials
5. To indicate Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics
6. To suggest shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy

**Nature of Paper: Engineering Science Elective**

**Minimum Passing Marks/Credits: 40% Marks /4**

L: 3
T: 0
P: 0(In Hours/Week)
Theory - 0
Practical- NIL

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Phase Diagrams: Solid solutions – Hume Rothery's rules – the phase rule – single component system – one-component system of iron – binary phase diagrams – isomorphous systems – the tie-line rule – the lever rule – application to isomorphous system – eutectic phase diagram – peritectic phase diagram – other invariant reactions – free energy composition curves for binary systems – microstructural change during cooling. | 09 |
| II | Ferrous Alloys: The iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels – eutectoid steel, hypo and hypereutectoid steels – effect of alloying elements on the Fe-C system – diffusion in solids – Fick's laws – phase transformations – T-T-T-diagram for eutectoid steel – pearlitic, baintic and martensitic transformations – tempering of martensite – steels – stainless steels – cast irons. | 09 |
| III | Mechanical Properties: Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip – strengthening methods – strain hardening – refinement of the grain size – solid solution strengthening – | 09 |

| | | |
|---|---|---|
| | precipitation hardening – creep resistance – creep curves – mechanisms of creep – creep-resistant materials – fracture – the Griffith criterion – critical stress intensity factor and its determination – fatigue failure – fatigue tests – methods of increasing fatigue life – hardness – Rockwell and Brinell hardness – Knoop and Vickers microhardness. | |
| IV | Magnetic, Dielectric & Superconducting Materials: Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites – dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization – dielectric breakdown – insulating materials – Ferroelectric materials – superconducting materials and their properties. | 09 |
| V | New Materials: Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics – metallic glasses: types , glass forming ability of alloys, melt spinning process, applications – shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications – carbon nanotubes: types. | 09 |

If the course is available as Generic Elective then the students of following departments may opt it.
**Not applicable**

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1. Class tasks/ Sessional Examination | 30 |
| 2. Presentations /Seminar | |
| 3. Assignments | 20 |
| 4. Research Project Report | |
| 5. Seminar On Research Project Report | -- |
| 6. ESE | 100 |
| **Total:** | **150** |

Prerequisites for the course:

**Course Learning Outcomes:** After undergoing this course, the students will be able to:
CO1.The learning process for holistic development
CO2.Impeccable governance
CO3.Effective institutional management
CO4.Well laid system of rewards and chastisement
CO5.Institutional climate where ‘rights’ enjoy and ‘wrongs’ are discouraged.
CO6.Understand Harmony in the Nature and Existence

**Format-3**

**IIMTU-NEP IMPLEMENTATION**
**Year: II / Semester: IV**
**(**ENGINEERING SCIENCE ELECTIVES)**

| | |
|---|---|
| **Programme: UG**<br>**Class: B. Tech (CSE)** | **Year: II**<br>**Semester: IV** |
| **Credits**<br>**Theory: 3**<br>**Practical: 0** | **Subject: Engineering Mechanics** |
| **Course Code:** | **SESB-231/241** |

**Course Objectives:** The objectives of studying this course are,

1. To reinstate Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel positionthe Solid solutions – Hume Rothery's rules – the phase rule – single component system
2. To focus on shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams.
3. To lay down Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem.
4. To suggest plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.
5. To indicate normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants.

**Nature of Paper: Engineering Science Elective**

**Minimum Passing Marks/Credits: 40% Marks /4**

L: 3
T: 0
P: 0(In Hours/Week)
Theory - 0
Practical- NIL

| Unit | Contents | No. of Lectures Allotted |
|---|---|---|
| I | Two-dimensional force systems: Basic concepts, Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, distribution of force systems, free body diagrams, equilibrium and equations of equilibrium. Friction: Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction. | 09 |
| II | Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams. Trusses: Introduction, simple truss and solution of simple truss, methods of F-joint and methods of sections. | 09 |
| III | Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem, principle moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere, and cone about their axis of symmetry. | 09 |

| | | |
|---|---|---|
| IV | Kinematics of rigid body: Introduction, plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity. Kinetics of rigid body: Introduction, force, mass and acceleration, work and energy, impulse and momentum, D'Alembert's principle and dynamic equilibrium. | 09 |
| V | Simple stress and strain: Introduction, normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants, one-dimensional loading of members of varying cross sections, strain energy. Pure bending of beams: Introduction, simple bending theory, stress in beams of different cross sections. Torsion: Introduction, torsion of shafts of circular cross sections, torque and twist, shear stress due to torque. | 09 |

If the course is available as Generic Elective then the students of following departments may opt it.
**Not applicable**

**Evaluation/Assessment Methodology**

| | **Max. Marks** |
|---|---|
| 1. Class tasks/ Sessional Examination | 30 |
| 2. Presentations /Seminar | |
| 3. Assignments | 20 |
| 4. Research Project Report | |
| 5. Seminar On Research Project Report | -- |
| 6. ESE | 100 |
| **Total:** | **150** |

Prerequisites for the course:

**Course Learning Outcomes:** After undergoing this course, the students will be able to:
CO1. The learning process for holistic development
CO2.Impeccable governance
CO3.Effective institutional management
CO4.Well laid system of rewards and chastisement
CO5.Institutional climate where 'rights' enjoy and 'wrongs' are discouraged.
CO6.Understand Harmony in the Nature and Existence